

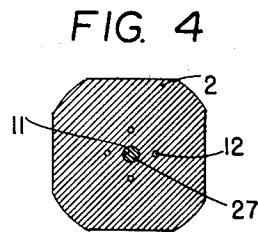
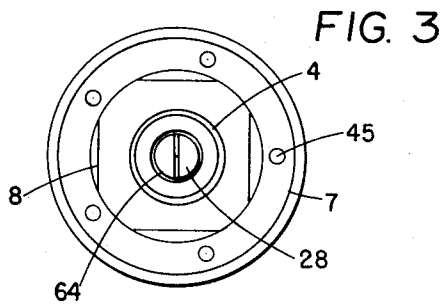
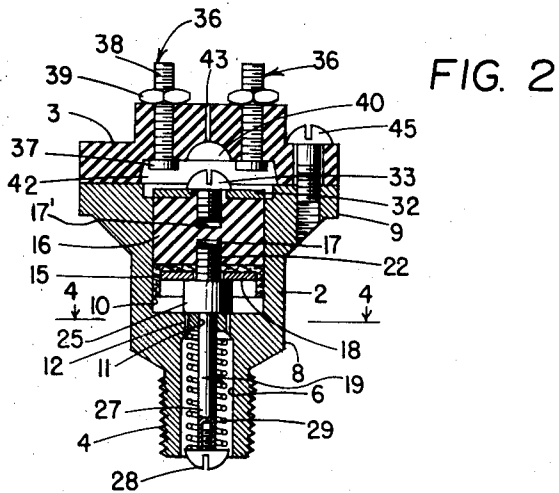
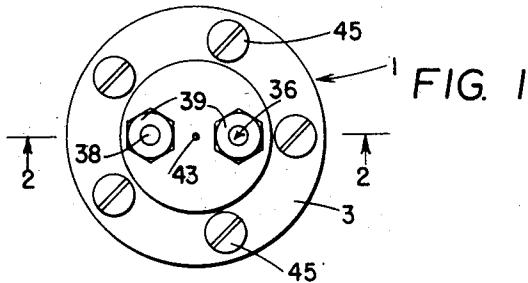
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PNEUMATIC ELECTRIC SWITCH

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Attv.

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PNEUMATIC ELECTRIC SWITCH

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This invention relates to pneumatically operated electric switches such as are particularly adapted for controlling signal lights on automobiles, trucks, trailers and the like.

Modern automobile trailer trucks require a large number of signal lights which are generally controlled by pneumatic switches located on the trailer and operated by pneumatic pressure controlled from the cab or driver's position. Such switches are frequently subjected to abuse or misuse by the operator and must therefore be exceedingly sturdy or rugged to withstand not only the rigorous treatment to which it is normally subjected but also the overloading to which it may be subjected by careless operators. Such switches must be certain in their operation since the failure of the switch may result in serious consequences. It is one of the objects of the present invention to provide a switch of the above mentioned character which is so constructed that the heat produced by the flow of current and produced by the arcing during current interruption cannot affect the actuating parts of the switch.

The switch of the present invention comprises a body and a cap forming a casing, the body having a cylinder therein in which an actuating piston moves, the arrangement being such that the casing always has atmospheric pressure on one side of the piston and is arranged to receive the pneumatic pressure on the other side of the piston for moving it in one direction. A spring is provided for returning the piston upon release of the pneumatic pressure. It is an object of the present invention to provide an arrangement wherein the spring as well as the piston pressure sealing means are entirely outside of the current carrying portions of the switch and are also insulated from the heat of an arc that may be formed during circuit interruption. As a result the spring retains its resiliency over long periods of time and also there is no danger of carbonization of the leather packing cup of the piston. It is a further object of the present invention to provide a structure of the above mentioned character wherein the number of parts is reduced to a minimum and wherein the amount of required accurate machining is also kept to a minimum.

It is a still further object of the present invention to provide a switch of the above mentioned character which is so arranged that it may be mounted in position by the same switch part that extends the pneumatic pressure connection to the switch.

The attainment of the above and further ob-

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jects of the present invention will be apparent from the following specification taken in conjunction with the accompanying drawing forming a part thereof.

In the drawing:

Figure 1 is a top view of the switch;

Figure 2 is a longitudinal sectional view taken along the line 2—2 of Figure 1;

Figure 3 is a bottom view of the switch; and

Figure 4 is a sectional view taken along the line 4—4 of Figure 2 and looking in the direction of the arrows.

Reference may now be had more particularly to the drawing wherein like reference numerals designate like parts throughout.

The switch of the present invention, which is indicated in general by the reference numeral 1, is adapted to be used, as heretofore stated, for controlling the turning on and off of signal lights on an automobile, an automobile truck or trailer, or on automobile truck trailers. The switch 1 comprises a body 2 and a cap 3 which together form a casing. The body 2 has at its lower end a hollow neck 4 that is externally threaded so that the neck may be threaded into a pipe or fitting of the controlled pressure line of the automobile truck, that neck serving to support the switch and also extend pressure to the switch. To that effect the neck 4 has a bore 6 extending longitudinally thereof. Above the neck the body 2 has an intermediate body portion 8 that has an outwardly extending enlargement or flange 9 for receiving the cap 3. The intermediate body portion has a cylindrical bore 10 formed therein with its longitudinal axis in alignment with the axis of the bore 6 in the neck 4. At the bottom of the cylinder bore 10 the intermediate body portion 8 has an inwardly projecting ledge 11 that serves as a guide for a piston stem, to be more fully described as this specification proceeds. The ledge 11 has a series of small holes 12 formed therein to maintain communication between the interior of the neck 4 and the cylinder bore 10.

A piston is mounted within the cylinder bore 10. The piston comprises a leather pressure cup 13 that slides in the cylinder bore 10 and makes a sealing sliding fit around the entire periphery of the bore 10. The pressure cup 13 is secured to a spacer 14, preferably of heat insulating material such as, for instance, fiber. The material of the spacer 14 is also an electric insulator. The spacer 14 is of a cylindrical shape and has centrally located aligned threaded bores 17—17' at opposite ends thereof. The cup 13 fits against

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the bottom of the spacer 16 and is secured in place by means of a circular metal washer 12 and a piston stem 19. The piston stem is made of steel and has a threaded stud 22 integral therewith which stud passes through the pressure cup 15 and threads into the bore 17 in the spacer 16. The piston stem also has as an integral part thereof an enlarged cylindrical portion 25 that bears against the washer 12 and presses it firmly against the pressure cup and presses the pressure cup against the spacer 16. The bottom of the cylindrical portion 25 of the stem serves as a stop to limit the downward movement of the piston. The piston stem 19 has at the bottom thereof a cylindrical rod 27 that slides through the ledge 11 and is guided thereby. At its lower end the rod 27 has a screw 28 threaded therein, that screw having a head which forms a seat for a return spring 29 that surrounds the rod 27. The opposite end of the spring 29 bears against the bottom of the ledge 11. The spring thus constantly forces the piston stem, and therefore the piston, to the switch open position illustrated in Figure 2. At its upper end the spacer 16 has a copper contact bridging member 32 secured thereto as by means of a screw 33 threaded into the bore 17'.

The cap 3 is preferably made of a suitable electrical insulating material such as, for instance, fiber. Two similar contact screws 36-36 are mounted in the cap. Each screw includes a head 37 and a threaded shank 38, the shank extending through the cap 3 and being locked in place by a lock nut 39. The shank 38 extends beyond the lock nut for receiving the electrical connections. The heads 37 of the two contact screws are adapted to be engaged by the bridging member 32 when the piston is moved to its elevated position. To permit such movement of the piston the cap is hollowed out on its under side and also has a cavity 40 into which the head of the screw 32 may extend. There is thus formed a low pressure chamber 42 where the contacts are located, that chamber being open to atmosphere by a venting opening 43. The cap is secured in place on the body 2 by a number of screws 45, five such screws being illustrated.

It is believed that the operation of the switch will be obvious from the description given above. When air pressure is applied to the interior of the neck 4 that pressure extends through the holes 12 into the pressure chamber at the bottom of the piston and forces the piston upwardly against the action of the return spring 29. The bridging member 32 makes contact with the heads 37 at the bottom of the two contact screws 36 and thus establishes a circuit between them. To open the switch it is merely necessary to release the air pressure applied to the switch through the neck 4. The spring 29 then moves the piston to its switch open position. The heat produced at the contacts by the current flowing therethrough or by the arc that forms during circuit interruption is at a considerable distance from the spring 29 and therefore there is little danger of overheating the spring, which would impair its resiliency. It is also at a considerable distance from the leather pressure cup 15 and separated from the pressure cup by the insulating spacer 16 so that the leather cup is not likely to be adversely affected by heat produced by the switch. In the event of pitting of the contacts they may be easily removed and replaced, and the bridging member

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32 can also easily be replaced. Furthermore, the bridging member is in the form of a plain copper washer so that if any pitting occurs on the washer at the places where the washer makes contact with the contacts 37 it may not even be necessary to replace the washer because the washer can be turned through a small arc and thus change the location of the points of engagement between the washer and the contact heads 37.

In compliance with the requirements of the patent statutes I have here shown and described a preferred embodiment of my invention. It is, however, to be understood that the invention is not limited to the precise construction here shown, the same being merely illustrative of the principles of the invention. What I consider new and desire to secure by Letters Patent is:

1. A pneumatic pressure operated switch including a casing comprising a body and a cap, the body having a hollow straight neck at one end open for receiving pneumatic pressure, the neck merging into an intermediate body portion, a piston-receiving cylinder in said intermediate body portion, a piston in said cylinder and dividing the casing into a high pressure chamber at the stem end thereof and a low pressure chamber at the cover end thereof, said piston comprising a flexible pressure sealing member slidable in the cylinder and making a sealing fit with the wall thereof, the sealing member being on the pressure chamber side of the piston, the piston including also a heat insulating cylindrical spacer slidable in the cylinder and secured to the sealing member and separating it from the low pressure chamber, a piston stem extending lengthwise into the neck, spring means on the pressure side of the piston for moving the piston in a direction opposite to the direction in which it is moved by pressure in the high pressure chamber, switch contacts on the inside of the low pressure chamber, and a contact bridging member mounted on the side of the spacer remote from the flexible sealing member and actuated by the spacer to close and open a circuit between the contacts in the low pressure chamber, the spacer serving to insulate the sealing means and the spring from heat produced by arcing at the switch contacts in the low pressure chamber, and venting means opening the low pressure chamber to the atmosphere.

2. A pneumatic pressure operated switch including a casing comprising a body and a cap, the body having a hollow straight neck at one end open for receiving pneumatic pressure, the neck merging into an intermediate body portion, a piston-receiving cylinder in said intermediate body portion, an outwardly extending cover-receiving flange surrounding the intermediate portion at the end thereof remote from the neck, means securing the cover to said flange, a piston in said cylinder and dividing the casing into a high pressure chamber at the stem end thereof and a low pressure chamber at the cover end thereof, said piston comprising a flexible pressure sealing member slidable in the cylinder and making a sealing fit with the wall thereof, the sealing member being on the pressure chamber side of the piston, the piston including also a heat insulating cylindrical spacer slidable in the cylinder and secured to the sealing member and separating it from the low pressure chamber, a piston stem secured to the piston and securing the sealing member to the cylindrical spacer, said stem extending lengthwise into the

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neck, spring means on the pressure side of the piston for moving the piston in a direction opposite to the direction in which it is moved by pressure in the high pressure chamber, said spring being located in the hollow neck and surrounding the stem, switch contacts on the inside of the low pressure chamber, and a contact bridging member mounted on the side of the spacer remote from the flexible sealing member and actuated by the spacer to close and open a circuit between the contacts in the low pressure chamber, the spacer serving to insulate the sealing means and the spring from heating produced by arcing at the switch contacts in the low pressure chamber, and venting means opening the low pressure chamber to the atmosphere.

3. A pressure operated switch including a casing comprising a body and a cap, the body having a hollow straight neck at one end threaded for mounting the body and hollow and open for receiving pneumatic pressure at its mounted end, the neck merging into an intermediate body portion of increased diameter and in line therewith, a piston-receiving cylinder in said intermediate body portion, a piston in said cylinder and dividing the casing into a high pressure chamber at the stem end thereof and a low pressure chamber at the cover end thereof, said piston comprising a flexible pressure sealing member slidable in the cylinder and making a sealing fit with the wall thereof, the sealing member being on the pressure chamber side of the piston, the piston including also a heat insulating cylindrical spacer slidable in the cylinder and secured to the sealing member and separating it from the low pressure chamber, a piston stem secured to the piston and securing the sealing member to the cylindrical spacer, said stem extending lengthwise into the mounting neck, spring means for moving the piston in a direction opposite to the direction in which it is moved by pressure in the high pressure chamber, said spring being located in the hollow neck and surrounding the stem, means at one end of the stem constituting a stop for the spring, switch contacts carried by the cover on the inside of the low pressure chamber, and a contact bridging member mounted on the side of the spacer remote from the flexible sealing member and actuated by the spacer to close and open a circuit between the contacts in the low pressure chamber, the spacer serving to insulate the sealing means and the spring from heat produced by arcing at the switch contacts in the low pressure chamber, and venting means opening the low pressure chamber to the atmosphere.

4. A pressure operated switch including a casing comprising a body and a cap, the body having a hollow straight neck at one end threaded for mounting the body and hollow and open for receiving pneumatic pressure at its mounted end, the neck merging into an intermediate body portion of increased diameter and in line therewith, a piston-receiving cylinder in said intermediate body portion, an outwardly extending cover-receiving flange surrounding the intermediate portion at the end thereof remote from the neck, means securing the cover to said flange, a piston in said cylinder and dividing the casing into a high pressure chamber at the stem end thereof and a low pressure chamber at the cover end thereof, said piston comprising a flexible pressure sealing member slidable in the cylinder and making a sealing fit with the wall thereof, the

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sealing member being on the pressure chamber side of the piston, the piston including also a heat insulating cylindrical spacer slidable in the cylinder and secured to the sealing member and separating it from the low pressure chamber, a piston stem secured to the piston and securing the sealing member to the cylindrical spacer, said stem extending lengthwise into the mounting neck, spring means for moving the piston in a direction opposite to the direction in which it is moved by pressure in the high pressure chamber, said spring being located in the hollow neck and surrounding the stem, means at one end of the stem constituting a stop for the spring, switch contacts carried by the cover on the inside of the low pressure chamber, and a contact bridging member mounted on the side of the spacer remote from the flexible sealing member and actuated by the spacer to close and open a circuit between the contacts in the low pressure chamber, the spacer serving to insulate the sealing means and the spring from heat produced by arcing at the switch contacts in the low pressure chamber, and venting means opening the low pressure chamber to the atmosphere.

5. In a pressure operated switch, a casing comprising a body and a cap, the body having a high pressure chamber and a low pressure chamber and a cylinder bore connecting said chambers, a piston in said cylinder closing off communication between the chambers, said body having a mounting neck in alignment with the longitudinal axis of the cylinder and which neck is part of the high pressure chamber, switch contacts in said low pressure chamber, said low pressure chamber being open to the atmosphere, the piston including on the high pressure side thereof a flexible pressure sealing member slidable in and making a sealing fit with the cylinder wall and a heat insulating cylindrical spacer to one side of which the pressure sealing member is secured, the spacer extending to the low pressure chamber, a contact bridging member secured to the spacer on the side thereof in the low pressure chamber, a piston stem secured to the piston and securing the flexible sealing member to the spacer, said stem extending in the mounting neck, a spring surrounding the stem in the mounting neck and urging the piston stem in one direction, the piston being moved in the opposite direction by pressure in the high pressure chamber.

6. In a pressure operated switch, a casing comprising a body and a cap, the body having a high pressure chamber and a low pressure chamber and a cylinder bore connecting said chambers, a piston in said cylinder closing off communication between the chambers, said body having a mounting neck in alignment with the longitudinal axis of the cylinder, said body having a perforated projection on the inside thereof between the part of the body constituting the neck and the part forming the cylinder, switch contacts in said low pressure chamber, said low pressure chamber being open to the atmosphere, the piston including on the high pressure side thereof a flexible pressure sealing member slidable in and making a sealing fit with the cylinder wall and a heat insulating cylindrical spacer to one side of which the pressure sealing member is secured, the spacer extending into the low pressure chamber, a contact bridging member secured to the spacer on the side thereof in the low pressure chamber, a piston stem secured to the piston, said stem extending

through said projection into the mounting neck, and a spring surrounding the stem in the mounting neck and having one end bearing on the stem and the opposite end bearing against the projection, whereby the spring urges the piston stem in one direction, the piston being moved in the opposite direction by pressure in the high pressure chamber.

7. In a pressure operated switch, a casing comprising a body and a cap, the body having a high pressure chamber and a low pressure chamber and a cylinder bore connecting said chambers, a piston in said cylinder closing off communication between the chambers, said body having a mounting neck opening into the high pressure chamber, switch contacts in said low pressure chamber, said low pressure chamber being open to the atmosphere, the piston including on the high pressure side thereof a flexible pressure sealing member slidable in and making a sealing fit with the cylinder wall and a heat insulating cylindrical spacer to one side of which the pressure sealing member is secured, the spacer extending to the low pressure chamber, a contact bridging member secured to the spacer on the low pressure side thereof, and spring means in the high pressure chamber urging the piston in one direction, the piston being moved in the opposite direction by pressure in the high pressure chamber.

8. In a pressure operated switch, a casing comprising a body and a cap, the body having a high pressure chamber and a low pressure chamber and a cylinder bore connecting said chambers, a piston in said cylinder closing off communica-

tion between the chambers, said body having a mounting neck opening into the high pressure chamber, switch contacts in said low pressure chamber, said low pressure chamber being open to the atmosphere, the piston including on the high pressure side thereof a flexible pressure sealing member slidable in and making a sealing fit with the cylinder wall and a heat insulating cylindrical spacer to one side of which the pressure sealing member is secured, the spacer extending to the low pressure chamber, a contact bridging member secured to the spacer on the low pressure side thereof, piston stop means on the inside of the body on the high pressure side thereof for limiting the movement of the piston in one direction, said piston having a stem extending therefrom past the stop means, and a piston return spring bearing at one end on the stem and at the other end against the stop means on the side thereof remote from the piston, and spring means in the high pressure chamber urging the piston in one direction, the piston being moved in the opposite direction by pressure in the high pressure chamber.

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