March 27, 1956 W. KULIKOFF 2,739,613

SWITCHES FOR HYDRAULIC PRESSURE DEVICES

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Fig. 1

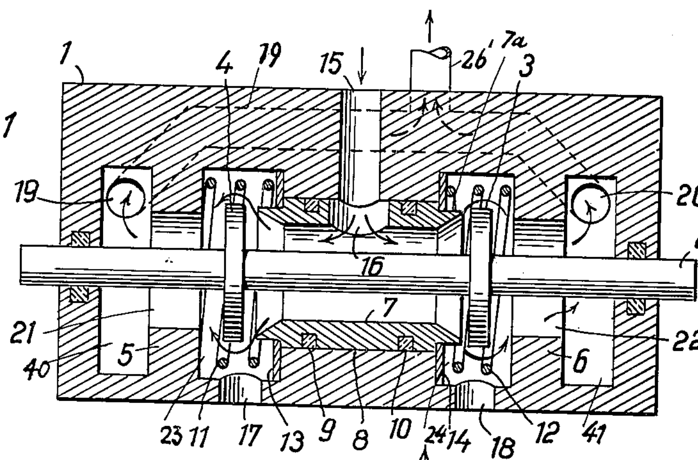


Fig. 2

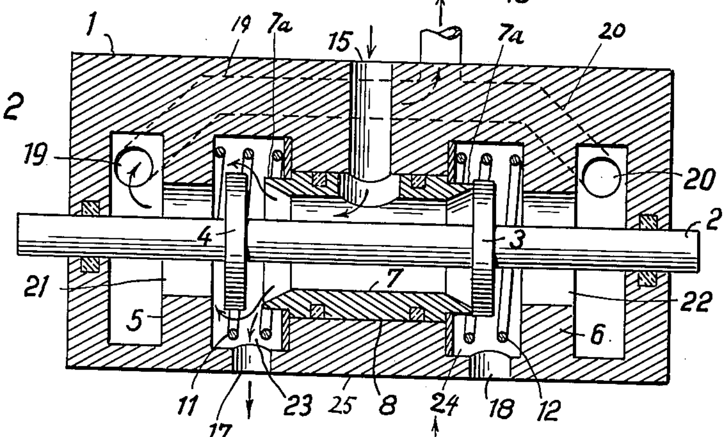
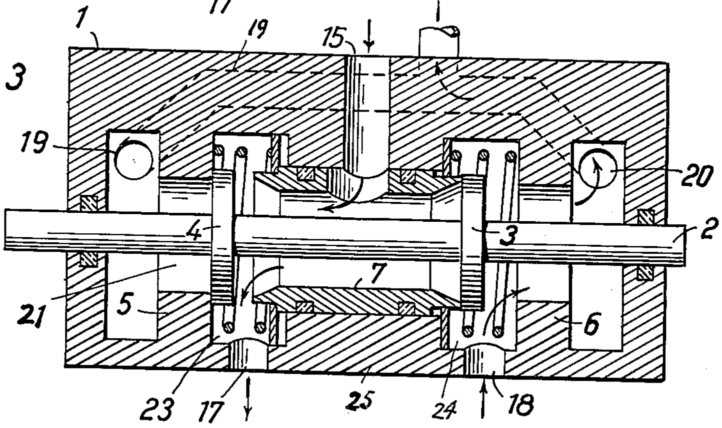


Fig. 3



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SWITCHES FOR HYDRAULIC PRESSURE DEVICES

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2 Claims. (Cl. 137—622)

The invention relates to switches for hydraulical pressure devices.

These switches are generally provided with rotatable or with slide valves. The application of this type of valves involves numerous disadvantages; their manufacture is expensive, they accumulate dirt and they become easily pitted; they are exposed to quick wear and do not adequately transmit pressure differentials; moreover, their manufacturing costs are high and their mounting as well as their adjustment is extremely laborious.

It is the object of the invention to eliminate these various disadvantages and difficulties of the known pressure switches for use in hydraulic power installations and to so construct the same, that the accumulation of dirt from the pressure fluids is prevented, the manufacturing costs are reduced, early abrasion and wear is eliminated and a free movement of the valve bushings as well as an automatic operation of the valves is secured.

With these and additional objects in view, which will become apparent as this specification proceeds, the invention will now be described more in detail and with reference to the accompanying drawings.

In the drawings:

Figs. 1–3 are vertical sectional views of the pressure switch in three different operative positions.

As apparent from the drawing, a shaft 2 is located in the switch casing 1, which casing is provided with a center wall 25 and two lateral partitions 5 and 6. The shaft 2 carries two identical valve discs 3, 4; it is axially movable in opposite directions; its displacement is interrupted, when the valves 3 or 4 press against the partitions 5 or 6.

A bushing 7 is axially slidable in a circular seat 8 provided in the casing between the two valves 3, 4; sealing rings 9, 10 are provided to seal the bushing in its guide seat 8. Next to the bushing 7 two circular chambers 23 and 24 are provided in casing 1, which house the springs 11 and 12 holding the bushing in its center position. The end portions of the bushing 7 are offset at the outside and these offset ends carry slidable discs 13, 14. Next to the chambers 23 and 24 the two partitions 5, 6 are provided having center passages 21, 22 and two chambers 40, 41 are located next to the partitions 5, 6.

An inflow passage 15 connected with opening 16 and outflow passages 19, 20 are provided for the pressure liquid leaving the switch through tube 26. The pressure medium enters a pressure operated hydraulic cylinder, not shown in the drawing, through openings 17, 18.

As shown in Fig. 1, the valves 3, 4 are in their median position; both chambers of the pressure cylinder are operatively connected with the conduits 17, 18; equal pressure will accordingly prevail in the cylinder and the same will remain in rest position.

In conformity with Fig. 2, the valve shaft 2 is moved from its median position of Fig. 1, towards the left side of the drawing until the valve disc 3 contacts the bushing 7.

The flow of the pressure liquid towards the right side of the switch is accordingly interrupted; the pressure fluid now flows from a pump or the like, through pressure channel 15, bushing 7 around the valve disc 4 through passage 21 in the return channel 19. This position defines the start of the pressure increase in channel 17.

If the movement of the valve shaft 2 towards the left side in the drawing is continued, the bushing 7 is displaced and the valve disc 4 approaches partition 5 and passage 21. The bushing 7 is moved by the valve disc 3 towards the left side of the drawing and spring 11 is compressed simultaneously. By the approach of valve disc 3 towards the left side of the drawing spring 11 is compressed and the flow of the pressure liquid through passage 21 is reduced.

Accordingly, the pressure is increased in the bushing 7, in chamber 23, in channel 17 and in the pressure chamber of a working cylinder, whereby its piston is actuated.

If now, the valve shaft 2 is further displaced and the valve disc 4 pressed against partition 5, Fig. 3, a position is reached, where the flow of the pressure liquid through partition 5 is fully interrupted and the entire pressure liquid now passes into channel 17 whereby pressure will be created at one end of a piston.

As soon as an excess pressure is created in space 23, the bushing 7 is automatically actuated in the following manner.

The diameter of seat 8, wherein slides the bushing 7, is slightly larger than the diameter of the valve discs 3, 4; consequently, the bushing 7 together with a valve disc thereon presents a larger cross section than that of a valve disc alone. Fig. 3 illustrates the position, where accordingly an excess pressure is created in chamber 23. This excess pressure tries to press the valve disc 4 towards the left side and against partition 5, and at the same time, the bushing 7 is pressed towards the valve disc 3. Since the valve disc 4 has a smaller diameter than the guide seat 8, a force results which exerts pressure against the bushing 7 on which there is in abutment the valve disc 3, and acts in the direction towards the right side with the tendency to open the valve 4.

In order to maintain the working pressure an outside force must be applied, which keeps the valve 4 closed. This force need not be large and it is only produced by the difference of cross-section of the guide seat 8 and of the passages 21, 22 to be closed by the valves 3, 4.

If, however, these passages 21, 22 were to have the same diameter as the guide seat 8, the reaction force of the bushing 7 would be equal to zero. Hence, the seat 8 has a larger diameter than the passages 21 and 22. This reaction force of the bushing 7 is of particular importance in those installations, which are manually operated. Since the bushing 7 automatically effects the exact adjustment of the two valves, it is not necessary to provide other external manual means for maintaining one of the valves 3, 4 closed until the desired effect has been accomplished; a subsequent manual release will start the automatic reaction movement of the bushing 7.

If the valve shaft 2 is displaced to the right, the bushing 7 automatically returns in the median position, shown in Fig. 1 by the actions of spring 11. The springs 11, 12 may be replaced by resilient rings, rubber plates or rubber balls.

As apparent from the above, the operation of the instant pressure switch is based on the lateral displacement of bushing 7 which is freely movable in a casing 1 towards two identical valves 3, 4. The bushing 7 transmits the pressure reactions and is self-adjustable.

In this manner, a simple and economical construction of the pressure switch results eliminating at the same time the danger of jamming during operation and enabling the pressure transmission at any desired rate. The valves 3, 4 need no adjustment, as the latter takes place automatically.

This automatic adjustment of the valves eliminates the difficulty of expensive mountings and practically excludes wear. Since the diameter of the bushing **7** is larger than the diameter of the valve disc **3**, **4** a movement of the bushing into predetermined positions is produced. The valves **3**, **4** are automatically operated and the necessity to exactly adjust the same which is a requisite of the hitherto customary switch constructions of the present type, is eliminated. The sedimentation of dirt on the operative parts of the switch is prevented.

Since certain changes may be made in the above article and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

What I claim is:

1. A switch for hydraulic pressure devices comprising a switch housing, a center partition and two lateral partitions in said housing, a circular seat in said center partition, a cylindrical bushing open at its opposite ends and having between the ends an aperture and being freely slidable in said circular seat and defining an inner space, a shaft axially slidable in said housing and centrally extending through said bushing and from said housing, two valve discs secured to said shaft adjacent to the ends of said bushing and adapted to be axially displaced by the displacement of said shaft into and out of operational abutment contact with the ends of said bushing for alternatively closing one end of said bushing, said switch

housing having an inlet passage communicating with said aperture and having outlet passages to conduct a pressure medium into and from said inner bushing space, said outlet passages being controlled by the displacement of said shaft and the closing and opening cooperation of said valve discs with said open ends of said bushing, the outer diameter of said bushing being larger than the diameter of said valve discs, the pressure of the liquid exerted against the side of the assembly, composed of the bushing and one of said valve discs abutting against an open end, being greater than the pressure of the liquid exerted against the other of the valve discs.

2. In a switch according to claim 1, two circular chambers provided in said housing adjacent to said bushing, two identical valves in said chambers, springs in said chambers surrounding said valves, said springs abutting against the wall of said chambers and against the end portions of said bushing, said chambers being located in said housing at the outside of said lateral portions and adjacently thereto, said chambers being connected with said outlet passages.

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