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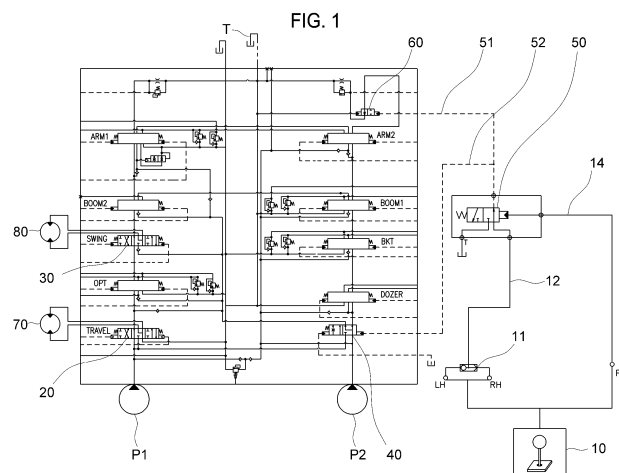
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(54) **APPARATUS FOR CONTROLLING COMBINED-OPERATION OF CONSTRUCTION MACHINE**

(57) The present disclosure relates to an apparatus for controlling a combined operations of a construction machine, the apparatus including: a first pump and a second pump which provide pressurized oil to a plurality of actuators for performing driving and swinging operations of the construction machine by an operation of an operating unit; a driving control spool which allows the first pump to communicate with a driving motor; a swing control spool which is positioned at a downstream of the driv-

ing control spool and allows the first pump to communicate with a swing motor; and a driving priority valve which allows the pressurized oil discharged from the first pump to be supplied to the driving control spool, and allows the pressurized oil discharged from the second pump to be supplied to the swing control spool when a combined operations of driving and swinging of the construction machine are performed.



Description**[Technical Field]**

[0001] An exemplary embodiment of the present disclosure relates to a construction machine, and more particularly, to an apparatus for controlling a combined-operations of a construction machine, which is capable of maintaining swing performance during a combined operations of driving and swinging of the construction machine.

[Background Art]

[0002] In general, a construction machine such as an excavator includes an engine, a hydraulic pump which generates hydraulic pressure by using power from the engine, a control unit which controls the hydraulic pressure generated by the hydraulic pump by using a hydraulic pressure valve, and actuators which perform work by using hydraulic pressure.

[0003] In particular, the construction machine controls flow rates and hydraulic pressure to perform specific work by operating a boom, an arm, a bucket and the like, and in this case, the flow rates and the hydraulic pressure applied to the actuators need to be controlled.

[0004] The construction machine has at least two main pumps, and pressurized oil of the main pumps is appropriately distributed and used for a driving or front operation.

[0005] Here, the front operation means operations such as an operation of moving up/down the boom, arm crowd, bucket crowd/dump, and swing of the construction machine such as an excavator.

[0006] In the case of a hydraulic system for a construction machine in the related art, when the construction machine performs a combined operations of driving and swinging, pressurized oil discharged from a single main pump is used and distributed to a driving motor for performing a driving operation and a swing motor for performing a swinging operation.

[0007] However, even though the hydraulic pressure system includes two main pumps, the driving motor and the swing motor share the amount of oil discharged from the single main pump.

[0008] Therefore, there is a problem in that a larger amount of oil is supplied to the driving motor than the swing motor, such that a driving speed is high, while a swing speed is very low.

[Disclosure]**[Technical Problem]**

[0009] An exemplary embodiment of the present disclosure provides an apparatus for controlling a combined operations of a construction machine, which is capable of controlling a swing speed when the construction ma-

chine performs a combined operations of driving and swinging so that the swing speed is equal to a swing speed when only a swinging operation is performed.

[Technical Solution]

[0010] According to the exemplary embodiment of the present disclosure, an apparatus for controlling a combined operations of a construction machine includes: a first pump and a second pump which provide pressurized oil to a plurality of actuators for performing driving and swinging operations of the construction machine by an operation of an operating unit; a driving control spool which allows the first pump to communicate with a driving motor; a swing control spool which is positioned at a downstream of the driving control spool and allows the first pump to communicate with a swing motor; and a driving priority valve which allows the pressurized oil discharged from the first pump to be supplied to the driving control spool and allows the pressurized oil discharged from the second pump to be supplied to the swing control spool when a combined operations of driving and swinging of the construction machine are performed.

[0011] The driving priority valve may be positioned at a most upstream side of the second pump.

[0012] The apparatus may further include a switching valve which provides pressurized oil for switching the driving priority valve.

[0013] The switching valve may be switched by driving pilot pressure discharged from the operating unit when the combined operations of driving and swinging are performed by the operation of the operating unit, and swing pilot pressure discharged from the operating unit may be supplied to the driving priority valve.

[0014] The apparatus may further include a bypass valve which controls pressurized oil discharged from the second pump, in which the switching valve provides the swing pilot pressure to the bypass valve when the combined operations are performed.

[0015] The bypass valve may be positioned at the most downstream side of the second pump, and may allow the second pump to communicate with a hydraulic oil tank.

[Advantageous Effects]

[0016] According to the exemplary embodiment of the present disclosure, in the apparatus for controlling the combined operations of the construction machine, the first pump is used only to perform the driving operation and the second pump is used only to perform the swinging operation when the combined operations of driving and swinging are performed, such that the driving and swinging operations may have no effect on each other, and may use a maximum flow rate (maximum speed).

[Description of Drawings]

[0017]

FIGS. 1 and 2 are circuit diagrams of an apparatus for controlling a combined operations of a construction machine according to an exemplary embodiment of the present disclosure.

FIGS. 3 and 4 are circuit diagrams of an apparatus for controlling a combined operations of a construction machine according to another exemplary embodiment of the present disclosure, which uses a driving priority valve having a structure different from a structure of a driving priority valve illustrated in FIG. 1.

[Description of Main Reference Numerals of Drawings]

[0018]

10: Operating unit
 11: First shuttle valve
 12: First supply line
 13: Second shuttle valve
 14: Second supply line
 20: Driving control spool
 30: Swing control spool
 40: Driving priority valve
 50: Switching valve
 51: First merging line
 52: Second merging line
 60: Bypass valve
 P1: First pump
 P2: Second pump
 T: Hydraulic oil tank

[Best Mode]

[0019] Hereinafter, exemplary embodiments of the present disclosure will be described in detail with reference to the accompanying drawings so that those skilled in the technical field to which the present disclosure pertains may easily carry out the exemplary embodiments. The present disclosure may be implemented in various different ways, and is not limited to the exemplary embodiments described herein.

[0020] It is noted that the drawings are schematic, and are not illustrated based on actual scales. Relative dimensions and proportions of parts illustrated in the drawings are exaggerated or reduced in size for the purpose of clarity and convenience in the drawings, and any dimension is just illustrative but not restrictive. Further, the same reference numerals designate the same structures, elements or components illustrated in two or more drawings in order to exhibit similar characteristics.

[0021] Exemplary embodiments of the present disclosure illustrate ideal exemplary embodiments of the present disclosure in more detail. As a result, various modifications of the drawings are expected. Therefore, the exemplary embodiments are not limited to specific forms in regions illustrated in the drawings, and also in-

clude, for example, modifications of forms by the manufacture.

[0022] Hereinafter, an apparatus for controlling a combined operations of a construction machine according to an exemplary embodiment of the present disclosure will be described with reference to FIGS. 1 and 4.

[0023] As illustrated in FIGS. 1 and 4, the apparatus for controlling the combined operations of the construction machine according to the exemplary embodiment of the present disclosure includes a first pump P1, a second pump P2, a driving control spool 20, a swing control spool 30, and a driving priority valve 40.

[0024] The apparatus for controlling the combined operations of the construction machine according to the exemplary embodiment of the present disclosure has the first pump P1 and the second pump P2 in order to perform driving and front operations.

[0025] Based on an operation of an operating unit 10, the first pump P1 provides pressurized oil to a plurality of actuators for performing the driving and front operations of the construction machine.

[0026] In addition, based on the operation of the operating unit 10, the second pump P2 provides pressurized oil to the plurality of actuators for performing the driving and front operations of the construction machine.

[0027] That is, the first pump P1 and the second pump P2 use pressurized oil by appropriately distributing the pressurized oil to the plurality of actuators.

[0028] In this case, the front operation means operations such as an operation of moving up/down the boom, arm crowd, bucket crowd/dump, and swing of the construction machine such as an excavator.

[0029] The driving control spool 20 and the swing control spool 30 are installed in a flow path which is connected with the first pump P1 and the second pump P2.

[0030] Specifically, when the driving operation is performed by the operating unit 10, the driving control spool 20 allows the first pump P1 to communicate with a driving motor 70. That is, the driving control spool 20 controls a flow of the pressurized oil being supplied to the driving motor 70.

[0031] The swing control spool 30 is positioned at a downstream side of the driving control spool 20 and allows the first pump to communicate with a swing motor 80 when the swinging operation is performed by the operating unit 10. That is, the swing control spool 30 controls a flow of the pressurized oil being supplied to the swing motor 80.

[0032] When the combined operations of driving and swinging are performed by the operating unit 10, the driving priority valve 40 supplies the pressurized oil discharged from the first pump P1 only to the driving control spool 20, and supplies the pressurized oil discharged from the second pump P2 only to the swing control spool 30.

[0033] In this case, the driving priority valve 40 may be positioned at a most upstream side of the second pump P2.

[0034] The apparatus for controlling the combined operations of the construction machine according to the exemplary embodiment of the present disclosure may further include a switching valve 50.

[0035] Specifically, the switching valve 50 provides pressurized oil for switching the driving priority valve 40. The direction of the switching valve 50 is changed to one direction by inputted pilot pressure, such that the switching valve 50 provides the pressurized oil to the driving priority valve 40.

[0036] The pilot pressure inputted to the switching valve 50 is generated when the operating unit 10 is operated. If the combined operations of driving and swinging are performed by the operating unit 10, driving pilot pressure and swing pilot pressure are discharged from the operating unit 10.

[0037] In this case, the swing pilot pressure discharged from the operating unit 10 is supplied to a lower end of the switching valve 50 through a first supply line 12, and the driving pilot pressure is supplied to one side of the switching valve 50 through a second supply line 14.

[0038] The direction of the switching valve 50 is changed to one direction only when the amount of the driving pilot pressure supplied to one side of the switching valve 50 is larger than pressure preset to the switching valve 50.

[0039] According to the exemplary embodiment of the present disclosure, a first shuttle valve 11 may be further provided in the first supply line 12, and a second shuttle valve 13 may be further provided in the second supply line 14.

[0040] The first shuttle valve 11 receives left swing pilot pressure and right swing pilot pressure generated by the swinging operation of the operating unit 10, and selects higher pressure from the inputted left and right swing pilot pressure and supplies the higher pressure to the lower end of the switching valve 50.

[0041] The second shuttle valve 13 receives left driving pilot pressure and right driving pilot pressure generated by the driving operation of the operating unit 10, and selects higher pressure from the inputted left and right driving pilot pressure and supplies the higher pressure to one side of the switching valve 50.

[0042] When the switching valve 50 is switched by the driving pilot pressure, the swing pilot pressure, which is supplied to the lower end of the switching valve 50, is supplied to a first merging line 51 and a second merging line 52.

[0043] In this case, the swing pilot pressure supplied to the first merging line 51 is provided as pressure for switching the driving priority valve 40.

[0044] The swing pilot pressure supplied to the second merging line 52 is supplied to a bypass valve 60.

[0045] The bypass valve 60 is positioned at a most downstream side of the second pump P2. Therefore, the second pump P2 and a hydraulic oil tank T are in communication with each other.

[0046] When the construction machine according to

the exemplary embodiment of the present disclosure only performs the driving operation without performing the swinging operation, the pressurized oil discharged from the second pump P2 is discharged into the hydraulic oil tank T.

[0047] At this time, if the combined operations of driving and swinging are performed by the operating unit 10, the pilot pressure supplied to the bypass valve 60 prevents the pressurized oil discharged from the second pump P2 from being discharged into the hydraulic oil tank T.

[0048] That is, the bypass valve 60 is switched in accordance with the swing pilot pressure, and as a result, it is possible to variably control the amount of oil being discharged from the second pump P2 into the tank 60.

[0049] In this case, the structure of the driving priority valve 40 or 41 according to the exemplary embodiment of the present disclosure may be formed as illustrated in FIGS. 1 and 2 or as illustrated in FIGS. 3 and 4.

[0050] That is, the structure of the driving priority valve 40 is not particularly limited as long as the valve structure is a valve structure in which a flow path is disposed so that when the driving priority valve 40 is switched by the pilot pressure, a part of the pressurized oil discharged from the driving priority valve 40 may be supplied to the swing control spool 30, and the remaining part of the pressurized oil may be discharged into the hydraulic oil tank 60.

[0051] Therefore, the structure of the driving priority valve 40 illustrated in FIGS. 1 to 4 may vary depending on those skilled in the art who implement the present disclosure.

[0052] According to the apparatus for controlling the combined operations of the construction machine which have the aforementioned configurations, the first pump P1 is used only to perform the driving operation and the second pump P2 is used only to perform the swinging operation when the combined operations of driving and swinging are performed, such that the driving and swinging operations may have no effect on each other, and may use a maximum flow rate (maximum speed).

[0053] The exemplary embodiment of the present disclosure has been described with reference to the accompanying drawings, but those skilled in the art will understand that the present disclosure may be carried out in any other specific form without changing the technical spirit or an essential feature thereof.

[0054] Accordingly, it should be understood that the aforementioned exemplary embodiment is described for illustration in all aspects and is not limited, and the scope of the present disclosure shall be represented by the detailed description and the claims to be described below, and it should be construed that all of the changes or modified forms induced from the meaning and the scope of the claims, and an equivalent concept thereto are included in the scope of the present disclosure.

Claims

1. An apparatus for controlling a combined operations of a construction machine, the apparatus comprising: 5
 - a first pump and a second pump which provide pressurized oil to a plurality of actuators for performing driving and swinging operations of the construction machine by an operation of an operating unit; 10
 - a driving control spool which allows the first pump to communicate with a driving motor;
 - a swing control spool which is positioned at a downstream of the driving control spool and allows the first pump to communicate with a swing motor; and 15
 - a driving priority valve which allows the pressurized oil discharged from the first pump to be supplied to the driving control spool and allows the pressurized oil discharged from the second pump to be supplied to the swing control spool when a combined operations of driving and swinging of the construction machine are performed. 20
25

2. The apparatus of claim 1, wherein the driving priority valve is positioned at a most upstream side of the second pump. 30

3. The apparatus of claim 1, further comprising:
 - a switching valve which provides pressurized oil for switching the driving priority valve. 35

4. The apparatus of claim 3, wherein the switching valve is switched by driving pilot pressure discharged from the operating unit when the combined operations of driving and swinging are performed by the operation of the operating unit, and swing pilot pressure discharged from the operating unit is supplied to the driving priority valve. 40

5. The apparatus of claim 4, further comprising: 45
 - a bypass valve which controls pressurized oil discharged from the second pump,
 - wherein the switching valve provides the swing pilot pressure to the bypass valve when the combined operations are performed. 50

6. The apparatus of claim 5, wherein the bypass valve is positioned at the most downstream side of the second pump, and allows the second pump to communicate with a hydraulic oil tank. 55

FIG. 1

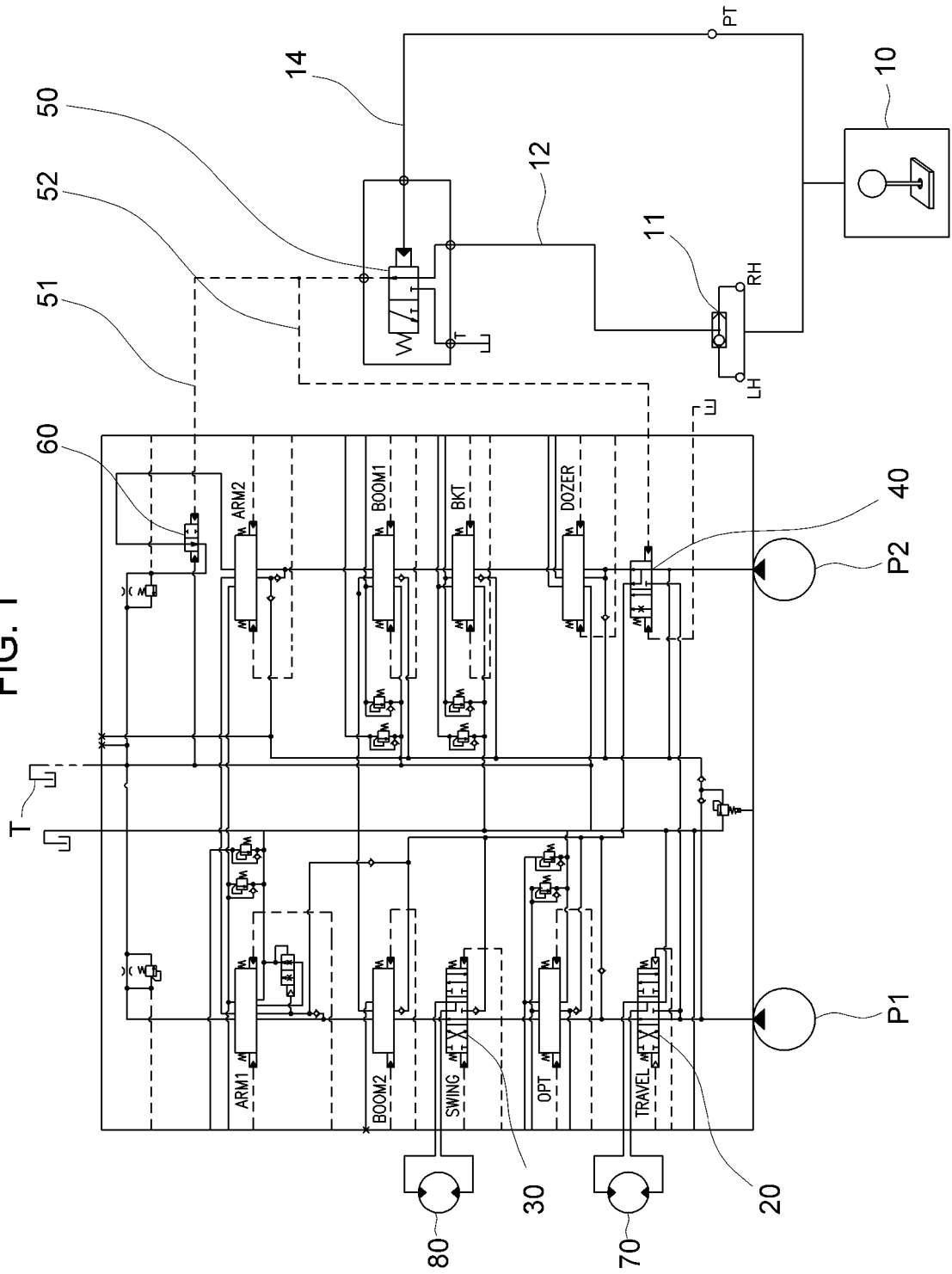


FIG. 2

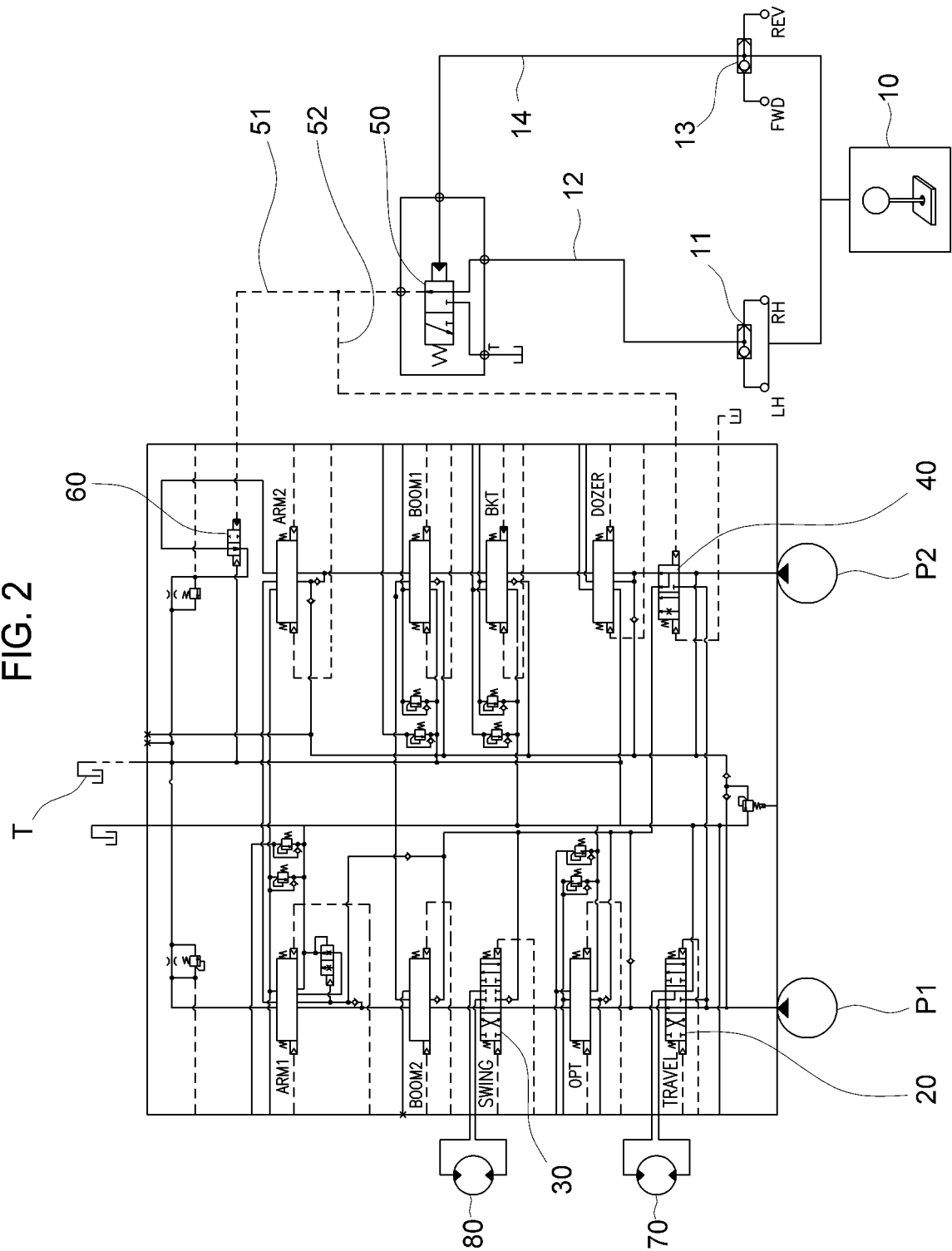


FIG. 3

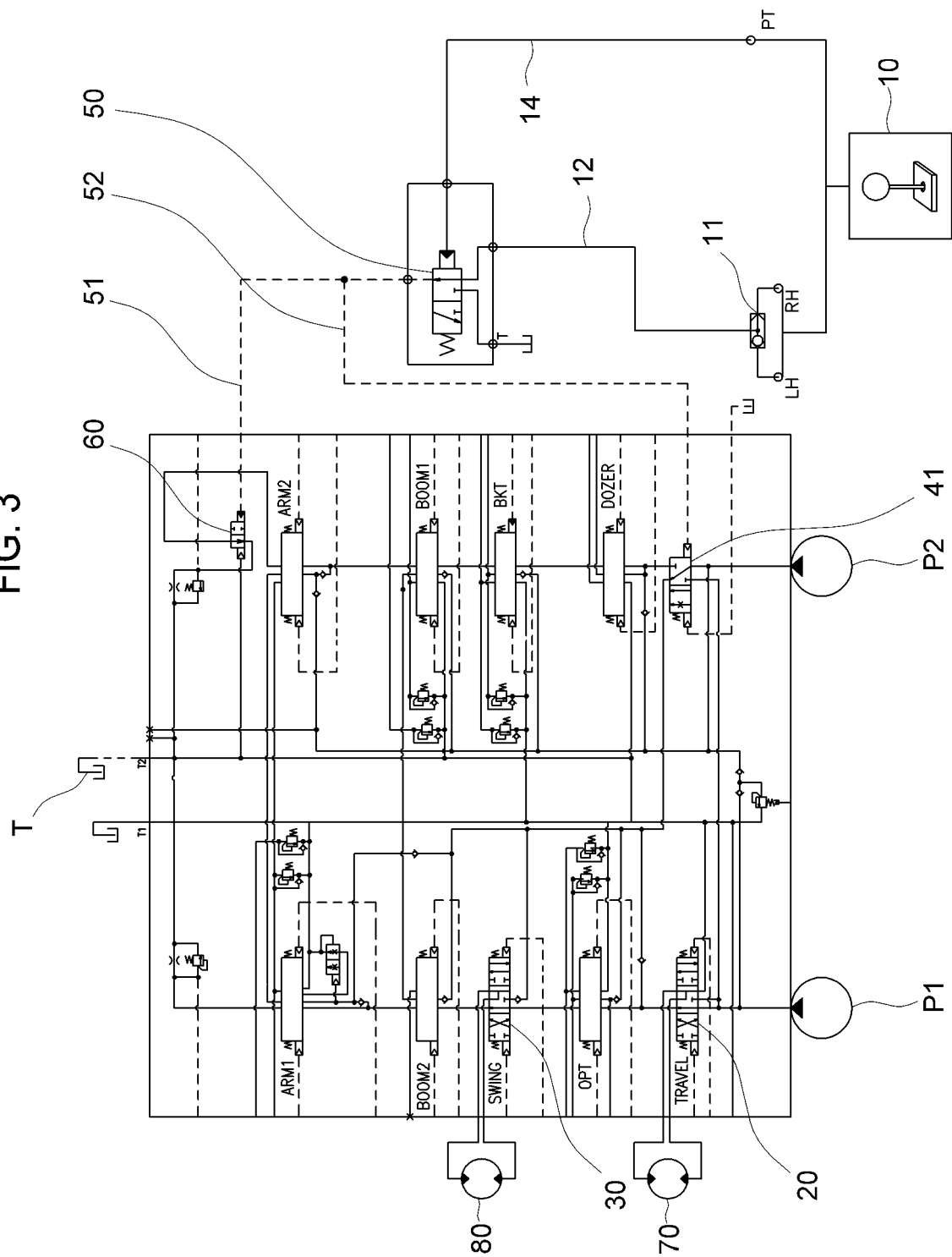
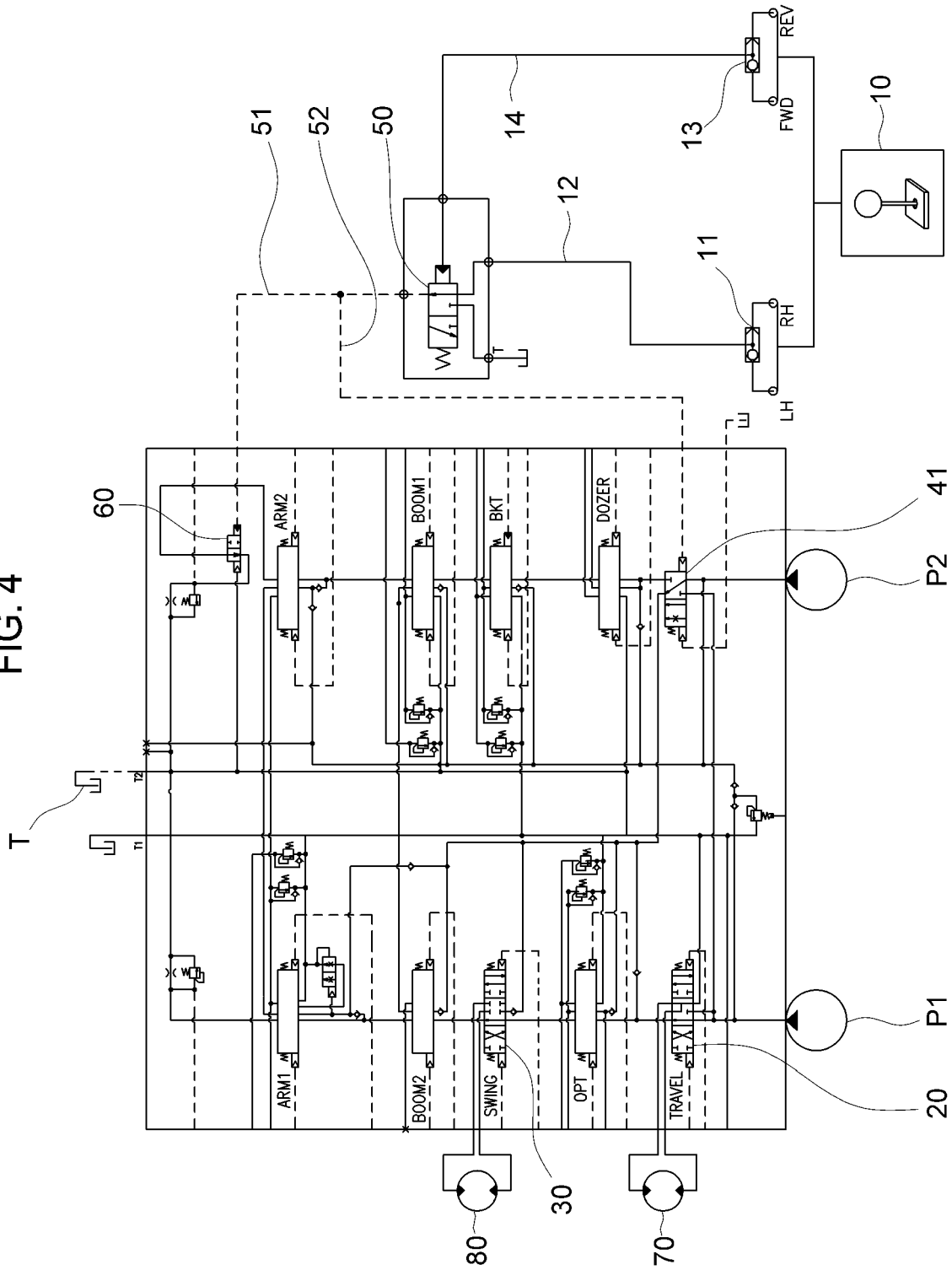


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2014/012439

A. CLASSIFICATION OF SUBJECT MATTER

E02F 9/22(2006.01)i, F15B 13/02(2006.01)i, F15B 11/20(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)

E02F 9/22; E02F 9/20; F15B 11/00; F15B 13/043; E02F 9/12; E02F 3/43; F15B 13/02; F15B 11/20

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: pump, drive motor, rotating motor, control spool, driving priority valve, construction equipment, composite motion, switching valve, bypass valve

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2013-089295 A1 (VOLVO CONSTRUCTION EQUIPMENT AB) 20 June 2013 See abstract, paragraphs [0009],[0013]-[0016],[0070]-[0084], claims 1,3,5 and figure 1.	1-6
A	KR 10-2010-0044585 A (VOLVO CONSTRUCTION EQUIPMENT AB) 30 April 2010 See abstract, paragraphs [0056]-[0071], claim 1 and figure 2.	1-6
A	KR 10-2011-0072719 A (DOOSAN INFRACORE CO., LTD.) 29 June 2011 See abstract, paragraphs [0023]-[0028], claim 1 and figure 2.	1-6
A	JP 2776702 B2 (NEW KETEO FILLER MITSUBISHI CORPORATION) 16 July 1998 See abstract, paragraphs [0027]-[0030], claim 1 and figure 1.	1-6
A	KR 10-0974285 B1 (VOLVO CONSTRUCTION EQUIPMENT AB) 06 August 2010 See abstract, paragraphs [0036]-[0048], claim 1 and figures 4,5.	1-6

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

* Special categories of cited documents:

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2014/012439

Patent document cited in search report	Publication date	Patent family member	Publication date
WO 2013-089295 A1	20/06/2013	CN 103998794 A KR 10-2014-0109884 A US 2014-0345268 A1	20/08/2014 16/09/2014 27/11/2014
KR 10-2010-0044585 A	30/04/2010	NONE	
KR 10-2011-0072719 A	29/06/2011	CN 102108720 A CN 102108720 B	29/06/2011 28/08/2013
JP 2776702 B2	16/07/1998	JP 6101249 A	12/04/1994
KR 10-0974285 B1	06/08/2010	KR 10-2010-0020188 A	22/02/2010