ABSTRACT: A device for detecting the end of travel of a piston in a double-acting jack cylinder fed by two feed conduits and a three-position distributor, the device including a pressure distributor connected to the two feed conduits and adapted to be actuated by a predetermined pressure, so that a pressure increase occurring in one or other of the conduits as a result of the piston reaching an end of travel position causes actuation of the pressure switch to cause a light indicator to be illuminated.
DEVICE FOR DETECTING THE END OF TRAVEL OF JACK PISTONS

The present invention concerns improvements to control devices for hydraulic or pneumatic jacks, and particularly those mounted on earth-working machines, such as mechanical shovels, cranes, etc.

When these machines are to be used for a particular task such as deep drilling, or, in general, any work in which direct visual control of the working tool is difficult, it is preferable, when the tool is driven by jacks, to know the position of these latter.

A main object of the present invention is to enable this kind of control to be effected, and more generally to permit the detection of end-of-travel positions of the pistons of hydraulic or pneumatic jacks, mounted notably in earth-working machines, without the addition of supplementary connections (hydraulic, pneumatic, electrical, etc.) between these jacks and the main fluid source.

According to the invention, there is provided an end-of-travel detection device for the piston of a double-acting jack, fed from a main hydraulic or pneumatic source through the agency of a three-position distributor, characterized in that it comprises in combination end-of-travel valves of known type mounted on the piston and adapted to place the two chambers of the jack in communication, a movable abutment, the control of which is coupled to that of the distributor, the abutment being adapted, according to whether the distributor is in its neutral position or not, to open or close the movable contacts of an electrical circuit in which is included a light indicator and a pressure switch adapted to operate at a certain predetermined pressure and connected by means of a pressure distributor to two pressure fluid feed conduits of the jack, the pressure switch being inserted in said electrical circuit.

In order that the invention may be more fully understood, an embodiment in accordance therewith will now be described, by way of example, with reference to the accompanying drawing, the single FIG. of which is a diagrammatic representation of the detection device of the invention.

In the drawing, there is shown a double-acting hydraulic jack 1 supplied with fluid under pressure by two conduits 2 from a main hydraulic source constituted by a pump 3 and a reservoir 4. The jack is fixed at the end 5 of the cylinder and by means of the end 6 of the piston rod 7 is connected to a bucket for example (not shown).

The piston 7 of the jack 1 is provided with end-of-travel valves 8 of known type permitting communication between the two chambers of the jack 1 when the piston 7 is in abutment against one or other of its faces.

A three-position distributor 9 is interposed in the two jack supply conduits 2 enabling one or the other chamber of the jack 1 to be fed with fluid under pressure or enabling pressure fluid to be cut off from the jack.

The control of the distributor 9 is coupled to that of a movable abutment 10 which is also adapted to occupy one of three positions, namely a rest position (as shown in the drawing) and corresponding to the neutral position of the distributor 9, and two extreme positions corresponding respectively to the two other positions of the distributor 9.

In these extreme positions, the movable contacts 11a and 11b are closed, these contacts being inserted in an electrical circuit comprising a source 12 of direct current and a light indicator 13.

The device also comprises a pressure switch 14 which may be adjusted to set the pressure at which it will be actuated, this switch being supplied with fluid under pressure from two conduits 2 by means of a pressure distributor 15. A movable contact 16 of the switch is inserted in the electrical circuit of the light indicator 13.

By pressure distributor there will be understood a hydraulic or pneumatic circuit of known principle adapted to select for example, and in the present case, the highest feed pressure between two possible fluid sources. Such a circuit includes a ball moving in a recess and blocking the inlet conduit of the smallest of the two pressures, the other conduit being in direct communication with the output of the circuit.

The device operates as follows:

The pressure switch 14 is adjustable initially so that the contact 16 is open when the pressure acting on the pressure switch is greater than a predetermined level and closed when this pressure falls below the given level.

When the distributor 9 is in the neutral position, the movable abutment 10 is also in the neutral position and the electrical circuit of the light indicator is open.

This circuit therefore remains open whether the movable contact 16 is open or closed, i.e., whether or not a static pressure prevails in the conduits 2.

When the distributor 9 is open to cause extension or retraction of the piston rod of the jack 1, the movable contact 11b or 11a respectively is closed. This action is accompanied by an increase in pressure in one of the conduits 2. This pressure acts, by means of the pressure distributor 15, on the pressure switch 14 which opens the contact 16. The light indicator 13 thus remains unlit.

When the piston 7 arrives at the end of its travel, the valves 8 cause the pressure in the appropriate conduit 2 to fall, and this causes the pressure switch 14 to close the contact 16. The light indicator 13 is lit since one of the contacts 11a or 11b remains closed.

The actuating pressure of the pressure switch 14 is set as a function of the pressure losses of the hydraulic circuit when the two chambers of the jack 1 are placed in communication.

If there is a risk of cavitation at the moment when the pressure rises in the feed circuit of the jack 1, a damping valve 17 is inserted in each feed conduit 2 of the jack 1 between the distributor 9 and the pressure distributor 15 can be used to eliminate such a risk. This valve defines a pressure slightly greater than that at which the pressure switch 14 is set to operate.

Such a device is more particularly used when a deep-drilling operation is to be effected. Such equipment enables the position of the bucket scoop of the machine effecting the drilling to be determined and ensures that the bucket is closed before being raised.

Moreover, possible rupture of the jack feed pipes can be detected, since this would cause the light indicator to be illuminated.

The present invention is not limited to the embodiment described and shown above, but covers all variants thereof.

1. A device for detecting the limits of travel of a piston in a fluid cylinder provided with a pair of fluid supply lines operatively interconnected the ends of said cylinder with a supply of fluid under pressure, comprising means for selectively connecting one of said fluid supply lines with said fluid supply source, comprising an electrical circuit having electrically actuated indicating means and first and second switches normally disposed in their open positions, means operatively interconnected said selectively communicating means and said first switch of said electrical circuit for closing said first switch when said selectively communicating means communicates either of said fluid supply lines with said fluid supply source, means responsive to a predetermined pressure in either of said fluid supply lines operatively connected to said second switch of said electrical circuit for closing said second switch upon sensing said predetermined pressure in either of said fluid supply lines, and said piston having means which opens at the end of piston travel for communicating the fluid chambers of said cylinder.

2. A device according to claim 1, wherein said electrically actuated indicating means comprises a lamp energized by said electrical circuit.

3. A device according to claim 1, wherein said means operatively interconnected said selectively communicating means and said first switch in said electrical circuit, comprises a movable actuating member having an abutment engageable with a movable contact element of said first switch for moving said contact element into closed positions.

4. A device according to claim 1, wherein said means responsive to said predetermined pressure in said fluid supply lines, operatively connected to said second switch, includes a
pressure-sensitive switch having a movable actuating member with an abutment engageable with a contact element of said second switch to close said contact element, a pair of fluid lines interconnecting said fluid supply lines and said pressure-sensitive switch, and means for selectively communicating said fluid pressure switch with one of said fluid lines.