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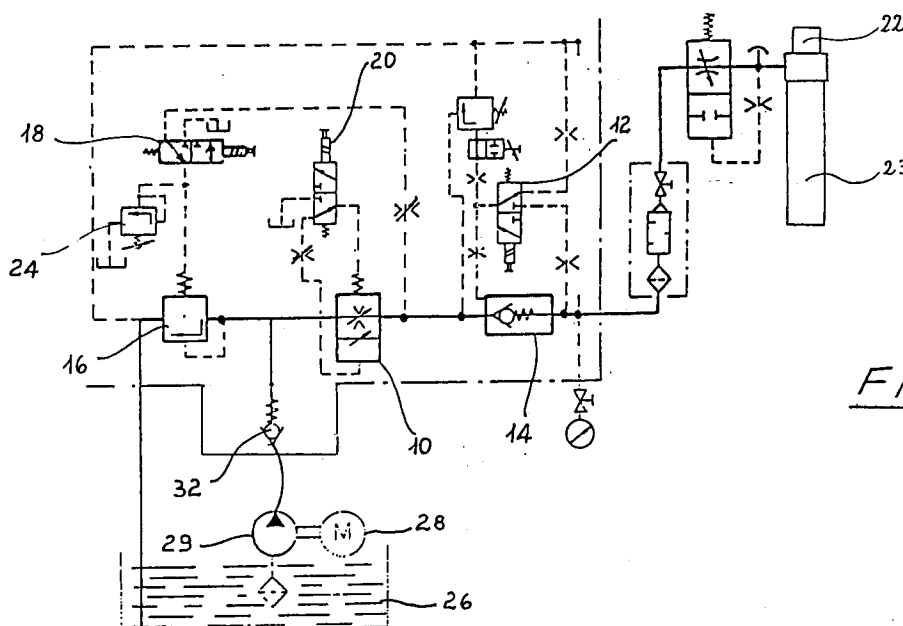
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I-20123 Milano(IT)(54) **Hydraulic circuit for passenger and freight elevators and the like.**

(57) Hydraulic circuit for passenger and freight elevators and the like with intrinsic safety comprising substantially a flow control valve (10), a magnetic descent valve (12), a check valve (14), an overpressure valve (16) and a magnetic starting valve (18) in

which said magnetic starting valve (18) is controlled electrically only during the descent phase and the overpressure valve (16) is closed in the absence of an electric command.

FIG. 1**EP 0 514 782 A1**

The present invention relates to a hydraulic circuit for passenger and freight elevators and the like. More specifically, the present invention relates to a hydraulic circuit for passenger and freight elevators and the like provided with intrinsic safety.

As known, in hydraulic systems for movement of elevator cars the basic aspect concerns safety of the whole. For this purpose the systems are conventionally provided with special elements, valves and similar devices which, in case of emergency, block the car and prevent its ascent and descent.

In known systems the hydraulic diagrams comprise control elements arranged in series in which the operating fluid always involves the same activators in both ascent and descent of the installation.

In such systems the oil flowrate involves basically a safety or overpressure valve, a flow control valve and a piloted check valve.

During the ascent phase of the car the safety, overpressure and flow control valves are hydraulically and/or electrically controlled. The last two valves, depending on the specific hydraulic and/or electric controls, govern the phases of acceleration, deceleration, levelling and stopping at the floor.

The ascent blocking valve behaves essentially like a check valve which is held open by the fluid pressure. Lack of pressure caused by stopping of the motor causes closing of said blocking valve and therefore holds the elevator stopped at the floor.

During the descent phase, the check valve is piloted by a release shutter controlled electrically and hydraulically, i.e. it is opened by oil pressure following an electrical signal. The flow control valve on the other hand behaves in the same manner in descent and ascent.

In descent the overpressure valve is obligatorily cut out and remains open so that all the flow can return to the tank. In known systems therefore it is not possible to activate the overpressure valve in descent because this would result in stopping of the installation during normal operation. The overpressure valve thus remains systematically open during descent even in case of failure of the check valve. In this case the car is blocked initially at a certain height and begins to descend progressively by gravity until all the fluid has returned to the tank, i.e. the installation performs the complete descent travel to the bottom of the pit with a speed proportional to the opening of the check valve.

To achieve the necessary safety and avoid in case of failure undesired descent by gravity of the car it is therefore necessary to provide the installations with specific and independent devices with consequent additional costs.

The object of the present invention is to eliminate the above shortcomings.

More specifically, the object of the present

invention is to provide a hydraulic circuit for passenger and freight elevators and the like which would prevent descent by gravity of the car once it has been blocked at a certain height without recourse to the use of specific and independent devices.

Another object of the present invention is to provide a hydraulic circuit for passenger and freight elevators and the like with intrinsic safety.

In accordance with the present invention these and other objects are achieved by a hydraulic circuit for passenger and freight elevators and the like comprising at least one flow control valve, a magnetic descent valve (VMD), a check valve (VNR), an overpressure valve (VB) and a magnetic starting valve (VMP) in which said magnetic starting valve (VMP) is controlled electrically during descent of the car and said overpressure valve (VB) is closed in the absence of an electric command.

In the hydraulic circuit of the present invention the overpressure valve provides safety in descent of the car because said valve is held sustained, i.e. closed, in the absence of a specific electric command.

The advantages achieved by the hydraulic circuit of the present invention are essentially the fact that, in case of failure, accidental descent by gravity of the car does not take place.

The hydraulic circuit of the present invention is distinguished by its structural simplicity and maximum reliability and furthermore it is accepted by safety standards for electric control because it is provided with two self-controlled elements which ensure the absence of failure. Indeed, the statistical probability of a failure occurring in two elements simultaneously, i.e. the overpressure valve and the check valve, is practically nil.

The hydraulic circuit of the present invention can be understood better from the detailed description given below wherein reference is made to the figures of the enclosed drawings which show some examples of embodiments of the present circuit and wherein:

FIG. 1 shows by way of example a hydraulic circuit of the present invention,

FIG. 2 shows the diagram of the activation and deactivation periods of the principal elements of the circuit of FIG. 1,

FIG. 3 shows by way of example a diagram of a variation of the hydraulic circuit of the present invention in which the magnetic starting valve is the 3-way type,

FIG. 4 shows a variation of the hydraulic circuit of the present invention in which the magnetic starting valve is 2-way and associated with a hydraulic pressure valve,

FIG. 5 shows by way of example another vari-

ation of the hydraulic circuit of the present invention in which the magnetic starting valve is 3-way and associated with a hydraulic pressure valve,

FIG. 6 shows by way of example another variation of the hydraulic circuit of the present invention in which the element which pilots the overpressure valve in the static and descent phases is deactivated hydraulically,

FIG. 7 shows by way of example another variation of the hydraulic circuit of the present invention in which the element which pilots the overpressure valve in the static and descent phases is deactivated electrically,

FIG. 8 shows the diagram of the activation and deactivation periods of the components in the above hypothetical variations, and

FIG. 9 shows by way of example a variation of the hydraulic circuit of the present invention with safety pressure switch.

With particular reference to the diagram of FIG. 1, the hydraulic circuit of the present invention for feeding hydraulic fluid from a tank (26) to a hydraulic cylinder (23) provided with a piston (22) for movement of an elevator car or of the platform of a freight elevator comprises a motor (28), a pump (29), a flow valve (VR) (32), a flow control valve (10), a magnetic descent valve (VMD) (12), a piloted check valve (VRP) (14), an overpressure or safety valve (VB) (16), a magnetic levelling valve (VML) (20), a pilot valve (VS) (24) for the safety valve (VB) (16), i.e. for control of the release pressure of said valve and a magnetic departure or starting valve (VMP) (18) (hereinafter referred to as VMP).

In accordance with the present invention the magnetic departure or starting valve (VMP) (18) is controlled electrically during descent of the installation.

The valve VMP (18) receives the signal downstream of the flow control valve (10) and commands the valve VB (16) which supplies the pulse for ascent of the piston (22).

The valve VB (16) is piloted by the valve VMP (18) as regards the acceleration and command signal while the pilot valve (VS) (24) divides this signal in case of excessive pressure and opens the valve (VB) (16) when the pressure exceeds the settings.

During descent of the piston (22) the valve (VB) (16) is closed and the valve VMP (18) is not controlled electrically. Therefore, the valve VB (16) does not allow passage of the fluid from the cylinder (23) to release and holds the circuit under pressure.

The valve VR (32) is a one-way valve. When the pressure of the pump (29) exceeds the pressure existing in the circuit the valve VR (32) opens.

If the pressure of the pump (29) is less than that of the circuit the valve VR (32) remains closed. The flow of hydraulic fluid is thus from the pump (29) to the circuit and not the contrary.

The pump (29) is generally a volumetric pump preferably of the screw type.

The valve (10) is a deceleration valve and is piloted by the magnetic levelling valve (VML) (20).

The valve (VRP) (14) is the check valve of the circuit and is controlled and commanded by the magnetic descent valve (VMD) (12).

Some known circuits include a valve VMP (18) which is however activated only during ascent of the installation, controlling among other things piloting of the safety valve VB (16).

In comparison with known circuits, the circuit of the present invention is characterized in that operation of the valve VMP (18) is reversed. In this case said valve VMP (18), when commanded electrically, does not sustain the overpressure valve VB (16) and it thus becomes necessary, on the one hand, to command electrically the valve VMP (18) to achieve release (or opening) of the valve VB (16) and on the other hand not command the valve VMP (18) during ascent of the piston (22).

In this manner the valve VB (16) is sustained up to the pressure set on the pilot valve VS (24), thus creating the pressure necessary for ascent of the piston (22).

The valve VB (16) is thus sustained, i.e. closed, in the absence of an electrical command and vice versa. During descent the valve (16) must therefore be activated, i.e. opened, by an electrical signal which thus enables descent of the piston (22).

Consequently, if a failure occurs, e.g. seizing of the piston of the check valve (14), the valve (16) automatically closes upon the electrical stop command and prevents the car from descending by gravity into the pit.

Analysis of the diagram of FIG. 2 shows clearly this peculiarity of the hydraulic circuit of the present invention. The horizontal sectors, shown in broken lines, show the moments when the various elements, and in particular the magnetic starting valve VMP (18) are not energized while the remaining horizontal sectors in dark background show the opposite situation. The characteristic operation of said magnetic starting valve (18) can thus be seen. Compared with conventional systems it acts in the opposite manner since in the absence of an electric command it allows ascent but not descent of the installation. There is therefore required an international electrical command derived from the control panel and additional to that usually provided in known systems to cause descent of the car.

FIGS. 3, 4 and 5 show variations of the hydraulic circuit of the present invention. In particular, FIG. 3 shows a diagram of a hydraulic circuit the

same as that of FIG. 1 except that the valve VMP (18) is 3-way.

FIG. 4 shows a diagram of a hydraulic circuit the same as that of FIG. 1 except that the valve VSP (18) is 2-way and is associated with a second hydraulic pressure valve (VP) (30).

FIG. 5 shows a diagram of a hydraulic circuit the same as that of FIG. 1 except that the valve VMP (18) is 3-way and is associated with a second hydraulic pressure valve (30).

These hydraulic circuits also achieve the object of the present invention, i.e. preventing accidental descent of the car in case of failure.

Indeed, in all these circuits the valve VB (16) opens only when the valve VMP (18) is activated electrically. This activation is only done during descent. During ascent, the valve VMP (18) is not activated electrically and hence the valve VB (16) remains closed.

FIG. 6 shows a diagram of a hydraulic circuit similar to that of FIGS. 1-5 above except that it calls for the use of a pressure switch as illustrated in FIG. 9. When the check valve (14) is effectively closed the circuit upstream of said valve (14) at point "X", i.e. between the valve VB (16) and the flow control valve (10), has zero pressure. If the check valve (14) is defective the piston (22) remains stopped by the effect of the valves VMP (18) and VB (16) but at point "X" of the circuit there is a positive pressure. Therefore, by inserting at this point "X" a pressure switch (40) (see FIG. 9) it is possible to have control of the check valve (14) because, with the installation stopped, the pressure switch measures a pressure greater than atmospheric if said valve (14) is defective.

Pressure is measured at a point (34) of the circuit upstream of the flow valve VR (32) instead of directly behind the overpressure valve VR (16). In this manner said reading is done in a zone of the circuit which is under pressure only during ascent of the piston (22). Thus is avoided the danger of opening by overload of the pilot valve (24) and, consequently, of the overpressure valve VB (16) during descent if the check valve VRP (14) has failed.

It is understood that a pressure switch can be inserted in any hydraulic circuit illustrated in FIGS. 1-5 described above and hence in the presence of a 2-way or 3-way magnetic starting valve (18) optionally associated with a hydraulic pressure valve (30).

The risk of possible opening due to overloading of the pilot valve VS (24) can also be avoided by providing the hydraulic circuit with another 2-way or 3-way valve (VSM) connected in series with said valve VS (24) as illustrated in FIG. 7.

Said valve VSM (36) is commanded electrically in ascent and allows passage of fluid between

points "Y" and "Z" and hence allows operation of the pilot valve VS (24).

During descent of the piston (22) said valve VSM (36) is closed since it is not commanded electrically and hence closes the passage between "Y" and "Z", excluding operation of the pilot valve (24) in the static and descent phases of the piston (22).

It is understood that insertion of a 2-way or 3-way valve (36) in series with the valve VS (24) can be done in any of the above hydraulic circuits of FIGS. 1-6 and hence in the presence of 2-way or 3-way magnetic starting valve VMP (18) optionally associated with a hydraulic pressure valve (30).

By way of example FIG. 8 shows the operational diagram of said valve VSM (36) in the above specified hypothesis.

FIG. 9 shows another hydraulic circuit diagram of the present invention.

Said circuit is provided at point "X" with a conventional pressure switch (40) designed to send an electric signal to the control panel upon occurrence of a failure in the system.

For example, if the check valve VRP (14) is out of order and thus open, the overpressure valve VB (16) will hold the car at the floor while the pressure switch (40) will be able to detect a pressure different from atmospheric.

Therefore, connection of the pressure switch (40) to the call-descent safety lines provides immediate indication of the failure occurring in the form of an electrical signal.

As may be seen from the above, the advantages of the present invention are evident.

The presence in the circuit of a magnetic starting valve VMP (18) activated electrically during descent of the installation leads the safety valve VB (16) to be sustained only in the absence of an electric command. The latter therefore allows descent of the piston (22) only if activated electrically.

Particularly advantageous is the adoption of a system allowing detection of the pressure signal upstream of the check valve (14) (position X, FIG. 9), i.e. in a sector of the hydraulic circuit under pressure only during ascent of the installation.

Equally advantageous is the possibility of adoption of a pressure switch (40) designed to signal occurrence of a failure in the system and hence a requirement for restoration, although the installation itself is in condition to continue operation.

Realization of a circuit of this type does not involve substantial addition of components.

Even if the invention has been described together with specific embodiments, it will be clear to those skilled in the art that alternatives and variations are possible. Accordingly the invention intends to embrace all the alternatives and variations

falling within the spirit thereof.

Claims

1. Hydraulic circuit for passenger and freight elevators and the like with intrinsic safety means for supplying a hydraulic fluid from a tank (26) to a hydraulic cylinder (23) provided with a piston (22) for moving an elevator car or a freight elevator platform and said hydraulic circuit comprising:
 - a motor (28),
 - a pump (29),
 - a one-way flow valve (VR) (32),
 - a flow control valve (10),
 - a magnetic descent valve (VMD) (12),
 - a piloted check valve (VRP) (14),
 - an overpressure or safety valve (VB) (16),
 - a magnetic levelling valve (VML) (20),
 - a pilot valve (VS) (24) for the safety valve (VB) (16), and
 - a magnetic departure or starting valve (VMP) (18) and characterized in that said magnetic departure or starting valve (VMP) (18) is commanded electrically only during descent and the overpressure valve (VB) (16) is closed in the absence of an electric command.
2. Hydraulic circuit in accordance with claim 1 characterized in that the overpressure valve (16) is opened during descent by an electrical signal from a coil.
3. Hydraulic circuit in accordance with one of the above claims 1 and 2 characterized in that the magnetic starting valve (18) is 2-way or 3-way and optionally associated with a hydraulic pressure valve (30) and said valve (18) being activated electrically to open the overpressure valve (16) during descent and deactivated during ascent.
4. Hydraulic circuit in accordance with any of the above claims characterized in that the pressure signal of the pilot valve (24) is detected upstream (34) of the flow valve (32).
5. Hydraulic circuit in accordance with any of the above claims characterized in that it has a 2-way or 3-way valve (36) commanded during ascent and designed to allow passage of fluid between points Y and Z with resulting operation of the pilot valve (24), the magnetic starting valve (18) being the 2-way or 3-way type optionally associated with a hydraulic pressure valve (30).
6. Hydraulic circuit in accordance with any one of the above claims characterized in that it is provided with a pressure switch (40) designed to send an electrical signal in the presence of a pressure other than zero and said pressure switch being connected to the elevator control panel.

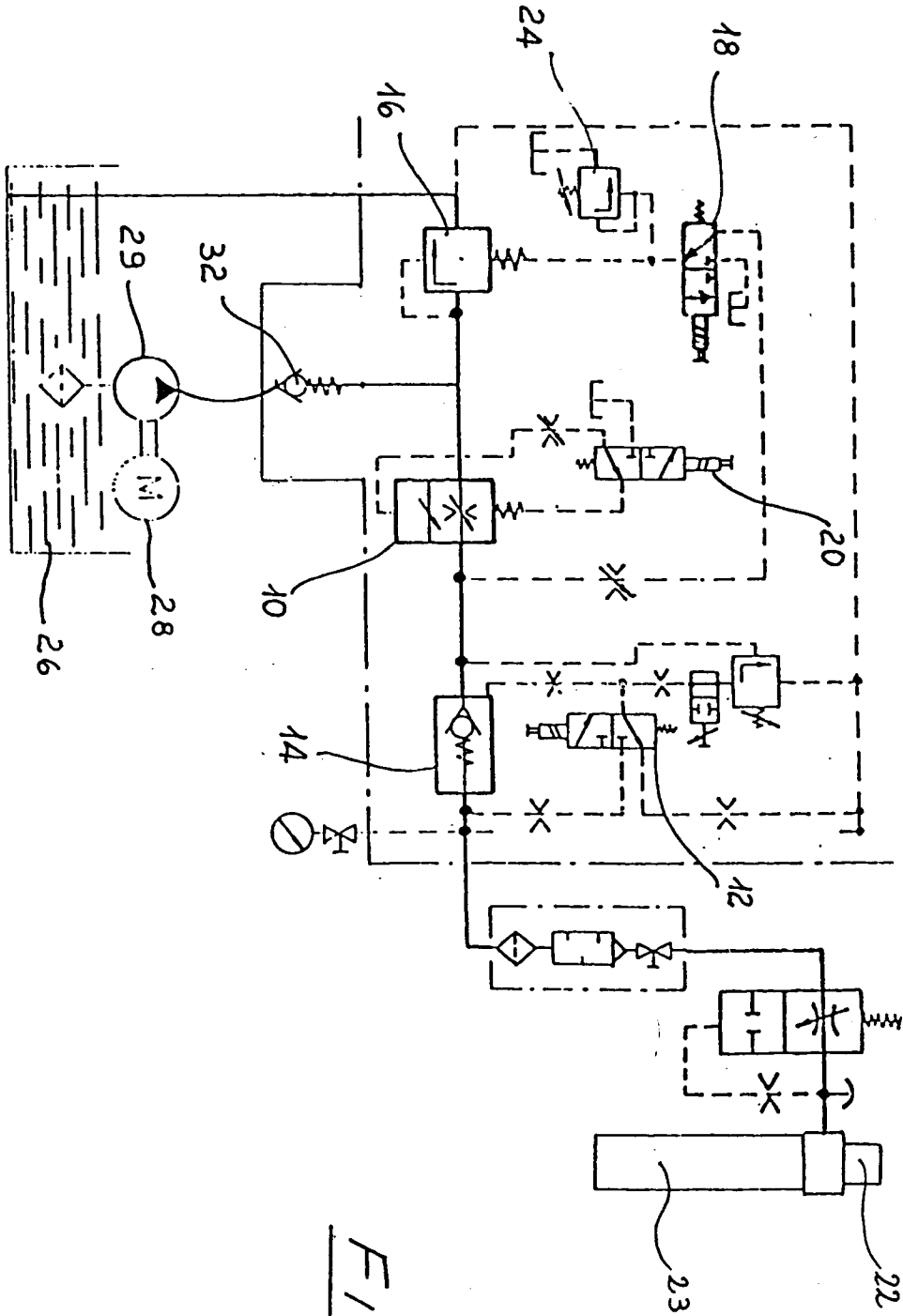
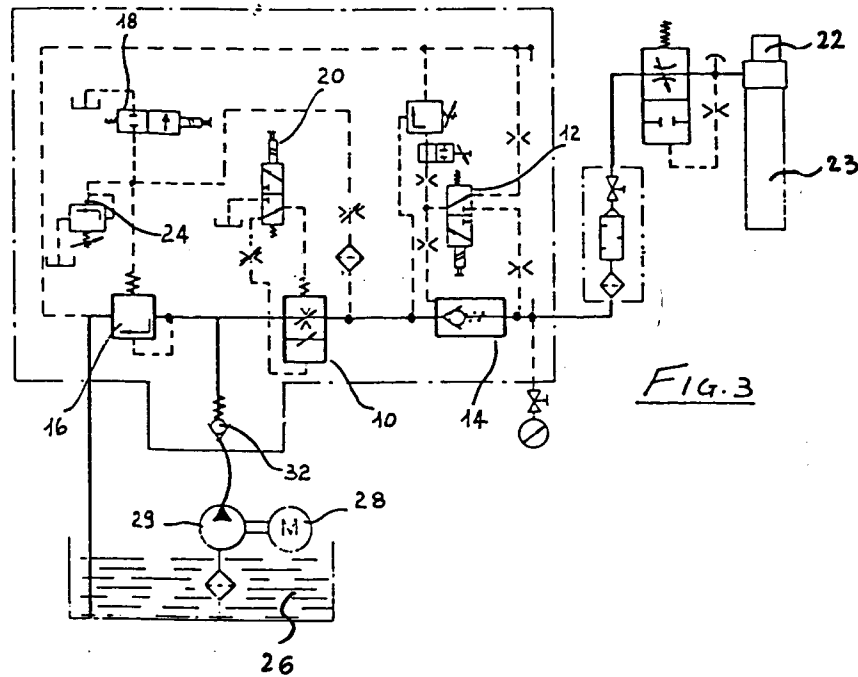
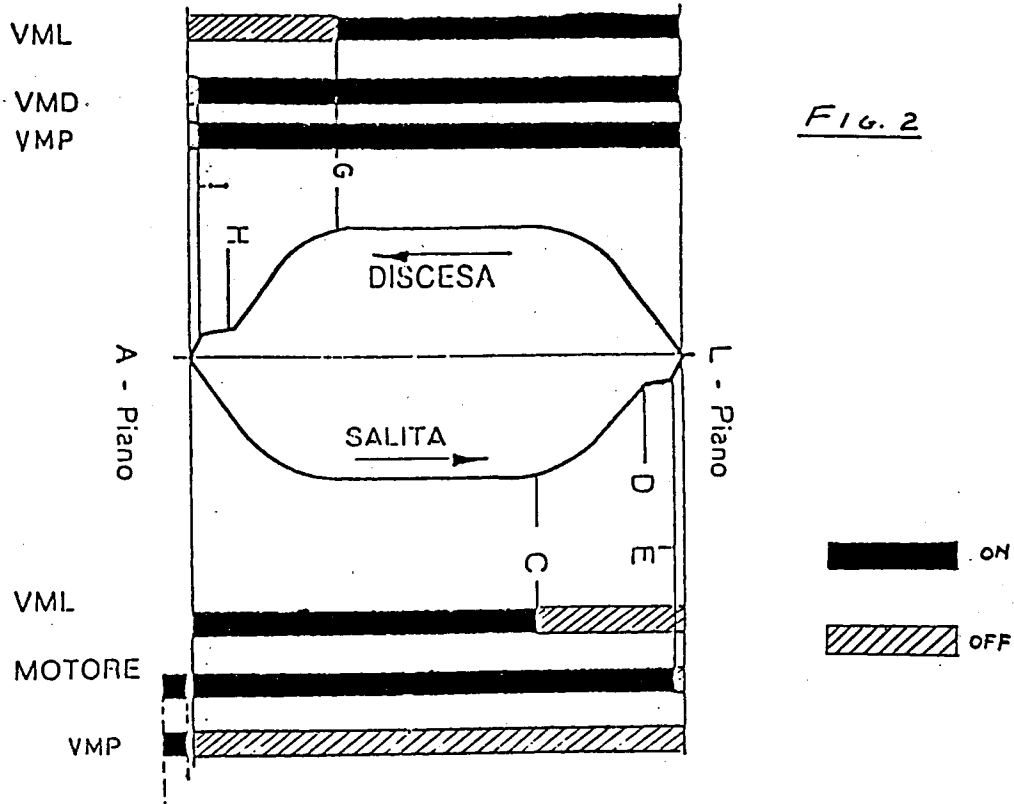
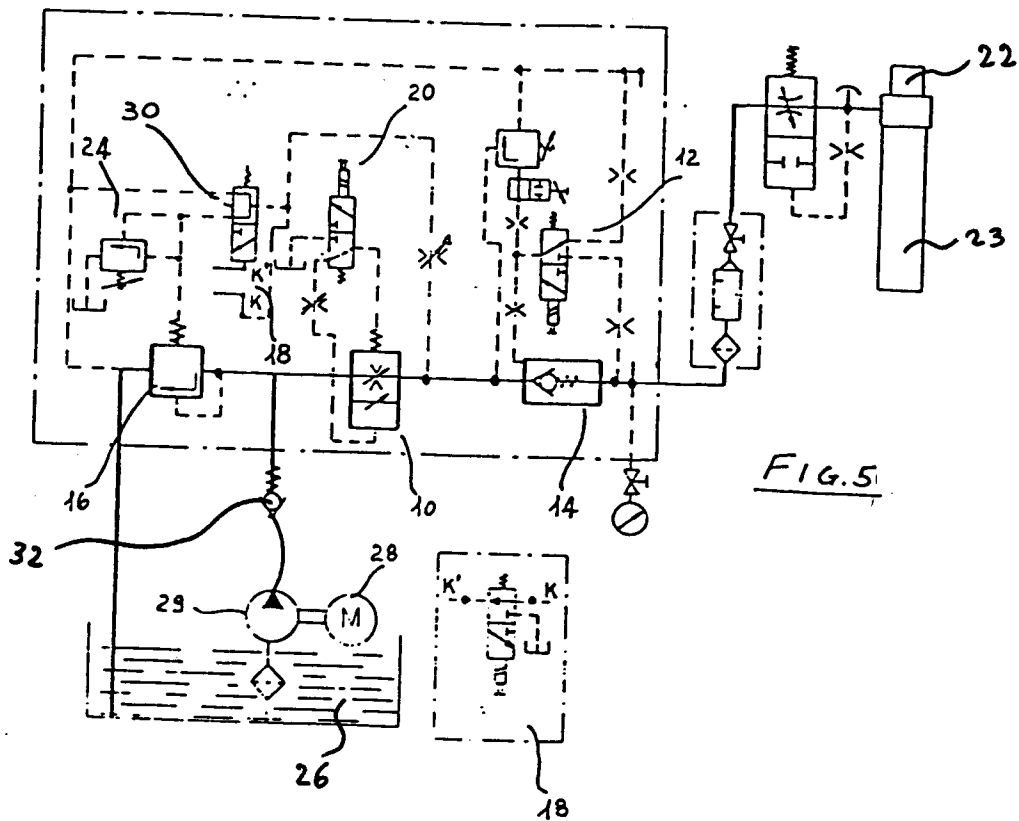
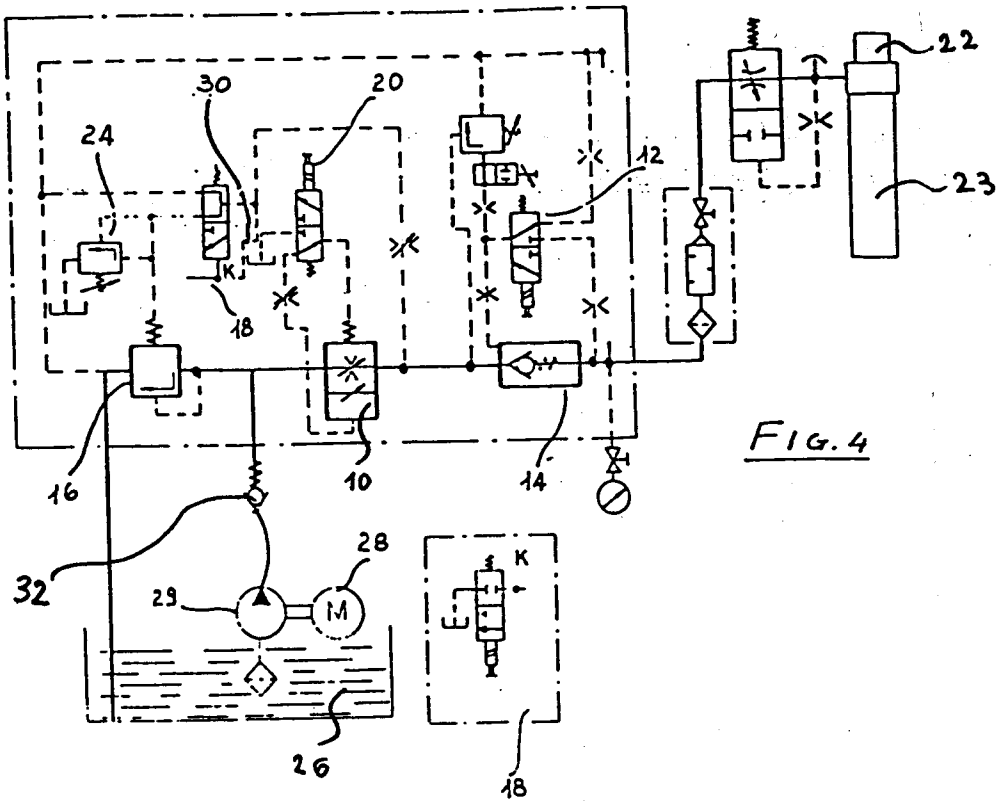
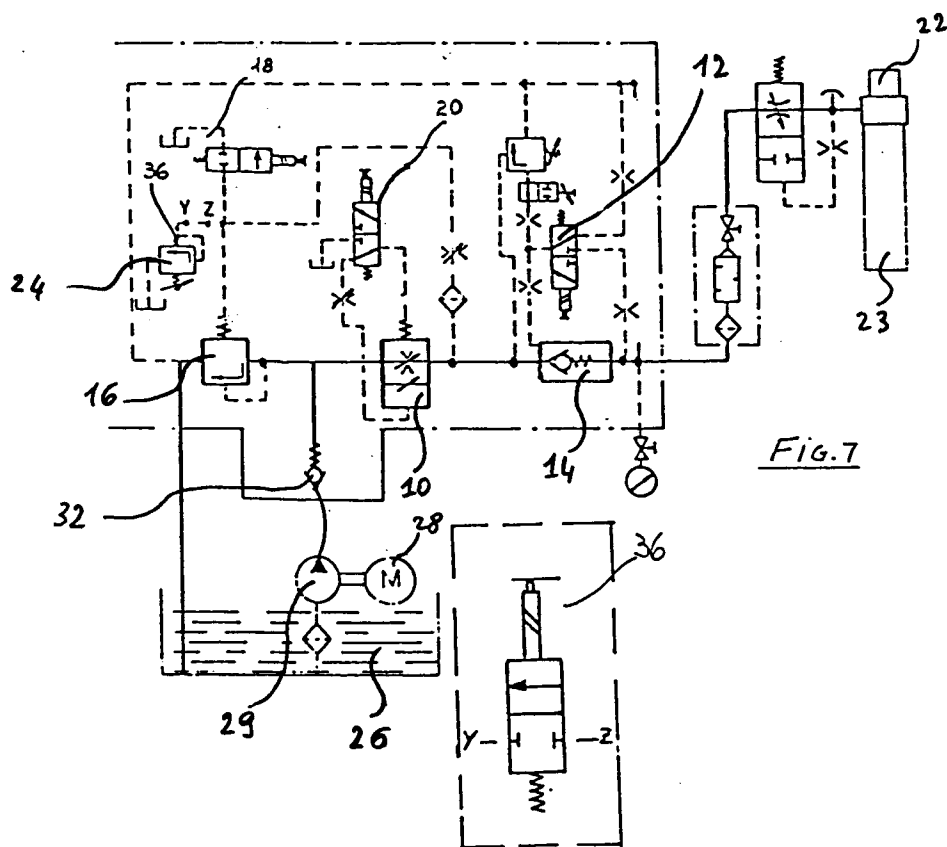
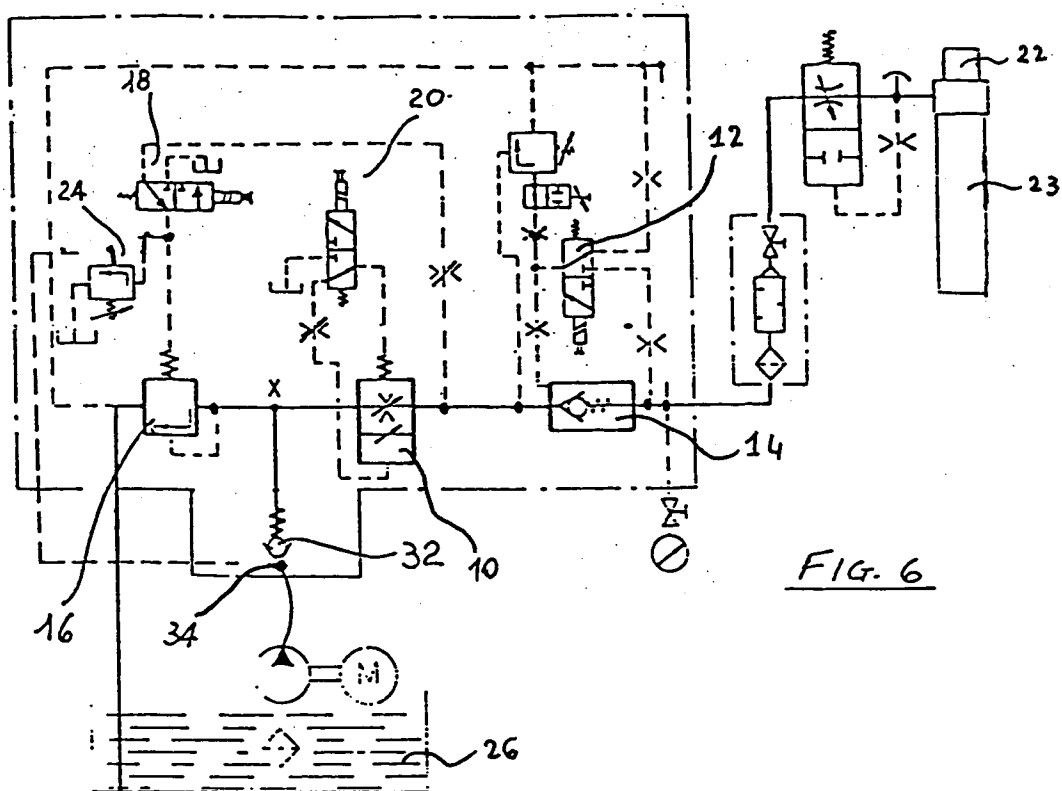
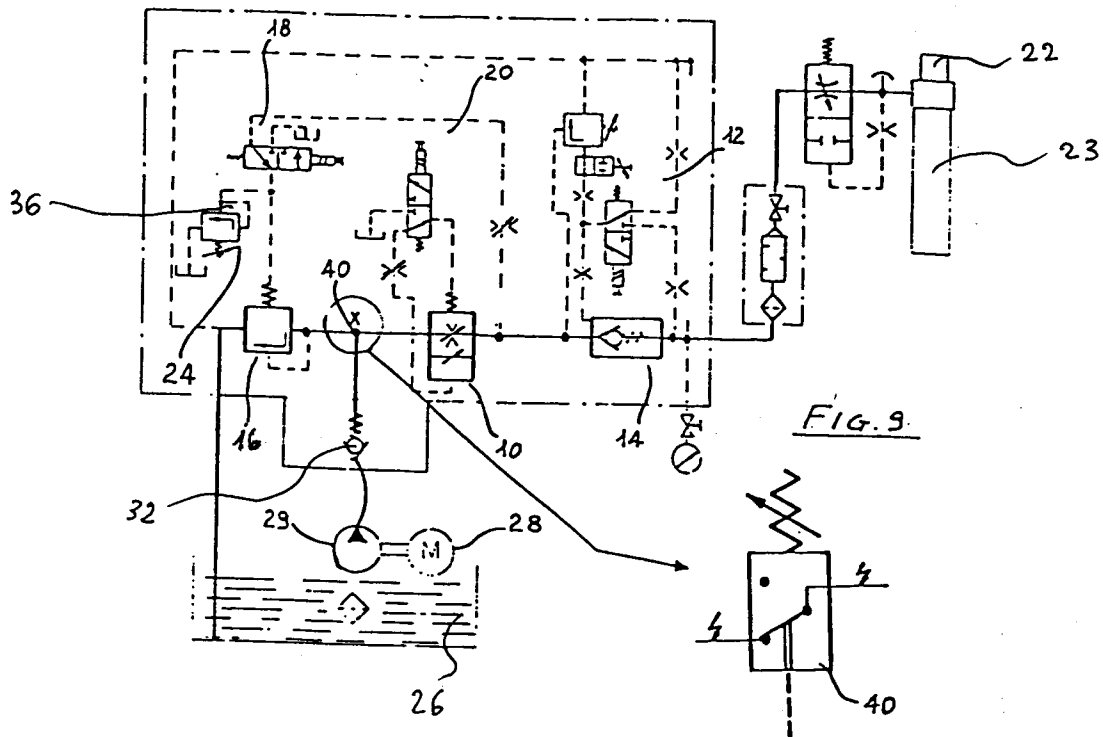
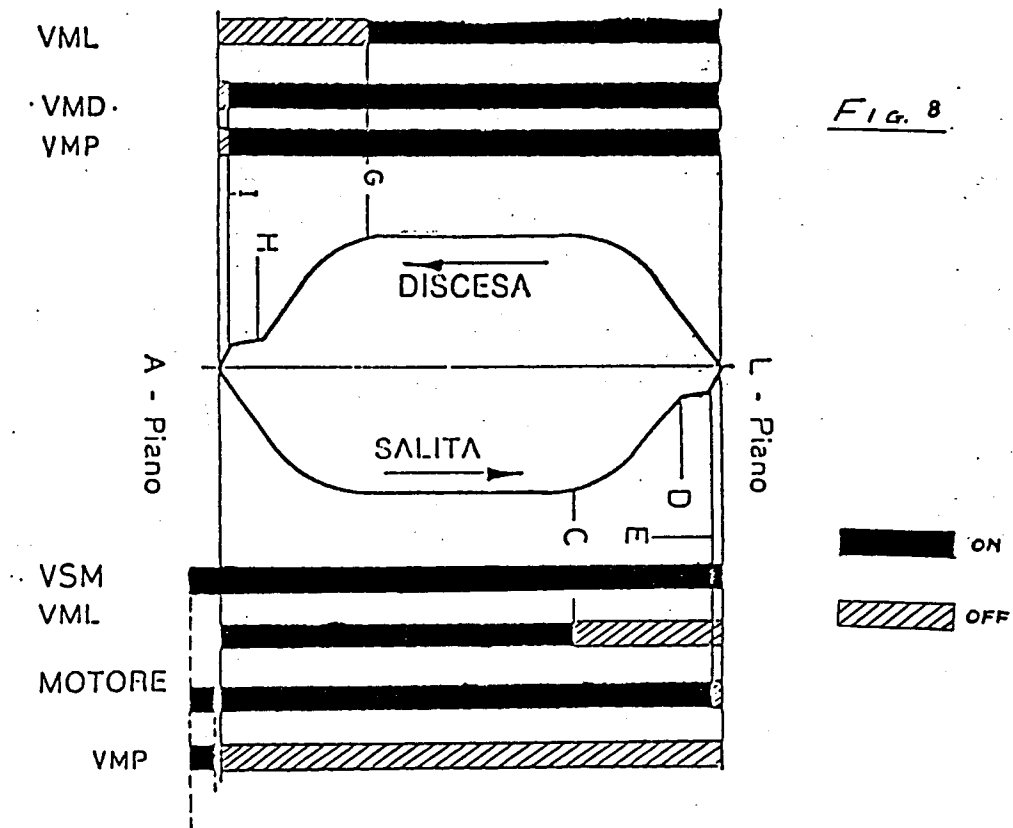


Fig. 1











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EUROPEAN SEARCH REPORT

Application Number

EP 92 10 8202

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-5 014 824 (FARGO) * column 3, line 4 - column 4, line 8; figure 1 * ---	1	B66B1/04
A	DE-A-3 709 661 (C. HAUSHAHN GMBH) * column 11, line 23 - line 46 * * column 14, line 6 - column 15, line 50; figures 1,2,8-10 * ---	1	
A	EP-A-0 227 297 (OTIS ELEVATOR COMPANY) * page 7, line 8 - page 9, line 12; figures 1,3 * ---	1	
A	EP-A-0 179 249 (BERINGER-HYDRAULIK GMBH) * page 13, line 23 - page 15, line 14; figures 1,2 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B66B F15B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 01 SEPTEMBER 1992	Examiner CLEARY F.M.
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