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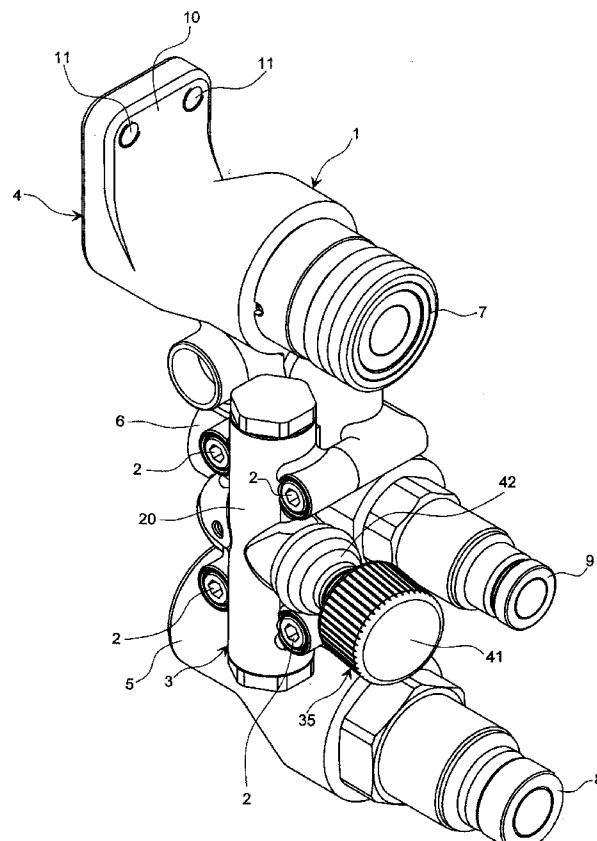
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[Continued on next page]

(54) Title: A HYDRAULIC CONNECTION ASSEMBLY WITH A PRESSURE DISCHARGE CONTROL, POSITIONABLE BETWEEN AN ONBOARD HYDRAULIC CIRCUIT OF AN ENGINEERING VEHICLE AND A REMOVABLE HYDRAULIC EQUIPMENT



(57) **Abstract:** There is described a hydraulic connection assembly with a pressure discharge control, which is positionable between an onboard hydraulic circuit of an engineering vehicle and a removable hydraulic equipment. The hydraulic assembly comprises a one-piece body (1, 51) attachable to the outside of the hydraulic machine near the hydraulic equipment and provided with at least one input hydraulic linkage (4, 5; 52) connectable to a pressure line of the hydraulic circuit of the vehicle, at least one coupling (7, 8; 54) suitable for the connection with a feeding input of a removable equipment and a pressure discharge hydraulic linkage (6; 53) connectable to a draining line, at least one normally closed discharge valve (21, 22; 55) positioned between said linkage (4, 5; 52) to a pressure line and said linkage (6; 53) to a draining line and a pressure discharge control (35; 56) operable so as to cause the opening of said at least one normally closed valve (21, 22; 55) for the connection of the above said pressure line to the draining line for discharging the pressure existing in the hydraulic circuit of the vehicle. The discharge valve (21, 22; 55) is of the sliding piston type (31) and the pressure discharge control (35; 56) is formed by a lever (35) rotatable around a transversal axis (36) between a stable resting position and a working position in which a side (37) of said lever (35) exerts an axial thrust on said sliding piston (31) for the opening control of said valve (21, 22; 55).

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- *of inventorship (Rule 4.17(iv))*

- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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“A hydraulic connection assembly with a pressure discharge control, positionable between an onboard hydraulic circuit of an engineering vehicle and a removable hydraulic equipment”

DESCRIPTION

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The present invention relates to a hydraulic connection assembly with a pressure discharge control, which is positionable between an onboard hydraulic circuit of an engineering vehicle and a removable hydraulic equipment.

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The engineering vehicles with onboard hydraulic circuits (excavators, front loaders, etc.) usually have the possibility to connect the circuit itself to removable hydraulic equipment (for instance, hammers, miller cutter, etc.) by means of the connection of flexible hoses and rapid couplings.

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In some vehicles, the hydraulic system may remain in residual pressure when the equipment is disconnected.

It is therefore required to firstly connect or disconnect the equipment, discharge the pressure of the onboard hydraulic system, by means of manoeuvres to be performed on the controls of the engineering vehicle.

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That is, it is required to leave the post near the equipment, enter the control post of the engineering vehicle and discharge the pressure; then the equipment is approached and its connection or disconnection is performed by means of manual rapid coupling.

Alternatively, the operation may be performed by two people, thus increasing the costs of the operation.

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Without these operations, the connection or disconnection of the hydraulic equipment is impossible or dangerous.

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WO-A-2004/070241 describes a hydraulic assembly, positionable between the engineering vehicle and the removable equipment. Such a hydraulic assembly has a one-piece body including hydraulic linkages to pressure lines of the hydraulic circuit of the vehicle and to corresponding

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feeding inputs for removable equipment, a hydraulic linkage to a draining line, normally closed discharge valves positioned between said linkages to pressure lines and said linkage to a draining line and a control for the pressure discharge which is operable so as to cause the opening of one and/or the other of said normally closed valves for the connection of the above said pressure lines to the draining line for the discharge of the pressure existing in the hydraulic circuit of the vehicle.

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The two valves are ball valves and the pressure discharge control consists of a knob rotatable around its longitudinal axis in order to allow one or more cam surfaces of a rod thereof to act on the control ball of one and/or the other of the above said valves to cause the opening thereof.

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It is the object of the present invention to make a hydraulic assembly positionable between an onboard hydraulic circuit of an engineering vehicle and a removable hydraulic equipment, in which a different and more efficient and safe pressure discharge control is provided for.

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According to the invention such an object is achieved by a hydraulic assembly comprising a one-piece body attachable to the outside of the hydraulic machine near the hydraulic equipment and provided with at least one hydraulic input linkage connectable to a pressure line of the hydraulic circuit of the vehicle, at least one suitable coupling for the connection with a feeding input of a removable equipment and a hydraulic pressure discharge linkage connectable to a draining line, at least one normally closed discharge valve positioned between said linkage to a pressure line and said linkage to a draining line and a pressure discharge control operable so as to cause the opening of said at least one normally closed valve for the connection of the above said pressure line to the draining line for the discharge of the pressure existing in the hydraulic circuit of the vehicle, characterised in that said discharge valve is of the sliding piston-type and said pressure discharge control is formed by a lever rotatable around a transversal axis between a stable resting position and a working position in which a side of said lever

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exerts an axial thrust on said sliding piston for the opening control of said valve.

In this manner there are ensured the stable and safe positioning of the control lever and of the discharge valve in the normal resting position to ensure the correct connection between the onboard hydraulic circuit and the removable equipment, and at the same time a simple and convenient transversal displacement of the lever allows to perform a precise and safe opening intervention of the valve by means of an axial thrust on its sliding piston.

Preferably there is provided the possibility to also lead the working position of the pressure discharge lever to be stable for the whole time required for the discharge of the pressure of the hydraulic circuit of the vehicle.

Furthermore, it may be arranged for the one-piece body to have two linkages to pressure lines and two couplings for the connection to removable equipment, and for two discharge valves operated by a single pressure discharge lever to accordingly be provided, the lever having in this case a resting position and two working positions, preferably arranged symmetrically like the two discharge valves, the two linkages and the two couplings.

The features of the present invention will become more apparent from the following detailed description of possible embodiments thereof shown by way of non-limitative example in the accompanying drawings, in which:

Figure 1 shows a perspective view of a one-piece body hydraulic assembly according to the present invention with two linkages to pressure lines and two couplings for removable equipment;

Figure 2 shows a side view of said hydraulic assembly;

Figure 3 shows an end view of said hydraulic assembly;

Figure 4 shows a section view of said hydraulic assembly along line IV-IV in Figure 2;

Figure 5 shows a perspective view of the detail of the one-piece body included in the hydraulic assembly in Figures 1-4;

Figure 6 shows a perspective view of an enlarged detail of the valve assembly included in the hydraulic assembly in Figures 1-4;

5 Figure 7 shows the enlarged detail of a discharge valve included in the valve assembly in Figure 6;

Figure 8 shows an axial section view of the valve assembly with a control lever of the opening of the valves in a resting position;

10 Figure 9 shows an axial section view of the valve assembly with the opening control lever of the valves in an opening position of a discharge valve;

Figures 10 and 11 show different perspective views of a variant of the hydraulic assembly according to the present invention which provides for four linkages to pressure lines and four couplings for removable equipment;

15 Figure 12 shows an enlarged scale view from the side of the couplings of the hydraulic assembly in Figures 10 and 11;

Figure 13 shows a section view of said hydraulic assembly along line XIII-XIII in Figure 12.

20 The hydraulic assembly shown in Figures 1-3 comprises a one-piece body 1 to which a valve assembly 3 is laterally attached in a detachable manner by means of screws 2.

25 A one-piece body 1, shown in detail in Figure 5, is intended for the hydraulic connection to an onboard hydraulic circuit of a hydraulic machine and for the attachment to the outside thereof near the removable equipment fed by said hydraulic circuit. For such a purpose, the one-piece body 1 comprises two end linkages 4 and 5 for the connection to respective pressure lines of the hydraulic circuit of the vehicle and an intermediate linkage 6 for the connection to a draining line of the hydraulic circuit itself, in turn connected to a hydraulic liquid tank, usually oil. Respective couplings 7 and 30 8 (preferably rapid couplings) for the connection to respective feeding inputs

for removable equipment are arranged in front of the linkages 4 and 5 for the pressure lines and in direct hydraulic connection therewith by means of holes 44 and 45 and a coupling 9 (this preferably being a rapid coupling as well) for the connection to a possible draining output of the removable equipment is arranged in front of the linkage 6 for the draining line and in direct hydraulic connection therewith by means of a hole 46. At least one of the linkages 5 and 6 is provided with a side flange 10 provided with holes 11 for fastener screws for the mechanical attachment of the one-piece block 1 to the hydraulic machine.

Within the one-piece body 1 there are provided passages 12 and 13 (highlighted in black), which hydraulically connect the linkages 4 and 5 for pressure lines with respective inputs 14 and 15 of the valve assembly 3 and further passages 16 and 17 (highlighted in black), which hydraulically connect respective outputs 18 and 19 of the valve assembly 3 with the linkage 6 for the draining line (Figures 4, 5 and 6).

The valve assembly 3, shown externally in Figure 6 and internally in Figures 4, 8 and 9, comprises an external body 20, within which two pressure discharge valves 21 and 22 are housed, which communicate with the above said inputs 14 and 15 and outputs 18 and 19 and therefore with the internal passages 12, 13, 16 and 17 of the one-piece body 1.

Each of the two valves 21 and 22 is formed as shown in Figure 7, that is it comprises a valve body 23 provided with an input 24 and an output 25, respectively connected with the inputs 14 and 15 and with the outputs 18 and 19 of the valve assembly 3, as well as an axial passage 26 for the communication between the input 24 and the output 25, a stopper 27 which is axially mobile between a closed position of said axial passage 26 in virtue of a gasket 28 (Figure 8) and an opening position of said axial passage 26 (Figure 4, 7 and 9), a spring 29 biasing between a closing cap 30 of the housing compartment of the valve in the external body 20 and the stopper 27 to elastically push it in said closed position against the gasket 28 and finally

an operating piston 31, which axially extends from the housing compartment of the valve and against which an end rod 32 of the stopper 27 rests by the effect of the spring 29.

5 Between the operating pistons 31 of the two valves 21 and 22, in a transversal compartment 33, a longitudinal rod 34 of a pressure discharge lever 35 is housed, which is rotatable around a transversal pin 36 from the resting position in Figure 8, in which a rounded part 37 of the rod 34 remains distanced from the operating pistons 31 to allow the stoppers 27 of the two valves to remain in a closed position.

10 A sleeve 38 stressed by a spring 39 towards an internal shoulder 40 of the rod 34 is slidingly fitted on the rod 34, as shown in Figure 8. An operating knob 41 is screwed on the front end of the sleeve 38. An elastically deformable hood 42 protects the input mouth 43 of the compartment 33, which is flared towards the outside to allow the positioning 15 of the lever 35 in the tilted position in Figure 9 or in an oppositely tilted position, from the entry of dust or other material, as will be explained hereafter.

20 During operation, when the pressure discharge lever 35 is stably held in the resting position of Figure 8 by the elastically forced insertion maintained by the sleeve 38 in the housing compartment 33, both of the discharge valves 21 and 22 are closed so that the oil or other liquid coming from the pressure lines of the hydraulic circuit of the engineering vehicle directly passes from the linkages 4 and 5 to the couplings 7 and 8, which are normally closed.

25 To connect the equipment to the onboard hydraulic circuit of the engineering vehicle the hydraulic circuit itself must be discharged in advance.

30 As far as the pressure line connected to the linkage 4 is concerned, this may be obtained by operating by traction on the knob 41 of the pressure discharge lever 35 until the sleeve 38 is extracted from the compartment 33

against the bias of the spring 39 and by then rotating the lever itself around the pin 36 until the tilted position in Figure 9 is reached, where it is held by the front engagement of the sleeve 38 with an edge of the input mouth 42 of the compartment itself.

5 The rounded portion 37 of the rod 34 thus axially pushes the operating piston 31 of the discharge valve 21, which in turn forces the axial sliding of the stopper 27 to the opening position of the valve, that is the communication position between the input 24 and the output 25 of the valve and thus between the internal passages 12 and 16 of the one-piece body 1.

10 The pressure line connected to the linkage 4 is thus connected with the draining line connected to the linkage 6 with subsequent discharge of the feeding pressure. A hydraulic equipment may thus be connected to the onboard hydraulic circuit of the engineering vehicle by means of the feeding coupling 7 and, if required, by means of the draining coupling 9.

15 In a totally similar manner, the pressure discharge lever 35 may be shifted to a symmetrical position with respect to Figure 9, so as to cause the opening of the valve 22 and the subsequent discharging of the pressure line connected to the linkage 5 and the similarly subsequent connection to an equipment to the coupling 8.

20 The pressure discharge lever 35 may then be shifted to the stable resting position in Figure 8 to allow the feeding of the connected hydraulic equipment.

25 Reverse operations are performed before carrying out the disconnection of the removable equipment from the onboard hydraulic circuit of the engineering vehicle.

It is apparent that by arranging the hydraulic assembly of Figures 1-9 outside the engineering vehicle and near the mechanical attachment point of the removable equipment, the pressure discharge operations and the connection and disconnection of the removable equipment may be carried out conveniently and rapidly, thus saving in terms of time and costs.

Figures 10-13 show a hydraulic assembly of the same type as that in Figures 1-9, which may serve four pieces of equipment and for this purpose is provided with a one-piece body 51, four linkages 52 for pressure lines, a linkage 53 for the draining line, four rapid couplings 54 for controlled equipment, four discharge valves 55 and a pressure discharge lever 56.

CLAIMS

1. A hydraulic connection assembly with a pressure discharge control, positionable between an onboard hydraulic circuit of an engineering vehicle and a removable hydraulic equipment, comprising a one-piece body (1, 51) attachable on the outside of the hydraulic machine near the hydraulic linkage and provided with at least one input hydraulic linkage (4, 5; 52) connectable to a pressure line of the hydraulic circuit of the vehicle, at least one coupling (7, 8; 54) suitable for the connection with a feeding input of a removable equipment and a pressure discharge hydraulic linkage (6; 53) connectable to a draining line, at least one normally closed discharge valve (21, 22; 55) positioned between said linkage (4, 5; 52) to a pressure line and said linkage (6; 53) to a draining line and a pressure discharge control (35; 56) operable so as to cause the opening of said at least one normally closed valve (21, 22; 55) for the connection of the above said pressure line to the draining line for the discharge of the pressure existing in the hydraulic circuit of the vehicle, characterised in that said discharge valve (21, 22; 55) is of the sliding piston-type (31) and said pressure discharge control (35; 56) consists of a lever (35) rotatable around a transversal axis (36) between a stable resting position and a working position wherein a side (37) of said lever (35) exerts an axial thrust on said sliding piston (31) for the opening control of said valve (21, 22; 55).

2. A hydraulic assembly according to claim 1, characterised in that said pressure discharge lever (35; 56) comprises a rod (34) rotatable around said transversal axis (36) and provided with a rounded portion (37) adapted to axially push said piston (31) when said lever (35; 56) is shifted to a working position.

3. A hydraulic assembly according to claim 2, characterised in that said pressure discharge lever (35; 56) comprises a sleeve (38) positioned around said rod (34) in an axially sliding manner against the thrust of elastic means (39) which hold it in position inserted within a housing compartment

(33) of said rod (34) to firmly hold said rod (34) in said resting position and a knob (41) screwed on said sleeve (38) for the traction of said sleeve (38) from said compartment (33) and the rotation of said rod in said working position.

5 4. A hydraulic assembly according to claim 3, characterised in that said sleeve (38) has a front engageable with an edge of the input mouth (43) of said compartment (33) for holding said lever (35; 56) in a working position.

10 5. A hydraulic assembly according to any of claims from 1 to 4, characterised in that said operating piston (31) of the discharge valve (21, 22; 55) cooperates with a stopper (27) axially sliding against the action of elastic means (29) to push it axially in an opening position of said valve (21, 22; 55) when said lever (35; 56) is shifted to working position.

15 6. A hydraulic assembly according to any of claims from 1 to 5, characterised in that said at least one discharge valve (21, 22) is included in a valve assembly (3) forming a body separate from said one-piece body (1) and detachably attached thereto.

20 7. A hydraulic assembly according to claim 1 or 6, characterised in that it comprises two linkages (4, 5) to pressure lines, two couplings (7, 8) with feeding inputs for removable equipment and two normally closed discharge valves (21, 22) alternatively operable in the opening position by shifting said pressure discharge lever (35) to respective working positions.

25 8. A hydraulic assembly according to claim 7, characterised in that said linkages (4, 5) to pressure lines, said couplings (7, 8) to feeding inputs of removable equipment and said discharge valves (21, 22) are arranged symmetrically with respect to said pressure discharge lever (35) so that said lever (35) is positionable in working positions arranged symmetrically with respect to said resting position.

30 9. A hydraulic assembly according to claim 1 or 6, characterised in that it comprises four linkages (52) to pressure lines, two couplings (54) to

feeding inputs of removable equipment and four normally closed discharge valves (55) alternatively operable in an opening position by shifting said pressure discharge lever (56) to respective working positions.

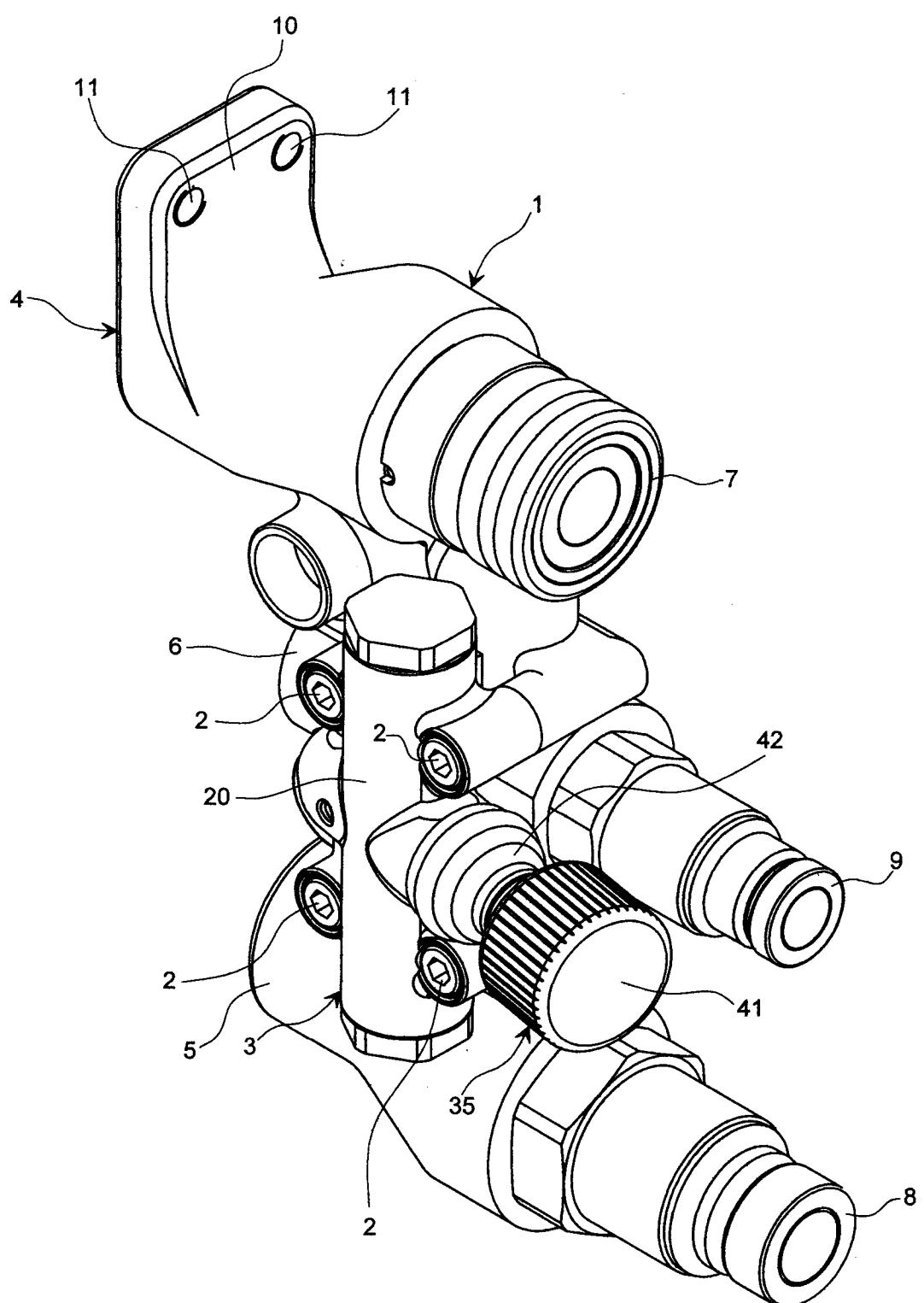


Fig. 1

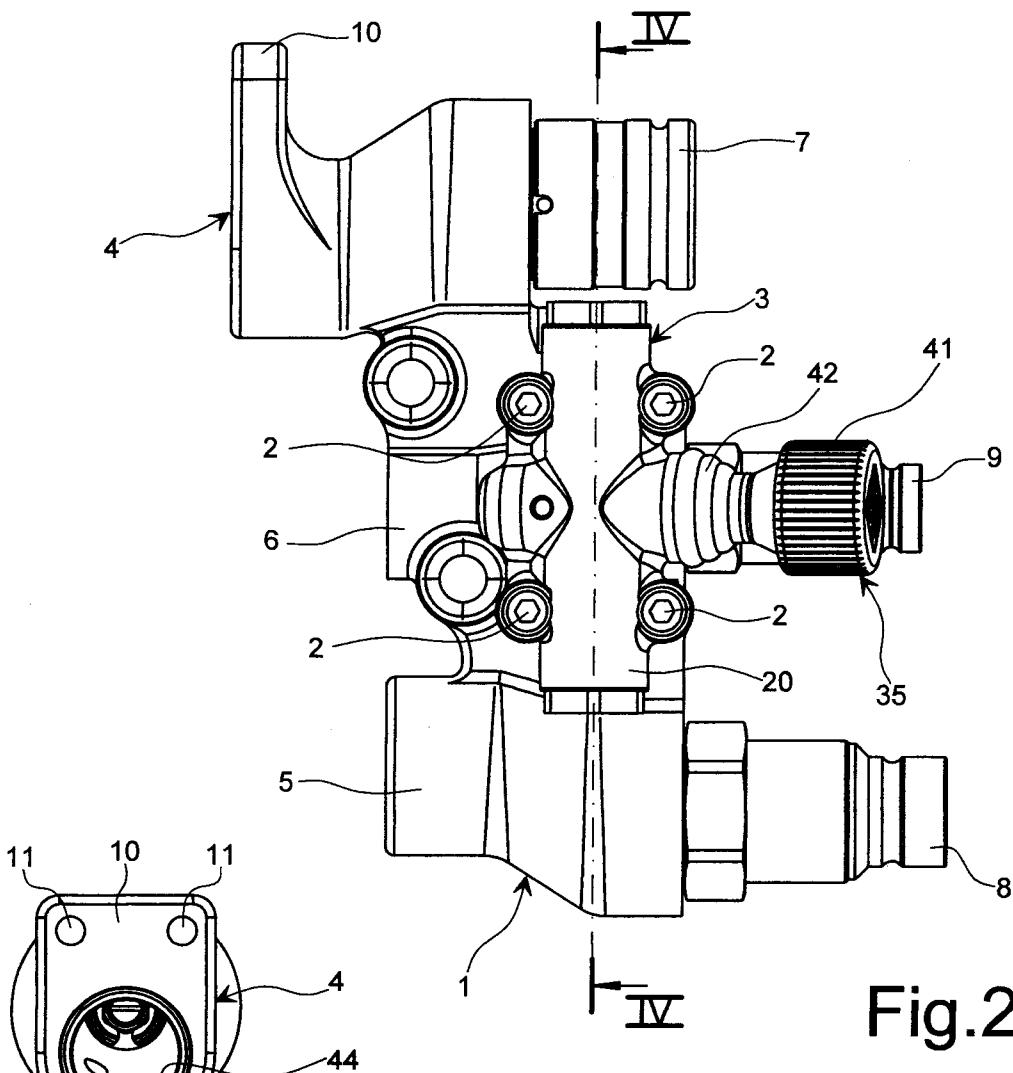


Fig.2

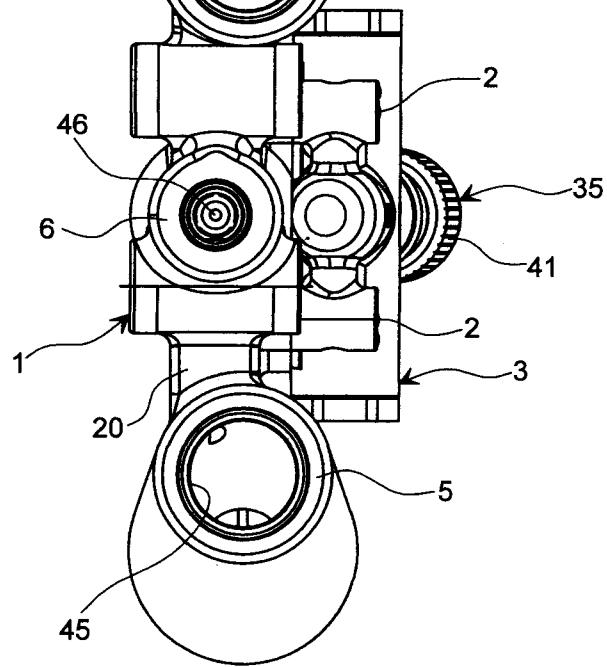


Fig.3

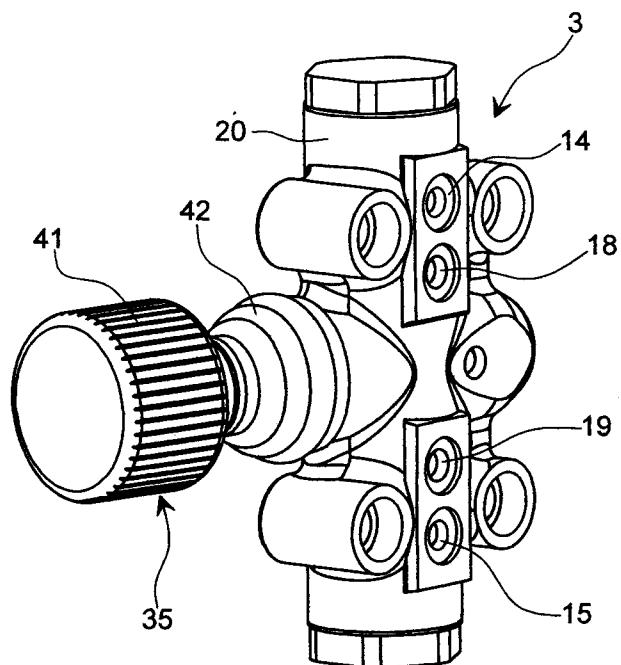


Fig.6

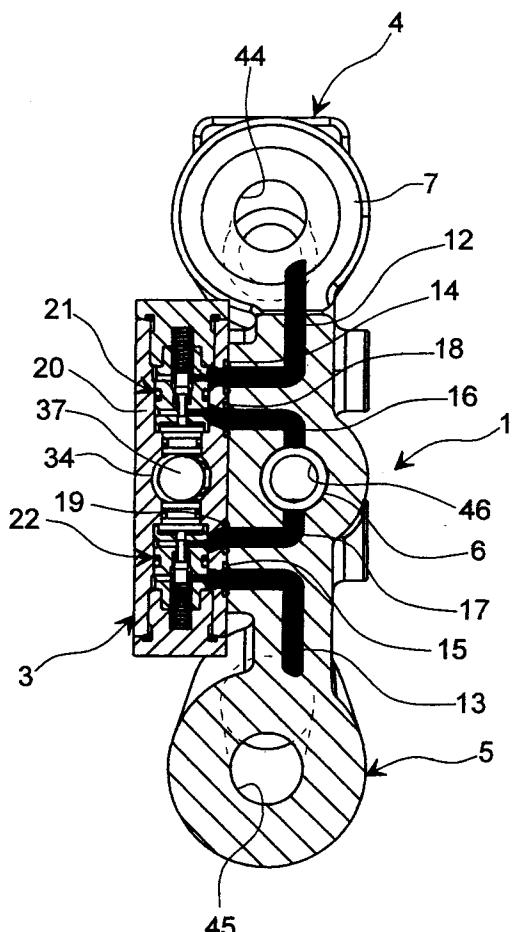


Fig.4

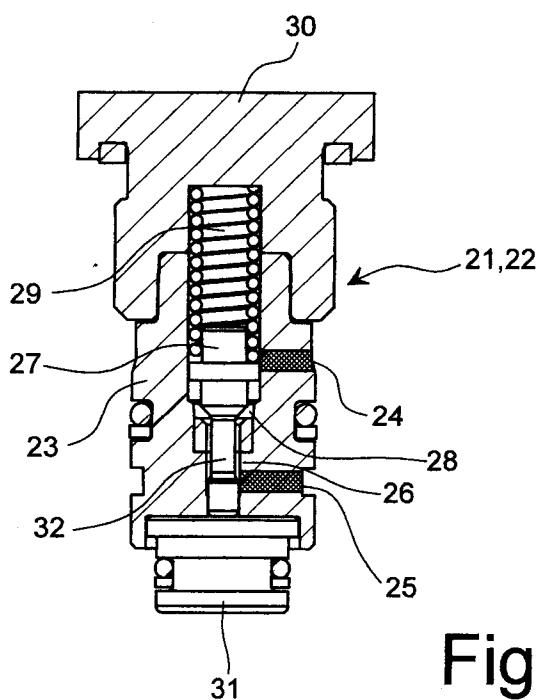


Fig.7

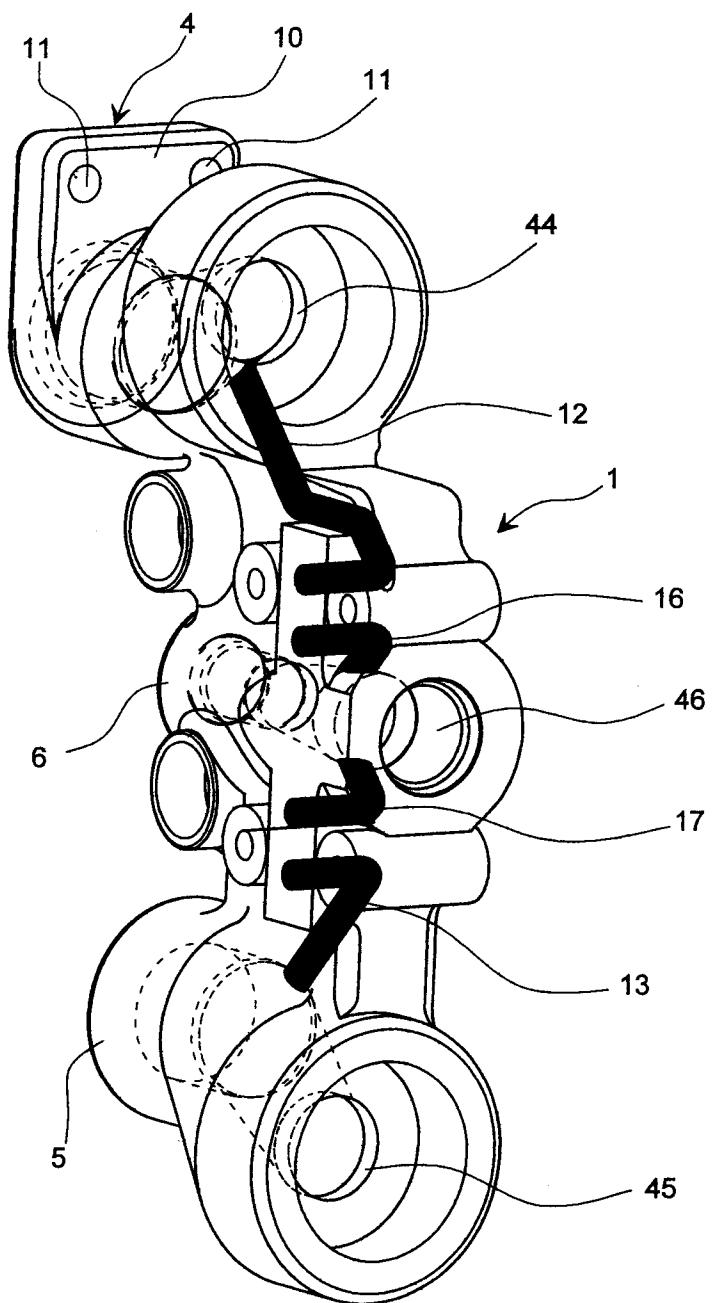


Fig.5

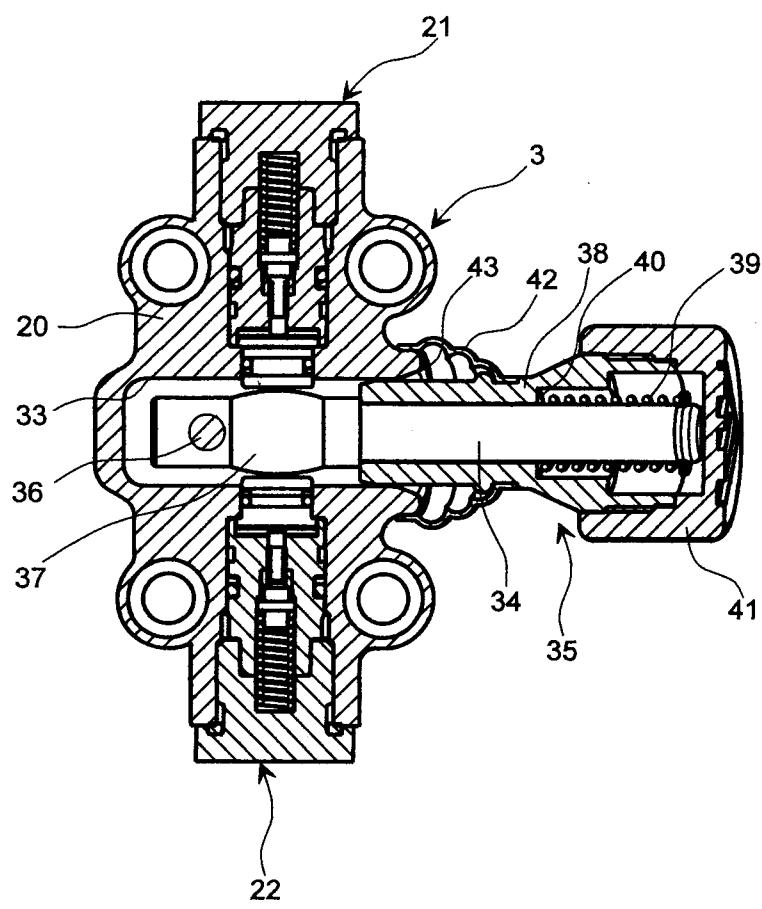


Fig.8

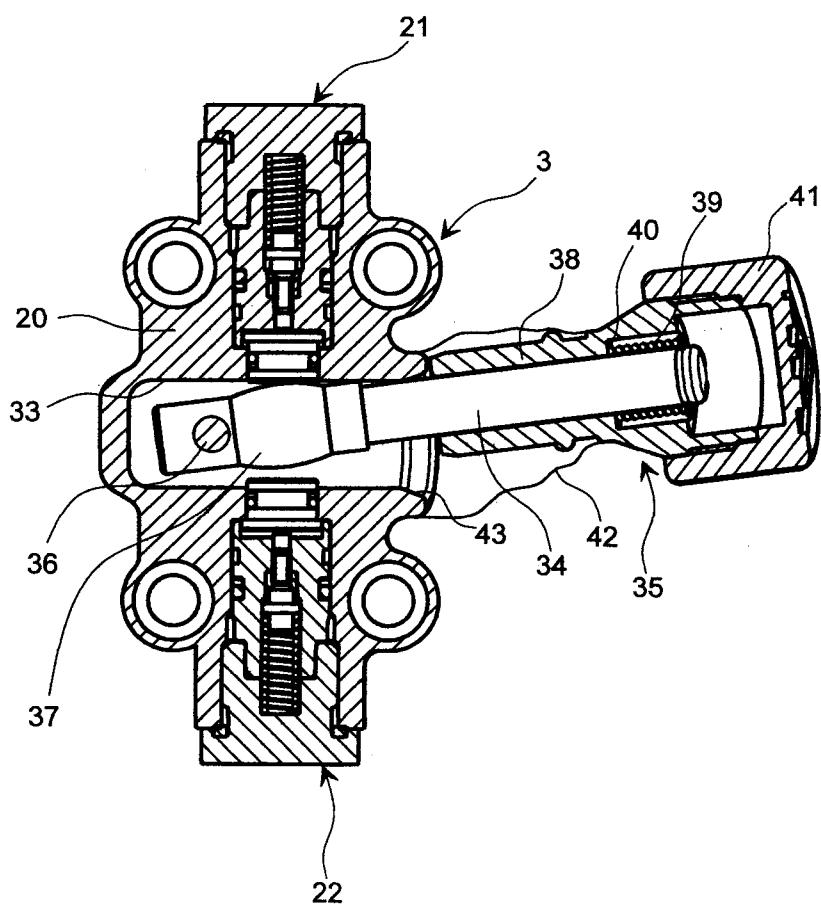
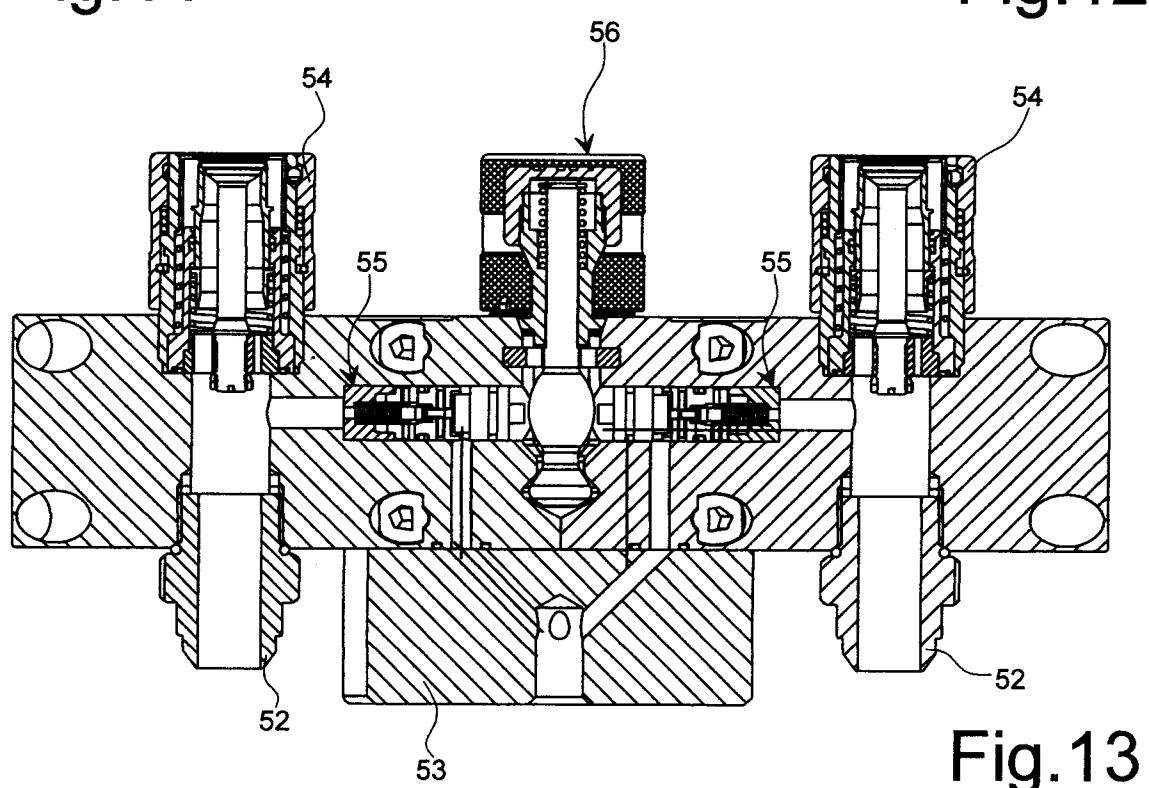
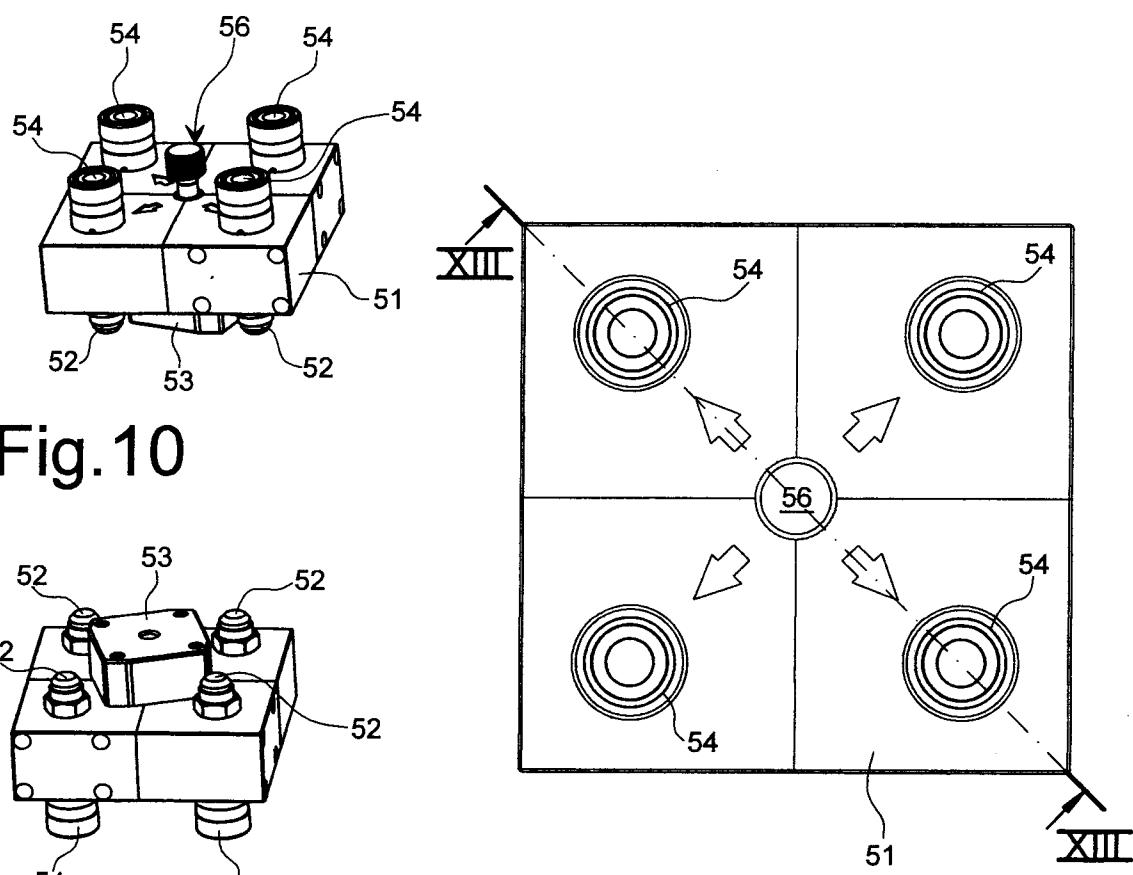


Fig.9



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/057593

A. CLASSIFICATION OF SUBJECT MATTER
INV. F15B20/00

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)
F15B F16L

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

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

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/130910 A1 (KNUTHSON PER [SE]) 22 June 2006 (2006-06-22) paragraphs [0061] - [0071]; figures 2A,2B,2C,3-5,6A ----- DE 199 38 876 A1 (VOSWINKEL KG [DE]) 8 March 2001 (2001-03-08) column 1, lines 6-22 column 4, line 55 - column 6, line 68 column 7, lines 46-49; figures 1,2 ----- -/-	1,2,5,6
X		1,2,5,7

Further documents are listed in the continuation of Box C.

See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
20 November 2007	30/11/2007
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer RECHENMACHER, M

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/057593

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2004/070241 A (SNAP TITE TECH INC [US]) 19 August 2004 (2004-08-19) cited in the application page 1, line 3 – page 2, line 8 page 10, line 7 – page 13, line 1 page 14, line 17 – page 15, line 19 page 16, line 16 – page 17, line 19 page 18, line 4 – page 19, line 4; figures 1,1B,5,8,9 -----	1
A	US 3 693 655 A (FRISK KNUT OLOV) 26 September 1972 (1972-09-26) column 1, lines 4-60 column 2, lines 18-40; figures 1-4 -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2007/057593

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US 2006130910	A1 22-06-2006	DE 102004055001 A1		18-05-2006
		EP 1657481 A2		17-05-2006
DE 19938876	A1 08-03-2001	NONE		
WO 2004070241	A 19-08-2004	AU 2003259850 A1		30-08-2004
		EP 1590587 A1		02-11-2005
		US 2004144436 A1		29-07-2004
US 3693655	A 26-09-1972	CA 930639 A1		24-07-1973
		DE 2061821 A1		01-07-1971
		FR 2074375 A5		01-10-1971
		GB 1324037 A		18-07-1973
		JP 49049138 B		25-12-1974
		SE 335653 B		01-06-1971
		ZA 7008627 A		27-10-1971