

OIL-COOLED DRIVE MOTOR INCLUDING REPLACEABLE OIL FILTER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority to Korean Patent
5 Application No. 10-2024-0134737, filed on 4 October 2024, in the
Korean Intellectual Property Office, the entire contents of which
are hereby incorporated by reference.

TECHNICAL FIELD

10 **[0002]** The present invention relates to a liquid-cooled drive
motor including a replaceable oil filter, and more particularly,
to a liquid-cooled drive motor including a replaceable oil filter
provided with an opening/closing device on the oil flow path to
prevent oil leakage from the filter housing during oil filter
15 replacement.

BACKGROUND

[0003] A hybrid vehicle operates in an electric vehicle (EV) mode
using only the power of the drive motor or in a hybrid electric
20 vehicle (HEV) mode using the rotational forces of both the engine
and the drive motor. The drive motor, used as a power source for
the vehicle, includes a stator core and a rotor core, with the
stator core coupled within the motor housing and the rotor core
disposed inside the stator core.

25 **[0004]** A refrigerant flow path is formed on the housing to cool

the heat generated by the stator core and rotor core during motor operation, and refrigerant flows through the flow path to cool the stator core and rotor core.

[0005] As such, directly cooling the motor's interior with oil
5 allows foreign substances, such as chips generated in the reducer, to move with the oil, which can cause issues in motor operation if not removed.

[0006] Thus, an oil filter is placed in the cooling flow path where oil moves to filter chips and foreign substances along with
10 the oil. Recently, oil filters are configured as replaceable, allowing the removal of the installed oil filter after a certain period and the installation of a new oil filter to enhance foreign substance removal efficiency.

[0007] Conventional drive motors including replaceable oil
15 filters require complete oil drainage before filter replacement due to oil leakage during filter removal, followed by the cumbersome process of refilling oil after replacement.

[0008] Therefore, there is a need to develop a technology to block the oil flow path during oil filter replacement to prevent
20 oil leakage.

SUMMARY OF THE INVENTION

[0009] The present invention has been conceived to address the above issue, and an object of the invention is to provide an oil-
25 cooled drive motor including a replaceable oil filter equipped

with an opening/closing device on the oil flow path to prevent oil leakage during oil filter replacement.

[0010] It is another object of the present invention to provide an oil-cooled drive motor including a replaceable oil filter
5 equipped with an inlet opening/closing device capable of sealing the oil inlet that supplies oil to the oil filter space during oil filter replacement, and an outlet opening/closing device capable of blocking the upstream side of the oil flow path where filtered oil is supplied.

10 **[0011]** It is still another object of the present invention to provide an oil-cooled drive motor including a replaceable oil filter, wherein the inlet opening/closing device and the outlet opening/closing device are interlocked with the rotation of the oil filter during replacement to open or block the oil inlet and
15 oil flow path.

[0012] An oil-cooled drive motor according to an embodiment of the present invention includes a housing accommodating components therein, having an oil flow path through which refrigerant flows to cool the components, a filter housing formed on the housing,
20 and a replaceable oil filter coupled replaceably with the filter housing for filtering foreign substances in the refrigerant, wherein the filter housing includes a filter insertion space configured to fixedly accommodate the oil filter, an oil inlet configured to communicate the filter insertion space with a
25 discharge side of the oil flow path to supply oil to the filter

insertion space, an oil discharge pipe configured to communicate with an inlet side of the oil flow path to return oil filtered through the oil filter to the oil flow path, protruding toward the filter insertion space, and an opening/closing door provided
5 on an inner surface of the filter insertion space, configured to seal the oil inlet by moving to one side in a circumferential direction and open the oil inlet by moving to the other side in the circumferential direction.

[0013] In addition, the oil filter is configured to be inserted
10 into the filter insertion space along an axial direction and then constrained or released by rotation, and includes a cylindrical filter body configured to filter oil supplied to the filter insertion space while the oil moves radially inward to a hollow portion of the filter body, the filter body including a first-
15 first driving protrusion formed on one side in the circumferential direction and a first-second driving protrusion spaced on the other side, both formed around an axial outer circumference of the filter body and protruding radially outward, and, upon insertion of the replaceable oil filter into the filter insertion
20 space, the first-first driving protrusion and the first-second driving protrusion being configured to fit circumferential ends of the opening/closing door therebetween, causing the opening/closing door to reciprocate in the circumferential direction in conjunction with the rotation of the replaceable oil
25 filter during constraint or release.

[0014] In addition, the opening/closing door is configured to open the oil inlet upon constraint of the replaceable oil filter and seal the oil inlet upon release of the replaceable oil filter, wherein the replaceable oil filter is constrained in the filter
5 insertion space by rotation to one side in the circumferential direction and released from the filter insertion space by rotation to the other side in the circumferential direction.

[0015] In addition, the inner surface of the filter insertion space a first rail groove recessed radially outward along the
10 circumferential direction, configured to guide the circumferential movement of the first-first and first-second driving protrusions, and a second rail groove recessed radially outward along the axial direction, configured to guide the axial movement of the first-first and first-second driving protrusions.

[0016] In addition, the opening/closing door is formed as a plate with an arc-shaped cross-section configured to slide along the inner surface of the filter insertion space, and includes a first rail protrusion on the outer circumferential surface of the opening/closing door, formed along the circumferential direction
20 and protruding radially outward to be inserted into the first rail groove.

[0017] In addition, the first-first and first-second driving protrusions are formed on the axial outer side of the filter body, and a second-first and second-second driving protrusion are
25 formed at a certain distance inward in the axial direction from

the first-first and first-second driving protrusions of the filter body.

[0018] In addition, the filter insertion space includes a stopper protruding radially inward, configured to abut a circumferential end on one side of the opening/closing door to prevent further movement in one circumferential direction upon the opening/closing door sealing the oil inlet.

[0019] In addition, the oil-cooled drive motor further include an outlet opening/closing device configured to open or close the inlet side of the oil discharge pipe.

[0020] In addition, the oil-cooled drive motor further includes an outlet opening/closing device provided at an end of the oil discharge pipe, configured to open or close the oil discharge pipe, the outlet opening/closing device including a rubber sealing portion configured to close the oil discharge pipe under normal conditions and open upon pressurization, and the replaceable oil filter further including a pressing protrusion configured to press the outlet opening/closing device during axial inward movement for installation and release the pressure on the outlet opening/closing device during axial outward movement for removal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] FIG. 1 is a cross-sectional perspective view illustrating an oil filter housing and oil flow path of a drive motor coupled

with an oil filter according to an embodiment of the present invention;

[0022] FIG. 2 is a cross-sectional perspective view illustrating an oil filter housing, oil flow path, and inlet opening/closing device of a drive motor coupled with an oil filter according to an embodiment of the present invention;

[0023] FIG. 3 is a cross-sectional perspective view illustrating an oil filter housing according to an embodiment of the present invention;

10 **[0024]** FIG. 4A and FIG. 4B are front and rear perspective views of an opening/closing door according to an embodiment of the present invention;

[0025] FIG. 5 is a cross-sectional perspective view illustrating an oil filter housing coupled with an opening/closing door according to an embodiment of the present invention;

[0026] FIG. 6 is a cross-sectional perspective view illustrating an oil filter housing with an oil inlet sealed by an opening/closing door according to an embodiment of the present invention;

20 **[0027]** FIG. 7 is a perspective view of an oil filter including an inlet opening/closing device according to an embodiment of the present invention;

[0028] FIG. 8 is a cross-sectional perspective view of an oil filter housing including an outlet opening/closing device according to an embodiment of the present invention;

[0029] FIG. 9 is a cross-sectional perspective view of an oil filter according to an embodiment of the present invention; and
[0030] FIG. 10 is a cross-sectional perspective view illustrating the opening/closing mechanism of an outlet opening/closing device
5 due to the coupling of an oil filter housing and an oil filter according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0031] Hereinafter, an embodiment of the present invention will
10 be described in detail with reference to the drawings.

[0032] FIG. 1 is a cross-sectional perspective view illustrating an oil filter housing 200 and an oil flow path 110 on a housing 100 of a drive motor coupled with an oil filter 300 according to an embodiment of the present invention.

15 **[0033]** As illustrated, the oil-cooled drive motor 1000 according to an embodiment of the present invention includes a housing 100 accommodating a stator and a rotor of the drive motor, a filter housing 200 integrally formed with the housing 100 and accommodating an oil filter 300.

20 **[0034]** The housing 100 has an oil flow path 110 through which refrigerant flows for cooling the components, and a filter housing 200 for coupling the oil filter 300 may be integrally formed with the housing 100.

[0035] The filter housing 200 is cylindrical with a filter
25 insertion space 250 formed inside, with an inner end sealed by

the housing 100 and an outer end open. At the inner end of the filter housing 200, an oil discharge pipe 210 may protrude outward at the center, with the upstream side of the oil discharge pipe 210 connected to the inlet side of the oil flow path 110 to supply
5 filtered oil from the oil filter 300 to the oil flow path 110. Additionally, the filter housing 200 has an oil inlet 220 (see FIG. 4) for introducing oil into the oil filter 300, and the oil inlet 220 may be connected to the discharge side formed at the end of the oil flow path 110.

10 **[0036]** The oil filter 300 includes a cylindrical filter body 310 and a filter cap 320 provided at the outer end of the filter body 310 to seal the open side of the filter housing 200 and fix the filter body 310 to the filter housing 200. The filter body 310 and the filter cap 320 may be integrally formed as in this
15 embodiment or may be separately formed. The filter body 310 may be a hollow cylinder along its longitudinal direction, with the oil discharge pipe 210 penetrating the inner end of the hollow portion to discharge oil from the hollow portion to the oil flow path 110 through the oil discharge pipe 210. Thus, oil introduced
20 into the filter housing 200 through the oil inlet 220 is filtered through the filter body 310, flows into the radially inner hollow portion of the filter body 310, and is returned to the inlet side of the oil flow path 110 through the oil discharge pipe 210.

[0037] FIG. 2 is a cross-sectional perspective view illustrating
25 an oil filter housing 200, an oil flow path 110, and an inlet

opening/closing device 600, 710, and 720 of a drive motor coupled with an oil filter 300 according to an embodiment of the present invention.

[0038] As illustrated, the drive motor further includes an inlet
5 opening/closing device 600, 710, and 720 for opening or closing
the oil inlet 220 (see FIG. 3) formed on the filter housing 200.
The inlet opening/closing device includes an opening/closing door
600 provided on the inner circumferential surface of the filter
insertion space 250 and reciprocating in a circumferential
10 direction, and first and second driving protrusions 710 and 720
provided on the filter body 310 to slide the opening/closing door
600 circumferentially during axial rotation of the oil filter 300
for replacement.

[0039] The oil filter 300 is inserted axially into the filter
15 housing 200 and rotated circumferentially by a certain angle to
be fixed to the filter housing 200 for secure coupling during
installation. During removal, the oil filter 200 is rotated in
the opposite direction by a certain angle to release the fixation
and then moved axially to separate it from the filter housing 200.
20 Thus, by providing the first and second driving protrusions 710
and 720 on the filter body 310 to move the opening/closing door
600, the opening/closing door 600 slides circumferentially by a
certain angle in conjunction with the rotation of the oil filter
300, opening or sealing the oil inlet 220.

25 **[0040]** The inlet opening/closing device 600, 710, and 720

according to an embodiment of the present invention with the above configuration is described in more detail with reference to the drawings.

[0041] FIG. 3 is a cross-sectional perspective view illustrating
5 the inner surface of the filter insertion space 250 of an oil filter housing 200 according to an embodiment of the present invention.

[0042] As illustrated, the inner surface of the filter insertion space 250 has an oil inlet 220 communicating with the downstream
10 side of the oil flow path 110 to supply oil into the filter insertion space 250. Additionally, at the inner center of the filter insertion space 250, an oil discharge pipe 210 communicating with the upstream side of the oil flow path 110 to supply filtered oil to the oil flow path 110 may protrude toward
15 the filter insertion space 250. Here, the inner surface of the filter insertion space 250 may have first rail grooves 251 and 252 formed to guide the sliding movement of the opening/closing door 600 and the circumferential movement of the first and second driving protrusions 710 and 720. The first rail grooves 251 and
20 252 are formed along the circumferential direction, consisting of a first-first rail groove 251 formed on the outer side and a first-second rail groove 252 spaced inward from the first-first rail groove 251. The first rail grooves 251 and 252 may be recessed radially outward from the inner surface of the filter
25 insertion space 250.

[0043] Additionally, the inner surface of the filter insertion space 250 may have a second rail groove 253 formed to guide the axial movement of the first and second driving protrusions 710 and 720. The second rail groove 253 is formed along the axial
5 direction and may be recessed radially outward from the inner surface of the filter insertion space 250.

[0044] The oil inlet 220 may be formed between the first-first rail groove 251 and the first-second rail groove 252.

[0045] Furthermore, when the opening/closing door 600 seals the
10 oil inlet 220 by moving to one side and opens it by moving to the other side, a stopper 230 may be formed at a position corresponding to the circumferential end of the opening/closing door 600 to prevent further movement in the sealed state. The stopper 230 protrudes radially inward from the inner surface of
15 the filter insertion space 250 and may be formed along the axial direction.

[0046] FIG. 4A and FIG. 4B is a front and rear perspective view of the opening/closing door 600 of the present invention.

[0047] As illustrated, the opening/closing door 600 may be a
20 plate with an arc-shaped cross-section to slide along the inner surface of the filter insertion space 250. Additionally, a first rail protrusion 610 may be formed on the outer side in the longitudinal direction of the outer circumferential surface of the opening/closing door 600, and a second rail protrusion 620
25 may be formed on the inner side. The first and second rail

protrusions 610, 620 protrude radially outward, and when the opening/closing door 600 is seated on the inner surface of the filter insertion space 250, the first rail protrusion 610 is inserted into the first-first rail groove 251, and the second
5 rail protrusion 620 is inserted into the first-second rail groove 252. Thus, the opening/closing door 600 is configured to move smoothly along the circumferential direction.

[0048] FIG. 5 is a cross-sectional perspective view illustrating an oil filter housing coupled with an opening/closing door 600
10 according to an embodiment of the present invention, and FIG. 6 is a cross-sectional perspective view illustrating an oil filter housing 200 with the oil inlet 220 sealed by the opening/closing door 600 according to an embodiment of the present invention.

[0049] As illustrated, the opening/closing door 600 is coupled
15 to the inner surface of the filter insertion space 250 to slide along the circumferential direction. Here, the axial outer end of the opening/closing door 600 has the first rail protrusion 610 inserted into the first-first rail groove 251 for circumferential sliding, and the second rail protrusion 620 inserted into the
20 first-second rail groove 252 for circumferential sliding.

[0050] Additionally, as shown in FIG. 5, the oil inlet 220 is opened when moving to the other side in the circumferential direction, and as shown in FIG. 6, the oil inlet 220 is sealed when moving to one side in the circumferential direction.
25 Furthermore, the opening/closing door 600 is configured by the

stopper 230 to prevent detachment in one direction while sealing the oil inlet 220.

[0051] Here, one side in the circumferential direction may be the release rotation direction of the oil filter, and the other
5 side in the circumferential direction may be the locking rotation direction of the oil filter. Thus, when the oil filter is rotated to one side in the circumferential direction for removal, the opening/closing door 600 moves in conjunction to one side in the circumferential direction, sealing the oil inlet 220 to prevent
10 oil in the oil flow path 110 from leaking through the oil inlet 220; when the oil filter is rotated to the other side in the circumferential direction for installation, the opening/closing door 600 moves in conjunction to the other side in the circumferential direction, opening the oil inlet 220 to allow oil
15 in the oil flow path 110 to be supplied to the filter insertion space 250.

[0052] FIG. 7 is a perspective view illustrating an oil filter 300 including an inlet opening/closing device 710 and 720 according to an embodiment of the present invention.

20 **[0053]** As illustrated, the filter body 310 of the oil filter 300 includes first and second driving protrusions 710 and 720 to move the opening/closing door 600 in conjunction with the rotation of the oil filter 300.

[0054] The first driving protrusion 710 is formed around the
25 axial outer circumference of the filter body 310 and may protrude

radially outward. The first driving protrusion 710 includes a first-first driving protrusion 710-1 formed on one side in the circumferential direction and a first-second driving protrusion 710-2 spaced on the other side. The first driving protrusion 710 is inserted into and moves along the second rail groove 253 during axial movement for oil filter 300 installation, and upon completion of axial movement, the circumferential ends of the opening/closing door 600 are fitted between the first-first driving protrusion 710-1 and the first-second driving protrusion 710-2.

[0055] Thus, during rotation of the oil filter 300, the opening/closing door 600 fitted between the first-first driving protrusion 710-1 and the first-second driving protrusion 710-2 slides circumferentially in conjunction. The first driving protrusion 710 may be configured to slide within the first-first rail groove 251 during rotation of the oil filter 300.

[0056] The second driving protrusion 720 is formed around the axial inner circumference of the filter body 310 and may protrude radially outward. The second driving protrusion 720 includes a second-first driving protrusion 720-1 formed on one side in the circumferential direction and a second-second driving protrusion 720-2 spaced on the other side. The second driving protrusion 720 is inserted into and moves along the second rail groove 253 during axial movement for oil filter 300 installation, and upon completion of axial movement, the circumferential ends of the

opening/closing door 600 are fitted between the second-first driving protrusion 720-1 and the second-second driving protrusion 720-2.

[0057] Thus, during rotation of the oil filter 300, the opening/closing door 600 fitted between the second-first driving protrusion 720-1 and the second-second driving protrusion 720-2 slides circumferentially in conjunction. The second driving protrusion 720 may be configured to slide within the first-second rail groove 252 during rotation of the oil filter 300.

10 **[0058]** FIG. 8 is a cross-sectional perspective view illustrating an oil filter housing 200 including an outlet opening/closing device 800 according to an embodiment of the present invention.

[0059] As illustrated, the filter housing 200 is cylindrical with a filter insertion space 250 formed inside, with an inner end sealed by the housing 100 and an outer end open. At the inner end of the filter housing 200, an oil discharge pipe 210 may protrude outward in the axial direction at the center, and the oil discharge pipe 210 is connected to the inlet side of the oil flow path 110, as described above, to supply oil from the filter hollow portion filtered through the oil filter 300 to the oil flow path 110.

[0060] At this time, the outlet opening/closing device 800 is provided at the inlet side end of the oil discharge pipe 210 to open or close the inlet side end of the oil discharge pipe 210. The outlet opening/closing device 800 is made of rubber material,

sealing the oil discharge pipe 210 under normal conditions, and may have a rubber seal structure that opens upon pressurization.

[0061] FIG. 9 is a cross-sectional perspective view illustrating an oil filter 300 according to an embodiment of the present invention, and FIG. 10 is a cross-sectional perspective view illustrating the opening/closing mechanism of the outlet opening/closing device 800 due to the coupling of the filter housing 200 and the oil filter 300 according to an embodiment of the present invention.

10 **[0062]** As illustrated, the oil filter 300 has the following configuration to press and open the outlet opening/closing device 800.

[0063] The oil filter 300 includes a cylindrical filter body 310 and a filter cap 320 provided at the outer end of the filter body 310 to seal the open side of the filter housing 200 and fix the filter body 310 to the filter housing 200. The filter body 310 includes an upper cover 311 formed on the axial inner side and a connection frame 312 for connecting the upper cover 311 and the filter cap 320. A hollow portion 315 through which the oil discharge pipe 210 passes may be formed on the upper cover 311. At this time, a pressing protrusion 340 may be formed on the connection frame 312 to press and open the outlet opening/closing device 800 when the oil filter 300 is installed and the oil discharge pipe 210 is inserted into the hollow portion 315 of the upper cover 311. The pressing protrusion 340 is disposed at the

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axial center of the connection frame 312, formed along the axial direction, and its axial outer end may be fixed on the connection frame 312.

[0064] Thus, as shown in FIG. 9 and FIG. 10, when the oil filter
5 300 moves inward in the axial direction for installation, the pressing protrusion 340 presses the outlet opening/closing device 800 to open it; when the oil filter 300 moves outward in the axial direction for removal, the pressing protrusion 340 disengages from the outlet opening/closing device 800, allowing
10 the outlet opening/closing device 800 to seal the oil discharge pipe 210 due to elasticity.

[0065] The oil-cooled drive motor including an oil filter according to the present invention, with the above configuration, is advantageous for preventing oil leakage from the oil flow path
15 into the oil filter insertion space by blocking the oil inlet and oil flow path during oil filter replacement.

[0066] Additionally, the oil-cooled drive motor including an oil filter according to the present invention is advantageous for preventing oil waste, simplifying the filter replacement process,
20 and reducing working time by eliminating the need to fully drain leaked oil before replacing the filter and refilling the oil afterward.

[0067] Furthermore, the oil-cooled drive motor including an oil filter according to the present invention is advantageous for
25 further simplifying the filter replacement process and reducing

working time by allowing the oil flow path to open or close in conjunction with the rotation of the oil filter during replacement, without requiring a separate process or device.

[0068] The technical concept of the present invention should not
5 be construed as being limited to the above embodiments. The scope
of application varies, and various modifications can be made at
the level of those skilled in the art without departing from the
gist of the invention claimed in the claims. Thus, such
improvements and modifications fall within the protection scope
10 of the present invention as long as they are obvious to those
skilled in the art.

DESCRIPTION OF REFERENCE NUMERALS

	1000: drive motor
	100: housing
15	110: oil flow path
	200: filter housing
	210: oil discharge pipe
	220: oil inlet
	230: stopper
20	250: filter insertion space
	251: first-first rail groove
	252: first-second rail groove
	253: second rail groove
	300: oil filter
25	310: filter body

311: upper cover
312: connection frame
315: hollow portion
320: filter cap
5 340: pressing protrusion
600: opening/closing door
610: first rail protrusion
620: second rail protrusion
710: first driving protrusion
10 720: second driving protrusion
800: outlet opening/closing device

WHAT IS CLAIMED IS:

1. An oil-cooled drive motor comprising:

a housing accommodating components therein, having an oil flow path through which refrigerant flows to cool the components;

5 a filter housing formed on the housing; and

a replaceable oil filter coupled replaceably with the filter housing for filtering foreign substances in the refrigerant,

wherein the filter housing comprises:

a filter insertion space configured to fixedly accommodate
10 the oil filter;

an oil inlet configured to communicate the filter insertion space with a discharge side of the oil flow path to supply oil to the filter insertion space;

an oil discharge pipe configured to communicate with an
15 inlet side of the oil flow path to return oil filtered through the oil filter to the oil flow path, protruding toward the filter insertion space; and

an opening/closing door provided on an inner surface of the filter insertion space, configured to seal the oil inlet by moving
20 to one side in a circumferential direction and open the oil inlet by moving to the other side in the circumferential direction.

2. The oil-cooled drive motor according to claim 1, wherein the replaceable oil filter is configured to be inserted into the
25 filter insertion space along an axial direction and then

constrained or released by rotation, and comprises a cylindrical filter body configured to filter oil supplied to the filter insertion space while the oil moves radially inward to a hollow portion of the filter body, the filter body comprising a first-
5 first driving protrusion formed on one side in the circumferential direction and a first-second driving protrusion spaced on the other side, both formed around an axial outer circumference of the filter body and protruding radially outward, and, upon insertion of the replaceable oil filter into the filter insertion
10 space, the first-first driving protrusion and the first-second driving protrusion being configured to fit circumferential ends of the opening/closing door therebetween, causing the opening/closing door to reciprocate in the circumferential direction in conjunction with the rotation of the replaceable oil
15 filter during constraint or release.

3. The oil-cooled drive motor of claim 2, wherein the opening/closing door is configured to open the oil inlet upon constraint of the replaceable oil filter and seal the oil inlet
20 upon release of the replaceable oil filter,

wherein the replaceable oil filter is constrained in the filter insertion space by rotation to one side in the circumferential direction and released from the filter insertion space by rotation to the other side in the circumferential
25 direction.

4. The oil-cooled drive motor of claim 2 or claim 3, wherein the inner surface of the filter insertion space comprises:

a first rail groove recessed radially outward along the circumferential direction, configured to guide the circumferential movement of the first-first and first-second driving protrusions; and

a second rail groove recessed radially outward along the axial direction, configured to guide the axial movement of the first-first and first-second driving protrusions.

5. The oil-cooled drive motor of claim 4, wherein the opening/closing door is formed as a plate with an arc-shaped cross-section configured to slide along the inner surface of the filter insertion space, and comprises a first rail protrusion on the outer circumferential surface of the opening/closing door, formed along the circumferential direction and protruding radially outward to be inserted into the first rail groove.

6. The oil-cooled drive motor of claim 4 or claim 5, wherein the first-first and first-second driving protrusions are formed on the axial outer side of the filter body, and a second-first and second-second driving protrusion are formed at a certain distance inward in the axial direction from the first-first and first-second driving protrusions of the filter body.

7. The oil-cooled drive motor of any one of claims 2 to 6,
wherein the filter insertion space comprises a stopper protruding
radially inward, configured to abut a circumferential end on one
5 side of the opening/closing door to prevent further movement in
one circumferential direction upon the opening/closing door
sealing the oil inlet.

8. The oil-cooled drive motor of any one of claims 1 to 7,
10 further comprising an outlet opening/closing device configured
to open or close the inlet side of the oil discharge pipe.

9. The oil-cooled drive motor of claim 8, further comprising
an outlet opening/closing device provided at an end of the oil
15 discharge pipe, configured to open or close the oil discharge
pipe, the outlet opening/closing device comprising a rubber
sealing portion configured to close the oil discharge pipe under
normal conditions and open upon pressurization, and the
replaceable oil filter further comprising a pressing protrusion
20 configured to press the outlet opening/closing device during
axial inward movement for installation and release the pressure
on the outlet opening/closing device during axial outward
movement for removal.