

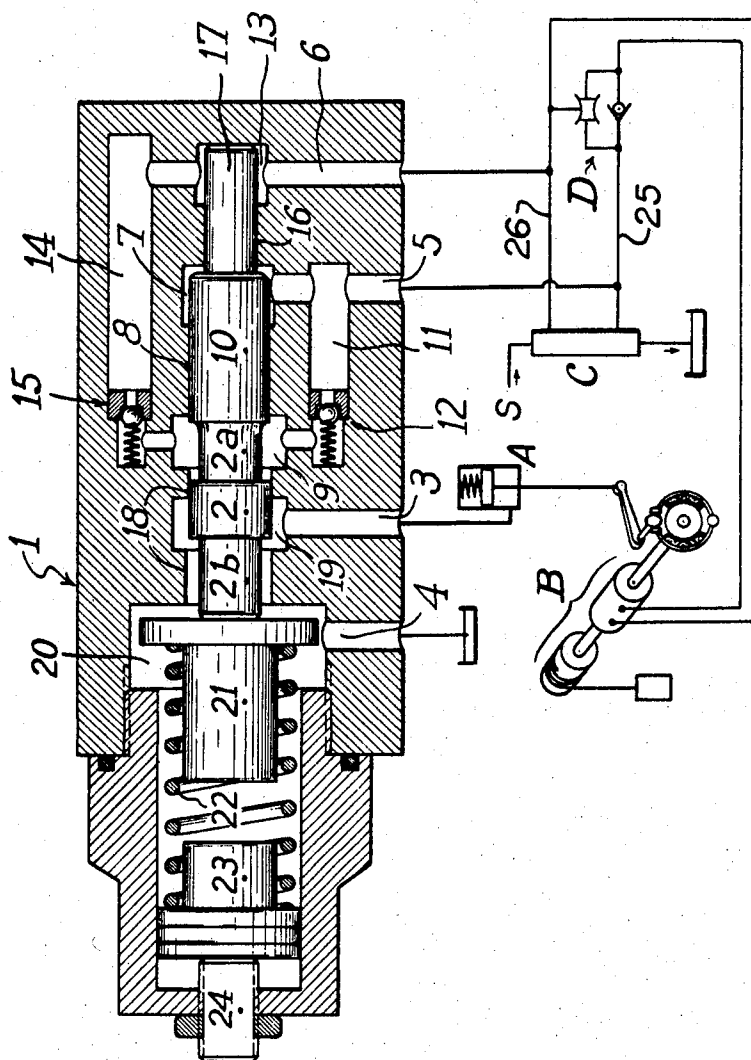
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DEVICE FOR RELEASING OR PRODUCING HYDRAULIC PRESSURE IN A CHAMBER

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DEVICE FOR RELEASING OR PRODUCING HYDRAULIC PRESSURE IN A CHAMBER

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6 Claims

ABSTRACT OF THE DISCLOSURE

A device for releasing or producing hydraulic pressure in an annular chamber associated with a reversible hydraulic motor supplied selectively with pressurized fluid by two conduits, the device comprising a control valve having an outlet connected to the chamber, an intermediate chamber, the annular chamber communicating with a duct to atmosphere and with a source of pressurized fluid. Two single-acting piloting rams are associated with the valve member of the control valve. The rams are adapted to operate the valve to bring the annular chamber into communication with the pressurized fluid source. The supply conduits of the reversible motor each are connected to a cylinder of one of the single-acting rams and connected jointly to the intermediate chamber through two nonreturn valves opening towards said intermediate chamber. A spring and piston are provided for returning the valve member into the position in which the annular chamber communicates with the duct to atmosphere.

This invention relates to a device for releasing or producing hydraulic pressure in a chamber associated with a reversible hydraulic motor supplied selectively with pressure fluid by two conduits.

A reversible hydraulic motor which can be driven selectively in one of two opposite directions by pressure fluid supplied through two conduits, the motor being associated with a chamber, which can either be connected to a vent of supplied with fluid through said conduits, is already known.

An example of apparatus of this kind is an hydraulic winch whose reversible motors are associated with a ram for releasing a safety brake, the hydraulic cylinder of which forms the aforementioned chamber.

Braking must cease, or in other words the pressure must be produced in the brake ram cylinder as soon as the motor is driven in one direction or the other. On the other hand, braking must occur, or in other words the ram cylinder must be connected to the vent, when the motor ceases to be driven.

Various attempts have been made at meeting these operational requirements by using, for example, a shuttle valve, or a sequence valve coupled to two nonreturn valves, or two sequence valves disposed in parallel.

None of these devices meets all the following conditions which are desirable for completely reliable operation: absence of communication between the two conduits of the reversible hydraulic circuit terminating at the motor; and the possibility of using different fluid pressures for driving the motor in different directions and for operating simultaneously, the cylinder of the brake-releasing ram.

It is an object of the invention to meet the above requirements, and also provide other advantages, by means of providing a device for carrying out double piloting of the valve member of a distributor valve in the supply

and venting circuit of the chamber associated with the reversible hydraulic motor.

With this object in view the invention consists of a device for releasing or producing hydraulic pressure in a chamber associated with a reversible hydraulic motor supplied selectively with pressurized fluid by two conduits, the device comprising a control valve having an outlet connected to the chamber and an intermediate compartment communicating with a vent to atmosphere and with a source of pressurized fluid, wherein the two single-acting pilot rams associated with the valve member of the control valve operate the valve to bring the chamber into communication with the pressurized fluid source, the supply conduits of the reversible motor each being connected to a cylinder of one of the single-acting rams and both being connected jointly to the intermediate compartment through two nonreturn valves opening towards said intermediate compartment means being provided for returning the valve member into the position in which the chamber communicates with the vent to atmosphere.

In a preferred embodiment of the invention, one of the ends of the valve member is repelled by a spring while the piston of one of the rams is connected to the other end of the said valve member, the piston of the other of the rams axially engaging the first piston.

The invention will be better understood and various secondary features and advantages thereof will be apparent from the following description, given by way of example, of one embodiment described with reference to the accompanying drawing, which is a section through a device according to the invention used for controlling the safety brake of an hydraulic winch.

Referring to this drawing a control valve body 1 contains a sliding valve member 2 through which a duct 3 communicates with a duct 4 in the position shown in the drawing. The duct 3 is connected through a pipe to the cylinder of an hydraulic ram A for releasing the safety brake of an hydraulic winch B, while the duct 4 is connected to the low pressure return side of the hydraulic installation.

The cylinder of the ram A forms the aforementioned chamber associated with the reversible motor, which in this case is the hydraulic motor of the winch B. The motor can be supplied selectively with pressurized fluid from a source S by a distributor C through one or the other of the two conduits 25 and 26 which are themselves connected together near the motor by a speed limiter D.

When the slide valve 2 occupies its second position—to the left as viewed in the drawing—it puts the duct 3 and thus the cylinder of the ram A into communication with an intermediate compartment in the control valve 1, to which a pressurized fluid is delivered, as will be explained hereinafter.

A duct 5 provided in the valve body 1 is connected to one of the conduits 25 of the reversible hydraulic circuit supplying the winch motor, another duct 6 provided in the valve body 1 being connected to the other conduit 26 of said reversible circuit.

Circulation of pressurized fluid in the reversible circuit in a direction such that the connection to the motor supply conduit of the duct 5 is upstream of the motor and that of the duct 6 downstream thereof, corresponds to the direction of winding-in of the winch. Circulation of the fluid in the opposite direction corresponds to the unwinding of the winch. These connections to the motor supply conduits 25 and 26 are both made at points located between the speed limiter D and the distributor C.

The duct 5 extends to a piloting chamber 7 disposed around the same axis as the valve member 2. The chamber 7 is extended in the direction of the valve member 2 by a bore 8 which terminates in an intermediate chamber 9. One end 2a of the valve member 2 extends into

the intermediate chamber 9. A piston or piloting ram 10 connected to the end 2a of the valve member 2 extends through the bore 8 and enters the piloting chamber 7. A duct 11 connects the duct 5 to the intermediate chamber 9. A nonreturn valve 12 mounted in the duct 11 allows pressure fluid to flow towards the chamber 9 but prevents it flowing in the opposite direction. In an identical manner, the duct 6 terminates in a second piloting chamber 13, which is connected by a duct 14, in which a nonreturn valve 15 is mounted, to the intermediate chamber 9. The chamber 13 is connected by a bore 16 to the chamber 7, and a piston or piloting ram 17 which can bear against the piston 10 is slidable in the bore 16 and extends into the chamber 13. The chambers 7, 13 and the corresponding pistons 10, 17 form the single acting pilot rams mentioned hereinbefore.

The intermediate chamber 9 is extended by a bore 18 in which the valve member 2 is slidable and in the center of which is an annular chamber 19 to which the duct 3 is connected. Beyond the bore 18 is an internal space 20 to which the duct 4 is connected and in which the end 2b of the valve member 2 bears against a pusher 21 loaded by a compression spring 22. The spring 22 bears against a seat 23 the position of which can be adjusted axially by means of a screw 24 which extends through the end wall of the valve body 1.

The device according to the invention operates as follows:

The jack A, whose cylinder is connected to the duct 3, must be fed with pressurized fluid to release the winch safety brake when pressurized fluid is delivered to one or the other of the conduits 25 or 26 of the reversible circuit of the motor driving the winch. Depending on the direction of the pressurized fluid in the circuit, fluid passes through the duct 5 into the piloting chamber 7 (when the winch cable is to be wound in) or through the duct 6 to the piloting chamber 13 (when the winch cable is to be unwound).

In both cases the fluid acts on the corresponding piston 10 or 17 and pushes it in the direction of the valve member 2. In the direction in which it is operated by the fluid pressure, each piston 10 or 17 is connected to the valve member 2, since any movement towards the left, with reference to the drawing, of a piston 10 or 17 causes an equal displacement of the valve member 2 in the same direction. The piston 10 is rigidly connected to the valve member 2. The piston 17 acts on the valve member 2 through the piston 10.

At the same time as the fluid pushes one of the pistons 10 or 17, it passes one of the nonreturn valves 12 or 15 and arrives in the intermediate chamber 9. However, since the valve member 2 has just been displaced against the action of the spring 22, the chamber 9 is in communication with the annular chamber 19 and the duct 3, while the latter is isolated from the venting duct 4. The brake releasing ram A connected to the duct 3 is therefore supplied with pressurized fluid and the brake is released, as soon as the winch motor is supplied with pressure fluid in either direction.

The intermediate chamber 9 acts as the normal inlet chamber for the pressurized fluid in a sliding control valve. However, the chamber 9 has no direct communicating duct terminating at the external surface of the valve body 1, and is connected to the fluid source through the piloting chambers 7, 17 and the nonreturn valves 12, 15.

When the flow of pressurized fluid in the motor circuit is interrupted in one direction or the other, two possibilities must be considered. If the motor circuit is connected to the vent (through the distributor C) when fluid flow ceases corresponding to open cylinder distribution, the spring 22 returns the assembly formed by the valve member 2 and the piston 10 (or the valve member 2 and the piston 10 and the piston 17) into the position shown in the drawing. The duct 3 communicates with the venting duct 4 and the winch brake is applied.

If fluid is no longer supplied to the motor circuit which

is not connected to the vent, corresponding to closed cylinder distribution, it would seem that the spring 22 would be unable to repel the moving assembly defined hereinbefore. However, in reality if the pressure persists because of the charge between the motor and the speed limiter D, the pressure disappears beyond the speed limiter D, and the chamber 7 is therefore no longer pressurized. The spring 22 then plays its part and restores the sliding valve member 2 to its starting position. Each piston 2, 10, 17 could have its own return spring. The use of a single spring for the valve member 2, the piston 10 and the piston 17 is more advantageous but not essential.

Due to the nonreturn valves 12, 15 the piloting chambers 7 and 13 are permanently isolated from one another, as are the two conduits 25 and 26 of the motor circuit, one connected to the duct 5 and the other to the duct 6. In these conditions it is possible to use different pressures for feeding the winch motor in different directions, the higher pressure corresponding to the winding-in of the winch cable and the lower pressure to its unwinding. In that case, as can be seen in the drawing, the pistons 10 and 17 have unequal effective diameters.

It will also be noted that the pistons 10, 17 and the valve member 2 can be returned into the position in which the duct 3 connected to the brake releasing ram is in communication with the venting duct 4 independently of the pressure in the ram and in the intermediate chamber 9. As soon as the pressure in the piloting chambers 7, 13 is inadequate to repel the spring 22, the device returns to the position illustrated, namely a safety position in which the brake is applied.

I claim:

1. A device for releasing or producing hydraulic pressure in a chamber associated with a reversible hydraulic motor supplied selectively with pressurized fluid by two conduits, the device comprising a control valve having an outlet connected to the chamber, an intermediate chamber, said chamber communicating with a duct to atmosphere and with a source of pressurized fluid, wherein two single acting piloting rams are associated with a valve member of the control valve, said rams being adapted to operate the valve member to bring the chamber into communication with the pressurized fluid source, the supply conduits of the reversible motor each being connected to a piloting chamber of one of the single acting rams and both being connected jointly to the intermediate chamber through two nonreturn valves opening towards said intermediate chamber means being provided for returning the valve member into the position in which the chamber communicates with the duct to atmosphere.

2. A device for releasing or producing hydraulic pressure in a chamber associated with a reversible hydraulic motor supplied selectively with pressurized fluid by two conduits, the device comprising a control valve having an outlet connected to the chamber, an intermediate chamber, said chamber communicating with a duct to atmosphere and with a source of pressurized fluid, wherein a pair of piloting chambers each include a single acting piloting ram, said piloting rams having different diameters and being associated with a valve member of the control valve, said rams being adapted to operate the valve member to bring the chamber into communication with the pressurized fluid source, the supply conduits of the reversible motor each being connected to one of the said piloting chambers for one of said single acting rams and both being connected jointly to the intermediate chamber through two non-return valves opening towards said intermediate chamber, means being provided for returning the valve member into the position in which the chamber communicates with the duct to atmosphere.

3. A device for releasing or producing hydraulic pressure in a chamber associated with a reversible hydraulic motor supplied selectively with pressurized fluid by two conduits, the device comprising a control valve having an outlet connected to the chamber, an intermediate cham-

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ber, said chamber, communicating with a duct to atmosphere and with a source of pressurized fluid, wherein two single acting piloting rams having different diameters are associated with a valve member of the control valve, said rams being adapted to operate the valve member and bring the chamber into communication with the pressurized fluid source, the supply conduits of the reversible motor each being connected to a piloting chamber of one of the single acting rams and both being connected jointly to the intermediate chamber through two nonreturn valves opening towards said intermediate chamber, means being provided for returning the valve member into the position in which the chamber communicates with the duct to atmosphere, said return means comprising a spring which bears against a displaceable member, the position of which is adjustable.

4. A device as set forth in claim 1, wherein one of the ends of the valve member is repelled by a spring, one of the piloting rams being connected to the other end of said valve member, and the other of the rams axially engaging the first ram.

5. A device as set forth in claim 2, wherein one of the ends of the valve member is repelled by a spring, one of

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the piloting rams being connected to the other end of said valve member, and the other of the rams axially engaging the first ram.

6. A device as set forth in claim 3, wherein one of the ends of the valve member is repelled by a spring, one of the piloting rams being connected to the other end of said valve member, and the other of the rams axially engaging the first ram.

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