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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
19/599,154

RECEIPT DATE / TIME
06/18/2026 05:00:07 PM Z ET

ATTORNEY DOCKET #
3449-5834PUS1

Title of Invention

REFRIGERATOR

Application Information

APPLICATION TYPE	Utility - U.S. National Stage under 35 USC 371	PATENT #	-
CONFIRMATION #	7630	FILED BY	Oanh Dong
PATENT CENTER #	77613166	FILING DATE	-
CUSTOMER #	2292	FIRST NAMED INVENTOR	Heejun LEE
INTL. APPLICATION #	PCT/KR2024/020822	INTL. FILING DATE	12/20/2024
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	James Eller

Documents

TOTAL DOCUMENTS: 20

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2026-06-18_ADS_3449-5834PUS1.pdf	10	Application Data Sheet	1813 KB
2026-06-18_DECasfiled_3449-5834PUS1.pdf	6	Oath or Declaration filed	1219 KB
2026-06-18_DrawingsAsfiled_3449-5834PUS1.pdf	22	Drawings-only black and white line drawings	4079 KB
2026-06-18_PCTISA210_3449-5834PUS1.pdf	6	Non Patent Literature	193 KB
2026-06-18_PCTISA237_3449-5834PUS1.pdf	6	Non Patent Literature	197 KB

2026-06-18_SPECasfiled_3449-5834PUS1.pdf		34	-	192 KB
2026-06-18_SPECasfiled_3449-5834PUS1-SPEC.pdf	(1-27)	27	Specification	177 KB
2026-06-18_SPECasfiled_3449-5834PUS1-CLM.pdf	(28-33)	6	Claims	108 KB
2026-06-18_SPECasfiled_3449-5834PUS1-ABST.pdf	(34-34)	1	Abstract	99 KB
2026-06-18_NewAppFilingDocs_3449-5834PUS1.pdf		17	-	942 KB
2026-06-18_NewAppFilingDocs_3449-5834PUS1-TRNA.pdf	(1-4)	4	Transmittal of New Application	299 KB
2026-06-18_NewAppFilingDocs_3449-5834PUS1-PA...pdf	(5-7)	3	Power of Attorney	494 KB
2026-06-18_NewAppFilingDocs_3449-5834PUS1-A.PE.pdf	(8-8)	1	Preliminary Amendment	82 KB
2026-06-18_NewAppFilingDocs_3449-5834PUS1-SPEC.pdf	(9-9)	1	Specification	82 KB
2026-06-18_NewAppFilingDocs_3449-5834PUS1-REM.pdf	(10-10)	1	Applicant Arguments/Remarks Made in an Amendment	82 KB
2026-06-18_NewAppFilingDocs_3449-5834PUS1-TRAN.LET.pdf	(11-16)	6	Transmittal Letter	137 KB
2026-06-18_NewAppFilingDocs_3449-5834PUS1-IDS.pdf	(17-17)	1	Information Disclosure Statement (IDS) Form (SB08)	110 KB
FOR_1-KR101151618.pdf		16	Foreign Reference	1875 KB
FOR_2-KR1020090076555.pdf		17	Foreign Reference	1743 KB
FOR_3-CN112943029.pdf		24	Foreign Reference	1787 KB
FOR_4-JP2014214893.pdf		63	Foreign Reference	6414 KB
FOR_5-JP2016011797.pdf		15	Foreign Reference	499 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
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2026-06-18_NewAppFilingDocs _3449-5834PUS1-IDS.pdf	CBF0936F5606224F712915770B0929AA4CFC59177CCE3D8BE F252E88C17010F8AFB65DDFB70E6F84581C62EAF5D33D29 7383D5510AF195FFD89547BA9A6EC3E
FOR_1-KR101151618.pdf	3DD0F3C0CE55723A8D054D2FBA4860559BCC6BA114EEB640 65BCD1863CF74DF7C1E46643B48919BA8CC2E4992DADE99D 775D4FBA07E7465EE55479464AC64989
FOR_2-KR1020090076555.pdf	079C312B31FEDB025FFBF0AC4167BFD249B84BC8E2E8F440 0B861148A2241FC1A727231AD6FD9C9D962103EEB4A3D4D84 B1834D830A53DB9001F405507426203
FOR_3-CN112943029.pdf	80296D0A10C619D539688C3FE088F33272918F831238BD2AE9 BEADCD0BD15E4BB94CAA6A4669DDF96626B920376E00C04F DD4E919C01BC541EE3714C26C17F4A
FOR_4-JP2014214893.pdf	926D219AC2F0CF8C96D588737FF2FB14AD3768A5EB2B6A1F0 508DA56A4C82FA5589493ED757A72CEC4845139E2DDC166E E9A955123EE68DDDE66FD429B996A2C
FOR_5-JP2016011797.pdf	997550D6D1C598FF3F826607E37A8839F633101B1A48C91F80 F8FDF6779032327923D51DDFBC249195867E69569CA47B4E9 9D4D6238E9771EE4EB76220216AA0

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
19/599,154	06/18/2026 05:00:07 PM Z ET	3449-5834PUS1

Title of Invention

REFRIGERATOR

Application Information

APPLICATION TYPE	Utility - U.S. National Stage under 35 USC 371	PATENT #	-
CONFIRMATION #	7630	FILED BY	Oanh Dong
PATENT CENTER #	77613166	AUTHORIZED BY	James Eller
CUSTOMER #	2292	FILING DATE	-
INTL. APPLICATION #	PCT/KR2024/020822	INTL. FILING DATE	12/20/2024
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Heejun LEE

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
DA / 022448	E20266HH01248831	Oanh Dong
PRE-AUTHORIZED ACCOUNT	PRE-AUTHORIZED CATEGORY	
022448	37 CFR 1.492 (National application filing, search, and examination fees)	

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1631	BASIC NATIONAL STAGE FEE	350.00	1	350.00
1642	NATIONAL STAGE SEARCH FEE - SEARCH REPORT PREPARED AND PROVIDED TO USPTO	580.00	1	580.00
1633	NATIONAL STAGE EXAMINATION FEE - ALL OTHER SITUATIONS	880.00	1	880.00
			TOTAL AMOUNT:	\$1,810.00

by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	3449-5834PUS1
		Application Number	
Title of Invention	REFRIGERATOR		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
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Inventor Information:

Inventor 1					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Heejun		LEE		
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service					
City	Seoul		Country of Residence ⁱ	KR	
Mailing Address of Inventor:					
Address 1		IP Center, LG Electronics Inc.			
Address 2		51, Gasan digital 1-ro, Geumcheon-gu			
City	Seoul		State/Province		
Postal Code	08592		Country ⁱ	KR	
Inventor 2					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Jinho		CHANG		
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service					
City	Seoul		Country of Residence ⁱ	KR	
Mailing Address of Inventor:					
Address 1		IP Center, LG Electronics Inc.			
Address 2		51, Gasan digital 1-ro, Geumcheon-gu			
City	Seoul		State/Province		
Postal Code	08592		Country ⁱ	KR	
Inventor 3					Remove
Legal Name					

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	3449-5834PUS1
		Application Number	
Title of Invention	REFRIGERATOR		

Prefix	Given Name	Middle Name	Family Name	Suffix
	Seongwon		GWON	
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service				
City	Seoul	Country of Residence ⁱ	KR	

Mailing Address of Inventor:				
Address 1	IP Center, LG Electronics Inc.			
Address 2	51, Gasan digital 1-ro, Geumcheon-gu			
City	Seoul	State/Province		
Postal Code	08592	Country ⁱ	KR	
Inventor 4				Remove
Legal Name				

Prefix	Given Name	Middle Name	Family Name	Suffix
	Yoongho		JUNG	
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service				
City	Busan	Country of Residence ⁱ	KR	

Mailing Address of Inventor:				
Address 1	2, Busandaehak-ro 63beon-gil, Geumjeong-gu			
Address 2				
City	Busan	State/Province		
Postal Code	46241	Country ⁱ	KR	
Inventor 5				Remove
Legal Name				

Prefix	Given Name	Middle Name	Family Name	Suffix
	Sanghu		PARK	
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service				
City	Busan	Country of Residence ⁱ	KR	

Mailing Address of Inventor:				
Address 1	2, Busandaehak-ro 63beon-gil, Geumjeong-gu			
Address 2				
City	Busan	State/Province		
Postal Code	46241	Country ⁱ	KR	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	3449-5834PUS1
		Application Number	
Title of Invention	REFRIGERATOR		

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.

Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ An Address is being provided for the correspondence Information of this application.

Customer Number	2292		
Email Address	mailroom@bskb.com	Add Email	Remove Email

Application Information:

Title of the Invention	REFRIGERATOR		
Attorney Docket Number	3449-5834PUS1	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	22	Suggested Figure for Publication (if any)	3

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	3449-5834PUS1
		Application Number	
Title of Invention	REFRIGERATOR		
Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	2292		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	a 371 of international	PCT/KR2024/020822	2024-12-20
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Remove
10-2023-0189307	KR	2023-12-22	Access Code ⁱ (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

- ☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
- NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	3449-5834PUS1
		Application Number	
Title of Invention	REFRIGERATOR		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide any foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	3449-5834PUS1
		Application Number	
Title of Invention	REFRIGERATOR		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.			
Applicant 1			
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.			
Clear			
☒ Assignee		☐ Legal Representative under 35 U.S.C. 117	
		☐ Joint Inventor	
☐ Person to whom the inventor is obligated to assign.		☐ Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor:			
If the Applicant is an Organization check here. ☒			
Organization Name	LG ELECTRONICS INC.		
Mailing Address Information For Applicant:			
Address 1	128, Yeoui-daero, Yeongdeungpo-gu		
Address 2			
City	Seoul	State/Province	
Country	KR	Postal Code	07336
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button.			

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	3449-5834PUS1
		Application Number	
Title of Invention	REFRIGERATOR		

Applicant 2			
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section. Clear			
☒ Assignee		☐ Legal Representative under 35 U.S.C. 117	☐ Joint Inventor
☐ Person to whom the inventor is obligated to assign.		☐ Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor:			
If the Applicant is an Organization check here. ☒			
Organization Name	PUSAN NATIONAL UNIVERSITY INDUSTRY-UNIVERSITY COOPERATION FOUNDATION		
Mailing Address Information For Applicant:			
Address 1	2, Busandaehak-ro 63beon-gil, Geumjeong-gu		
Address 2			
City	Busan	State/Province	
Country	KR	Postal Code	46241
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button.			

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.
If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	3449-5834PUS1
		Application Number	
Title of Invention	REFRIGERATOR		

Organization Name	LG ELECTRONICS INC.
-------------------	---------------------

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1		128, Yeoui-daero, Yeongdeungpo-gu	
Address 2			
City		Seoul	State/Province
Country ⁱ	KR	Postal Code	07336
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Assignee 2

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

Organization Name	PUSAN NATIONAL UNIVERSITY INDUSTRY-UNIVERSITY COOPERATION FOUNDATION
-------------------	--

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1		2, Busandaehak-ro 63beon-gil, Geumjeong-gu	
Address 2			
City		Busan	State/Province
Country ⁱ	KR	Postal Code	46241
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	3449-5834PUS1
		Application Number	
Title of Invention	REFRIGERATOR		

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/James T. Eller, Jr./		Date (YYYY-MM-DD)	2026-06-18	
First Name	James T.	Last Name	ELLER, Jr.	Registration Number	39538

Additional Signature may be generated within this form by selecting the Add button.

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013), <https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf>.

Routine uses of the information in this record may include disclosure to: 1) law enforcement, in the event that the system of records indicates a violation or potential violation of law; 2) a federal, state, local, or international agency, in response to its request; 3) a contractor of the USPTO having need for the information in order to perform a contract; 4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record; 5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record; 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations; 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals; 8) another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)); 9) the Office of Personnel Management (OPM) for personnel research purposes; and 10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371		Attorney Docket No. 3449-5834PUS1
		U. S. Application No. (if known, see 37 CFR 1.5) NEW
International Application No. PCT/KR2024/020822	International Filing Date December 20, 2024	Priority Date Claimed December 22, 2023
Title of Invention REFRIGERATOR		
First Named Inventor Heejun LEE		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and information. 1. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). NOTE: The express request under 35 U.S.C. 371(f) will not be effective unless all of the requirements referred to in Items 2-5 below have been satisfied. <u>35 U.S.C. 371(c)(1), (c)(2), and (c)(4) Requirements</u> 2. ☒ The basic national fee (35 U.S.C. 371(c)(1)) 3. A copy of the International Application (35 U.S.C. 371(c)(2))* a. ☒ not attached because the International Application was published by the International Bureau and/or was filed with the United States Receiving Office (RO/US). b. ☐ attached hereto because the International Application was neither published by the International Bureau nor filed with the RO/US. The copy of the International Application must include the Request, description, claims, abstract, and any drawings. NOTE: If the International Application contains a sequence listing part of the description in computer readable form, Item 6. a. is required. *Not required if the International Application was published by the International Bureau or was filed with the RO/US. In such case, the Office will use the description, claims, abstract and any drawings from the published application or filed with the RO/US (if not published) for the U.S. national stage application under 35 U.S.C. 371. 4. An English translation of the International Application (35 U.S.C. 371(c)(2)) a. ☒ attached hereto. NOTE: If the International Application contains a sequence listing in computer readable form, Item 6. b. may be required. b. ☐ not attached because the International Application was filed or published in English. c. ☐ not attached because the translation was previously filed during the international phase under 35 U.S.C. 154(d)(4). 5. An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)) a. ☒ attached hereto. b. ☐ previously filed during international phase under PCT Rule 4.17(iv). <u>Sequence Listing</u> 6. A sequence listing in computer readable form (i.e. ST.25 textfile where the international filing date is before July 1, 2022, or ST.26 XML file where the international filing date is on or after July 1, 2022) provided as: ST.25 text ST.26 XML a. ☐ ☐ Part of the copy of the International Application, under 35 U.S.C. 371(f) for express entry prior to publication of the International Application by the International Bureau (37 U.S.C. 371(c)(2)). b. ☐ ☐ A translation into English of the sequence listing part of the description of the International Application (37 U.S.C. 371(c)(2)). c. ☐ ☐ A preliminary amendment to add a "Sequence Listing XML" under 37 CFR 1.835(a), where the International Application does not comprise a sequence listing, or to replace the sequence listing contained in the International Application, under 37 CFR 1.835(b). d. ☐ ☐ A preliminary amendment to add a "Sequence Listing" in text format under 37 CFR 1.825(a), where the International Application does not comprise a sequence listing, or to replace the sequence listing (text format) contained in the International Application, under 37 CFR 1.825(b). e. ☐ ☐ A "Sequence Listing" in text format under 37 CFR 1.821(e) only for search purposes, which is a copy of sequence listing in PDF (image) format contained as a separate part of the description in the International Application.		

This collection of information is required by 37 CFR 1.414 and 1.491-1.492. The information is required to obtain or retain a benefit by the public, which is to file. A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0021. Public burden for this form is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PCT Article 19 and 34 amendments

7. ☐ Amendment to the claims under PCT Article 19 (not required if published by the International Bureau) (35 U.S.C. 371(c)(3)).
8. ☐ English translation of the PCT Article 19 amendment (35 U.S.C. 371(c)(3)).
9. ☐ English translation of Article 19 and/or 34 amendments (i.e. annexes to the International Preliminary Examination Report) (35 U.S.C. 371(c)(5)).
10. A request to cancel amendments made during international phase.
- a. ☐ Do not enter the amendment made in the international phase under PCT Article 19.
- b. ☐ Do not enter the amendment made in the international phase under PCT Article 34.

NOTE: A proper amendment made in English under Article 19 or 34 will be entered in the U.S. national phase application absent a clear instruction from applicant not to enter the amendment(s).

Additional documents

11. ☒ A preliminary amendment.
12. ☐ A substitute specification. NOTE: A substitute specification cannot include claims. See 37 CFR 1.125(b).
13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☒ An Application Data Sheet under 37 CFR 1.76.
15. ☐ Applicant hereby requests that the name of the applicant be corrected or updated under 37 CFR 1.46(c)(1). An Application Data Sheet (ADS) in accordance with 37 CFR 1.76(c) with the corrected or updated information is included. Note: Requests under 37 CFR 1.46(c)(1) may be filed to correct typographical errors in the name of the § 1.46 applicant, or for updating the name of the § 1.46 applicant (i.e., where there is no change in the applicant itself but just in the applicant's name). See the Manual of Patent Examining Procedure (MPEP) section 605.01 and 1893.01(b).
16. ☐ Applicant hereby requests that the applicant be changed under 37 CFR 1.46(c)(2). An application data sheet (ADS) in accordance with 37 CFR 1.76(c) identifying the change and a Statement Under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) are included. See MPEP 605.01, 1893.01(b) and 325.
17. ☒ A power of attorney and/or change of address letter.
18. ☐ Assignment papers (*cover sheet and document(s)*). Name of Assignee: _____
19. ☐ 37 CFR 3.73(c) Statement (*when there is an Assignee*).
20. ☒ Other items or information:

Drawings - 22 sheets; PTO/AIA/82A Transmittal; PCT/ISA/210 and PCT/ISA/237

NOTE: Where an appropriate time limit under 37 CFR 1.495 has not been met, a petition to revive (37 CFR 1.137(a)) must be filed in the national phase application and granted to restore the International Application to pending status.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

FEE CALCULATION		Fee Amounts
21. ☒ Basic national fee (37 CFR 1.492(a)).....	\$350	\$ 350.00
22. ☒ Examination fee (37 CFR 1.492(c))		\$ 880.00
- If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates that all claims satisfy provisions of PCT Article 33(1)-(4)..... - All other situations.....	\$0 \$880	
23. ☒ Search fee (37 CFR 1.492(b))		\$ 580.00
- If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates that all claims satisfy provisions of PCT Article 33(1)-(4)..... - If the search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as International Searching Authority..... - If the International Search Report was prepared by an ISA other than the US and is provided to the Office or previously communicated to the US by the International Bureau - All other situations	\$0 \$150 \$580 \$770	
SUBTOTAL: 21 + 22 + 23		= \$ 1,810.00
24. ☐ Application size fee (37 CFR 1.492(j))		
Fee for each additional 50 sheets, or fraction thereof, of the published International Application specification (including description, claims, abstract and, if present, sequence listing in PDF format) and drawings, in excess of 100 sheets.		
Total sheets 41	Extra sheets - 100 =	Number of each additional 50 sheets, or fraction thereof (round up to whole number) / 50 =
x \$450 =		+ \$
25. ☐ Excess claim fees (37 CFR 1.492(d-f))		
Total claims 20	Extra claims - 20 =	Fee Due x \$200 =
		+ \$
Independent claims 2	Extra claims - 3 =	Fee Due x \$600 =
		+ \$
Multiple dependent claim(s), if applicable		+ \$
		\$925
26. ☐ Surcharge for furnishing any of the search fee, examination fee, or the oath or declaration after the date of commencement of the national stage (37 CFR 1.492(h))	\$170	+ \$
27. ☐ Processing fee for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i)).....	\$150	+ \$
28. ☐ Continuing Application fee (37 CFR 1.17(w))		+ \$
- If the international filing date of the application is more than six years, and no more than nine years, after the earliest benefit date..... - If the international filing date of the application is more than nine years after the earliest benefit date.....	\$2,700 \$4,000	
29. ☐ Fee for very lengthy sequence listing (mega-sequence listing) (37 CFR 1.21(o))		+ \$
- Sequence listing in electronic form of 300MB to 800MB (without file compression)..... - Sequence listing in electronic form of more than 800MB (without file compression).....	\$1,140 \$11,290	
30. TOTAL OF ABOVE FEES		= 1,810.00
☐ Applicant asserts small entity status. See 37 CFR 1.27. Fees above are reduced by 60%.		
☐ Applicant certifies micro entity status. See 37 CFR 1.29. Fees above are reduced by 80%. Applicant must attach form PTO/SB/15A or PTO/SB/15B or equivalent.		
TOTAL NATIONAL FEE		= \$ 1,810.00
Fee for recording the enclosed assignment (37 CFR 1.21(h)(2)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31)		+ \$
		\$54.00 per property
TOTAL FEES ENCLOSED		= \$ 1,810.00

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Fee Payment

- a. ☒ The above fees are being paid using an electronic payment method available in Patent Center (deposit account, credit or debit card, or EFT).
- b. ☐ Please charge my Deposit Account No. 02-2448 in the amount of \$ 1,810.00 to cover the above fees.
- c. The Director is hereby authorized to charge additional fees that may be required, as indicated below, or credit any overpayment, to Deposit Account No. 02-2448 as follows:
- i. ☐ any required fee.
- ii. ☒ any required fee except for excess claims fees required under 37 CFR 1.492(d) and (e) and multiple dependent claim fee required under 37 CFR 1.492(f).
- d. ☐ A check in the amount of \$ _____ to cover the above fees is enclosed.
- e. ☐ Fees are to be charged to a credit/debit card using the Credit Card Payment Form (PTO-2038) submitted by mail or hand delivery.

WARNING: Information on this transmittal form may become public. Credit card information should **not** be included on this form.**ADVISORY:** Form PTO-2038 should only be mailed, hand-delivered, or faxed to the USPTO. However, when paying the basic national fee, the PTO-2038 may NOT be faxed to the USPTO. See 37 CFR 1.6(d)(3). If filing electronically, do **NOT** attach the PTO-2038 form as a PDF along with your Office Electronic Filing System submission. Please be advised that by doing so your **credit/debit card information may be displayed via Patent Center**. To protect your information, it is recommended to pay fees online by using an electronic payment method.**Correspondence Address**☒ The address associated with Customer Number: 2292 **OR** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country				Telephone	
Email					

Signature	/James T. Eller, Jr./		Date	June 18, 2026	
Name (Print/Type)	James T. Eller, Jr.		Registration No. (Attorney/Agent)	39538	

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	NEW
Filing Date	June 18, 2026
First Named Inventor	Heejun LEE
Title	REFRIGERATOR
Art Unit	Not Yet Assigned
Examiner Name	Not Yet Assigned
Attorney Docket Number	3449-5834PUS1

SIGNATURE of Applicant or Patent Practitioner

Signature	/James T. Eller, Jr./	Date (Optional)	June 18, 2026
Name	James T. Eller, Jr.	Registration Number	39538
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.



*Total of 2 forms are submitted.

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0035. Public burden for this form is estimated to average 3 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS.** If filing this completed form by mail, send to: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

- ☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above:
- OR
- ☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

- ☒ The address associated with the above-mentioned Customer Number

OR

- ☐ The address associated with Customer Number:

OR

- ☐ Firm or Individual Name

Address

City

State

Zip

Country

Telephone

Email

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

LG ELECTRONICS INC.

- ☐ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature

Date (Optional)

Name

Hwi Jae Cho

Title

Vice President, LG Electronics Inc.

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

- ☒ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PA..

Document Description: Power of Attorney

PTO/AIA/82B (07-13)

Approved for use through 09/30/2025. OMB 0651-0035

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date
NEW	

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)



I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above:

2292

OR



I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:



The address associated with the above-mentioned Customer Number

OR



The address associated with Customer Number: 2292

OR

Firm or Individual Name				
Address				
City		State		Zip
Country				
Telephone		Email		

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

PUSAN NATIONAL UNIVERSITY INDUSTRY-UNIVERSITY COOPERATION FOUNDATION



Inventor or Joint Inventor (title not required below)



Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)



Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)



Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

✓ Signature	PARK, Seong-Ho	✓ Date (Optional)	JUN, 15, 2026
✓ Name	PARK, Seong-Ho		
✓ Title	Team Leader		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☒ Total of 1 forms are submitted.

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0035. Public burden for this form is estimated to average 3 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS.** If filing this completed form by mail, send to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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Docket No.: 3449-5834PUS1
(Patent)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application of:

Heejun LEE et al.

Application No.: NEW

Confirmation No.: Not Yet Assigned

Filed: June 18, 2026

Art Unit: Not Yet Assigned

For: REFRIGERATOR

Examiner: Not Yet Assigned

PRELIMINARY AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

Prior to examination on the merits, please amend the above-identified U.S. patent application as follows:

Amendments to the Specification.

Remarks.

AMENDMENTS TO THE SPECIFICATION

Page 1

Before line 4 of the specification (after the Title), please insert the following new header and paragraph:

Cross Reference to Related Applications

This application is the National Phase of PCT International Application No. PCT/KR2024/020822, filed on December 20, 2024, which claims priority under 35 U.S.C. 119(a) to Patent Application No. 10-2023-0189307, filed in the Republic of Korea on December 22, 2023, all of which are hereby expressly incorporated by reference into the present application.

REMARKS

Claims 1-20 are pending in this application. The specification has been amended to insert a cross-reference paragraph. No new matter has been added.

Entry of the above amendments is earnestly solicited. An early and favorable first action on the merits is earnestly solicited.

For any outstanding matters in the present application, the Examiner is respectfully requested to contact James T. Eller, Jr., Registration No. 39,538, at 703-205-8044 to discuss the present application. If unable to reach the above-identified contact, please call the general mailbox number 703-205-8007.

Dated: June 18, 2026

Respectfully submitted,

By James T. Eller, Jr.
James T. Eller, Jr.
Registration No.: 39,538
BIRCH, STEWART, KOLASCH & BIRCH, LLP
2600 Park Tower Drive
Suite 600
Vienna, VA 22180

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application of:

Heejun LEE et al.

Application No.: NEW

Confirmation No.: Not Yet Assigned

Filed: June 18, 2026

Art Unit: Not Yet Assigned

For: REFRIGERATOR

Examiner: Not Yet Assigned

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

Applicant hereby submits an Information Disclosure Statement for consideration by the Examiner.

I. LIST OF PATENTS, PUBLICATIONS OR OTHER INFORMATION

The patents, publications, or other information submitted for consideration by the Office are listed on the attached PTO/SB/08.

II. COPIES

☒ a. Copies of foreign patent documents, non-patent literature and other information are provided.

☐ b. REFERENCES PREVIOUSLY CITED OR SUBMITTED: Copies of any information not provided can be found in one or more of the following applications which has been relied upon for an earlier filing date under 35 U.S.C. § 120:

U.S. Application No. and U.S. Filing Date
filed

III. CONCISE EXPLANATION OF THE RELEVANCE/OTHER INFORMATION

☒ a. NON-ENGLISH LANGUAGE DOCUMENTS: A concise explanation of the relevance of all non-English language patents, publications, or other information listed on the attached PTO/SB/08 form(s) is indicated thereon by a check mark at column T to designate the submission of one or more of the following: an English language abstract (as a partial translation); a machine-generated translation; a full or partial translation; and/or a statement of relevance.

☒ b. ENGLISH LANGUAGE SEARCH REPORT OR FOREIGN PATENT OFFICE COMMUNICATION: An English language version of the search report or Foreign Patent Office communication that indicates the degree of relevance is attached.

☒ c. OTHER: The following additional information is provided.

The International Search Report (PCT/ISA/210) and the Written Opinion of the International Searching Authority (PCT/ISA/237) issued in PCT/KR2024/020822, dated March 31, 2025, are submitted herewith.

IV. STATEMENT UNDER 37 C.F.R. § 1.97(e)

The undersigned hereby states that:

☐ a. Each item of information contained in the IDS was first cited in any communication from a foreign patent office in a counterpart foreign application not more than **three months** prior to the filing of the IDS. *See 37 C.F.R. § 1.97(e)(1)*. This statement does not relate to English language counterparts not listed in a communication from the foreign patent office. Such English language counterparts are provided to aid the Examiner's consideration of non-English items first cited in the communication from the foreign patent office; or

☐ b. No item of information contained in the IDS was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the IDS was known to any individual designated in 37 C.F.R. § 1.56(c) more than **three months** prior to the filing of the IDS. *See 37 C.F.R. § 1.97(e)(2)*; or

☐ c. The items of information in the IDS that are listed on the attached communication from a foreign patent office were first cited in a communication from a foreign patent office in a counterpart foreign application not more than **three months** prior to the filing of this IDS. *See 37 C.F.R. § 1.97(e)(1)*. This statement does not relate to English language counterparts to those items of information that are not listed in the communication from the foreign patent office in the counterpart foreign application. Such English language counterparts are provided to aid the Examiner's consideration of non-English items first cited in the communication from the foreign patent office. As to the remaining items of information, including any communication(s) from a foreign patent office or the United States Patent and Trademark Office, to the knowledge of the person signing the certification after making reasonable inquiry, such items of information were not known to any individual designated in 37 C.F.R. § 1.56(c) more than **three months** prior to the filing of this statement. *See 37 C.F.R. § 1.97(e)(2)*.

V. STATEMENT UNDER 37 C.F.R. § 1.704(d)(1)

Patent Term Adjustment Reduction Should Not Apply

☐ Form PTO/SB/133 is attached. This statement does not relate to English language counterparts not listed in a communication from a patent office in a counterpart foreign or international application or from the Office, which are provided for the Examiner's convenience.

VI. FEES

☒ a. This Information Disclosure Statement is being filed concurrently with the filing of a new patent application or Request for Continued Examination. No fee is required.

☐ b. This Information Disclosure Statement is being filed within three months of the filing date of an application. *See 37 C.F.R. § 1.97(b)(1) and 37 C.F.R. § 1.97(b)(2)*. No fee is required.

☐ c. This Information Disclosure Statement is being filed before the mailing date of a first Action on the merits. *See 37 C.F.R. § 1.97(b)(3)*. No fee is required. If a first Office Action on the merits has issued, please consider this IDS under 37 C.F.R. § 1.97(c) and see the statement under 37 C.F.R. § 1.97(e) above. If no statement has been made, charge our deposit account for the required fee.

☐ d. This Information Disclosure Statement is being filed before the mailing date of a Final Office Action or before the mailing date of a Notice of Allowance or before an action that otherwise closes prosecution in the application. *See 37 C.F.R. § 1.97(c)(1)*.

☐ No statement. The fee as required by 37 C.F.R. § 1.17(p) is provided.

or

☐ See the above statement. No fee is required.

☐ e. This Information Disclosure Statement is being filed on or after the mailing date of a Final Office Action, on or after the mailing date of a Notice of Allowance, or on or after an action that otherwise closes prosecution in the application (*see 37 C.F.R. § 1.97(d)*), see the statement above. The fee as required by 37 C.F.R. § 1.17(p) is provided.

VII. PAYMENT OF FEES UNDER 37 CFR § 1.17(p).

- ☐ The required fee is listed on the attached Fee Transmittal.
- ☒ No fee is required.

VIII. WRITTEN ASSERTION OF IDS SIZE FEE UNDER 37 CFR § 1.98(a)(4).

Total number of Items of Information listed on SB/08 Form(s) filed, including current filing: 5.

- ☒ No IDS size fee is required.
- ☐ The IDS size fee under 37 CFR § 1.17(v)(1) is required (51-100 items of information).
- ☐ The IDS size fee under 37 CFR § 1.17(v)(2) is required (101-200 items of information).
- ☐ The IDS size fee under 37 CFR § 1.17(v)(3) is required (200+ items of information).

Total amount of IDS size fee previously paid: \$0.

Total amount of IDS size fee due now: \$0.

If the Examiner has any questions concerning this IDS, please contact the undersigned. If it is determined that this IDS has been filed under the wrong rule, the USPTO is requested to consider this IDS under the proper rule and charge the appropriate fee including the IDS size fee under 37 CFR § 1.17(v)(1), (2) or (3) identified above to Deposit Account No. 02-2448.

Dated: June 18, 2026

Respectfully submitted,

By /James T. Eller, Jr./

James T. Eller, Jr.

Registration No.: 39538

BIRCH, STEWART, KOLASCH & BIRCH, LLP

2600 Park Tower Drive

Suite 600

Vienna, VA 22180

703-205-8000

Attachment(s):

- ☒ PTO/SB/08
- ☒ Document(s)
- ☐ Foreign Patent Office Communication(s)
- ☒ Foreign Search Report(s)
- ☐ Form PTO/SB/133
- ☐ Fee
- ☐ Other:

Under the Paperwork reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449A/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	NEW
				Filing Date	June 18, 2026
				First Named Inventor	Heejun Lee
				Art Unit	NOT YET ASSIGNED
				Examiner Name	NOT YET ASSIGNED
				Attorney Docket Number	3449-5834PUS1
Sheet	1	of	1		

[illegible]

FOREIGN PATENT DOCUMENTS							
Examiner Initial *	Cite No. 1	Foreign Patent Document		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, columns, Lines, Where Relevant Passages or Relevant Figures Appear	T
		Country ³ Code	Number ⁴ Kind Code (if known) ⁵				
	1	KR	10-1151618 - B1	06-08-2012			☒
	2	KR	10-2009-0076555 - A	07-13-2009			☒
	3	CN	112943029 - A	06-11-2021			☒
	4	JP	2014-214893 - A	11-17-2014			☒
	5	JP	2016-11797 - A	01-21-2016			☒
							☐

Examiner Signature		Date Considered	
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* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1. Applicant's unique citation design number (optional). 2. See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. 3. Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4. For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5. Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. 6. Applicant is to place a check mark here if English language Translation is attached.

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0031. Public burden for this form is estimated to average 2 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. If filing this completed form by mail, send to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

DESCRIPTION

Invention Title

REFRIGERATOR

Technical Field

[01] The present specification relates to a refrigerator.

Background Art

[02] Generally, a refrigerator is a home appliance that allows food to be stored at a low temperature in an internal storage space shielded by a door.

[03] The storage space is surrounded by an insulating wall, so that the inside of the storage space is maintained at a temperature lower than an outdoor temperature. Depending on a temperature range of the storage space, the storage space may be referred to as a refrigerating chamber or a freezing chamber.

[04] In order to put an object into the storage space or take the object out of the storage space, a user opens the door. Generally, the door is rotatably provided at a cabinet, and a gasket is provided between the door and the cabinet. Therefore, in a state in which the door is closed, the gasket is in contact between the door and the cabinet, so that cold air in the storage space can be prevented from leaking. As the adhesion force of the gasket increases, a cold air leakage prevention effect can be increased.

[05] In order to increase the adhesion force of the gasket, the gasket may be formed of a rubber magnet, and a magnet may be provided inside the gasket. However, when the adhesion force of such a gasket increases, a large force is required accordingly when opening the door.

[06] Therefore, recently, a refrigerator in which an auto opening function of a door is implemented has been provided. As a related prior art document, Chinese Utility Registration No. 208324468 exists.

Disclosure

Technical Problem

[07] An embodiment provides a refrigerator in which an opening angle of a door is increased when the door is automatically opened.

[08] Alternatively or additionally, an embodiment provides a refrigerator in which a door is not only automatically opened but also can be automatically closed.

[09] Alternatively or additionally, an embodiment provides a refrigerator in which a door is not only automatically opened but also a manual opening is possible by a user.

[10] Alternatively or additionally, an embodiment provides a refrigerator in which damage to a driver for auto opening is prevented during a manual opening of a door.

Technical Solution

[11] A refrigerator according to one aspect may include a cabinet having a storage space; a door that opens and closes the storage space; and a door opening and closing device to open the door.

[12] The door opening and closing device may include a driver that generates power, and a power transmission portion that transmits the power of the driver.

[13] The door opening and closing device may include a first operating portion that operates by receiving the power of the driver. The door opening and closing device may further include a second operating portion that operates by receiving the power of the driver and is disposed at a position spaced apart from a rotation center of the door.

[14] When the driver operates for an auto opening of the door, the first operating portion may start to operate, and the second operating portion may start to operate after the first operating portion starts to operate.

[15] The door opening and closing device may further include a first transmission unit to transmit the power of the driver to the first operating portion during an auto opening process of the door. The door opening and closing device may further include a second transmission unit to transmit the power of the driver to the second operating portion.

[16] The first operating portion may include a rack gear connected to the first transmission unit.

[17] The first operating portion may include a first member including the rack gear. The first operating portion may further include a second member rotatably connected to the first member and in contact with a rear surface of the door.

[18] The second operating portion may include a body extending from the cabinet toward the door. The second operating portion may further include a first coupling portion located at one side of the body and coupled to the door. The second operating portion may further include a second coupling portion located at another side of the body and coupled to the second transmission unit.

[19] In an auto opening process of the door, the first transmission unit may block transmission of the power while the first operating portion is operated.

[20] The door opening and closing device may further include an elastic body providing an elastic force to the first operating portion or the first transmission unit so that the first operating portion returns to an initial position in a state in which the transmission of the power is blocked.

[21] In a period of an auto opening process of the door, the first operating portion and the second operating portion may move together in a door opening direction.

[22] In the auto opening process of the door, the first operating portion may move from an initial position to an end position, and the second operating portion may move from an initial position to a door opening position.

[23] Before the second operating portion moves to the door opening position, the first operating portion may move to the end position and then return to the initial position again.

[24] In an auto closing process of the door, in a state in which the first operating portion is stopped at the end position, the second operating portion may move from the door opening position to the initial position.

[25] In a manual opening process of the door, the second transmission unit may block a rotational force of the door from being transmitted to the driver.

[26] In the auto opening process of the door, the second transmission unit may receive the power of the driver from the first transmission unit.

[27] The first transmission unit may include a first transmission gear having a moving portion. The first transmission unit may further include a second transmission gear having a slot in which the moving portion is accommodated and connected to the first operating portion.

[28] In a state in which the moving portion is located in the slot, the first transmission gear and the second transmission gear may interlock with each other.

[29] In a state in which the moving portion is disengaged from the slot, the first transmission gear and the second transmission gear may not interlock with each other.

[30] In the auto opening process of the door, the first operating portion may move from an initial position to an end position. When the first operating portion moves to the end position, the moving portion may be disengaged from the slot.

[31] The second transmission gear may include a recess communicating with the slot, and an inclined surface in contact with the moving portion as a surface forming the recess.

[32] In the auto closing process of the door, when the second transmission gear rotates in another direction, the moving portion may be moved from the recess into the slot along the inclined surface.

[33] The second transmission unit may include a first transmission portion, and a second transmission portion connectable to or disconnectable from the first transmission portion. The second transmission unit may further include a third transmission portion connected to the second transmission portion and the second operating portion.

[34] The first transmission portion may include a first portion in which gear teeth are absent, and a second portion in which gear teeth are present.

[35] In a state in which the door is closed, the first transmission portion may be located at a disconnected position where the first portion is aligned with the second transmission portion. In the auto opening process of the door, when the first transmission portion is rotated by a predetermined angle, the second portion may be connected to the second transmission portion.

[36] At the disconnected position of the first transmission portion, the door is manually openable.

[37] In the manual opening process of the door, the second operating portion is movable to the door opening position by the rotational force of the door.

[38] A refrigerator according to another aspect may include a cabinet having a storage space; a door that opens and closes the storage space; and a door opening and closing device to open the door, wherein the door opening and closing device may include a driver that generates power, and an operating portion that operates by receiving the power of the driver and is disposed at a position spaced apart from a rotation center of the door; a first transmission portion to transmit the power of the driver; and a second transmission portion connectable to or disconnectable from the first transmission portion.

[39] In a state in which the door is closed, the first transmission portion may be located at a disconnected position where the first transmission portion is disconnected to the second transmission portion. When the driver operates for an auto opening of the door, the first transmission portion may move to a connected position to be connected to the second transmission portion in the auto opening process of the door.

Advantageous Effects

[40] According to an embodiment, there is an advantage in that an opening angle of a door is increased when the door is automatically opened.

[41] According to an embodiment, there is an advantage in that a door is not only automatically opened but also can be automatically closed.

[42] According to an embodiment, there is an advantage in that a door is not only automatically opened but also a manual opening is possible by a user.

[43] According to an embodiment, there is an advantage in that damage to a driver for auto opening is prevented and operation noise is reduced during a manual opening of a door.

Description of Drawings

[44] FIG. 1 is a perspective view showing a portion of a configuration of a refrigerator according to an embodiment.

[45] FIG. 2 is a plan view of a refrigerator according to the embodiment.

[46] FIG. 3 is an enlarged view showing a state in which a door opening and closing device is installed on the refrigerator according to the embodiment.

[47] FIG. 4 is a view showing a portion of a configuration of a power transmission portion in a door opening and closing device according to the embodiment.

[48] FIG. 5 is a cross-sectional view of a first transmission gear for transmitting power to a first operating portion.

[49] (a) of FIG. 6 is a perspective view of a second transmission gear, and (b) of FIG. 6 is a side view of a second transmission gear.

[50] FIGS. 7 to 14 are views showing a process in which a door is automatically opened.

[51] FIGS. 15 to 18 are views showing a process in which a door is automatically closed.

[52] FIG. 19 is a view showing a process in which a moving portion of a first transmission gear moves into a slot of a second transmission gear in a process in which a door is automatically closed.

[53] FIG. 20 is a control block diagram of a refrigerator according to the embodiment.

[54] FIGS. 21 and 22 are views showing a process in which a door is manually opened.

Mode for Invention

[55] Hereinafter, some embodiments of the present disclosure will be described in detail with reference to the accompanying drawings. It should be noted that when components in the drawings are designated by reference numerals, the same components have the same reference numerals as far as possible even though the components are illustrated in different drawings. Further, in description of embodiments of the present disclosure, when it is determined that detailed descriptions of well-known configurations or functions disturb understanding of the embodiments of the present disclosure, the detailed descriptions will be omitted.

[56] Also, in the description of the embodiments of the present disclosure, the terms such as first, second, A, B, (a) and (b) may be used. Each of the terms is merely used to distinguish the corresponding component from other components, and does not delimit an essence, an order or a sequence of the corresponding component. It should be understood that when one component is “connected”, “coupled”, “joined” to another component, the former may be directly connected, coupled, or joined to the latter or may be “connected”, coupled”, or “joined” to the latter with a third component interposed therebetween.

[57] In the present specification, it may be interpreted that at least one of component A and component B includes component A, component B, or component A+B.

[58] In addition, it may be interpreted that at least one of component A or component B includes component A, component B, or component A+B.

[59] In the present specification, a front surface of the second door is a surface forming a front appearance of the door, and a rear surface is a surface facing the first door. A front surface of the first door is a surface forming a front appearance of the first door and facing the rear surface of the second door. The rear surface of the first door is a surface facing a cabinet or a storage space.

[60] FIG. 1 is a perspective view showing a portion of a configuration of a refrigerator according to an embodiment, and FIG. 2 is a plan view of a refrigerator according to the embodiment.

[61] Referring to FIGS. 1 and 2, a refrigerator 1 according to the embodiment may include a cabinet 10 to form a storage space 12, and a door 20 that opens and closes the storage space 12.

[62] The storage space 12 may include a refrigerating chamber as an example. Alternatively, the storage space 12 may include a freezing chamber as an example. Alternatively, although not shown, the storage space 12 may further include an additional storage space.

[63] The door 20 may be a refrigerating chamber door or a freezing chamber door. The door 20 may include a first door 21 for opening and closing a portion of the storage space 12. The door 20 may include a second door 22 for opening and closing another portion of the storage space 12. Alternatively, a single door 21 may open and close a single storage space 12, or may simultaneously open and close a plurality of storage spaces 12.

[64] The door 20 may be formed of a single door, or may include a main door 23 and a sub door 24.

[65] FIG. 2 illustrates an example in which the first door 21 of the door 20 is formed of a main door 23 (or an inner door) and a sub door 24 (or an outer door), but is not limited thereto.

[66] The main door 23 may open and close the storage space 12, and the sub door 24 may be rotatable with respect to the main door 23. The sub door 24 may be rotatably connected to the main door 23 or may be rotatably connected to the cabinet 10.

[67] The refrigerator of the embodiment may further include a door opening and closing device 100 to open the door 20. When the door 20 includes a plurality of doors 21 and 22, the door opening and closing device 100 may open a part or all of the plurality of doors 21 and 22.

[68] FIG. 2 illustrates an example in which the door opening and closing device 100 opens the first door 21 among the doors 20.

[69] In the case of the embodiment, the door 20 may be automatically opened by the door opening and closing device 100. In addition, the door 20 may be manually opened by a user.

[70] The door opening and closing device 100 may be installed on an upper surface of the cabinet 10 as an example, but may be installed on a lower surface thereof. A portion of the door opening and closing device 100 may be connected to an upper side (or a lower side) of the door 20.

[71] When the door 20 includes the main door 23 and the sub door 24, a portion of the door opening and closing device 100 may be connected to an upper side of the main door 23. That is, when the door opening and closing device 100 operates, the main door 23 may be automatically opened.

[72] A gasket (40 in FIG. 3) for limiting cold air leakage of the storage space 12 may be provided between the door 20 and the cabinet 10. As an example, the gasket 40 may be coupled to the door 20. A magnet may be provided inside the gasket 40. A state in which the gasket 40 is in contact with the cabinet 10 may be maintained by the magnet.

[73] Hereinafter, the door opening and closing device 100 of the embodiment will be described in detail.

[74] FIG. 3 is an enlarged view showing a state in which a door opening and closing device is installed on a refrigerator according to the embodiment, FIG. 4 is a view showing a portion of a

configuration of a power transmission portion in a door opening and closing device according to the embodiment, and FIG. 5 is a cross-sectional view of a first transmission gear for transmitting power to a first operating portion. (a) of FIG. 6 is a perspective view of a second transmission gear, and (b) of FIG. 6 is a side view of a second transmission gear.

[75] Referring to FIGS. 2 to 6, the main door 23 may be rotatably connected to the cabinet 10 by a first hinge bracket 31. An upper surface of the main door 23 may include a recess 23a depressed downward. The first hinge bracket 31 may be connected to the recess 23a.

[76] The sub door 24 may be rotatably connected to the main door 23 by a second hinge bracket 32.

[77] A door opening and closing device 100 of the embodiment may include a driver 110. The driver 110 may include a bidirectionally rotatable motor as an example.

[78] The door opening and closing device 100 may further include a power transmission portion 120 to transmit the power of the driver 110.

[79] The door opening and closing device 100 may further include a first operating portion 170 (or a door opening portion) that operates by receiving power from the power transmission portion 120. The door opening and closing device 100 may further include a second operating portion 180 (or a door opening portion) that operates by receiving power from the power transmission portion 120. In an auto opening process of the door 20, the first operating portion 170 and the second operating portion 180 may operate sequentially. The second operating portion 180 serves as a door closing portion that allows the door to be closed in an auto closing process of the door.

[80] The door opening and closing device 100 may further include a first transmission unit that transmits power to the first operating portion 170. The door opening and closing device 100 may further include a second transmission unit that transmits power to the second operating portion 180.

[81] The power transmission portion 120 may include a plurality of gears. The door opening and closing device 100 may include a frame 101. The plurality of gears may be rotatably supported by the frame 101. The frame 101 may cover at least a portion of components constituting the door opening and closing device 100.

[82] As an example, the plurality of gears may include first to fifth gears 121, 122, 123, 124, and 125 connected to each other. However, it should be noted that a number of the plurality of gears is not limited in the embodiment. In addition, it should be noted that a shape of the plurality of gears is not limited.

[83] The first gear 121 may be connected to a shaft of the driver 110. The second gear 122 and the third gear 123 may be reduction gears. The fourth gear 124 and the fifth gear 125 may be idle gears. At least one of the second to fourth gears may be a two-stage gear having portions with different diameters.

[84] A last gear among the plurality of gears may be connected to the first transmission unit. As an example, the fifth gear 125 may be connected to the first transmission unit.

[85] The first transmission unit may transmit power to the first operating portion 170 in a period of the auto opening process of the door 20. As an example, the first transmission unit may transmit power to the first operating portion 170 in an initial period of the auto opening process. The first transmission unit may block the power transmission to the first operating portion 170 in another period of the auto opening process. That is, the first transmission unit may block the transmission of the power while the first operating portion 170 is operated.

[86] The first transmission unit may include a first transmission gear 130. The first transmission gear 130 may be engaged with a last gear among the plurality of gears.

[87] The first transmission gear 130 may include a moving portion 135. The moving portion 135 may be movably provided at a position spaced apart from a rotation center of the first transmission

gear 130. The moving portion 135 may move in a direction parallel to a rotation center line of the first transmission gear 130.

[88] The first transmission gear 130 may include a first portion 131 in which the moving portion 135 is accommodated. The first transmission gear 130 may include a second portion 132 as an opening through which the moving portion 135 passes. A diameter of the first portion 131 may be greater than a diameter of the second portion 132.

[89] The first transmission gear 130 may further include a third portion 133 as an opening for insertion of the moving portion 135. The first portion 131 may be located between the second portion 132 and the third portion 133. A diameter of the third portion 133 may be equal to or greater than the diameter of the first portion 131.

[90] The first transmission gear 130 may further include a cover portion 137 to cover the third portion 133. A diameter of the cover portion 137 may be equal to or less than the third portion 133. A portion of the cover portion 137 may be inserted into the first portion 131. The cover portion 137 may restrict the moving portion 135 from being separated toward the third portion 133 in the first transmission gear 130.

[91] A portion of the moving portion 135 protruding outwards of the first transmission gear 130 may include a rounded surface. The rounded surface may be in contact with the second transmission gear 140.

[92] The moving portion 135 may be formed in a cylindrical shape as an example. Based on the drawings, an upper surface of the moving portion 135 may include a rounded surface.

[93] The moving portion 135 may further include an extension portion 135a extending outwards. A portion of the moving portion 135 may pass through the second portion 132 to protrude outwards of the first transmission gear 130. The extension portion 135a may be caught on a stepped portion

formed by a difference in diameter between the first portion 131 and the second portion 132. The extension portion 135a may be moved within the first portion 131.

[94] Upward movement of the moving portion 135 may be restricted by the extension portion 135a. Downward movement of the extension portion 135a may be restricted by the cover portion 137 or an elastic member 138 to be described later.

[95] The first transmission gear 130 may further include an elastic member 138 providing an elastic force to the moving portion 135. The elastic member 138 may elastically support the moving portion 135. The elastic member 138 may be a coil spring as an example.

[96] A groove 135b in which a portion of the elastic member 138 is accommodated may be formed in the moving portion 135. Another side of the elastic member 138 may be supported by the cover portion 137.

[97] When an external force is removed after the moving portion 135 is moved downward by the external force, the moving portion 135 may be moved upward by the elastic force of the elastic member 138.

[98] The second transmission gear 140 may be provided with gear teeth 141 on a portion of a circumferential surface thereof. Another portion of the second transmission gear 140 where the gear teeth 141 are not provided may be provided with a slot 142 in which the moving portion 135 is accommodated. The slot 142 may pass through the second transmission gear 140 in a direction parallel to a rotation center line of the second transmission gear 140. Alternatively, the slot 142 may be depressed from the circumferential surface toward a rotation center of the second transmission gear 140.

[99] The moving portion 135 may be selectively accommodated in the slot 142. In a state in which the moving portion 135 is accommodated in the slot 142, a rotational force of the first transmission gear 130 may be transmitted to the second transmission gear 140. On the other hand, in a state in

which the moving portion 135 is disengaged from the slot 142, the rotational force of the first transmission gear 130 is not transmitted to the second transmission gear 140.

[100] In the present embodiment, a state in which the moving portion 135 is accommodated in the slot 142 may be referred to as a connected state of the first transmission gear 130 and the second transmission gear 140. In the connected state of the first transmission gear 130 and the second transmission gear 140, the first transmission gear 130 and the second transmission gear 140 may interlock with each other.

[101] A state in which the moving portion 135 is disengaged from the slot 142 may be referred to as a disconnected state of the first transmission gear 130 and the second transmission gear 140. In the disconnected state of the first transmission gear 130 and the second transmission gear 140, the first transmission gear 130 and the second transmission gear 140 may not interlock with each other.

[102] The second transmission gear 140 may further include a recess 143 provided at one side of the slot 142. The recess 143 may communicate with the slot 142.

[103] The recess 143 may provide a path or space through which the moving portion 135 located outside the slot 142 can be inserted into the slot 142. One surface of the second transmission gear 140 forming the recess 143 may include an inclined surface 144. The inclined surface 144 may be inclined such that a depression depth of the recess 143 upward from a bottom surface decreases toward the slot 142. The moving portion 135 may come into contact with the inclined surface 144.

[104] The second transmission gear 140 may be connected to an elastic body 149. For the opening of the door 20, the second transmission gear 140 may be rotated in the other direction. In a process in which the second transmission gear 140 is rotated in the other direction, when the moving portion 135 is disengaged from the slot 142, the elastic body 149 may provide an elastic force so that the second transmission gear 140 returns to an initial position in one direction.

[105] The elastic body 149 may be a torsion spring as an example, but it should be noted that a type of spring is not limited. The second transmission gear 140 may be provided with a coupling portion 146 to which the elastic body 149 is coupled.

[106] As another example, it is also possible for the elastic body 149 to provide an elastic force to the first operating portion 170. In this case as well, when the moving portion 135 is disengaged from the slot 142, the elastic body 149 may provide an elastic force so that the first operating portion 170 returns to an initial position. In a process in which the first operating portion 170 returns to the initial position, the second transmission gear 140 may return to the initial position in one direction.

[107] In the present embodiment, the first transmission unit serves as a clutch that transmits power or blocks power transmission to the first operating portion 170 during the auto opening process of the door 20, and thus may be named a first clutch unit.

[108] The first operating portion 170 may be engaged with the second transmission gear 140. The first operating portion 170 may be formed of a single member or a plurality of members.

[109] As an example, the first operating portion 170 may include a first member 171 engaged with the second transmission gear 140, and a second member 176 rotatably connected to the first member 171.

[110] The first member 171 may include a rack gear 172. When the second transmission gear 140 rotates, the first member 171 may move linearly. The door opening and closing device 100 may further include a guide portion 104 that guides a movement of the first member 171. The guide portion 104 may be formed integrally with the frame 101 or may be coupled to the frame 101.

[111] The second member 176 may be rotatably connected to the first member 171 by a shaft 174. The second member 176 may be in contact with the door 20 during the auto opening process of

the door. A portion of the second member 176 may include a portion whose width or thickness increases in a direction away from the shaft 174.

[112] The second transmission unit may include a first transmission portion 150. The first transmission portion 150 may be connected to the first transmission gear 130.

[113] The first transmission portion 150 may include a first portion 150a and a second portion 150b distinguished by presence or absence of gear teeth on a circumferential surface thereof.

[114] Gear teeth are absent on a circumferential surface of the first portion 150a. Gear teeth 152 are present on a circumferential surface of the second portion 150b. That is, the first transmission portion 150 may be a partial gear. The second portion 150b may be engaged with the first transmission gear 130.

[115] The second transmission unit may further include a second transmission portion 154. The second transmission portion 154 may be connected to the first transmission portion 150 in the auto opening process of the door 20. On the other hand, in the manual opening process of the door, it may be spaced apart from the first transmission portion 150.

[116] In a state in which the door 20 is closed, the first portion 150a may be located to face or correspond to the second transmission portion 154. When the driver 110 operates, the first transmission portion 150 is rotated, and when a predetermined time elapses after the driver 110 starts to operate or the first transmission portion 150 is rotated by a predetermined angle, the second portion 150b is connected to the second transmission portion 154 so that the second transmission portion 154 can be rotated.

[117] A state in which the second portion 150b is connected to the second transmission portion 154 may be referred to as a connected state of the first transmission portion 150 and the second transmission portion 154. A state in which the second portion 150b is not connected to the second transmission portion 154 may be referred to as a disconnected state of the first transmission portion

150 and the second transmission portion 154. A position of the first transmission portion 150 in the disconnected state may be referred to as a disconnected position. In the auto opening process of the door 20, the first transmission portion 150 may move to a connected position so that the first transmission portion 150 and the second transmission portion 154 can be connected.

[118] The second transmission unit may further include a third transmission portion 160. The third transmission portion 160 may be connected to the second transmission portion 154. The third transmission portion 160 may be connected to the second operating portion 180. The third transmission portion 160 may transmit a rotational force of the second transmission portion 154 to the second operating portion 180.

[119] The third transmission portion 160 may include a body 161 formed in a sector shape as an example. Gear teeth 163 may be formed on one surface of the body 161.

[120] A coupling portion 162 to which a shaft 107 providing a rotation center is connected may be provided on another surface of the body 161. The shaft 107 may be provided on the first hinge bracket 31, or may be provided on a member 106 separate from the first hinge bracket 31. At least a portion of the third transmission portion 160 may overlap with the first hinge bracket 31 in a vertical direction.

[121] The third transmission portion 160 may further include a coupling portion 165 to which the second operating portion 180 is connected. The second operating portion 180 may be rotatably connected to the third transmission portion 160 at a position spaced apart from the rotation center of the third transmission portion 160.

[122] The third transmission portion 160 may include one or more holes. The one or more holes can improve strength of the third transmission portion 160. Weight of the third transmission portion 160 can be reduced by the one or more holes.

[123] When a plurality of holes are formed in the third transmission portion 160, it is also possible to be used for detecting a position of the third transmission portion 160 by a position detection sensor.

[124] The second operating portion 180 may include a body 181. The body 181 may extend from the cabinet 10 toward the door 20.

[125] The second operating portion 180 may include a first coupling portion 182 provided at one side of the body 181. The first coupling portion 182 may be rotatably connected to a shaft 33 provided on the door 20 (for example, a main door). Alternatively, it is also possible for the first coupling portion 182 to have a shaft. The first coupling portion 182 may be located in a recess 23a of the main door 23. The shaft 33 may be provided on the first hinge bracket 31, or may be provided on a separate member spaced apart from or coupled to the first hinge bracket 31.

[126] The body 181 may be formed in a linear shape, or may be formed in a shape bent at least once. In a state in which the door 20 is closed, the first coupling portion 182 may be located near a rotation center C1 of the door 20 (or a rotation center of the main door). As an example, in a state in which the door 20 is closed, the first coupling portion 182 may be located closer to the cabinet 10 or a gasket 40 than the rotation center C1 of the door 20.

[127] The second operating portion 180 may include a second coupling portion 183 provided at another side of the body 181. The second coupling portion 183 may be connected to the third transmission portion 160.

[128] Depending on a shape of the first transmission portion 150, the second transmission unit serves as a clutch that transmits the power of the driver 110 to the second operating portion 180 in an auto opening and closing process of the door 20, and blocks a moving force of the second operating portion 180 from being transmitted to the driver 110 in a manual opening and closing process of the door 20. Therefore, the second transmission unit may be named a second clutch unit.

[129] Hereinafter, a process in which the door is opened and closed will be described.

[130] FIGS. 7 to 14 are views showing a process in which a door is automatically opened, and FIGS. 15 to 18 are views showing a process in which a door is automatically closed. FIG. 19 is a view showing a process in which a moving portion of a first transmission gear moves into a slot of a second transmission gear in a process in which a door is automatically closed. FIG. 20 is a control block diagram of a refrigerator according to the embodiment.

[131] Referring to FIGS. 3 to 20, a refrigerator of the present embodiment may further include a controller 200. The controller 200 may be installed on or spaced apart from an object for control. The controller 200 may be located inside or outside the object for control.

[132] As an example, the controller 200 may be provided on the cabinet 10 or provided on the door 20.

[133] The controller 200 can control the driver 110. The controller 200 may be located outside the driver 110. It is possible for the controller 200 to control the driver 110 alone, and it is also possible to control other components other than the driver 110 in the refrigerator.

[134] The refrigerator 1 may further include an input portion 210. The input portion 210 may input a door opening command for opening the door 20.

[135] The input portion 210 may include a touch sensor that detects a user's touch on a front surface of the door 20, or may include a knock sensor that detects a plurality of knocks applied to the front surface of the door 20. Alternatively, the input portion 210 may include a capacitance sensor, a sensor for detecting vibration, or a sensor for detecting sound waves. Alternatively, the input portion 210 may include a mechanical button or a touch screen through which a user's command can be input. Since the input portion 210 can input a command by a user or detect a user's command, the input portion 210 may also be referred to as an input detection portion.

[136] The input portion 210 may be provided on the cabinet 10 or provided on the door 20.

[137] The refrigerator 1 may further include a sensor portion 220. The sensor portion 220 can detect opening and closing of the door 20. The sensor portion 220 may be provided on the cabinet 10 or provided on the door 20.

[138] An operation of the driver 110 for the auto opening of the door 20 may be performed in a state in which the door 20 is closed. That is, when the auto opening command of the door 20 is input in a state in which closing of the door 20 is detected by the sensor portion 220, the driver 110 can operate.

[139] In a state in which the door 20 is closed, the first operating portion 170 and the second operating portion 180 may be located at initial positions.

[140] At the initial position of the first operating portion 170, the first operating portion 170 may be spaced apart from a rear surface of the door 20. A first transmission gear 130 may be located between the first operating portion 170 and the second operating portion 180. The second operating portion 180 may be located closer to the rotation center C1 of the door 20 than the first operating portion 170.

[141] At the initial position of the second operating portion 180, the second coupling portion 183 may be located farther from a front surface of the cabinet 10 than the first operating portion 170. The driver 110 may be located farther from the front surface of the cabinet 10 than the second coupling portion 183.

[142] [Auto Opening and Closing Process of Door]

[143] In a state in which the door 20 is closed, a door opening command may be input from the input portion 210. Then, the controller 200 can control the driver 110 for the auto opening of the door 20.

[144] Referring to FIG. 7, the controller 200 may rotate the motor in a forward direction as an example. When the motor rotates in the forward direction, power of the motor can be transmitted

to the first operating portion 170 through a power transmission portion 220 and the first transmission unit.

[145] At an initial position of the first transmission portion 150, the first transmission portion 150 and the second transmission portion 154 are in a disconnected state. Therefore, even if the first transmission unit operates and the first transmission portion 150 rotates, the second transmission portion 154 maintains a stopped state.

[146] In a state in which the second transmission portion 154 is stopped, the third transmission portion 160 and the second operating portion 180 also maintain a stopped state.

[147] For an operation of the first operating portion 170, the first transmission gear 130 is rotated in one direction (clockwise direction in the drawing), and the second transmission gear 140 can be rotated in the other direction (counterclockwise direction in the drawing). When the second transmission gear 140 rotates in the other direction, the first operating portion 170 moves in a first direction (for example, a front-rear direction) (a door opening direction) from the initial position toward an end position.

[148] As shown in FIG. 8, when the first operating portion 170 moves in the first direction, the first operating portion 170 is in contact with the rear surface of the door 20. In a state in which the first operating portion 170 is in contact with the rear surface of the door 20, the second operating portion 180 maintains the stopped state.

[149] As shown in FIG. 9, when the first operating portion 170 additionally moves in the first direction, the first operating portion 170 pushes the door 20 so that the door 20 is automatically rotated in an opening direction. Accordingly, at least a portion of the gasket 40 begins to be spaced apart from the cabinet 10.

[150] As shown in FIG. 10, when the first operating portion 170 additionally moves in the first direction, the door 20 is further rotated in the opening direction so that the gasket 40 is completely separated from the cabinet 10.

[151] In the present embodiment, the first operating portion 170 operates so that the gasket 40 is separated from the cabinet 10 at an initial stage of the auto opening of the door 20.

[152] The second operating portion 180 may not operate until the first operating portion 170 operates and the gasket 40 is completely separated from the cabinet 10. Alternatively, the second operating portion 180 may operate after a portion of the gasket 40 is separated from the cabinet 10. In any case, the second operating portion 180 may operate after the first operating portion 170 operates and a set time elapses or the first operating portion 170 moves a set distance.

[153] Referring to FIG. 11, even after a portion of the gasket 40 is separated from the cabinet 10, the first operating portion 170 may move additionally in the first direction. In a state such as FIG. 11, the first transmission portion 150 engages with the second transmission portion 154 so that the second transmission portion 154 can be rotated.

[154] When the auto opening of the door 20 is started and the first transmission portion 150 is rotated by a predetermined angle or more, the second portion 150b engages with the second transmission portion 154 so that a rotational force of the first transmission portion 150 can be transmitted to the second transmission portion 154. When the second transmission portion 154 is rotated, the third transmission portion 160 is also rotated so that the second operating portion 180 moves in a door opening direction. After the second operating portion 180 starts to operate, an opening angle of the door 20 can be increased.

[155] The second operating portion 180 may move from an initial position to a door opening position in the door opening direction. The second operating portion 180 may move from the door opening position to the initial position in a door closing direction.

[156] In a process in which the second operating portion 180 moves in the door opening direction, the door 20 is spaced apart from the first operating portion 170. In a state in which the first operating portion 170 and the door 20 are spaced apart from each other, the first operating portion 170 no longer applies force to the door 20.

[157] As shown in FIGS. 11 and 12, in a period of the auto opening process of the door 20, the first operating portion 170 may operate together with the second operating portion 180. That is, the first operating portion 170 moves in a first direction toward an end position, and the second operating portion 180 may move to the door opening position.

[158] In the auto opening process of the door 20, the first transmission gear 130 can be rotated only in the one direction. As shown in FIG. 12, in a state in which the moving portion 135 of the first transmission gear 130 is accommodated in the slot 142 of the second transmission gear 140, when the first transmission gear 130 rotates in one direction, the second transmission gear 140 rotates in the other direction.

[159] While the second transmission gear 140 rotates in the other direction, the first operating portion 170 moves in the first direction.

[160] Referring to FIG. 13, during a rotation of the first transmission gear 130 in one direction, the moving portion 135 may be disengaged from the slot 142 of the second transmission gear 140. A position of the first operating portion 170 at a time point when the moving portion 135 is disengaged from the slot 142 of the second transmission gear 140 may be the end position.

[161] When the moving portion 135 is disengaged from the slot 142 of the second transmission gear 140, the rotational force of the first transmission gear 130 is not transmitted to the second transmission gear 140. That is, a connection between the first transmission gear 130 and the second transmission gear 140 may be released.

[162] Accordingly, the second transmission gear 140 is rotated in one direction by an elastic force of the elastic body 149 to return to the initial position.

[163] In a process in which the second transmission gear 140 rotates in one direction, the first operating portion 170 moves in a second direction from the end position to the initial position.

[164] Referring to FIG. 14, when the second operating portion 180 continuously moves in the door opening direction to move to the door opening position, the opening angle of the door 20 becomes maximum. In the present embodiment, the maximum opening angle of the door 20 may be greater than 90 degrees.

[165] When the maximum opening angle of the door 20 is 90 degrees or more, there is an advantage in that a user can easily access the storage space 12 without the user manually opening the door 20 additionally.

[166] In a process in which the second operating portion 180 moves from the initial position to the door opening position, the second operating portion 180 may maintain a state located adjacent to the first hinge bracket 31. As an example, when a body 181 of the second operating portion 180 is formed in a bent shape and is formed in a shape similar to a bent shape of the first hinge bracket 31, movement of the second operating portion 180 is possible in a state in which the body 181 of the second operating portion 180 is close to the first hinge bracket 31.

[167] Alternatively, in a state in which the second operating portion 180 moves to the door opening position, at least a portion of the second operating portion 180 may overlap with the first hinge bracket 31 in a vertical direction. Accordingly, there is an advantage in that external exposure of the second operating portion 180 is reduced in a state in which the door is opened. As an example, when the body 181 of the second operating portion 180 is formed in a bent shape, a vertical overlap amount between the second operating portion 180 and the first hinge bracket 31 can become maximum in a state in which the second operating portion 180 moves to the door opening position.

[168] If a hinge cover covering the first hinge bracket 31 is added, the second operating portion 180 can be moved within the hinge cover. In this case, there is an advantage in that external exposure of the second operating portion 180 can be minimized.

[169] On the other hand, after the auto opening of the door 20 is completed, the motor may be rotated in a reverse direction for an auto closing of the door 20.

[170] As an example, when a closing command of the door 20 is detected or recognized, such as when a set time elapses after the door 20 is opened, a user is not detected after the door 20 is opened, or a separate door closing command is input, the controller 200 can control the motor to rotate in the reverse direction.

[171] When the motor rotates in the reverse direction, power of the motor is transmitted to the second transmission unit so that the second operating portion 180 can move from the door opening position to the initial position in a door closing direction.

[172] Since the connection between the first transmission gear 130 and the second transmission gear 140 is released in a process in which the door 20 is opened, the first operating portion 170 and the second transmission gear 140 maintain a stopped state in a process in which the motor rotates in the reverse direction.

[173] Referring to FIGS. 16 to 19, in the process in which the motor rotates in the reverse direction, the first transmission gear 130 rotates in the other direction.

[174] In a process in which the first transmission gear 130 rotates in the other direction, the moving portion 135 may be aligned with the recess 143 as shown in (a) of FIG. 19. When the first transmission gear 130 additionally rotates in the other direction, the moving portion 135 is into contact with the inclined surface 144 within the recess 143. Referring to (b) and (c) of FIG. 19, in the process of rotation of the first transmission gear 130 in the other direction, the moving portion 135 is pressed by the inclined surface 144 to move downward. When the moving portion 135

moves downward, the elastic member 148 may contract. Thereafter, referring to (d) of FIG. 19, when the moving portion 135 is aligned with the slot 142, the elastic member 148 is extended so that the moving portion 135 is inserted into the slot 142 by an elastic force of the elastic member 148. The motor may be stopped at a time point when the moving portion 135 is inserted into the slot 142 or after the moving portion 135 is inserted into the slot 142.

[175] According to the present embodiment, at an initial stage of auto opening of a door, power of a motor is transmitted to a first operating portion to be used for separation of a gasket, and after a separation process or separation of the gasket, it is used as an opening force of the door. Therefore, there is an advantage in that the gasket of the door can be easily separated at the initial stage of door opening.

[176] In addition, in the case of the present embodiment, since a door is not only automatically opened but also automatically closed, there is an advantage in that user convenience is improved.

[177] [Manual Opening Process of Door]

[178] FIGS. 21 and 22 are views showing a process in which a door is manually opened.

[179] Referring to FIGS. 21 and 22, a user can manually open the door 20 in a state in which the door 20 is closed.

[180] As described above, in a state in which the door 20 is closed, since the first transmission portion 150 and the second transmission portion 154 are in a disconnected state, rotation of the first transmission portion 150 is restricted even if the second transmission portion 154 rotates. In the disconnected state of the first transmission portion 150 and the second transmission portion 154, the first transmission portion 150 may be located at a disconnected position.

[181] When a user holds a handle of the door 20 and pulls the door 20, the door can rotate. When the door 20 rotates in an opening direction, the second operating portion 180 connected to the door

20 moves together with the door 20. In a manual opening process of the door 20, the second operating portion 180 is movable to a door opening position by a rotational force of the door 20.

[182] When the second operating portion 180 moves together with the door 20, the third transmission portion 160 connected to the second operating portion 180 rotates. When the third transmission portion 160 rotates, the second transmission portion 154 also rotates. However, since the first transmission portion 150 is located at the disconnected position, the first transmission portion 150 does not rotate even if the second transmission portion 154 rotates. Therefore, in the manual opening process of the door 20, the manual rotational force of the door 20 is not transmitted to the first transmission portion 150. Since the rotational force of the door 20 is not transmitted to the driver 110 either, a load can be prevented from acting on the driver 110. In addition, in the manual opening process of the door 20, since the rotational force of the door 20 is not transmitted to the first transmission unit and the power transmission portion 120 either, generation of noise due to rotation of gears can be prevented.

[183] Even in a process in which a user closes the door 20, the second transmission portion 154 rotates, but the first transmission portion 150 can maintain a stopped state.

[184] On the other hand, considering weight of a door or strength of magnetic force of a magnet, it is also possible to omit the first transmission unit and the first operating portion.

CLAIMS

[Claim 1]

A refrigerator, comprising:

a cabinet having a storage space;

a door that opens and closes the storage space; and

a door opening and closing device configured to open the door,

wherein the door opening and closing device comprises:

a driver that generates power;

a power transmission portion that transmits the power of the driver;

a first operating portion that operates by receiving the power of the driver; and

a second operating portion that operates by receiving the power of the driver and is disposed at a position spaced apart from a rotation center of the door,

wherein when the driver operates for an auto opening of the door, the first operating portion starts to operate, and the second operating portion starts to operate after the first operating portion starts to operate.

[Claim 2]

The refrigerator of claim 1,

wherein the door opening and closing device further comprises:

a first transmission unit configured to transmit the power of the driver to the first operating portion during an auto opening process of the door; and

a second transmission unit configured to transmit the power of the driver to the second operating portion.

[Claim 3]

The refrigerator of claim 2,

wherein the first operating portion comprises a rack gear connected to the first transmission unit.

[Claim 4]

The refrigerator of claim 3,

wherein the first operating portion comprises:

a first member including the rack gear; and

a second member rotatably connected to the first member and in contact with a rear surface of the door.

[Claim 5]

The refrigerator of claim 2,

wherein the second operating portion comprises:

a body extending from the cabinet toward the door;

a first coupling portion located at one side of the body and coupled to the door; and

a second coupling portion located at another side of the body and coupled to the second transmission unit.

[Claim 6]

The refrigerator of claim 2,

wherein in the auto opening process of the door, the first transmission unit blocks transmission of the power while the first operating portion is operated.

[Claim 7]

The refrigerator of claim 6,

wherein the door opening and closing device further comprises an elastic body providing an elastic force to the first operating portion or the first transmission unit so that the first operating portion returns to an initial position in a state in which the transmission of the power is blocked.

[Claim 8]

The refrigerator of claim 1,

wherein in a period of an auto opening process of the door, the first operating portion and the second operating portion move together in a door opening direction.

[Claim 9]

The refrigerator of claim 1,

wherein in an auto opening process of the door, the first operating portion moves from an initial position to an end position, and the second operating portion moves from an initial position to a door opening position,

wherein before the second operating portion moves to the door opening position, the first operating portion returns to the initial position again after being moved to the end position.

[Claim 10]

The refrigerator of claim 9,

wherein in the auto closing process of the door, the second operating portion moves from the door opening position to the initial position in a state in which the first operating portion is stopped at the end position.

[Claim 11]

The refrigerator of claim 2,

wherein in a manual opening process of the door, the second transmission unit blocks a rotational force of the door from being transmitted to the driver.

[Claim 12]

The refrigerator of claim 2,

wherein in the auto opening process of the door, the second transmission unit receives the power of the driver from the first transmission unit.

[Claim 13]

The refrigerator of claim 2,

wherein the first transmission unit comprises:

a first transmission gear having a moving portion; and

a second transmission gear having a slot in which the moving portion is accommodated and connected to the first operating portion,

wherein when the first transmission gear is rotated in one direction in a state in which the moving portion is located in the slot, the second transmission gear is rotated together,

wherein when the first transmission gear is rotated in the one direction in a state in which the moving portion is disengaged from the slot, the second transmission gear is not rotated.

[Claim 14]

The refrigerator of claim 13,

wherein in the auto opening process of the door, the first operating portion moves from an initial position to an end position,

wherein when the first operating portion moves to the end position, the moving portion is disengaged from the slot.

[Claim 15]

The refrigerator of claim 13,

wherein the second transmission gear comprises a recess communicating with the slot, and an inclined surface in contact with the moving portion as a surface forming the recess,

wherein in an auto closing process of the door, when the second transmission gear rotates in another direction, the moving portion is moved from the recess into the slot along the inclined surface.

[Claim 16]

The refrigerator of claim 2,
wherein the second transmission unit comprises:
a first transmission portion;
a second transmission portion connectable to or disconnectable from the first transmission portion; and
a third transmission portion connected to the second transmission portion and the second operating portion.

[Claim 17]

The refrigerator of claim 16,
wherein the first transmission portion comprises a first portion in which gear teeth are absent, and a second portion in which gear teeth are present,
wherein in a state in which the door is closed, the first transmission portion is located at a disconnected position where the first portion is aligned with the second transmission portion,
wherein in the auto opening process of the door, when the first transmission portion is rotated by a predetermined angle, the second portion is connected to the second transmission portion.

[Claim 18]

The refrigerator of claim 17,
wherein at the disconnected position of the first transmission portion, the door is manually openable.

[Claim 19]

The refrigerator of claim 18,
wherein in a manual opening process of the door, the second operating portion is movable to the door opening position by the rotational force of the door.

[Claim 20]

A refrigerator, comprising:

a cabinet having a storage space;

a door that opens and closes the storage space; and

a door opening and closing device configured to open the door,

wherein the door opening and closing device comprises:

a driver that generates power;

an operating portion that operates by receiving the power of the driver and is disposed at a position spaced apart from a rotation center of the door;

a first transmission portion configured to transmit the power of the driver; and

a second transmission portion connectable to or disconnectable from the first transmission portion,

wherein in a state in which the door is closed, the first transmission portion is located at a disconnected position where the first transmission portion is disconnected to the second transmission portion,

wherein when the driver operates for an auto opening of the door, the first transmission portion moves to a connected position to be connected to the second transmission portion in an auto opening process of the door.

ABSTRACT

The refrigerator according to an embodiment includes: a cabinet having a storage chamber; a door for opening and closing the storage chamber; and a door opening and closing device for opening the door, wherein the door opening and closing device includes: a driving unit for generating power; a power transmission unit for transmitting power from the driving unit; a first operation unit operated by receiving power from the driving unit; and a second operation unit operated by receiving power from the driving unit and disposed at a position spaced apart from the center of rotation of the door, and when the driving unit operates to automatically open the door, the first operation unit starts to operate, and after the first operation unit starts to operate, the second operation unit starts to operate.

FIG. 1

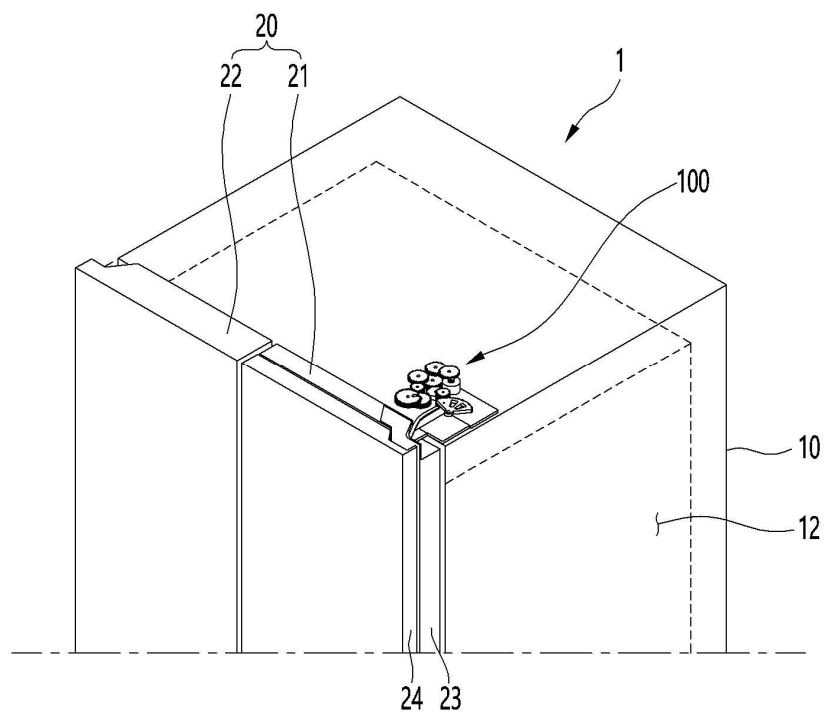


FIG. 2

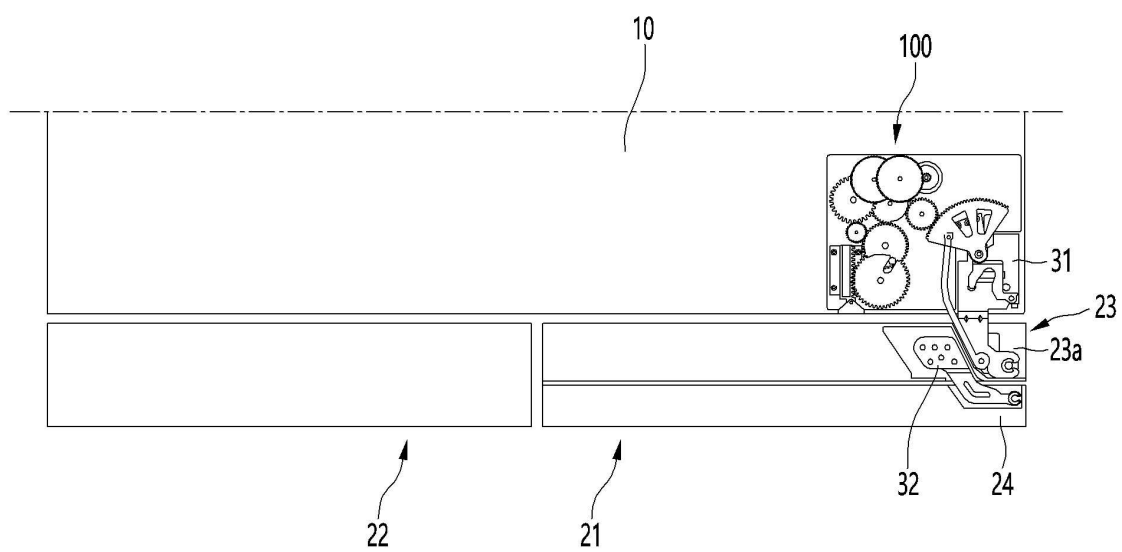


FIG. 3

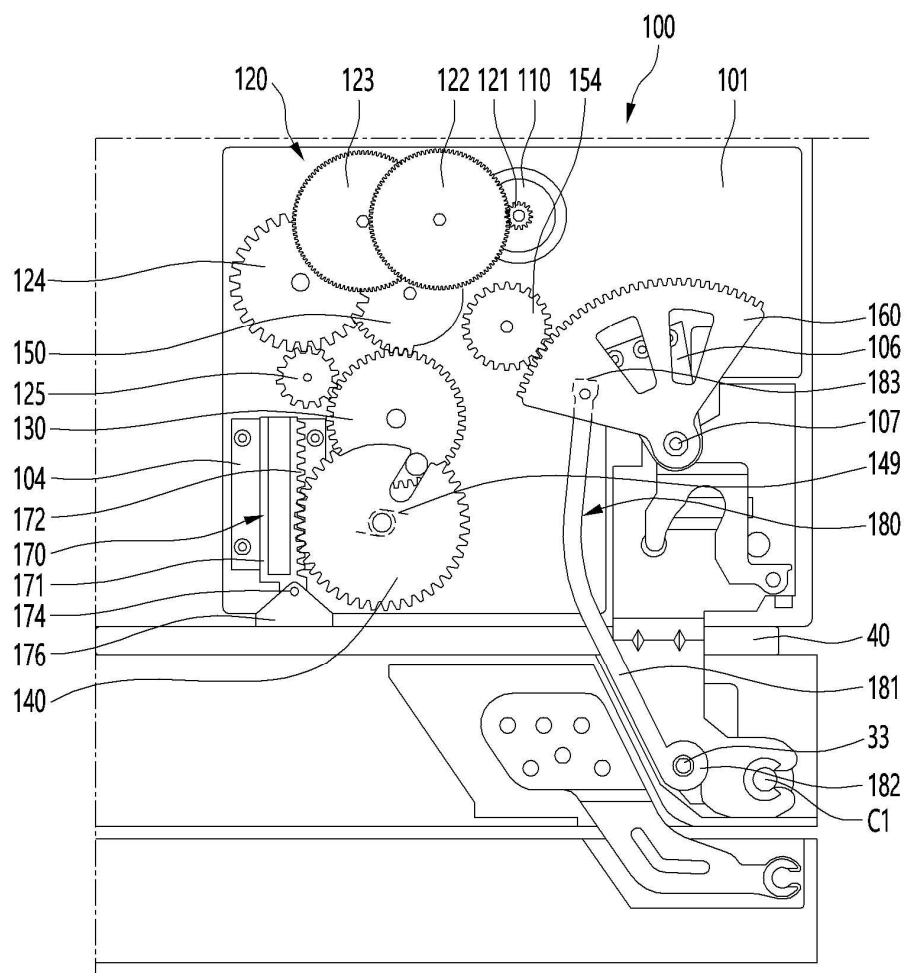


FIG. 4

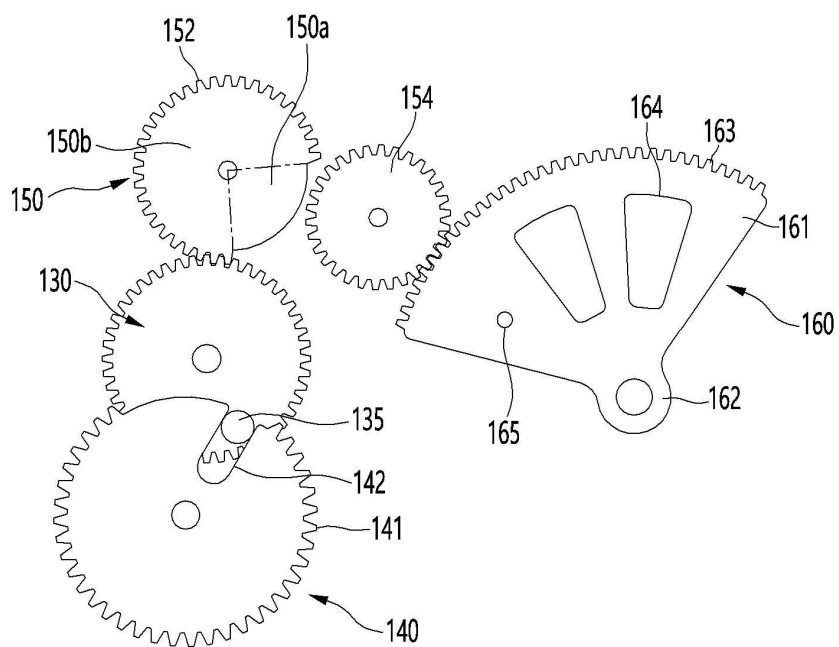


FIG. 5

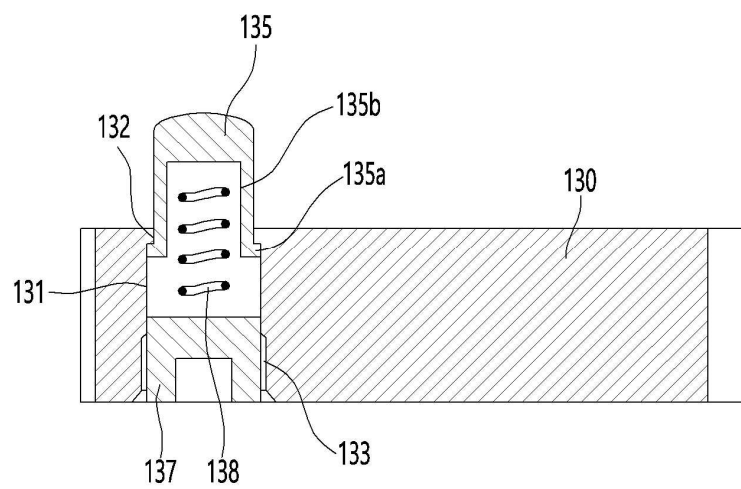
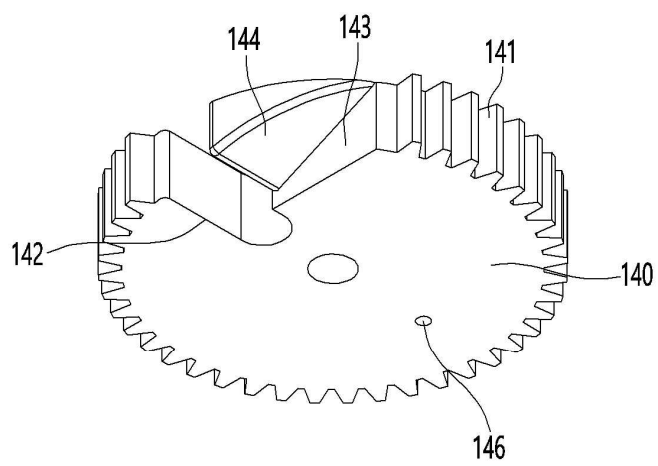
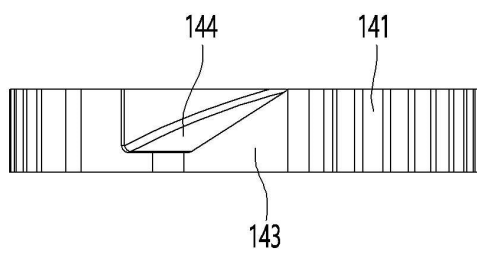


FIG. 6



(a)



(b)

FIG. 7

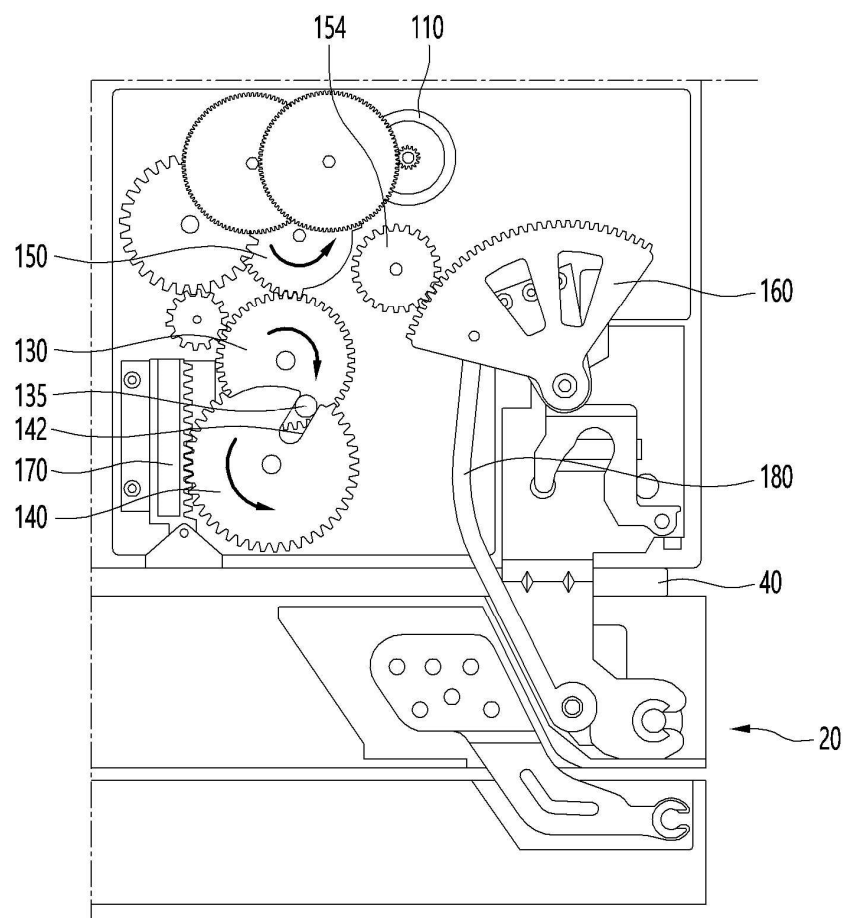


FIG. 8

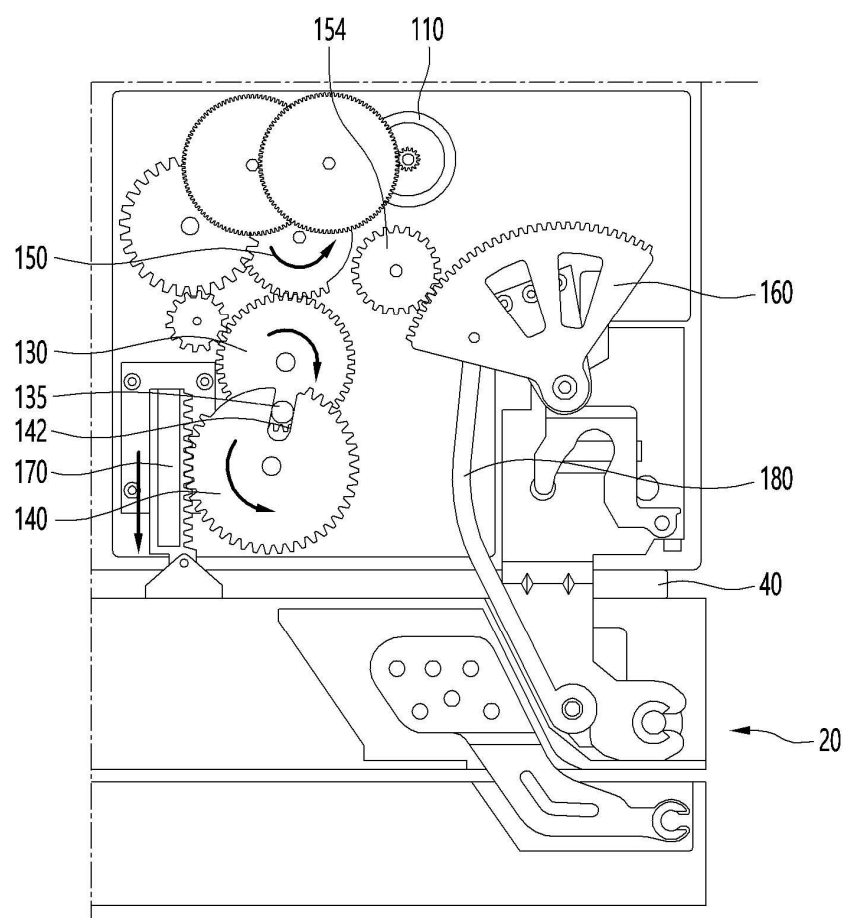


FIG. 9

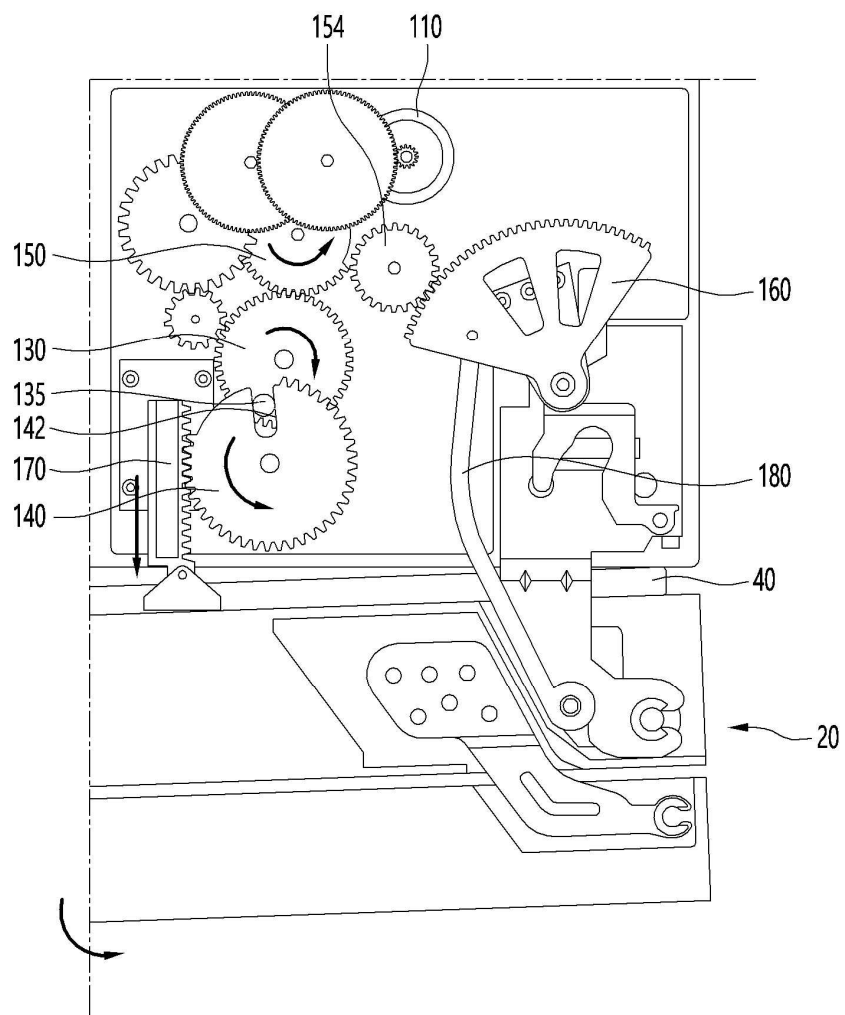


FIG. 10

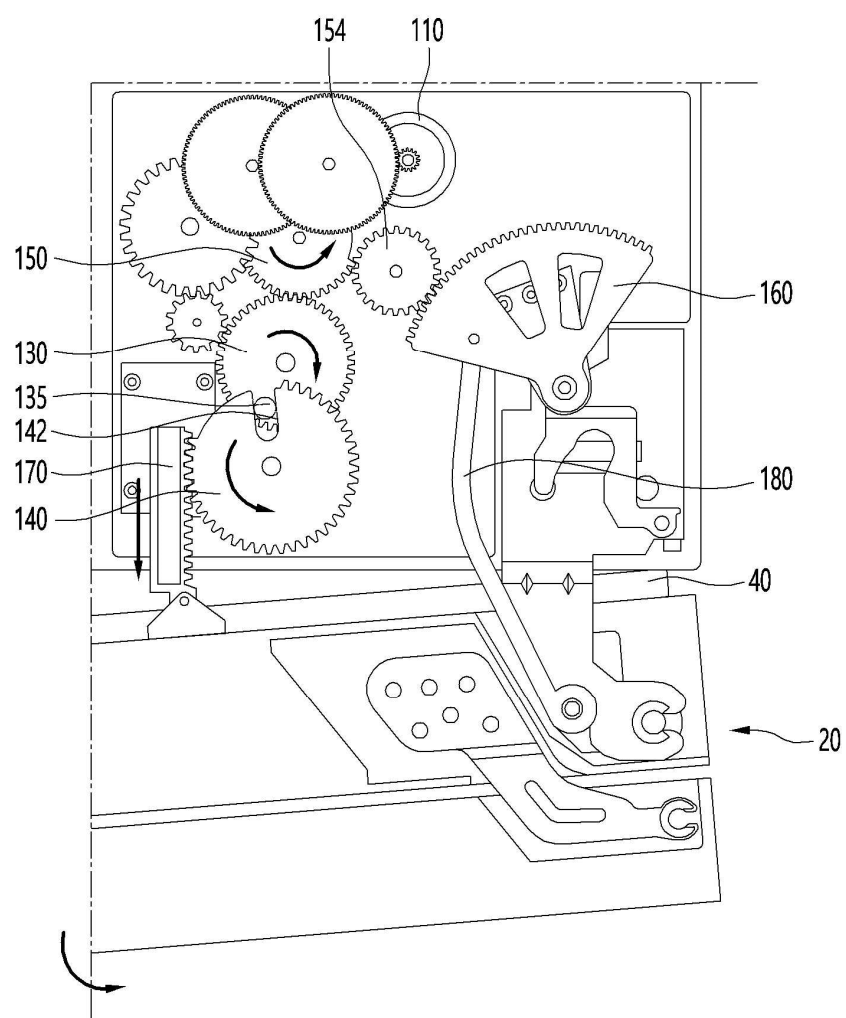


FIG. 11

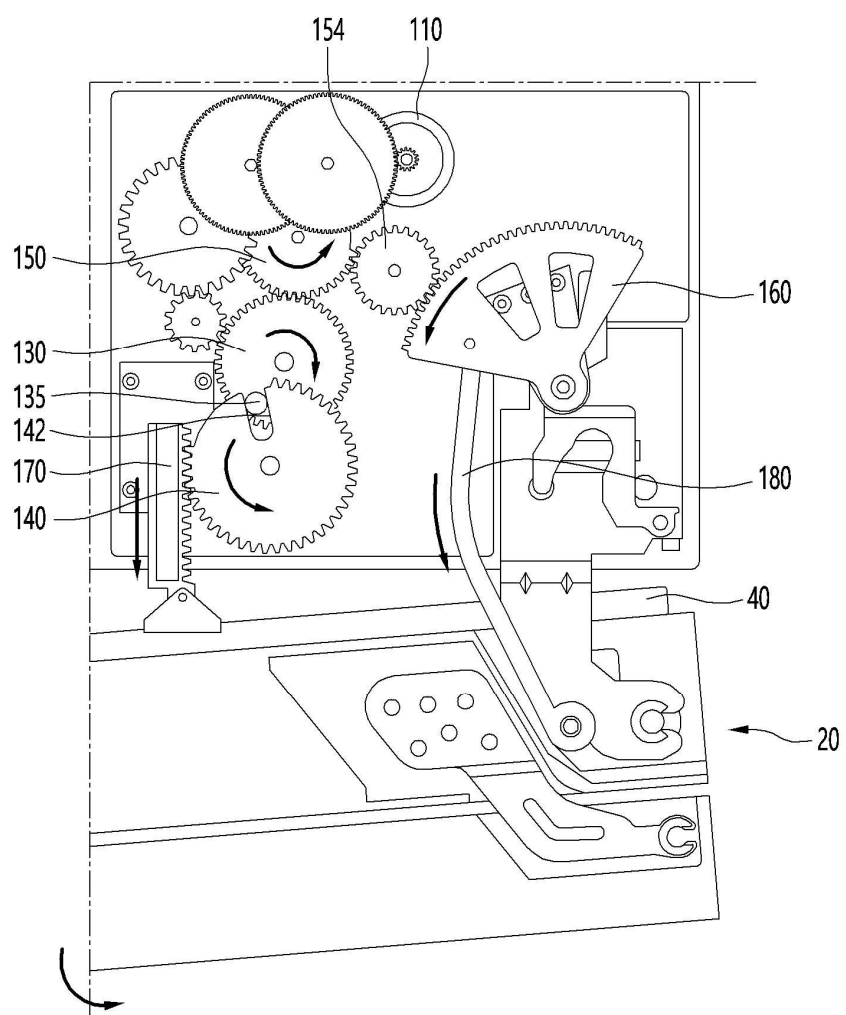


FIG. 12

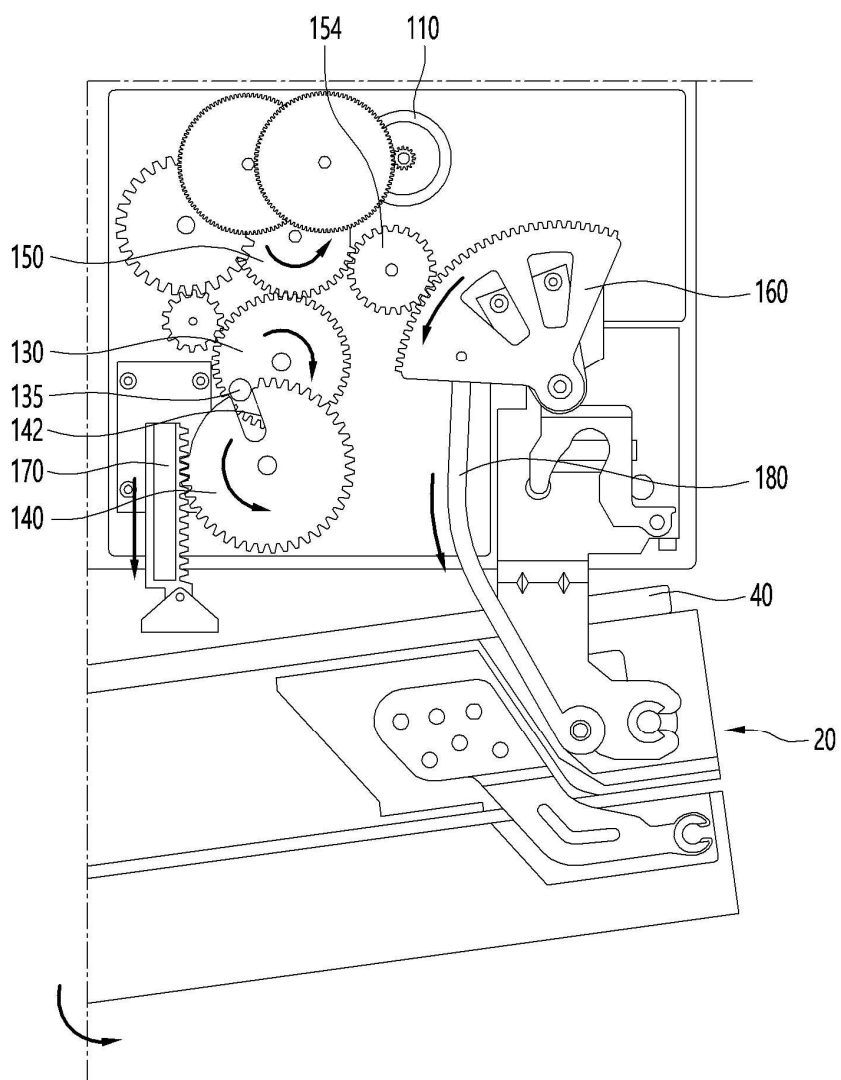


FIG. 13

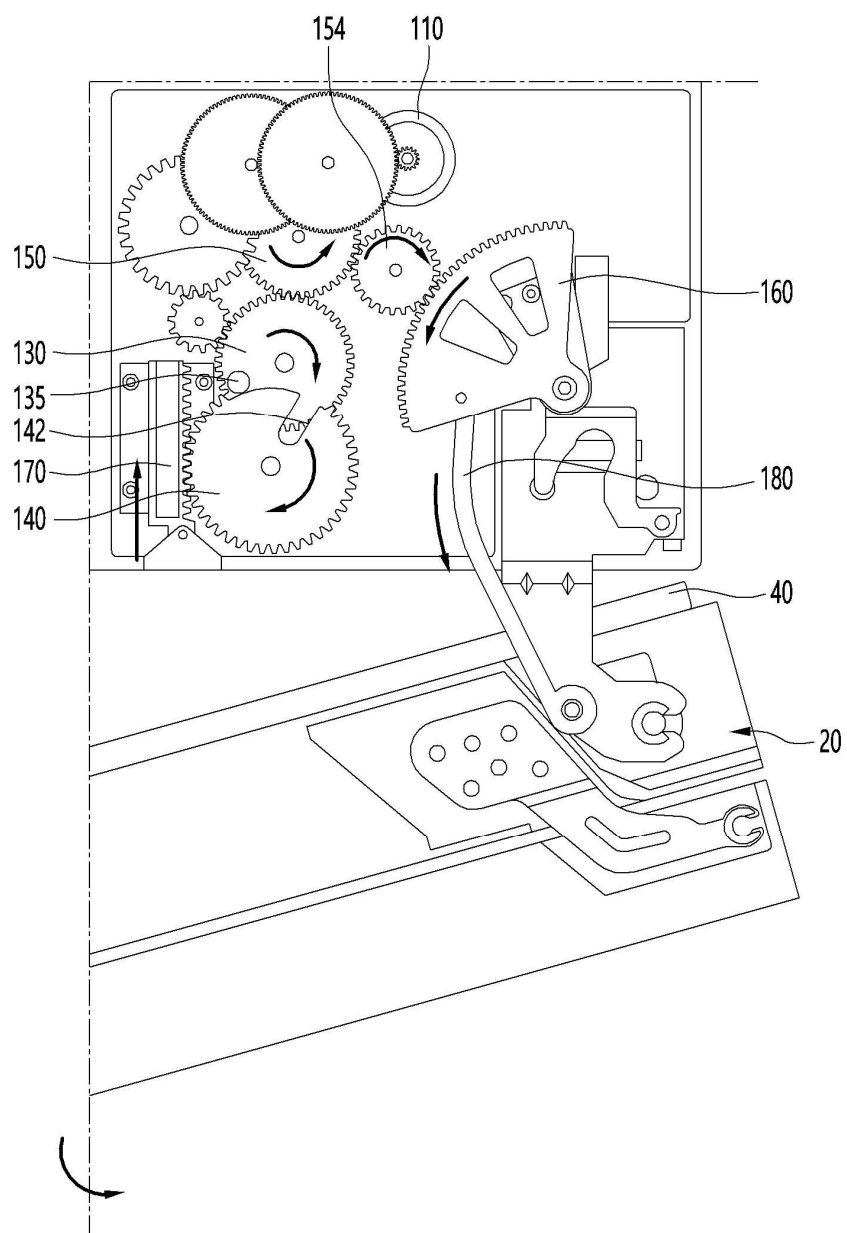


FIG. 14

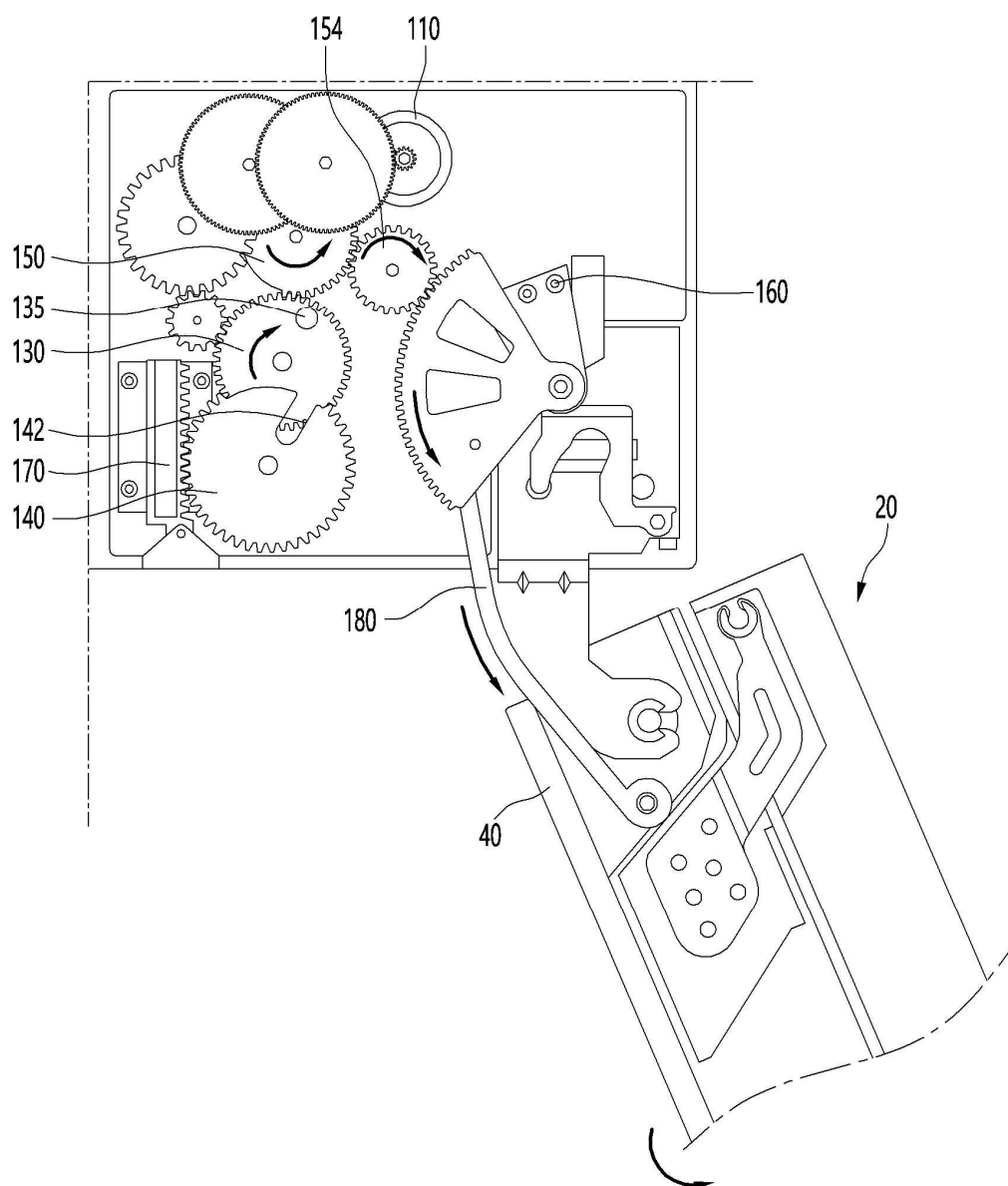


FIG. 15

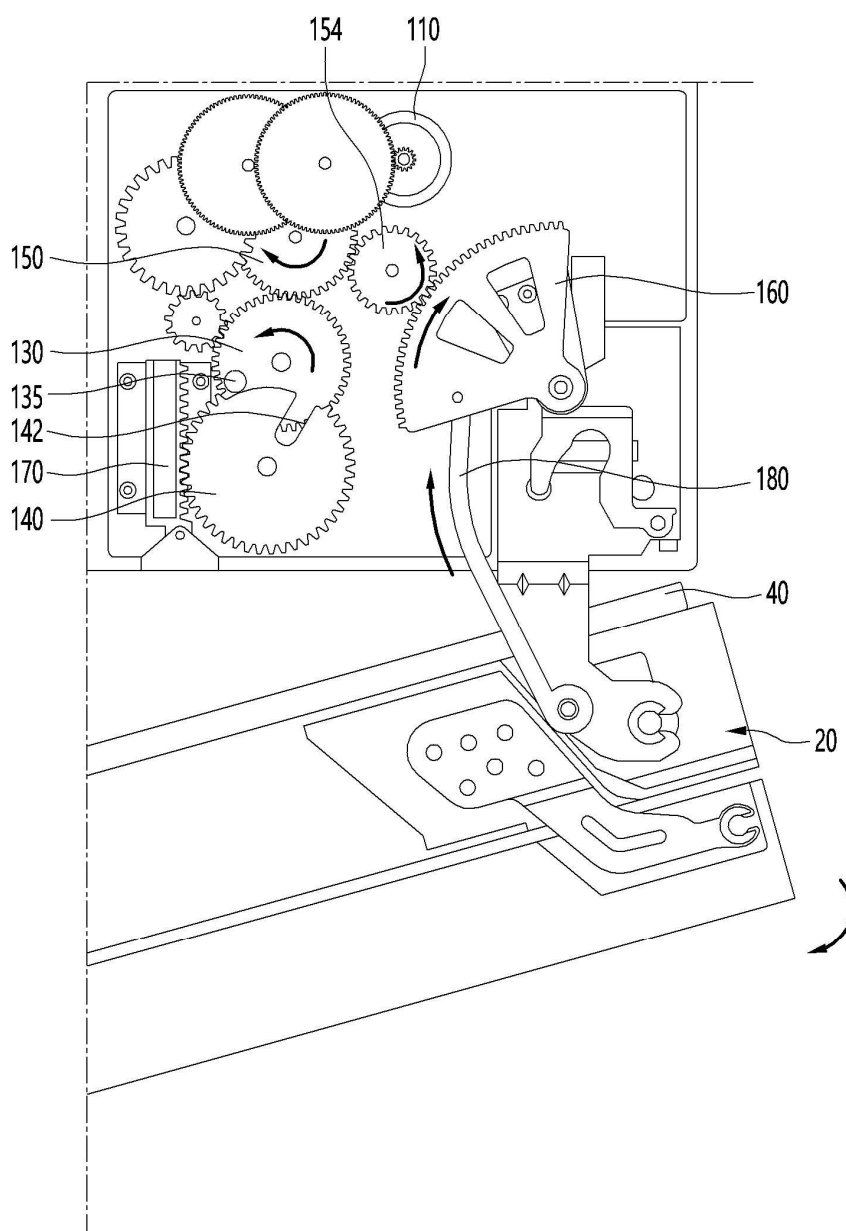


FIG. 16

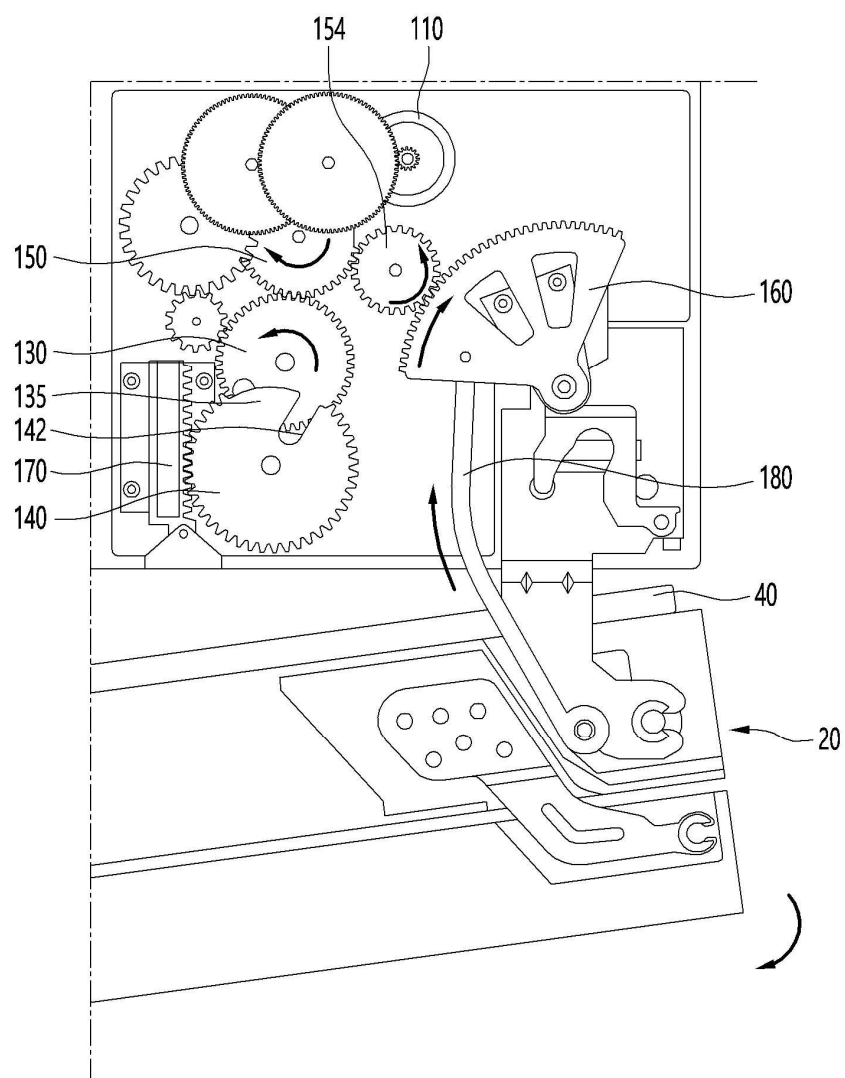


FIG. 17

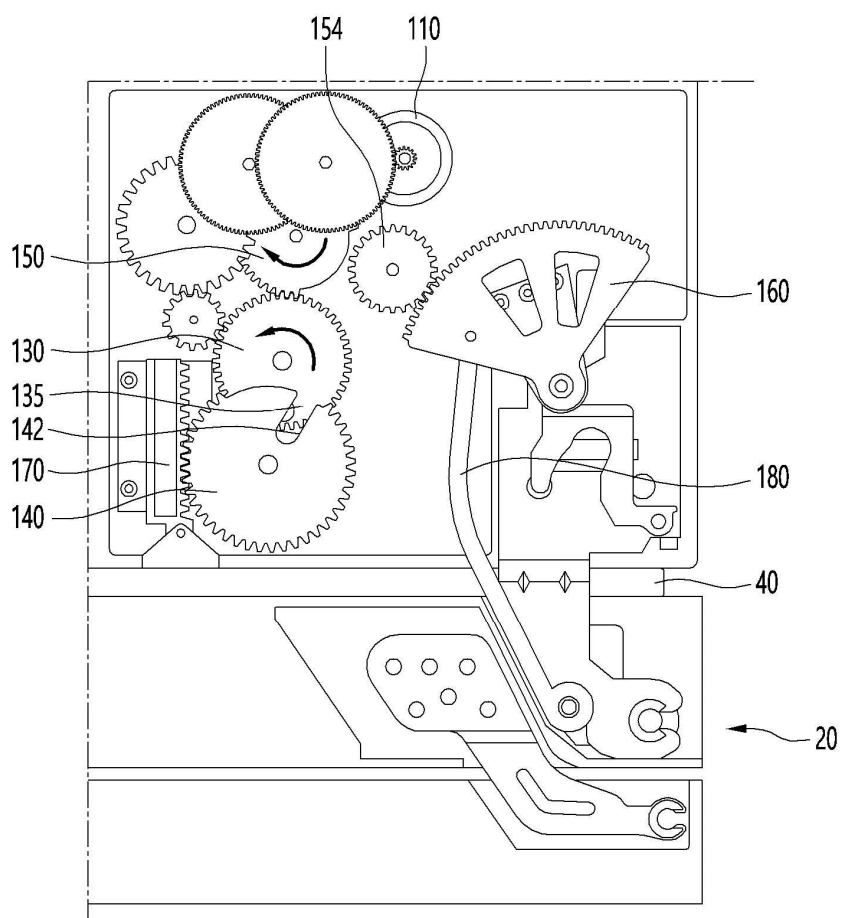


FIG. 18

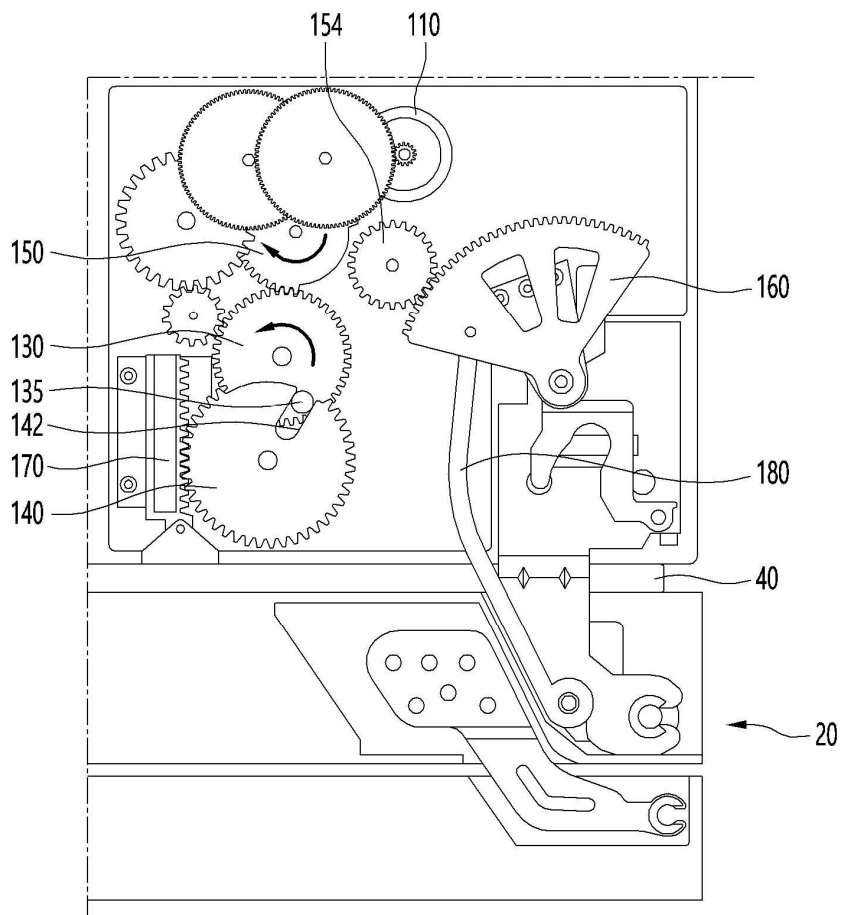
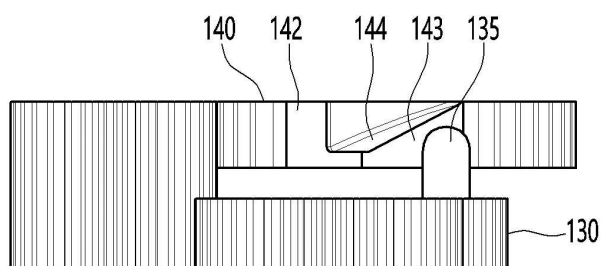
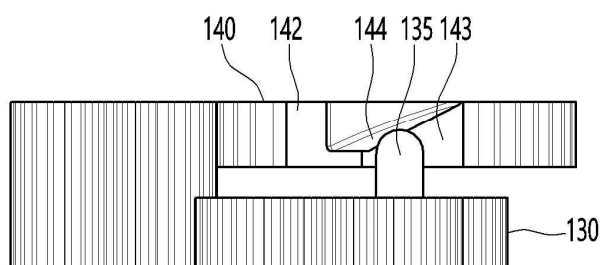


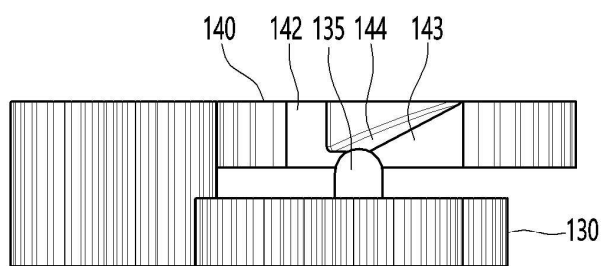
FIG. 19



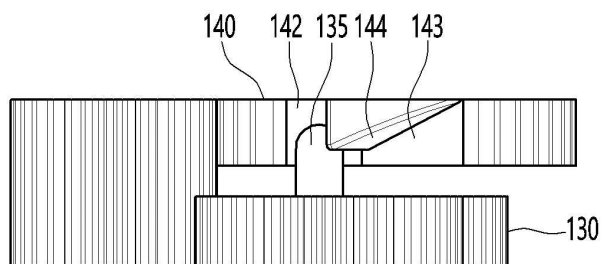
(a)



(b)



(c)



(d)

FIG. 20

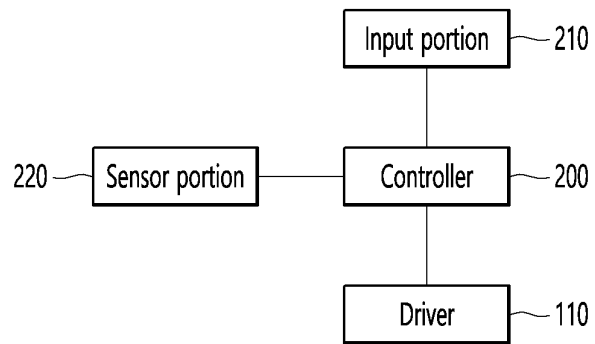


FIG. 21

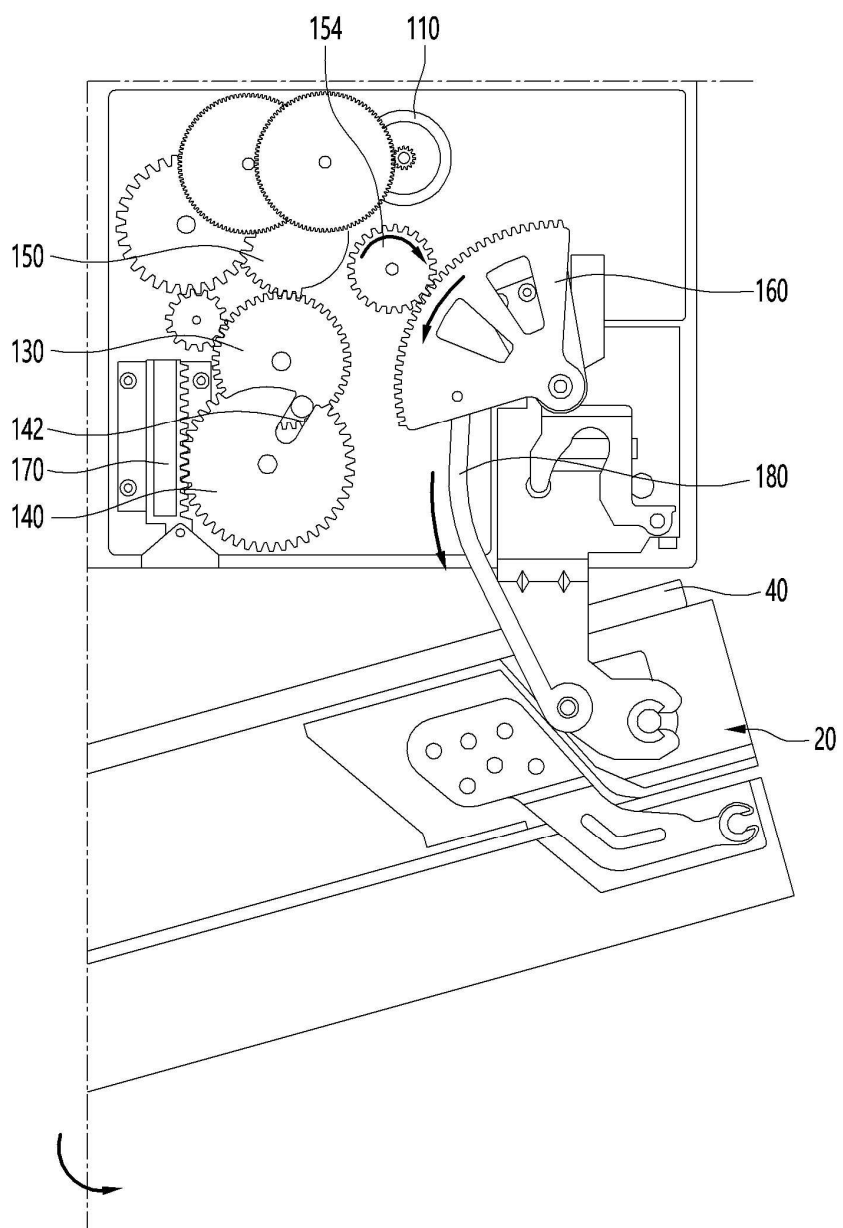
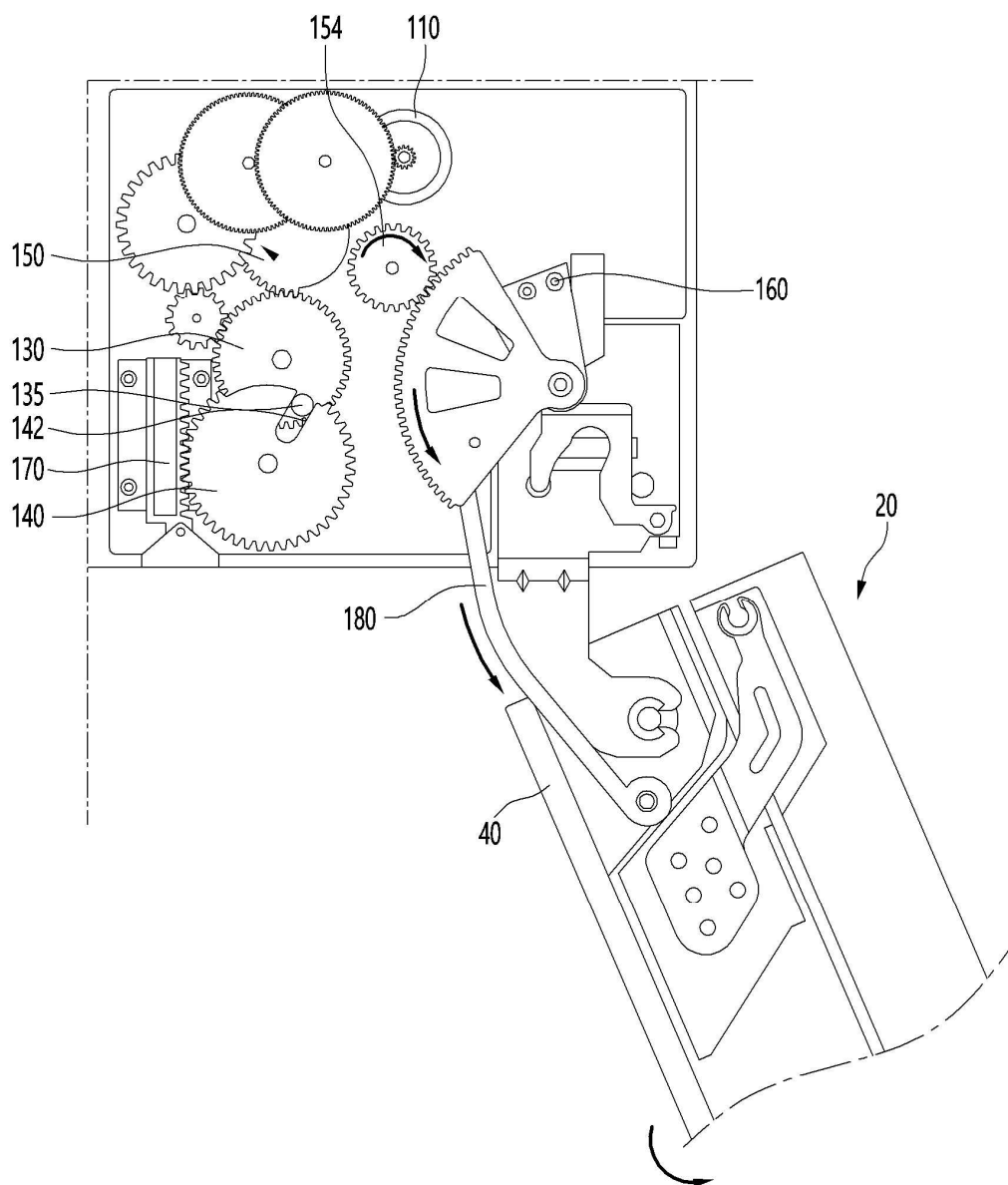


FIG. 22



DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)
--

Title of Invention	REFRIGERATOR
As the below named inventor, I hereby declare that: This declaration is directed to: ☒ The attached application, or ☐ United States application or PCT international application number _____ filed on _____. The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.	
LEGAL NAME OF INVENTOR Name of inventor : LEE, Heejun Date (Optional) : Jun 04, 2026 Signature :  <u>LEE, Heejun (Jun 4, 2026 11:23:43 GMT+9)</u>	

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)
--

Title of Invention	REFRIGERATOR
As the below named inventor, I hereby declare that: This declaration is directed to: ☒ The attached application, or ☐ United States application or PCT international application number _____ filed on _____. The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.	
LEGAL NAME OF INVENTOR Name of inventor : CHANG, Jinho Date (Optional) : Jun 04, 2026 Signature :  <u>JINHO CHANG (Jun 4, 2026 07:45:06 GMT+9)</u>	

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)
--

Title of Invention	REFRIGERATOR
As the below named inventor, I hereby declare that: This declaration is directed to: ☒ The attached application, or ☐ United States application or PCT international application number _____ filed on _____. The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.	
LEGAL NAME OF INVENTOR Name of inventor : GWON, Seongwon Date (Optional) : Jun 05, 2026 Signature :  <u>Seongwon Gwon (Jun 5, 2026 07:32:19 GMT+9)</u>	

BIRCH, STEWART, KOLASCH & BIRCH, LLP
2600 Park Tower Drive, Suite 600, Vienna, VA 22180
Telephone: (703) 205-8000 • Facsimile: (703) 205-8050 • Email: mailroom@bskb.com

**DECLARATION AND ASSIGNMENT
FOR PATENT AND DESIGN APPLICATIONS**

UNITED STATES PATENT RIGHTS, OR
UNITED STATES PLUS ALL FOREIGN PATENT RIGHTS

Title of Invention ⇒ **REFRIGERATOR**

As a below named inventor (hereinafter designated as the undersigned), I hereby declare that:

This declaration is directed to the application attached hereto.

Application not Attached ⇒ If the application is not attached hereto, the application is as identified by the attorney docket number as set forth above and/or the following:

Enter Appln. No. ⇒ United States Application Number or PCT International Appln. No. **PCT/KR2024/020822**

Enter Filing Date ⇒ filed on **December 20, 2024**.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I have reviewed and understand the contents of the above-identified application, including the claims.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations § 1.56.

The undersigned hereby acknowledges that any willful false statement made in this declaration is punishable under 18 U.S.C. § 1001 by fine or imprisonment of not more than five (5) years, or both.

WHEREAS, the undersigned has invented certain new and useful improvements described in the application identified.

Insert Name of Assignee ⇒ **WHEREAS, PUSAN NATIONAL UNIVERSITY INDUSTRY-UNIVERSITY COOPERATION FOUNDATION**

Insert Address of Assignee ⇒ **of 2, Busandaehak-ro, 63beon-gil, Geumjeong-gu, Busan 46241, Republic of Korea,**

its heirs, successors, legal representatives and assigns (hereinafter designated as the Assignee) is desirous of acquiring the entire right, title and interest in and to said invention and in and to any Letters Patent(s) that may be granted therefor in the United States of America and

Check Box if Appropriate ⇒ ☐ **in any foreign countries.**

NOW, THEREFORE, for good and valuable consideration, the receipt of which is hereby acknowledged, the undersigned has sold, assigned and transferred, and by these presents does (do) sell, assign and transfer unto said Assignee the full and exclusive right to the said invention in the United States of America, its territories, dependencies and possessions and the entire right, title and interest in and to any and all Letters Patent(s) which may be granted therefor in the United States of America, its territories, dependencies and possessions, and if the box above is designated, in any and all foreign countries; including all rights under the International Convention for the Protection of Industrial Property or similar agreements as well as the right to claim benefit from the priority of the above-mentioned application; and to any and all divisions, reissues, continuations, conversions and extensions thereof for the full term or terms for which the same may be granted.

The undersigned agrees to execute all papers necessary in connection with this application and any continuing, divisional, conversion or reissue applications thereof and also to execute separate assignments in connection with such applications as the Assignee may deem necessary or expedient.

The undersigned agrees to execute all papers necessary in connection with any interference which may be declared concerning this application or continuation, division, conversion or reissue thereof or Letters Patent(s) or reissue patent issued thereon and to cooperate with the Assignee in every way possible in obtaining and producing evidence and proceeding with such interference.

The undersigned agrees to execute all papers and documents and to perform any act which may be necessary in connection with claims or provisions of the International Convention for the Protection of Industrial Property or similar agreements.

The undersigned agrees to perform all affirmative acts which may be necessary to obtain a grant of (a) valid United States of America patent(s) or a grant of (a) valid United States of America and any foreign patent(s) to the Assignee and to vest all rights therein hereby conveyed to said Assignee as fully and entirely as the same would have been held by the undersigned if this Assignment and sale had not been made.

The undersigned hereby authorizes and requests the Patent and Trademark Office Officials in the United States of America and in any foreign countries to issue any and all Letters Patent(s) resulting from said application or any continuing, divisional conversion or reissue applications thereof to the said Assignee, as Assignee of the entire interest, and hereby covenants that he has the full right to convey the entire interest herein assigned, and that he has not executed, and will not execute, any agreement in conflict herewith.

The undersigned hereby grants the law firm of Birch, Stewart, Kolasch & Birch, LLP the power to insert any further identification which may be necessary or desirable in order to comply with the rules of the U.S. Patent and Trademark Office.

The undersigned hereby covenants that no assignment, sale, agreement or encumbrance has been or will be made or entered into which would conflict with this assignment.

In witness whereof, executed by the undersigned on the date opposite the undersigned name.

LEGAL NAME OF INVENTOR

Inventor's Name ⇒ Inventor: Yoongho JUNG Date: June 11, 2026

Inventor's Signature ⇒ Signature: 

An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use a separate form for each inventor; or check the box below and complete the attached page(s) to list additional inventors.

☒ Additional inventors are being named on the 1 supplemental sheet(s) attached hereto.

**SUPPLEMENTAL SHEET FOR
DECLARATION AND ASSIGNMENT**

ADDITIONAL INVENTOR(S)
Supplemental Sheet Page 1 of 1

LEGAL NAME OF JOINT INVENTOR, IF ANY

Inventor's Name ⇒ Inventor: **Sanghu PARK** Date: June 11, 2026

Inventor's Signature ⇒ Signature: *Park, Sanghu*

특허협력조약

발신: 국제조사기관

수신: 허용록 대한민국 06252 서울특별시 강남구 역삼로 114 현죽빌딩 6층
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PCT

국제조사기관의 견해서
(PCT규칙 43의2.1)

출원인 또는 대리인의 서류참조기호 24REF019PC02		발송일 (일/월/년) 2025년03월31일(31.03.2025)
국제출원번호 PCT/KR2024/020822		추가적인 조치 아래 2를 참조
국제출원일 (일/월/년) 2024년12월20일(20.12.2024)	우선일 (일/월/년) 2023년12월22일(22.12.2023)	
국제특허분류(IPC) F25D 23/02(2006.01)i; E05F 15/619(2015.01)i; E05F 15/614(2015.01)i; E05D 15/40(2006.01)i		
출원인 엘지전자 주식회사 등		

1. 본 견해서는 다음 기재란에 관한 내용을 포함합니다.

- | | | |
|-------------------------------------|-------|---|
| ☒ | 제1기재란 | 견해서의 기초 |
| ☐ | 제2기재란 | 우선권 |
| ☐ | 제3기재란 | 신규성, 진보성 및 산업상이용가능성에 관한 견해 부작성 |
| ☐ | 제4기재란 | 발명의 단일성 결여 |
| ☒ | 제5기재란 | 신규성, 진보성 또는 산업상이용가능성에 관한 견해(PCT규칙 43의2.1(a)(i)), 이를 뒷받침하는 인용문헌 및 설명 |
| ☐ | 제6기재란 | 특이 인용문헌 |
| ☐ | 제7기재란 | 국제출원의 흠결 |
| ☒ | 제8기재란 | 국제출원에 관한 의견 |

2. 추가적인 조치

국제예비심사가 청구되면, 본 견해서는 국제예비심사기관("IPEA")의 견해서로 간주될 것입니다. 다만, 출원인이 본 기관 이외의 기관을 IPEA로 선택하고, 그 선택된 IPEA가 PCT규칙 66.1의2(b)에 따라 본 국제조사기관의 견해서가 위와 같이 간주되지 않을 것임을 국제사무국에 통보한 경우에는 그러하지 않습니다.

본 견해서가 상기와 같이 IPEA의 견해서로 간주되는 경우, 출원인은 서식 PCT/ISA/220의 발송일로부터 3월 또는 우선일로부터 22월 중 늦게 만료되는 날 이전에 의견서 및 보정서(해당하는 경우)를 IPEA에 제출할 수 있습니다.

다른 선택사항에 대하여는 서식 PCT/ISA/220에 대한 안내문을 참조하십시오.

ISA/KR의 명칭 및 우편주소 대한민국 특허청 (35208) 대전광역시 서구 청사로 189, 4동 (둔산동, 정부대전청사) 팩스 번호 +82-42-481-8578	본 견해서의 완료일 2025년03월18일(18.03.2025)	심사관 이연수 전화번호 +82-42-481-8539
---	---------------------------------------	--

서식 PCT/ISA/237 (표지) (2022년 7월)

제1기재란

본 견해서의 기초

1. 언어와 관련하여, 본 견해서는 아래에 기초하여 작성되었습니다.



출원시의 언어로 된 국제출원



국제조사를 위하여 _____로 번역되어 제출된 국제출원의 번역문
(PCT규칙 12.3(a) 및 23.1(b))

2. ☐ 본 견해서는 PCT규칙 91에 따라 당해 기관이 허가하였거나 당해 기관에 통보된 명백한 잘못의 정정을 고려하여 작성되었습니다(PCT규칙 43의2.1(b)).

3. ☐ 국제출원에 개시된 핵산염기 및/또는 아미노산 서열과 관련하여, 본 견해서는 아래에 기초하여 작성되었습니다.

a.



출원시 국제출원의 일부를 구성하는 서열목록

b.



국제조사를 목적으로 국제출원일 이후에 제출된 서열목록(규칙 13의3.1(a))



서열목록이 출원시 국제출원의 개시 범위를 넘지 않는다는 취지의 진술서를 첨부

4. ☐ 국제출원에 개시된 핵산염기 및/또는 아미노산 서열에 대해, 본 견해서는 WIPO 표준 ST.26을 준수하는 서열목록이 없이 유효한 견해를 제시할 수 있는 범위에서 작성되었습니다.

5. 추가 의견:

제5기 재란

신규성, 진보성 또는 산업상 이용가능성에 관한 견해(PCT규칙 43의 2.1(a)(i)), 이를 뒷받침하는 인용문헌 및 설명

1. 견해

신규성 (N)	청구항	2-20	있음
	청구항	1	없음
진보성 (IS)	청구항	13-15,17-19	있음
	청구항	1-12,16,20	없음
산업상 이용가능성 (IA)	청구항	1-20	있음
	청구항	없음	없음

2. 인용문헌 및 설명:

참고한 인용문헌은 다음과 같습니다.

D1: KR 10-2009-0076555 A (엘지전자 주식회사) 2009.07.13
D2: KR 10-1151618 B1 (주식회사 에스 씨디) 2012.06.08
D3: JP 2016-011797 A (HAIER ASIA CO., LTD.) 2016.01.21
D4: JP 2014-214893 A (HITACHI APPLIANCES INC.) 2014.11.17
D5: CN 112943029 A (BEIJING XIAOMI MOBILE SOFTWARE CO., LTD.) 2021.06.11

I. 신규성 및 진보성(PCT 제33조(2) 및 (3))

1. 청구항 1-19

1.1. 청구항 1

청구항 1과 가장 근접한 D1에는 본체; 냉장고 도어(70); 및 도어 자동 개방 장치(100)를 포함하고, 도어 자동 개방 장치(100)는, 구동 모터(120), 구동 모터(120)의 회전력을 전달하는 구동 기어(140), 구동 기어(140)를 통해 회전력을 전달받는 제1 개방수단(200) 및 냉장고 도어(70)의 힌지축(60)과 인접한 위치에 배치된 제2 개방수단(300)을 포함하며, 제2 개방수단(300)은 냉장고 도어(70)의 힌지축(60)과 인접한 위치에 배치되어, 제1 개방수단(200)이 작동한 후, 소정 시간차를 가지고 순차로 작동되는 냉장고 (단락 [0024]-[0027], [0034] 및 도면 3-5g 참조)가 개시되어 있습니다.

청구항 1의 모든 기술적 특징은 D1에 나타나 있으므로, 청구항 1은 신규성이 없습니다.

1.2. 청구항 2, 6-10, 12

청구항 2의 추가적인 특징은 D1에 개시된 제1 개방수단(200)은 구동 기어(140)와 치합하여 회전력을 전달받는 중동 기어(210)를 포함하는 것 및 제2 개방수단(300)의 구동력은 제1 개방수단(200)에 제공되는 제1 풀리(220)의 회전력을 제2 풀리(320)로 전달하는 회전력 전달부재(410)에 의해 제공되는 것 (단락 [0029], [0038] 및 도면 3 참조)으로부터 통상의 기술자가 쉽게 도출할 수 있습니다.

청구항 6의 추가적인 특징은 D1에 개시된 냉장고 도어(70)를 개방하기 위해 구동력을 제공하는 구동모터(120)를 제어하는 제어부(단락 [0026] 참조)로부터 통상의 기술자가 쉽게 설계 변경할 수 있습니다.

청구항 7의 추가적인 특징은 D1에 개시된 좌측 도어(10)가 개방되면, 제어부는 구동 모터(31)를 반대로 회전시켜 메인캠(32)을 중앙으로 복귀시키고, 이에 따라 제1 서브캠(33)은 제1 복원스프링(35)의 탄성력에 의해 복귀되고, 좌측 도어(10) 밖으로 돌출되었던 제1 서브캠(33)의 일부분도 다시 안쪽으로 들어오게 되는 것(단락 [0009] 및 도면 2 참조)으로부터 통상의 기술자가 쉽게 도출할 수 있습니다.

청구항 8-10의 추가적인 특징들은 D1에 개시된 제1, 2 개방수단(200, 300)은 순차적 및 단계적으로 작동되는 것(단락 [0022] 및 도면 3-5g 참조)으로부터 통상의 기술자가 쉽게 설계 변경할 수 있습니다.

제5기 재란

신규성, 진보성 또는 산업상이용가능성에 관한 견해(PCT규칙 43의 2.1(a)(i)), 이를 뒷받침하는 인용문헌 및 설명

청구항 12의 추가적인 특징은 D1에 개시된 제2 개방수단(300)의 구동력은 제1 개방수단(200)에 제공되는 제1 풀리(220)의 회전력을 제2 풀리(320)로 전달하는 회전력 전달부재(410)에 의해 제공되는 것(단락 [0038] 및 도면 3 참조)으로부터 통상의 기술자가 쉽게 도출할 수 있습니다.

따라서 청구항 2, 6-10, 12는 D1에 의해 진보성이 없습니다.

1.3. 청구항 3-4

청구항 3-4의 추가적인 특징들은 D2에 개시된 도어 열림 장치는 기어부를 포함하고, 기어부는 웜기어(2), 보조기어(3), 프릭션기어(4), 메인기어(5) 및 랙기어(6)를 포함하고, 메인기어(5)는 프릭션기어(4)의 피니언(11)과 맞물려 회전운동을 전달받아 랙기어(6)로 전달하게 되고, 랙기어(6)는 일측이 기어 형상으로 이루어져 케이스(1) 내측에 위치된 상태로 메인기어(5)와 맞물리며, 타측은 바 형상으로 이루어져 케이스(1) 외측에 구비된 것(단락 [0018]-[0023] 및 도면 1 참조)으로부터 통상의 기술자가 쉽게 도출할 수 있습니다.

따라서 청구항 3-4는 D1, D2의 결합에 의해 진보성이 없습니다.

1.4. 청구항 5, 11, 16

청구항 5의 추가적인 특징은 D3에 개시된 자동 개폐 장치는, 냉장고 본체에 장착된 동력 전달 기구(35) 및 동력 전달 기구(35)의 회전력을 전달받는 제1 브라켓(48)과, 도어(24)에 회전 가능하게 접속된 제2 내지 제4 브라켓(50, 52, 54)을 포함하는 것(단락 [0020]-[0030] 및 도면 1-2 참조)으로부터 통상의 기술자가 쉽게 도출할 수 있습니다.

청구항 11의 추가적인 특징은 D3에 개시된 자동 개폐 장치와 문이 연동하지 않고, 수동으로 문을 개폐할 수 있는 것(단락 [0011] 참조)으로부터 통상의 기술자가 쉽게 도출할 수 있습니다.

청구항 16의 추가적인 특징은 D3에 개시된 제1 톱니바퀴(38)는 제2 톱니바퀴(40)와 계합해 회전하고, 제3 톱니바퀴(42)는 제2 톱니바퀴(40)와 동기화 된 것으로, 제4 톱니바퀴(44)와 계합하고, 제4 톱니바퀴(44)는 제5 톱니바퀴(46)와 계합하며, 제5 톱니바퀴(46)의 중심부는 제1 브라켓(48)이 고정되어 함께 회전하는 것(단락 [0025] 및 도면 2-4 참조)으로부터 통상의 기술자가 쉽게 도출할 수 있습니다.

따라서 청구항 5, 11, 16은 D1, D3의 결합에 의해 진보성이 없습니다.

1.5. 청구항 13-15, 17-19

청구항 13, 17의 추가적인 특징들은 인용문헌들에 개시되어 있지 않고, 통상의 기술자가 쉽게 도출할 수 없습니다.

청구항 14-15는 청구항 13의, 청구항 18-19는 청구항 17 종속항입니다.

따라서 청구항 13-15, 17-19는 신규성 및 진보성이 있습니다.

2. 청구항 20

청구항 20과 가장 근접한 D1에는 본체; 냉장고 도어(70); 및 도어 자동 개방 장치(100)를 포함하고, 도어 자동 개방 장치(100)는, 구동 모터(120), 냉장고 도어(70)의 힌지축(60)과 인접한 위치에 배치된 제2 개방수단(300) 및 구동 기어(140)를 통해 회전력을 전달받는 제1 개방수단(200)을 포함하는 냉장고(단락 [0024]-[0027], [0034] 및 도면 3-4 참조)가 개시되어 있습니다.

다만, 청구항 20의 제1 전달부와 연결되거나 연결 해제될 수 있는 제2 전달부를 포함하고, 도어가 닫힌 상태에서, 제1 전달부는 제2 전달부와 미 연결되는 연결 해제 위치에 위치하고, 도어의 자동 개방을 위하여 구동부가 작동하면, 도어의 자동 개방 과정에서, 제1 전달부가 연결 위치로 이동하여 제2 전달부와 연결되는 것이 D1에 개시되어 있지 않다는 점에서 차이가 있으나, 이러한 차이가 있는 특징은 통상의 기술자가 D4에 개시된 배분 톱니바퀴(76a) 및 배분 톱니바퀴(76b)와 연결되거나 연결 해제될 수 있는 요동 톱니바퀴(81)를 포함하고, 요동 톱니바퀴(81)가 배분 톱니바퀴(76a)와 맞물리면, 제1 문개방 수단(61a)이 작동하고, 배분 톱니바퀴(76b)와 맞물리면, 제2 문개방 수단(61b)이 작동하며, 맞물리지 않으면,

제5기 재판

신규성, 진보성 또는 산업상 이용가능성에 관한 견해(PCT규칙 43의 2.1(a)(i)), 이를 뒷받침하는 인용문헌 및 설명

제1, 2 문개방 수단(61a, 61b)은 작동하지 않는 것(단락 [0080]-[0089] 및 도면 6-16 참조)으로부터 쉽게 도출할 수 있습니다.

따라서 청구항 20은 D1, D4의 결합에 의해 진보성이 없습니다.

II. 산업상 이용가능성(PCT 제33조(4))

청구항 1-20은 산업상 이용가능합니다.

제8기 재란

국제출원에 관한 의견

청구범위, 명세서 및 도면의 명료성에 관하여 또는 청구범위가 명세서에 의하여 충분히 뒷받침되고 있는지에 관하여 다음과 같은 의견을 제시합니다.

청구항 19는 청구항 18의 "도어 개방 위치"를 인용하고 있습니다. 그러나 상기 "도어 개방 위치"는 청구항 18에 기재되어 있지 아니하므로, 청구항 19는 발명이 명확하지 않습니다(PCT 제6조).

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2024/020822

A. CLASSIFICATION OF SUBJECT MATTER**F25D 23/02**(2006.01)i; **E05F 15/619**(2015.01)i; **E05F 15/614**(2015.01)i; **E05D 15/40**(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F25D 23/02(2006.01); E05F 15/614(2015.01); F25D 23/00(2006.01); F25D 29/00(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models: IPC as above

Japanese utility models and applications for utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & keywords: 냉장고(refrigerator), 도어 개폐 장치(door opener), 전달(transmission), 기어(gear), 랙(rack), 슬롯(slot), 자동(auto), 수동(manual), 해제(release)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-2009-0076555 A (LG ELECTRONICS INC.) 13 July 2009 (2009-07-13) See paragraphs [0009] and [0022]-[0038] and figures 2-5g.	1-2,6-10,12
Y		3-5,11,16,20
A		13-15,17-19
Y	KR 10-1151618 B1 (SCD) 08 June 2012 (2012-06-08) See paragraphs [0018]-[0023] and figure 1.	3-4
Y	JP 2016-011797 A (HAIER ASIA CO., LTD.) 21 January 2016 (2016-01-21) See paragraphs [0011] and [0020]-[0030] and figures 1-4.	5,11,16
Y	JP 2014-214893 A (HITACHI APPLIANCES INC.) 17 November 2014 (2014-11-17) See paragraphs [0080]-[0089] and figures 6-16.	20



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“D” document cited by the applicant in the international application

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

18 March 2025

Date of mailing of the international search report

31 March 2025

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208

Facsimile No. +82-42-481-8578

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2024/02082

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 112943029 A (BEIJING XIAOMI MOBILE SOFTWARE CO., LTD.) 11 June 2021 (2021-06-11) See paragraphs [0056]-[0064] and figures 1-3.	1-20

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2024/020822

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
KR	10-2009-0076555	A	13 July 2009	KR	10-1447291	B1	06 October 2014
KR	10-1151618	B1	08 June 2012	DE	102011051568	A1	19 April 2012
				DE	102011051568	A8	28 June 2012
				KR	10-2012-0003772	A	11 January 2012
JP	2016-011797	A	21 January 2016	JP	6385733	B2	05 September 2018
				WO	2016-000465	A1	07 January 2016
JP	2014-214893	A	17 November 2014	CN	104121748	A	29 October 2014
				CN	104121748	B	31 August 2016
				JP	6177574	B2	09 August 2017
CN	112943029	A	11 June 2021	CN	112943029	B	23 September 2022

특허협력조약

PCT

국제조사보고서

(PCT 제 18 조 및 PCT규칙 43 및 44)

출원인 또는 대리인의 서류참조기호 24REF019PC02	추가적인 조치 서식 PCT/ISA/220 및 아래 5.(해당하는 경우) 참조	
국제출원번호 PCT/KR2024/020822	국제출원일 (일/월/년) 2024년12월20일 (20.12.2024)	(최) 우선일 (일/월/년) 2023년12월22일 (22.12.2023)
출원인 엘지전자 주식회사 등		

본 국제조사보고서는 본 국제조사기관에 의하여 작성되었으며 PCT 제18조의 규정에 따라 출원인에게 송부됩니다. 이 국제조사 보고서의 사본은 국제사무국에 송부됩니다.

본 국제조사보고서는 총 3 매로 구성되어 있습니다.

☐ 본 보고서에서 인용된 각 선행기술 문헌의 사본도 첨부되어 있습니다.

1. 보고서의 기초

a. 언어와 관련하여, 국제조사는 아래에 기초하여 수행되었습니다.

☒ 출원시의 언어로 된 국제출원

☐ 국제조사를 위해 _____ 로 번역되어 제출된 국제출원의 번역문(PCT규칙 12.3(a) 및 23.1(b))

b. ☐ 본 국제조사보고서는 PCT규칙 91의 규정에 따라 당해 기관이 허가하였거나 또는 당해 기관에 통보된 명백한 잘못의 정정을 고려하여 작성되었습니다(PCT규칙 43.6의2(a)).

c. ☐ 국제출원에 개시된 핵산염기 및/또는 아미노산 서열에 관하여는 제1기재란을 참조하십시오.

2. ☐ 일부 청구항은 조사할 수 없습니다(제2기재란 참조).

3. ☐ 발명의 단일성이 결여되어 있습니다(제3기재란 참조).

4. 발명의 명칭과 관련하여,

☒ 출원인이 제출한 대로 승인합니다.

☐ 본 국제조사기관이 다음과 같이 발명의 명칭을 작성하였습니다:

5. 요약서와 관련하여,

☒ 출원인이 제출한 대로 승인합니다.

☐ PCT규칙 38.2의 규정에 따라 본 기관이 제4기재란에 표시된 대로 요약서를 작성하였습니다. 출원인은 본 국제조사 보고서의 발송일로부터 1월 이내에 본 기관에 의견을 제출할 수 있습니다.

6. 도면과 관련하여,

a. 요약서와 함께 공개될 도면은 제 3 도이며

☒ 출원인이 제안하였습니다.

☐ 출원인이 도면의 번호를 제안하지 않았기 때문에 본 기관이 선택하였습니다.

☐ 본 도면이 발명의 특징을 더 잘 나타내고 있기 때문에 본 기관이 선택하였습니다.

b. ☐ 요약서와 함께 공개될 도면이 없습니다.

A. 발명이 속하는 기술분류(국제특허분류(IPC))

F25D 23/02(2006.01)i; E05F 15/619(2015.01)i; E05F 15/614(2015.01)i; E05D 15/40(2006.01)i

B. 조사된 분야

조사된 최소문헌(국제특허분류를 기재)

F25D 23/02(2006.01); E05F 15/614(2015.01); F25D 23/00(2006.01); F25D 29/00(2006.01)

조사된 기술분야에 속하는 최소문헌 이외의 문헌

한국등록실용신안공보 및 한국공개실용신안공보: 조사된 최소문헌란에 기재된 IPC

일본등록실용신안공보 및 일본공개실용신안공보: 조사된 최소문헌란에 기재된 IPC

국제조사에 이용된 전산 데이터베이스(데이터베이스의 명칭 및 검색어(해당하는 경우))

eKOMPASS(특허청 내부 검색시스템) & 키워드: 냉장고(refrigerator), 도어 개폐 장치(door opener), 전달(transmission), 기어(gear), 랙(rack), 슬롯(slot), 자동(auto), 수동(manual), 해제(release)

C. 관련 문헌

카테고리*	인용문헌명 및 관련 구절(해당하는 경우)의 기재	관련 청구항
X	KR 10-2009-0076555 A (엘지전자 주식회사) 2009.07.13 단락 [0009], [0022]-[0038] 및 도면 2-5g	1-2,6-10,12
Y		3-5,11,16,20
A		13-15,17-19
Y	KR 10-1151618 B1 (주식회사 에스 씨디) 2012.06.08 단락 [0018]-[0023] 및 도면 1	3-4
Y	JP 2016-011797 A (HAIER ASIA CO., LTD.) 2016.01.21 단락 [0011], [0020]-[0030] 및 도면 1-4	5,11,16
Y	JP 2014-214893 A (HITACHI APPLIANCES INC.) 2014.11.17 단락 [0080]-[0089] 및 도면 6-16	20
A	CN 112943029 A (BEIJING XIAOMI MOBILE SOFTWARE CO., LTD.) 2021.06.11 단락 [0056]-[0064] 및 도면 1-3	1-20

☐ 추가 문헌이 C(계속)에 기재되어 있습니다.☒ 대응특허에 관한 별지를 참조하십시오.

* 인용된 문헌의 특별 카테고리:

“A” 특별히 관련이 없는 것으로 보이는 일반적인 기술수준을 정의한 문헌

“D” 본 국제출원에서 출원인이 인용한 문헌

“E” 국제출원일보다 빠른 출원일 또는 우선일을 가지나 국제출원일 이후에 공개된 선출원 또는 특허 문헌

“L” 우선권 주장에 의문을 제기하는 문헌 또는 다른 인용문헌의 공개일 또는 다른 특별한 이유(이유를 명시)를 밝히기 위하여 인용된 문헌

“O” 구두 개시, 사용, 전시 또는 기타 수단을 언급하고 있는 문헌

“P” 우선일 이후에 공개되었으나 국제출원일 이전에 공개된 문헌

“T” 국제출원일 또는 우선일 후에 공개된 문헌으로, 출원과 상충하지 않으며 발명의 기초가 되는 원리나 이론을 이해하기 위해 인용된 문헌

“X” 특별한 관련이 있는 문헌. 해당 문헌 하나만으로 청구된 발명의 신규성 또는 진보성이 없는 것으로 본다.

“Y” 특별한 관련이 있는 문헌. 해당 문헌이 하나 이상의 다른 문헌과 조합하는 경우로 그 조합이 당업자에게 자명한 경우 청구된 발명은 진보성이 없는 것으로 본다.

“&” 동일한 대응특허문헌에 속하는 문헌

국제조사의 실제 완료일

2025년03월18일(18.03.2025)

국제조사보고서 발송일

2025년03월31일(31.03.2025)

ISA/KR의 명칭 및 우편주소

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국제조사보고서에서 인용된 특허문헌	공개일	대응특허문헌	공개일
KR 10-2009-0076555 A	2009/07/13	KR 10-1447291 B1	2014/10/06
KR 10-1151618 B1	2012/06/08	DE 102011051568 A1	2012/04/19
		DE 102011051568 A8	2012/06/28
		KR 10-2012-0003772 A	2012/01/11
JP 2016-011797 A	2016/01/21	JP 6385733 B2	2018/09/05
		WO 2016-000465 A1	2016/01/07
JP 2014-214893 A	2014/11/17	CN 104121748 A	2014/10/29
		CN 104121748 B	2016/08/31
		JP 6177574 B2	2017/08/09
CN 112943029 A	2021/06/11	CN 112943029 B	2022/09/23