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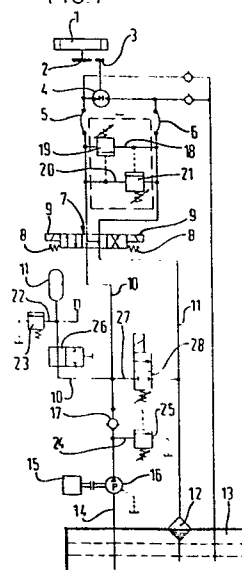
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(54) **Device for locating a load hanging on a hoisting cable.**

(57) A device for locating in a horizontal plane a load suspended from a carrying frame (1) which is adapted to be rotated about a vertical axis when suspending from a hoisting cable, said device comprising a flywheel mounted for rotation about a vertical axis in said frame, a reversible hydraulic machine (4) also mounted in said frame and adapted either to idle or to operate as motor to drive the flywheel or as pump to stop the flywheel by braking and a hydraulic circuit provided with a high-pressure vessel (11), a low-pressure reservoir (13) and control means adapted either to hydraulically bridge the machine permitting it to idle or to connect one end of the machine to the high-pressure vessel and the other end thereof to the low-pressure reservoir and vice versa.

FIG. 1



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Device for locating a load hanging on a hoisting cable.

The invention relates to a device for locating in a horizontal plane a load rotatable about a vertical axis and suspended from a hoisting cable, said device comprising a carrying frame adapted to turn about a vertical axis and to
5 be fastened to a hoisting cable and having means for engaging the load, at least one flywheel rotatable about a vertical axis and arranged in said carrying frame, at least one machine arranged in the carrying frame, coupled with said flywheel and being optionally actuatable in one or the other of
10 two opposite operational directions, said machine serving during operation either for accelerating the flywheel so that the carrying frame is turned or for decelerating the flywheel so that the turning carrying frame is braked and comprising means for controlling the machine.

15 Locating devices of the kind set forth are known. When the flywheel thereof is driven in a given direction, the

carrying frame with the machine is turned about its point of suspension in the opposite direction by the reactive force. For driving and decelerating the flywheel the known devices are provided with one or more electric motors. Deceleration
5 or braking of the flywheel is performed electrically (see the brochure Rotacon of Holec) or by means of a mechanical or pneumatic brake (see Dutch Patent application 6708643). Since starting of motors suitable for the purpose described requires a high torque for locating loads having high inertia
10 force, the motors are started in the first case across starting resistors and decelerated across brake resistors and braked. Large part of the starting power and the braking power is then converted into heat. During deceleration only a small portion of the energy used for locating is returned to
15 the electric means. In the second case part of the driving energy is converted into heat in the starting resistors and the entire braking energy gets lost in heat or partly in heat and partly in the gas transport.

The invention provides a locating device of the kind
20 set forth, in which almost all energy used for turning the load is regained during braking of the turning load for subsequent use. This effect is achieved in that the machine of the locating device described in the preamble is a hydraulic machine to be used as a motor for driving and as a pump for
25 braking the carrying frame, said machine being arranged with the intermediary of a reversing system operable from the outside and having valves or slides in a conduit extending between a vessel containing a fluid subjected to high pressure by a previously stretched spring and a reservoir con-
30 taining fluid at a low pressure, for example, atmospheric pressure, said fluid conduit including a closing member also operable from the outside and arranged between the high-pressure vessel on the one hand and the machine and the low-pressure reservoir on the other hand. In this device the
35 expansion of the previously stretched spring is utilized for driving the machine then working as a motor starting the fly-

wheel, as a result of which the carrying frame with the load is turned. When subsequently the reversing system is changed over, the machine is driven as a pump by the energy accumulated in the rotating flywheel and the turning carrying frame with the load so that fluid is returned from the low-pressure reservoir to the high-pressure vessel and consequently the spring is again stretched for subsequent use of the locating device. In this locating device the losses are substantially only those caused by leakage and friction in the conduit system, those caused by friction in the bearings of the rotating parts and those resulting from the air resistance experienced by the flywheel and the turning carrying frame with or without the load. It appears that these losses are compensated for by only a small percentage of the energy consumed for locating the load.

Said losses, though being slight, bring about a loss of spring tension after each locating cycle. In order to bring the spring back to its initial tension from time to time, it is advisable to supplement the hydraulic locating device with a conduit arranged between the low-pressure reservoir and the high-pressure vessel and including a supplemental pump and a non-return valve opening towards the vessel.

Although for maintaining the high pressure of the fluid in the high-pressure vessel a cylinder having a mechanically spring-loaded piston may be used, it is preferred to use a pre-stressed gas cushion, for example, a nitrogen cushion above the fluid level in the high-pressure vessel. Leakage losses along a piston are then excluded.

It is advantageous for the reversing system and the closing member to form part of a control member adjustable in three positions which holds the conduit part connected with the high-pressure vessel in the closed state and a bypass conduit bridging the machine in the open state in the rest, medium position, which connects in one end position the high-pressure vessel with one side and the low-pressure reservoir with the other side of the machine and which in the other end position connects the low-pressure reservoir with one side

and the high-pressure vessel with the other side of the machine and which, in both end positions, holds the bypass conduit in the closed state. In order to constantly keep the machine and the conduits of the hydraulic system filled with
5 fluid under a slight excess pressure, each of the two sides of the machine may be connected with the low-pressure reservoir subjected to said spring pressure through its own conduit including a non-return valve opening towards the machine.

10 In order to avoid a hazardous pressure on the pressure slide of the machine operating as a motor or as a pump the machine may be bridged as a conduit having a pressure-limiting valve allowing fluid to pass only in one direction and by a conduit having a pressure-limiting valve allowing
15 fluid to pass only in the other direction.

It is advantageous to construct the hydraulic locating device in a manner such that the hydraulic control member can be electrically actuated through a circuit-
arrangement actuated by means of push-buttons or switches.
20 However, in order to be able to adapt the time during which the flywheel and the carrying frame with or without load are accelerated and the time during which said parts are decelerated to the load, to the angle through which the load has to be turned and to external conditions such as wind effort, it
25 is advisable to use a circuitry which includes at least one adjustable time relay determining said times. Such a time relay renders the control independent of the time during which a push-button is held depressed or a switch in the switched-on position.

30 Due to leakage and friction losses during the turn of the carrying frame with or without load the time required for deceleration will be shorter than that required for accelerating a carrying frame with or without load. This means that the crane driver will have to re-adjust the time
35 relay after acceleration and prior to deceleration of the flywheel and the carrying frame with or without load, if only one time relay is provided in the electric circuit-arrangement.

If the load has a high inertia moment, the time required for acceleration and deceleration of the carrying frame with the load will be relatively long so that before turning back the carrying frame without load the crane driver
5 will again have to re-adjust the time relay twice, since otherwise the backward turn would take place with too high a speed. In order to avoid these repeated readjustments of the time relay the locating device may be designed so that for each of the two directions of turn of the carrying frame a
10 separate adjustable time relay for limiting the duration of the acceleration and a separate, adjustable time relay for limiting the duration of the deceleration of the turn of the carrying frame with and without load respectively are included in the electric circuit-arrangement. In each phase of a
15 cycle comprising a forward turn of the carrying frame with the load and a backward turn thereof without load the duration of acceleration and deceleration respectively can then be set in advance. This is important when many identical loads, for example, pipes, railway rails, concrete or metal
20 slabs, containers and the like have to be successively turned through the same angle. A different method of actuating the locating device by only one time relay is possible when the set duration is so short that rather driving and braking pulses are concerned. In this case the differences between
25 acceleration and deceleration durations of the carrying frame with and without load respectively are determined by the difference between the incoming pulses.

The invention will be described more fully hereinafter with reference to embodiments shown in the drawing.

30 In the drawing:

fig. 1 shows the hydraulic diagram of a locating device in accordance with the invention,

fig. 2 the electric diagram of a structure for actuating a hydraulic control member used in the hydraulic
35 system of fig. 1 and

fig. 3 the electric diagram of a variant of the structure shown in fig. 2.

Referring to fig. 1, reference numeral 1 designates a carrying frame that can be fastened to a hoisting cable
5 (not shown) and is adapted to turn about a vertical axis and is arranged about a flywheel rotatable about a vertical axis. This flywheel is coupled through pinions 2, 3 with a hydraulic machine 4 fixed in said carrying frame and being suitable for use as a motor for accelerating the flywheel and as a
10 pump for decelerating or braking the flywheel. The carrying frame is provided in a conventional manner with means, for example, chains with hooks, grabs, electro-magnets, suction pads for engaging the load to be transported and turned.

When the flywheel is driven by the machine 4 oper-
15 ating as a motor, the carrying frame is turned in accelerated movement in opposite direction about its suspension point. If subsequently the machine 4 is driven by the operating flywheel 1 it starts operating as a pump and the flywheel and the carrying frame are decelerated or braked, so that they
20 finally come to a standstill and the carrying frame has turned through an angle.

The machine 4 communicates through the fluid conduits 5 and 6 with a control slide 7, which may occupy three positions, which is constantly urged back by reset springs 8
25 into the medium position, the rest position, and which can be set from the outside into one or the other end position by electrical, hydraulic, pneumatic or mechanic control members 9.

The control slide 7 communicates through a fluid
30 conduit 10 with a high-pressure vessel 11. This vessel is filled partly with a fluid and partly with a gas, for example, nitrogen subjected to a high pressure, for example, 200 to 300 atmospheres. The control slide 7 communicates furthermore through a fluid conduit 11 with a filter 12 with
35 a fluid reservoir 13 subjected to low pressure, for example, atmospheric pressure. When this reservoir is closed, a slight excess pressure, for example, of 0.6 to 1.2 bar can be main-

tained therein, which ensures that the fluid anywhere in the hydraulic system is at an excess pressure, so that no air can leak in.

Between the conduit 10 and the high-pressure vessel 5 11 on the one hand and the low-pressure reservoir 13 on the other a conduit 14 is provided, which includes a supplemental pump 16 driven by a motor 15 and a non-return valve 17 opening towards the high-pressure vessel. The supplemental pump 16 ensures that the pressure in the high-pressure vessel 10 11, after it has dropped during operation or due to leakage below a given value, is brought back to the high value required for a reliable operation.

In the rest position shown for the control slide 7 the conduits 5 and 6 are interconnected by said slide, so 15 that the machine 4 is bridged by an open conduit and the machine and the flywheel 1 can freely rotate. During this free rotation fluid is pumped from the pressure side of the machine then operating as a pump through the conduits 5 and 6 towards the suction side of the machine 4.

20 When the control slide 7 is set in right-hand end position by means of the control members 9, fluid is pushed by the pre-stressed gas spring in the high-pressure vessel 11 through the conduit 10, the slide 7, the conduit 5, the machine 4, the conduit 6, the slide 7, the conduit 11 and the 25 filter 12 towards the low-pressure reservoir 13, as a result of which the machine 4 starts working as a motor, which starts the flywheel and thus causes the carrying frame with the load to turn. When a sufficient angular speed is attained, the slide 7 is reset to the rest position, so that 30 the high-pressure conduit 10 is closed, the machine 4 is bridged by the then open conduit 5, 6, the flywheel 1 and the machine 4 freely turn on and the carrying frame with the load substantially uniformly turns further with the angular speed attained. In actual fact there are losses which cause a de- 35 crease of said angular speed. When in due time prior to the attainment of the new angular position of the load the con-

trol slide 7 is changed over to the left-hand end position, the machine 4 is driven by the rotating flywheel 1 and the turning carrying frame with the load, so that it will start working as a pump withdrawing fluid from the reservoir 13 through the conduit 11, the slide 7 and the conduit 5 and pushing it through the conduit 6, the slide 7 and the conduit 10 against the pressure of the gas spring into the high-pressure vessel. As a result the flywheel 1, the machine 4 and the carrying frame with the load are strongly braked, so that they come to a standstill. When the slide 7 subsequently remains in the left-hand end position, the machine, the flywheel and the carrying frame with the load are driven in the opposite sense. In order to avoid the latter effect, the slide 7 has to be reset to the medium or rest position at the instant of the standstill. During the acceleration of the flywheel and the load the gas pressure of the high-pressure vessel drives the machine, so that this pressure decreases and during the deceleration of the load the latter and the flywheel drive the machine, so that fluid is pushed back into the high-pressure vessel, so that the gas pressure regains the initial value. In actual fact there are losses, so that the the initial gas pressure cannot be attained without supplementation by the pump 16.

In order to turn the carrying frame with or without load in the opposite sense, the control slide 7 is first set in the left-hand end position for acceleration and subsequently in the right-end position for deceleration and stopping of the flywheel and the carrying frame.

The hydraulic system shown in the drawing includes a few safety members. The machine 4 is permanently bridged by a conduit 18 having a pressure limiting valve 19 allowing fluid to pass only to the right and by a conduit 20 having a pressure-limiting valve 21 allowing fluid to pass only to the left. These valves 19 and 20 prevent the pressure on the high-pressure side of the machine 4 from exceeding a hazardous value irrespective of the sense of rotation of the machine. Moreover, the high-pressure vessel 11 and the conduit 10 are guarded against too high a fluid pressure by an

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outlet conduit 22 having a pressure-limiting valve 23 allowing fluid to pass only towards the outlet. An identical outlet conduit 24 having a pressure-limiting valve 25 is connected with the pressure slide of the supplemental pump 16.

5 Finally, the high-pressure conduit 10 includes a normally open closing member 26, whilst the high-pressure conduit 10 is connected through a conduit 27 having a normally shut closing member 28 with the low-pressure conduit 11. The closing member 26 is closed, when work has to be done
10 in the hydraulic system and the pressure in the vessel 11 has to be maintained. The closing member 28 is opened when the fluid of the vessel 11 and the conduit 10 has to be released and drained.

 From the foregoing it will be understood that the
15 duration required for acceleration and that for deceleration of the turn of the load depend upon the pressure on the fluid in the high-pressure vessel, the inertia moment of the flywheel, the carrying frame and the load, on the losses occurring in the system, the permissible angular speed of the
20 load and on the angle through which the load has to be turned. For facilitating previous setting of the time required for acceleration and deceleration respectively of the load the control slide can be electrically actuated and the electric circuitry provided for this purpose may include
25 one or more adjustable time relays. Examples of such electric arrangements are shown in figs. 2 and 3.

 Referring to fig. 2, reference numerals 29a and 29b designate electro-magnets coupled with the control slide 7, by means of which the control slide can be drawn out of the
30 medium position to the left and to the right respectively. These electro-magnets are each connected on the one hand through the series combination of a first make contact 30a and 30b respectively and a second make contact 31a and 31b respectively of a relay 32a and 32b respectively and through
35 a break contact 33b and 33a respectively of the relay 32b and 32a respectively to one terminal 34 of a voltage source and

on the other hand through a break contact 35 of an adjustable time relay 36 to the other connecting terminal 37 of the voltage source. The time relay 36 is connected on the one hand both through the series combination of a third make
5 contact 38a and a second make contact 31a of the relay 32a and the break contact 33b of the relay 32b and the series combination of a third make contact 38b and the second make contact 31b of the relay 32b and the break contact 33a of the relay 32a to the terminal 34 and on the other hand through
10 the break contact 35 to the terminal 37 of the voltage source. The make contact 31a and 31b respectively of relay 32a and 32b respectively are bridged by a push-button 39a and 39b respectively.

When in this circuitry push-button 39a is actuated,
15 relay 32a is energized. As a result relay 32a closes contact 31a and remains energized across the same after release of the push-button or as is schematically indicated in this circuitry by the rod 40a, after it is reset to the rest position by relay 32a or it is rendered inoperative in a different
20 manner, for example, as illustrated in fig. 3. Further consequences of the activity of relay 32a are that the electro-magnet 29a receives current through contact 30a and draws the control slide 7 into the left-hand end position, so that the flywheel of the locating device is driven and the
25 carrying frame with the load starts turning in a given direction, that furthermore the time relay 36 is energized through contact 38a and that the break contact 33a is opened, so that actuation of the pushbutton 39b will have no effect as long as relay 32a is alive. However, when after termination of the
30 set time the time relay 36 opens break contact 35, relay 32a, electro-magnet 29a and time-relay 36 no longer pass current, so that the control slide 7 returns to the medium position and the flywheel and the carrying frame with the load continue turning freely. When a short time before the load has
35 turned though the desired angle the push-button 39b is actuated, relay 32b is energized so that the electro-magnet 29b

receives current, the control slide 7 is drawn to the right and the flywheel, the carrying frame and the load are decelerated. Again time relay 36 is switched on as a result of which, after termination of the set time relays 32b and 36
5 and the electro-magnet 29b no longer receive current and the control slide 7 returns to the medium position. Contact 33b ensures that actuation of the pushbutton 39a has no effect as long as relay 32b is energized.

Since the time required for acceleration of the
10 flywheel and the carrying frame with or without the load up to the permissible angular speed will be longer due to losses during the turn of said parts than the time required for the deceleration of the flywheel, and the carrying frame with or without load to a standstill of the flywheel, the carrying
15 frame, and as the case may be, the load, the crane driver will have to set the time relay to a slightly shorter time during the turn of the carrying frame without the load. Moreover, acceleration and deceleration of the carrying frame with the load will require more time than acceleration and
20 deceleration of the carrying frame without load. Consequently, the use of a single adjustable time relay results in that in order to carry out the whole cycle, that is to say, acceleration through the desired angle of turn, the free turn and the deceleration of the carrying frame with the load and
25 subsequently the turn back to the starting point, i.e. acceleration, the free turn and the deceleration of the carrying frame without load the crane driver has to set the time relay four times.

It should be noted, that when only one time relay
30 is used, it is also possible to render the set duration of time so short, that for turning through substantially any angle a number of acceleration pulses and a slightly lower number of deceleration pulses are required. In this case the time relay need only have a single setting and the duration
35 of acceleration and deceleration of the carrying frame with or without load is then exclusively determined by the number of acceleration and deceleration pulses respectively.

If many identical loads have to be turned through the same angle, it is advantageous to use the electric circuit-arrangement of fig. 3. This circuitry is four-fold and has an individual, previously adjustable time relay 36a, b, c and d for each phase of the cycle i.e. the acceleration of the carrying frame with the load, the deceleration thereof, the acceleration of the carrying frame without load and the deceleration thereof, the break contacts 35a, b, c, d of which relays are connected in series in the line to the terminal 37. The electric diagrams of the four parts a, b, c, and d of this circuitry are substantially identical to those of the two parts a and b of the circuitry of fig. 2.

The difference between the four separate time relays resides in that in each part of the circuitry the make contacts 31a, b, c, d of relay 32a, b, c, d bridges the series combination of the push-button 39a, b, c, d and a break contact 41a, b, c, d of a relay 42a, b, c, d, as well as in that the normally closed locking contacts 33a and 33c are connected in series and apart therefrom the normally closed locking contacts 33b and 33d are connected in series.

When, for example, the pushbutton 39a is depressed, relay 32a and relay 42a are simultaneously energized as a result of which contact 31a is closed, the relay 32a remains energized and contact 41a is opened so that continued depression or release of the pushbutton has no longer any effect. Across contact 30a the electro-magnet 29a, c of the control slide 7 and across contact 38a time relay 36a are switched on so that after the set time contact 35a is opened and the circuit 29a, c, 30a, 31a, 33a, 35a, 36a, 38a returns to the rest position irrespective of continued depression or release of the pushbutton 39a. If this phase of the cycle is used, for example, for accelerating the carrying frame with the load in one sense of rotation, it is necessary to decelerate the carrying frame with the load before the required new position of the load is attained. In this case the crane

driver can depress the pushbutton 39d, so that the electro-magnet 29b, d of the control slide 7 and the time relay 36d set to the required delay time are switched on. The deceleration time is chosen so that the load exactly comes
5 to a standstill when the contact 35d is opened and the circuit 29b, d, 30d, 31d, 32d, 33d, 35d, 36d, 38d has regained the rest position.

If subsequently the carrying frame without the load has to be turned back to the initial angular position, the
10 pushbutton 39c has to be depressed for the acceleration and after a give time the pushbutton 39c has to be depressed for decelerating the carrying frame. During the return of the carrying frame first the electro-magnet 29b, c and the time relay 36b are switched on, after which the elctro-magnet 29a,
15 c and the time relay 36c are energized.

The locking contacts 33a and 33c prevent the depression of the push-button 39a or 39c the actuation of the push-button 39b or 39d from having any effect. The locking contacts 33b and 33d ensure that after the depression of the
20 push-button 39b or 39d the depression of the push-button 39a or 39c has no effect. The push-buttons 39a and 39c neither the pushbuttons 39b and 39d are interlocked. This is not necessary since if the push-buttons 39a and 39c or the push-buttons 39b and 39d should be simultaneously depressed, the
25 time relay 36a or the time relay 36d with the adjusted shortest duration determine the duration of acceleration or deceleration respectively of the carrying frame with or without load.

Needless to say that for greater safety the maximum
30 permissible speed of rotation can be limited by means of a centrifugal regulator driven by the flyhweel. It is furthermore possible to render the setting of the or each time relay dependent upon the flywheel i.e. upon the acceleration of the rotating movement of the carrying frame with or without load,

said accelerations being dependent upon the inertia moment of the flywheel, the carrying frame with or without load and other parts of the assembly to be turned.

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C L A I M S

1. A device for locating in a horizontal plane a load rotatable about a vertical axis and suspended from a hoisting cable, said device comprising a carrying frame adapted to turn about a vertical axis and to be fastened to a
5 hoisting cable and having means for engaging the load, at least one flywheel rotatable about a vertical axis and arranged in said carrying frame, at least one machine arranged in the carrying frame, coupled with said flywheel and being optionally actuatable in one or the other of two opposite
10 operational directions, said machine serving during operation either for accelerating the flywheel so that the carrying frame is turned or for decelerating the flywheel so that the turning carrying frame is braked and comprising means for controlling the machine, characterized in that the machine is
15 a hydraulic machine to be used as a motor for driving and as a pump for braking the carrying frame, said machine being

arranged with the intermedairy of a reversing system operable from the outside and having valves or slides in a conduit extending between a vessel containing a fluid subjected to high pressure by a previously stretched spring and a reservoir containing fluid at a low pressure, for example, atmospheric pressure, said fluid conduit including a closing member also operable from the outside and arranged between the high-pressure vessel on the one hand and the machine and the low-pressure reservoir on the other hand.

10 2. A hydraulic locating device as claimed in claim 1, characterized in that the reversing system and the closing member form part of a control member that can be set in three positions and that in the medium or rest position holds the conduit portion connected with the high-pressure vessel in
15 the closed state and a bypass conduit bridging the machine in the open state, in one end position connects the high-pressure vessel with one side and the low-pressure reservoir with the other side of the machine and in the other end position connects the low-pressure reservoir with one side
20 and the high-pressure vessel with the other side of the machine and holds the bypass conduit in the closed state in both end positions.

 3. A hydraulic locating device as claimed in claim 1 or 2, characterized in that each of the two sides of the
25 machine communicates through its own conduit having a non-return valve opening towards the machine with the low-pressure reservoir and in that this reservoir is maintained at a relatively low excess pressure.

 4. A hydraulic locating device as claimed in claim
30 1, 2 or 3, characterized in that the machine is bridged by a conduit having a pressure-limiting valve allowing fluid to pass only in one direction and by a conduit having a pressure-limiting valve allowing fluid to pass only in the other direction.

35 5. A hydraulic locating device as claimed in claim 1, 2, 3 or 4, characterized in that between the low-pressure reservoir and the high-pressure vessel a conduit having a

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supplemental pump and a non-return valve opening towards the vessel is arranged.

6. A hydraulic locating device as claimed in claim 1, 2, 3, 4 or 5 characterized in that the fluid in the high-
5 pressure vessel is loaded by a previously stretched gas spring.

7. A hydraulic locating device as claimed in claim 2, characterized in that the hydraulic control member is electrically actuatable through a circuit-arrangement oper-
10 able by means of push-buttons or switches and in that said circuit-arrangement includes at least one adjustable time relay for limiting the time during which the carrying frame is accelerated or decelerated respectively during its turn.

8. A hydraulic locating device as claimed in claim 15 7, characterized in that for each of the two directions of rotation of the carrying frame the electric circuit arrangement comprises a separately adjustable time relay for limiting the duration of acceleration and a separately adjustable time relay for limiting the duration of deceleration of the turn
20 of the carrying frame with and without the load respectively.

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FIG. 1

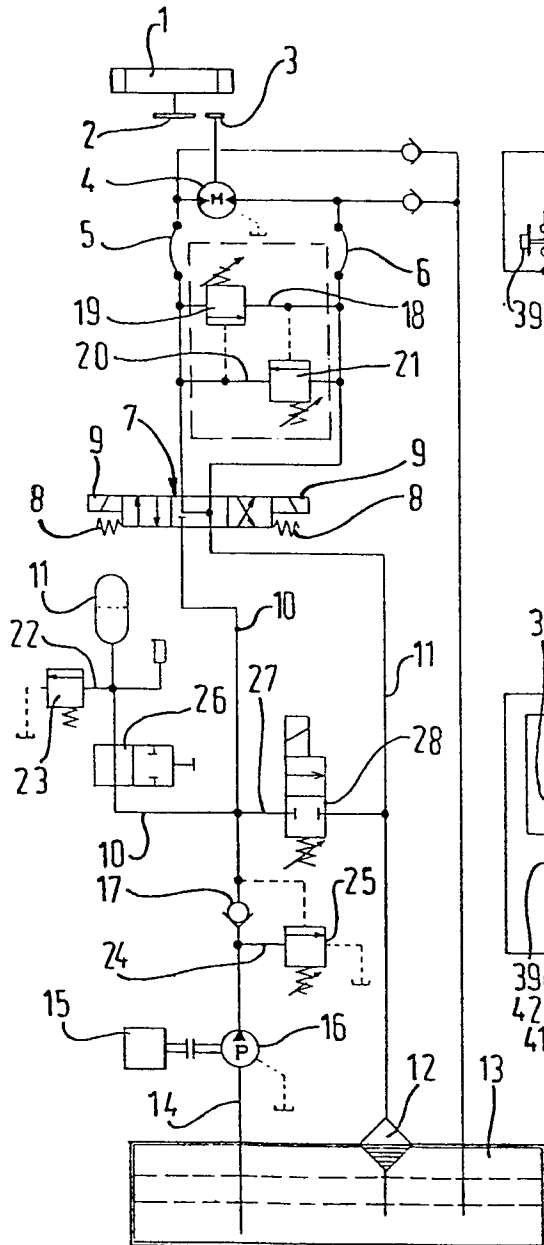


FIG. 2

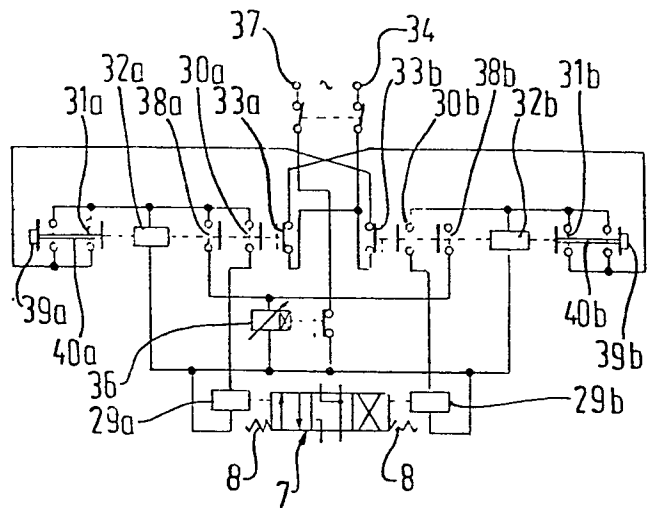
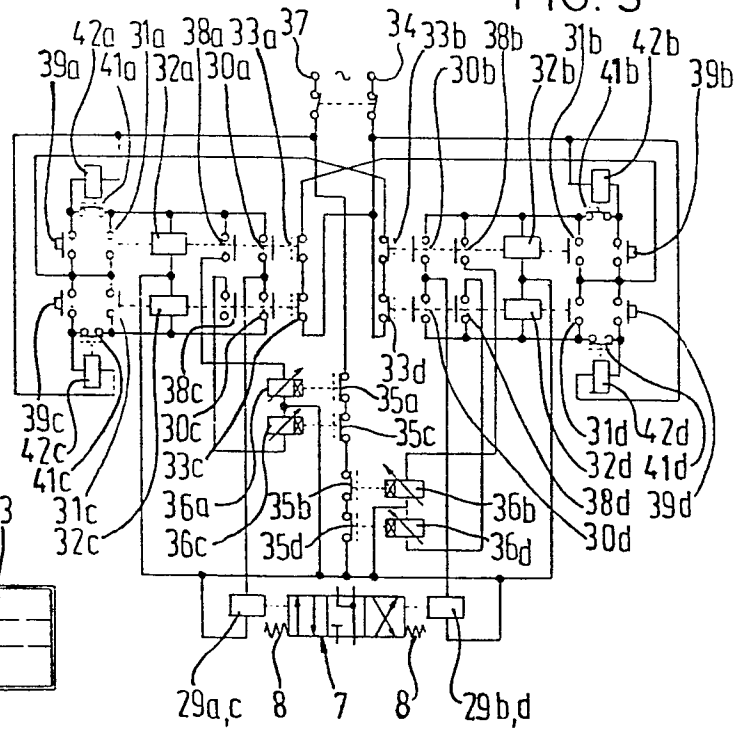


FIG. 3





European Patent
Office

EUROPEAN SEARCH REPORT

0023381
Application number
EP 80 20 0731

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<u>FR - A - 2 174 709</u> (LA ROCHETTE-CEMPA) * Whole document * --	1,2,4,7	B 66 C 13/08
	<u>FR - A - 2 388 175</u> (CARMAN) * Page 3, lines 33-40; page 4, lines 1-40; page 5, lines 1,2 * --	1,5,6	
A	<u>US - A - 3 210 114</u> (LAWTON)		
A	<u>NL - A - 77 06928</u> (SMIT SLIKKER-VEER)		TECHNICAL FIELDS SEARCHED (Int. Cl.)
A	<u>DE - A - 2 515 178</u> (WAWNER-BIRO)		B 66 C F 16 H
A	<u>DE - A - 1 940 375</u> (SKAGIT CORP.)		
A	<u>GB - A - 993 269</u> (TULLIS)		
A	<u>FR - A - 2 289 372</u> (M.A.N.) ----		
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
The present search report has been drawn up for all claims			
Place of search The Hague	Date of completion of the search 07-10-1980	Examiner VAN DEN BERGHE	