Jan. 12, 1932. J. W. WHITE 1,840,340

STOPLIGHT SWITCH

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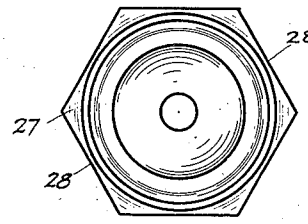
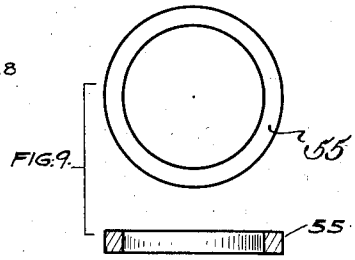
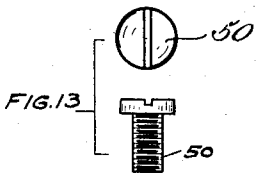


FIG. 4





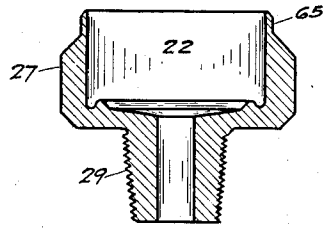
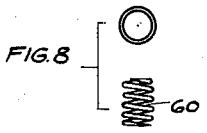


FIG. 3.



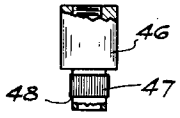


FIG. 12

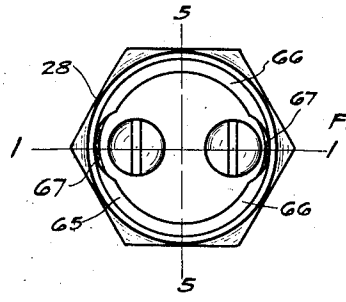
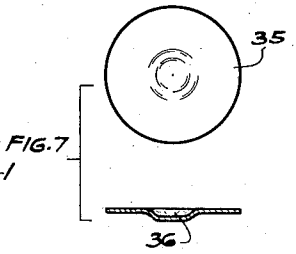
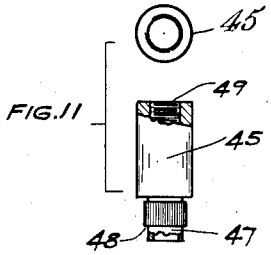


FIG. 2.





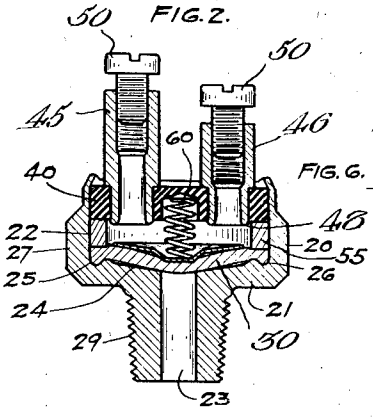
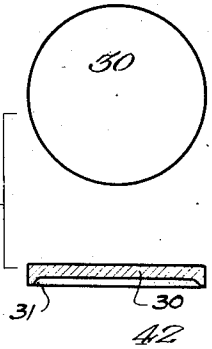


FIG. 1.



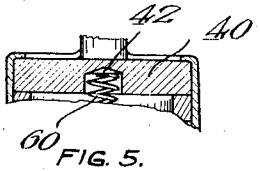
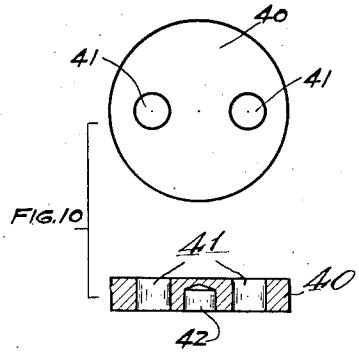


FIG. 5.



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STOPLIGHT SWITCH

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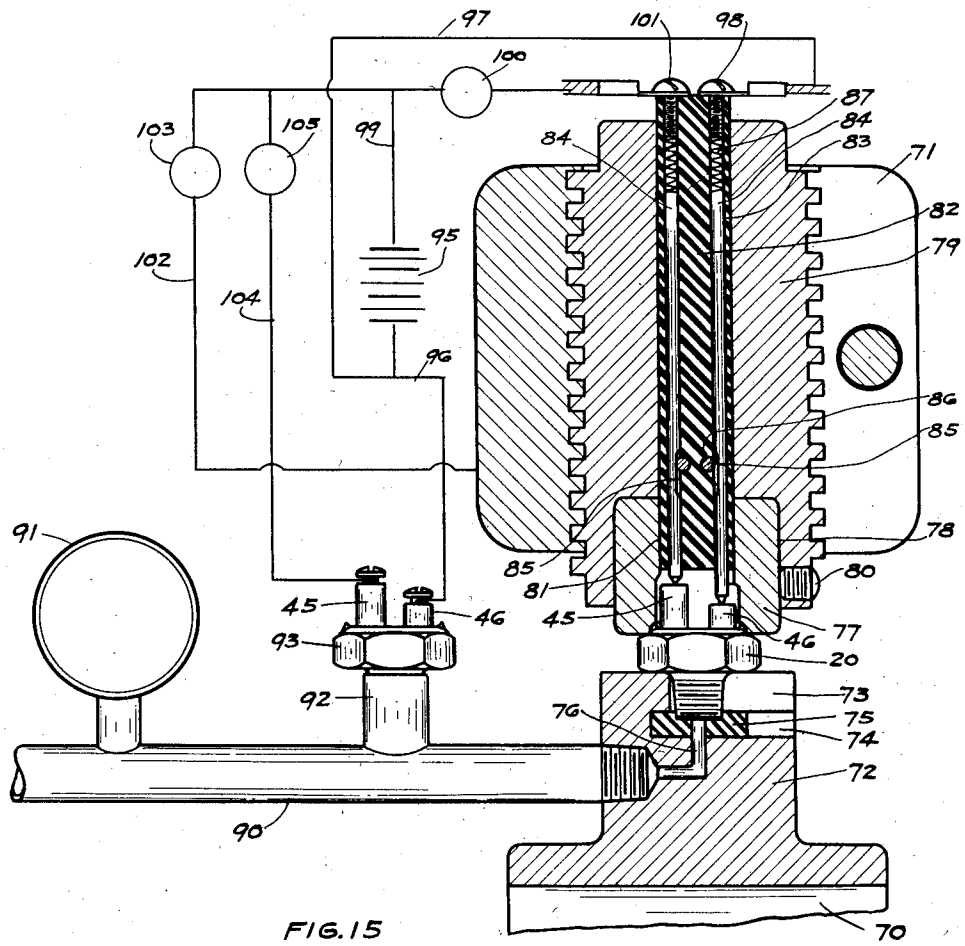


FIG. 15

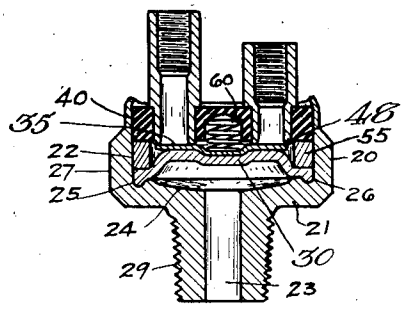


FIG. 14

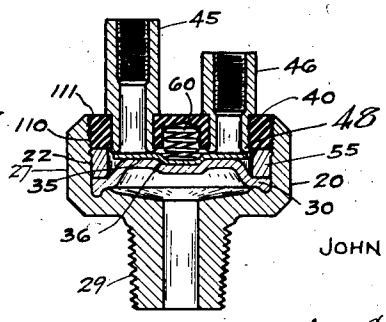


FIG. 16

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Patented Jan. 12, 1932 1,840,340

UNITED STATES PATENT OFFICE

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STOPLIGHT SWITCH

Application filed December 22, 1927. Serial No. 241,805.

This invention relates to an improvement in a stop light switch and to the method of and apparatus for forming and simultaneously testing such a switch.

The primary object of this invention is to provide a switch intended particularly for use in connection with a stop light for motor vehicles and characterized by the fact that the switch is very small and compact and is responsive to a very definite range of pressures. Another object of the invention is to provide a switch including a casing, the outer contour of which is such that it can be manipulated directly by a wrench and a movable part in said casing out of its normal position both when idle and when operating. A further object of the invention is to provide, in a machine for assembling the parts of the switch, electrical connections whereby the operating pressure can be determined and any electrical defect in the switch detected.

Other objects will appear to one skilled in the art from an examination of the following description taken in connection with the drawings which form a part thereof and in which

Fig. 1 is a sectional elevation of a completed switch in the idle position taken along the line 1—1 on Fig. 2;

Fig 2. is a top plan view of the switch;

Fig. 3 is a sectional view of the casing;

Fig. 4 is a top plan view of the casing;

Fig. 5 is a sectional view of the upper portion of the casing taken along the line 5—5 of Fig. 2;

Fig. 6 is a plan view and a cross sectional view of a disk of flexible material;

Fig. 7 is a plan view and a cross sectional view of a metal plate;

Fig. 8 is a plan view and a side elevation of a spring;

Fig. 9 is a plan view and a cross sectional view of a ring;

Fig. 10 is a plan view and a cross sectional view of the cover of this device;

Fig. 11 is a plan view and a side elevation with parts broken away of one of the binding posts of this device;

Fig. 12 is a side elevation with parts broken away of another binding post of this device;

Fig. 13 is a plan view and side elevation of a screw adapted to be used with both binding posts;

Fig. 14 is a sectional view showing the parts in the operating position;

Fig. 15 is a side elevation partly in section of the press in which the stop light is assembled and in which it is tested; and

Fig. 16 is a view similar to Fig. 14 of another embodiment of this invention.

As is shown clearly in Fig. 1 of the drawings the stop light switch, designated generally at 20, comprises a casing 21 having a cup or pocket 22 therein and a passage 23 opening into the base of the cup 22. The inner face of the base 24 of the cup 22 is preferably concaved slightly, as shown in Fig. 1, and provided at its outer perimeter with an annular groove 25 defined by an annular projection 26. The portion 27 of the casing 20 which forms the cup 22 is preferably hexagonal on its outer surface, having a series of flat faces 28 which are adapted to provide a grip for a wrench. The portion 29 of the casing 20 through which the passage 23 extends is externally threaded so that the switch may be easily and quickly mounted in an internally threaded sleeve, boss or the like being tightened down by a wrench or suitable means engaging the flat faces 28.

Within the cup 22, resting upon the base 24 thereof, is a diaphragm 30 of rubber or other flexible material provided on its under face with an annular flange 31 which, when the parts are assembled as shown in Figs. 1 and 14, enters the annular groove 25. Resting upon the diaphragm 30 is a metal plate 35 provided at its center with a depression 36. The plate 35 is of thin metal and capable of bending under the application of pressure. A cover 40 of dielectric material closes the mouth of the cup 22 and is provided with a pair of holes 41 and a recess 42. As will be clearly seen from an examination of Fig. 10, the holes 41 pass completely through the cover while the recess 42 is formed centrally in the under face thereof between the holes 41.

Carried by the cover 40 are a pair of bind-

ing posts 45, 46, the post 45 being longer than the post 46 for a reason to be set forth hereinbelow. Each post terminates in a projection 47 provided with longitudinally extended striations. The posts are mounted in the cover 40 by inserting the projections 47 in the holes 41, the engagement of the striations with the walls of the holes fixing the posts in place. The tips 48 of the posts which project below the under face of the cover 40 and are preferably bent over the edges of the holes to secure the posts in place, constitute terminals as will be pointed out below. The binding posts 45, 46 are internally threaded at 49 to receive screws 50 which may be of the usual type.

Between the cover 40 and the diaphragm 30 is a ring 55 which bears upon the outer edge of the diaphragm 30 and compresses it against the annular projection 26 forcing the flange 31 of the diaphragm into the groove 25. A spring 60 seated at one end in the recess 42 and at the other end in the central depression 36 of the plate 35 normally places the plate and diaphragm under compression.

When the casing 21 is formed a continuous annular flange 65 is provided at the mouth of the cup 22 which projects above the cover when the parts are assembled. It will be noted that in order to make the switch 20 as compact as possible the binding posts 45, 46 are quite near the outer edge of the cover 40 and since these posts are of metal and function as conductors of electricity, it is obviously necessary that there be no contact between the posts and the casing. Accordingly, as is clear from an examination of Figs. 1 and 2, only the portion 66 of the flange 65 between the posts 45, 46 are spun or crimpled over the top of the cover to secure it in position, the portions 67 of the flange adjacent the binding posts being left standing substantially upright.

The operation of the stop light switch 20 will be described with particular reference to Figs. 1 and 14 of the drawings. Fig. 1 shows the normal or idle position of the parts of the switch when completely assembled and as there shown the spring 60 forces the plate 35 against the diaphragm 30 and moves the diaphragm out of its normal position. The spring 60, being seated at one end in the depression 36, holds the central portion of the plate 35 in very close contact with the center of the diaphragm 30 and since the plate is of metal, usually brass, it has been found that after a short time the portion 37 of the plate is united to the diaphragm by reason of the devulcanizing process due to the presence of copper. The ring 55 is clamped by the cover 40 against the periphery of the diaphragm and thus seals the cup from the entry of any fluid which might otherwise enter through the passage 23 past the diaphragm 30.

When the stop light switch is in use it is mounted upon some portion of a hydraulic brake system such as is shown in my copending application Serial No. 102,701, filed April 17, 1926. Fluid pressure through the passage 23 acts against the bottom of the diaphragm 30 and flexes it, carrying the plate 35 against the urge of the spring 60 into contact with the terminals 48 of the binding posts 45, 46, thus completing the electrical connection between the two posts (see Fig. 14).

From an examination of my earlier application, it will be obvious that one post is connected to the battery or other suitable source of current while the other post is connected to the lamp (not shown) which is to be controlled by the switch. Thus when the plate 35 is brought into contact with the posts 45, 46 the current from the battery will flow through the switch and light the lamp.

The plate 35 does not contact with the ring 55 and is held at the center of the cup by means of the spring 60 which enters the central depression 36 and by reason of the fact as pointed out above that it becomes united to the diaphragm. Since the post 45 is longer than the post 46 the wires, not shown, which are fixed upon the posts by the screws 50 will be out of contact and thus the switch 20 may be made smaller.

When the parts have been assembled with the flange 65 upstanding the switch is placed in a press, shown in Fig. 15, comprising a movable ram 70 and a head 71. It is customary that the ram 70 be raised by any suitable means, as for example a toggle, thus carrying the switch into contact with the head 71. The ram 70 includes a holder 72 provided with a slot 73 which receives the lower end of the switch casing 20. Below the slot 73 is provided a pocket 74 in which is seated a rubber pad 75 on which the casing rests. Leading through the base of the holder 72 and the pad 75 is a conduit 76 which terminates at one end below the passage 23 of the switch. Mounted in the head 71 is a punch 77 carried in the recess 78 of a holder 79 and secured in position by any suitable means, such as a set screw 80. Through the punch 77 and the holder 79 extends a central passage 81 in which is inserted a plug 82 of rubber or other dielectric material. Longitudinally through the plug 82 are two holes 83 in which are seated pins 84, provided with notches 85 which receive set screws 86 to permit a certain amount of reciprocation of the pins 84 but prevent removal of the same from the holes 83. Springs 87 in the holes 83 bear on the pins 84 and force them into the lowest position permitted by the screws 86. It will be noted from an examination of Fig. 15 that when the stop light switch is located in the die holder 72 and brought into contact with the punch 77 by raising the ram 70,

the pins 84 will contact with the binding posts 45, 46 of the switch, while the punch 77 will crimp the portions 66 of the projecting flange 65 down onto the cover 40, thus bringing the parts into their final assembled position.

For the purpose of determining the range of pressure under which the switch will operate and of detecting any defect in the switch, a pipe 90 is connected to the outer end of the conduit 76. Pressure is set up in the pipe 90 by any suitable means, and its amount is indicated by the reading of a gage 91 mounted upon the pipe. Mounted upon a sleeve 92 projecting from the pipe 90 is a master switch 93 which is set to operate at the desired pressure. One pole of a battery or other source of electrical current 95 is connected to the post 46 of the master switch by a lead 96 and to the post 46 of the switch in the press by a lead 97, a screw 98, the spring 87 and the pin 84. The other pole of the battery is connected to the post 45 of the switch in the press by a lead 99 through a bulb 100, a screw 101, the spring 87 and the pin 84 and to the post 45 of the master switch by a lead 104 which includes a bulb 105. The battery 95 is also connected to the head 71 of the press by a lead 102 joined to the lead 99 and including a bulb 103.

It will be noted from an examination of Fig. 15 that one pole of the battery is connected to the post 46 of each switch while the other pole is connected through the bulb 100 to the post 45 in the press, through the bulb 105 with the post 45 of the master switch and with the press itself through the bulb 103. Any desired amount of pressure may be introduced into the pipe 90, which pressure will be applied both to the master switch 93 and to the switch 20 in the press and cause the plates 35 in both switches 20 and 93 to rise into contact with the terminals 48 as shown in Fig. 14, thus completing the connection between the binding posts 45, 46. By reason of the electrical arrangement previously described the bulbs 100 and 105 thus will be lighted. As the operator crimps the flange 65 of the switch in the press, he simultaneously admits pressure into the pipe 90. The master switch 93 will cause the bulb 105 to be lighted when the desired amount of pressure is supplied. At the same time if the switch in the press is properly made the bulb 100 will be lighted. Thus the operator can, simultaneously with completing the switch, test its operation and make sure that it will respond to the desired pressure.

If the bulb 100 should light after the bulb 105 it is apparent that too much pressure is required to raise the plate 35 into contact with the terminals 48 or in other words that the distance between the plate 35 in its idle position and the terminals is too great. The press will accordingly be adjusted to increase the amount of crimping, thus forcing the cover 40 into the cup 22 and the ring 55 against the diaphragm 30, until the bulb 100 lights simultaneously with the bulb 105. If the bulb 100 should light before the bulb 105 the crimping is too heavy and the switch is defective. In order to avoid such a condition it is the practice to set the press at the point of minimum crimping and then increase the crimping if necessary in order to increase the responsiveness of the switch. The bulb 103 being connected to the head 71 of the press will light if the switch is in any way grounded, thus indicating a defect. For the purpose of facilitating the checking up of the electrical circuits, it has been found desirable to make the bulbs 100, 103 and 105 of different colors. Preferably the bulb 100 is green, the bulb 103 is red, and the bulb 105 is white.

The switch shown in Fig. 16 differs from that previously described solely by the manner in which the cover 40 is mounted in the casing 20. In that construction the casing 20 is provided with internal threads 110 at the mouth of the cup 22, and the outer edge of the cover 40 is externally threaded to mesh with such threads. In the construction thus described there is no difficulty in ensuring the separation of the binding posts 45, 46 from the casing, and hence it is possible to make the switch as a whole a trifle smaller in diameter. The parts are assembled in this modification in the same manner in which they are assembled in the preferred form, and the cover with its binding posts is screwed down forcing the ring 55 against the periphery of the disk 30 and seating the spring 60 in the depression 36 of the plate 35 until the desired response to pressure is attained. In this embodiment as in the other embodiment the operating pressure is determined by the distance the plate 35 must travel from its idle position to its operative position in contact with the terminals 48.

In order to insure the instantaneous operation of the switch when the brake system is actuated it must be subjected directly to the maximum braking pressure which is ordinarily in the neighborhood of 350 pounds per square inch. Moreover, in accordance with the usual practice a test pressure of 2500 pounds per square inch is applied to the whole system and hence the switch must be built to withstand such pressure as well. The switch 20 must be small and compact and yet be built strong enough to withstand such pressures without injury and be at the same time sufficiently flexible to respond to a pressure as low as 25 or 35 pounds per square inch. The advantage of such a switch has long been appreciated but the switch embodying this invention is the first to satisfy these requirements. This switch has an outside diameter of only 13/16 inches and yet, by

virtue of the construction set forth above, sufficient clearance between the binding posts has been provided, all danger of a short circuit has been avoided and the switch has stood up under pressures as high as 5000 pounds per square inch.

The plate 35 is so thin and flexible that if pressure continues after it contacts with the terminals it will bear against the under face of the cover 40 thus avoiding the danger of forcing the posts out of their proper positions in the cover. The diaphragm 30 is 45/64ths of an inch in diameter and 1/16th of an inch in thickness. The cover 40 is 1/8th of an inch thick and the ring 55 is 3/32ds of an inch thick.

I claim:

In a stop light switch including a casing having a cup, a cover for closing said cup, binding posts carried by said cover, and a flange at the mouth of said cup only that portion of said flange between said posts being crimped over said cover to secure it in said cup.

Signed by me at Buffalo, New York, this 15th day of December, 1927.

JOHN WILLIAM WHITE.