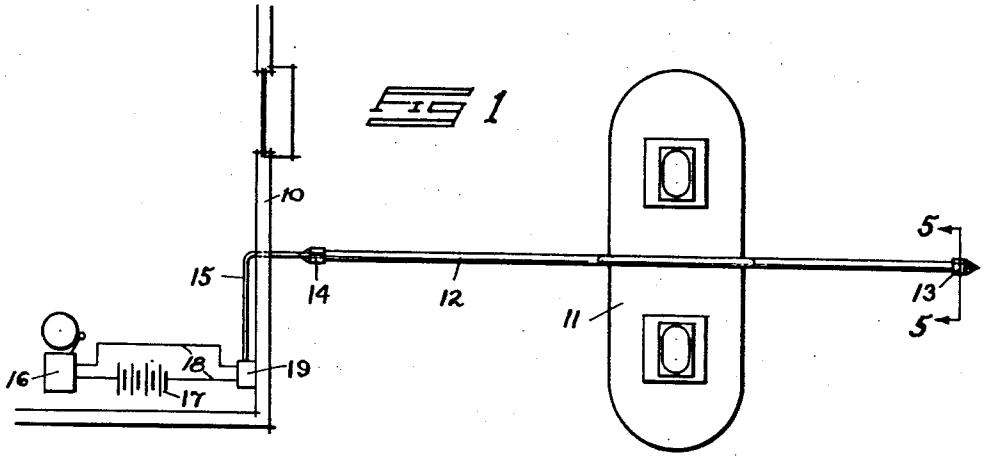
March 18, 1941. J. T. STUBBINS 2,235,123

SIGNAL SYSTEM

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FIG 1



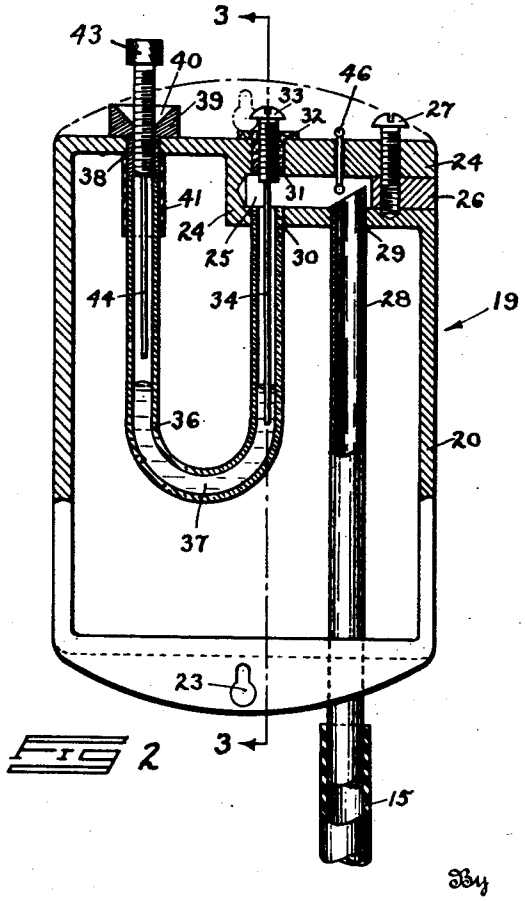


FIG 2

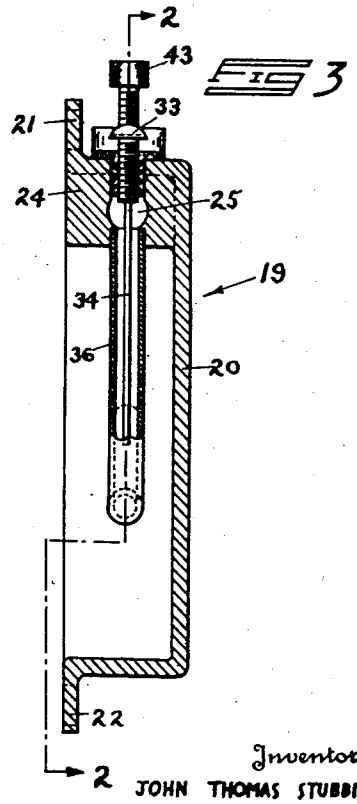


FIG 3

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By Francis J. Klempay

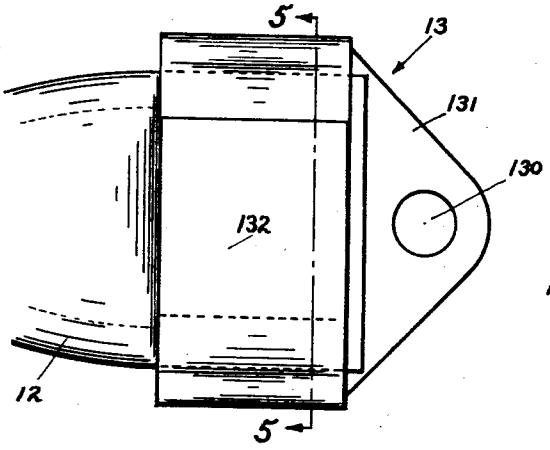
Attorney

March 18, 1941. J. T. STUBBINS 2,235,123

SIGNAL SYSTEM

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Fig 4



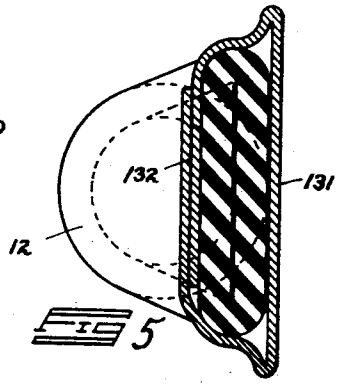


Fig 5

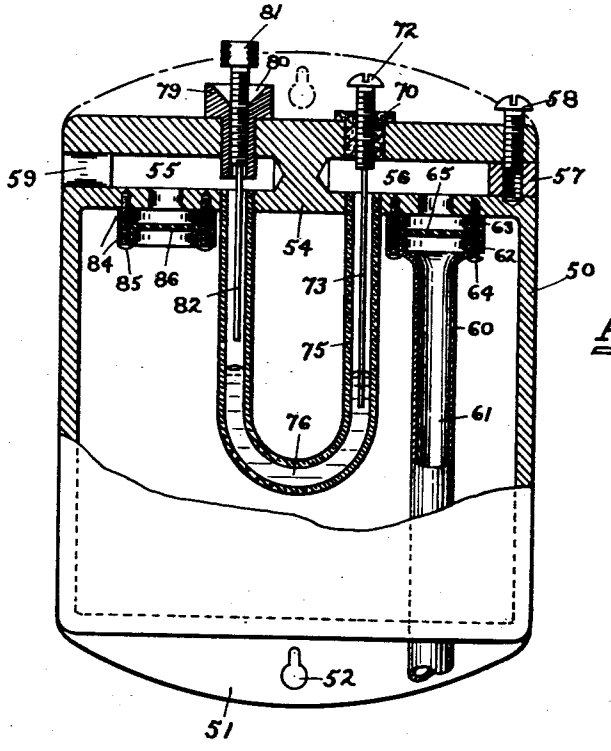


Fig 6

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Patented Mar. 18, 1941 2,235,123

UNITED STATES PATENT OFFICE

2,235,123

SIGNAL SYSTEM

John Thomas Stubbins, Youngstown, Ohio

Application April 28, 1938, Serial No. 204,795

11 Claims. (Cl. 200—81)

This invention relates to a signal system and more particularly to an improved fluid pressure or impulse operated switch for the momentary closing of the energizing circuit of a signal device and to features of construction of the fluid pressure or impulse generating tube for actuating the switch.

The primary object of the invention is the provision of a rugged and durable switch unit which may be readily and economically manufactured and which is easily maintainable in serviceable condition by an attendant not particularly skilled in such tasks. Although the unit is particularly useful in signal installations in gasoline filling stations to signal the approach of vehicles to the dispensing apparatus, it should be understood that it may be employed for other uses to which it may be applicable. The invention resides in the various features of design and arrangement of the elements constituting the switch and has for its further object the provision of such design and arrangement that all the elements may be mounted on a single stamped or cast casing with means to protect breakable elements, to expose adjusting and servicing elements enabling manual engagement thereof, and to removably support the assembly on a wall or other suitable place.

A further object of the invention is to provide an improved construction for a fluid pressure impulse operated mercury switch in which the air in the chamber containing the mercury is sealed against the admission of moisture or foreign matter which would tend to disrupt the sensitive operation of the switch.

Another object of the invention is the provision of improved means to close and secure the free end of a collapsible tube when it is desired to employ the tube as a generator for the fluid impulses required for actuating the switch.

These and other objects and advantages of the invention will become apparent from a consideration of the drawings and the following detailed specification.

In the drawings:

Figure 1 is a plan view of a signal installation, embodying my invention, as applied to a gasoline filling station;

Figure 2 is an elevational view, partly in section, showing a preferred form of switch embodying the principles of my invention;

Figure 3 is a sectional view of the apparatus of Figure 2 taken along the line 3—3 of Figure 2;

Figures 4 and 5 are plan and sectional views, respectively, of the means for sealing and securing the end of the pulsator tube; and

Figure 6 is a part sectional view of a modified form of switch embodying the principles of the invention.

Figure 1 illustrates a representative installation of the signal system of this invention in which the pulsator 12 is extended across the inner driveway between the building 10 and the pump island 11, over the pump island, and onto the driveway beyond the island. The tube is secured at its ends to the roadway by the cleats 13 and 14, cleat 13 being shown in detail in Figures 4 and 5 and cleat 14 being of similar construction but not swaged down sufficiently to collapse the tube. The switch proper 19 is mounted within the building 10, preferably on an outer wall thereof and is connected with the pulsator tube 12 by a smaller tube 15, a suitable reducer being positioned in the end of tube 12 to make the connection. As shown schematically in Figure 1 the switch 19 controls the closing of the circuit-power source 17, switch 19, conductor 18, bell or other signal device 16 and battery 17 and the operation is such that closing of the contacts of the switch 19 energizes the bell or other signal device.

The switch of my invention consists generally of a casing 20, a lead-in tube 28, a U-tube 36 partially filled with mercury and contacts 34 and 44. Casing 20 is of box-like character and has an open back and upper and lower flanges 21 and 22, respectively, in the plane of the back. Each of the flanges 21 and 22 is provided with a key-hole slot 23 for engagement with a headed nail or screw fixed into the wall of the building to support the switch and allow ready removal thereof for a purpose to be later described. Casing 20 is preferably cast and in the process an extra amount of material 24 is allowed to remain in one corner thereof so as to provide the solid portion 24. To provide a duct through a part of the portion 24, a bore 25 is drilled into the portion 24 from the side of the casing, which bore is subsequently sealed by a plug 26 held in place by the screw 27. The lower wall of the casing 20 and the lower wall of the bore 25 are provided with aligned apertures for the reception of the lead-in tube 28 and if considered desirable the upper end of tube 28 may be cemented or soldered in the upper aperture 29.

Aligned apertures 31 and 30 are provided in the upper and lower walls, respectively, of the bore 25 at a location spaced from the tube 28 and another aperture 38 is drilled in the upper

wall of casing 20 at a point spaced from the heavied portion 24. Fitting tightly into the aperture 38 is the reduced portion of the member 39 which is of substantial diameter at its top, is provided with a threaded bore, and has a conical shaped depression 40 in its upper surface surrounding the upper end of the bore. U-shaped tube 36, preferably of glass, has one of its ends cemented into the aperture 30 and its other end abutted against the lower end of member 39. As shown the reduced portion of member 39 and the tube 36 have substantially equal external diameters and to hold the tube against the member a sleeve 41, preferably of rubber, overlaps the ends of the tube and member.

An insulating bushing 32, preferably of hard fibre, is fitted into the aperture 31 and into this bushing is threaded the screw 33 which carries at its lower end the contact pin 34 extending down into the straight leg portion of the mercury tube 36. A screw 43 carrying contact pin 44 is screw threaded into member 39 and the pin extends down into the other straight leg portion of the tube 36. A quantity of mercury 37 is placed in the tube 36 and this quantity and the position of the lower end of pin 44 are so regulated that with the casing vertically aligned the upper surface of the mercury in the adjacent leg will be normally just short of the lower end of the pin. Pin 34, however, is of sufficient length that it will be in engagement with the mercury substantially at all times. Due to the insulation 32 the screw 33 will be insulated from the pin 44 and consequently the casing unless the mercury 37 contacts the pin 44. Screws 27 and 33 are therefore conveniently utilized as the terminals of the switch for connection with the leads 18 to the battery or power source and the signal device.

In operation, an impulse of air or other fluid coming into the bore 25 through tubes 28 and 15 from the pulsator tube 12, as when tube 12 is collapsed by the wheel of a vehicle, will force the mercury around the bend of the U-tube and into engagement with pin 44. A circuit will then be established between the terminals 27 and 33 and the signal device will be energized. To limit the length of such energization a small aperture is provided in the upper wall of bore 25 and into this aperture is placed the member 46 which consists of a smaller diametered wire having a ball or bend at each end, one above the upper surface of the casings top wall and the other within the bore. In case compression of the fluid is sustained by the continued depression of the pulsator tube, the pressure will be released by the escape of fluid between the walls of the aperture and the wire of member 46 and the contact between mercury 37 and pin 44 will be maintained but momentarily. The balls or bends on the ends of the wire maintain the wire in position and provide a means to grip the wire to move the same and loosen any duct or foreign matter which tends to close the aperture. After the parts are assembled the entire casing is then preferably filled with tar, pitch or other suitable cementitious material (not shown) to securely hold the tubes 28 and 36 in position and to prevent any tampering with or breakage of the tube 36.

It should be observed that the unit described above is simple, rugged and well suited for the purpose for which it is intended. In its manufacture it is only necessary to provide the casting and subject this casting to but a few simple drilling operations. No elaborate machine work or other complicated processes are required. The ports required are simple, readily procurable and the assembled unit as a whole may be provided at low cost.

During the operation of mercury switches, the mercury combines with the metal of the contacts and after a time an appreciable amount of the amalgam collects on the surface of the mercury to which is added other impurities which come into the tube. This seriously interferes with the proper operation of the switch and must be removed from time to time. In the servicing of the switch of this invention it is only necessary to remove screw 43, unhook the casing 19 from the wall, and tilt the same to allow the fouled mercury to flow out. The impurities may then be separated or a new supply of mercury poured into the tube, the conical upper surface of the member 39 serving as a funnel for this purpose. Such servicing may be accomplished without disturbing any connections as the flexibility of tube 15 enables the casing to be tilted for the purpose. Contacts 34 and 44 which deteriorate fairly rapidly may be readily replaced simply by unscrewing members 33 and 43 which carry the contacts and replacing them with new ones. By furnishing a quantity of mercury and new contacts along with the unit the unit may readily be maintained in serviceable condition by anyone capable of following simple directions. The structural features of the switch unit enables this to be accomplished.

Referring particularly to Figures 4 and 5, the cleat 13 used to secure and close the outer end of the pulsator tube 12 consists essentially of a unitary plate member having a flat portion 131 adapted to engage the surface of the roadway and a pair of integral lugs 132 adapted to be bent over the tube toward each other and to be swaged down tightly. The metal of the cleat is of sufficient gauge to hold the end of the tube closed so that this end of the tube will be air tight. Flat portion 131 extends beyond the end of the tube and is provided with an aperture 130 to receive means for securing the same to the surface of a roadway.

Figure 6 illustrates a modified form of switch unit in which the chamber containing the mercury is effectively sealed against the admission of outside air and impurities and in which the oscillation of the mercury in the tube is dampened whereby recurrent contacting of the switch points is prevented and the life of the unit is increased. The casing 50, having flanges 51 with key hole slots 52, is generally similar to the casing 20 of the first form described but in this modification the block of material 54 extends entirely across the upper end of the casing. Block 54 is drilled from both sides of the casing to provide the bores 55 and 56, the bore 55 being sealed by a driven plug 59 and the bore 56 by the plug 57 conveniently held in place by the terminal screw 58. Aligned apertures are drilled in the top and bottom wall of each of the bores and the two lower of these apertures are adapted to receive the ends of the U-tube 75. The aperture in the upper wall of bore 56 receives the hard fibre sleeve 70 in which is threaded the screw 72 carrying conductor pin 73 which extends down into the mercury 76 in the tube 75. The aperture in the upper wall of the bore 55 receives the member 79 having a screw threaded bore extending therethrough and a conical shaped depression 80 in its upper surface. Screw threaded

in the member 70 is the adjusting screw 81 which carries at its lower end the contacting pin 82 extending downwardly into the tube 75.

A lead-in conduit 61 extends upwardly through an aperture in the lower wall of the casing and is provided with a flanged upper end 62. Flange 62 is clamped to the lower surface of block 54 by the screws 64 with a flexible diaphragm 65 and a spacing collar 63 positioned between the flange and the surface. As shown, an aperture provides communication between the upper side of the diaphragm 65 and the bore 56. A similar diaphragm 86 is mounted adjacent the bottom wall of the bore 55, the collars 84 and screws 85 serving to space and clamp the diaphragm 86. The space immediately above the diaphragm 86 communicates with the bore 55 by a suitable aperture.

With the parts assembled as shown in Figure 6, an impulse of air or other fluid coming through tube 61 will react on the diaphragm 65 distending the same upwardly and transmitting the impulse to the air within the bore 56 and the adjacent leg of the tube 75. This forces the mercury 76 around the bend of the tube and into contact with the pin 82, the diaphragm 86 distending downwardly to relieve the pressure in bore 55. Upon release of pressure on the under side of diaphragm 65 either by loss through aperture 60 in tube 61 or by return of the pulsator tube to its original shape, the pressures in bores 55 and 56 will equalize and the mercury will return to its normal position as shown. The diaphragms cushion the impulses and prevent undue displacement of the mercury thereby preventing the surging or excessive oscillation of the same. In normal use, as when a vehicle wheel runs over the pulsator tube, the contact will be made but once. By sealing the mercury chamber in the manner above described, foreign matter and moisture are prevented from entering the same and consequently the switch is not so apt to develop trouble and it will have a longer life.

Conductors connecting the energy source and the signal device are connected with the screws 58 and 72 and as in the switch first described the conducting pins 73 and 82 are readily replaceable and the unit is otherwise readily serviced in a simple manner and without the aid of any special tools.

The above specifically described embodiments of my invention should be considered as illustrative only as obviously many changes may be made therein without departing from the spirit of my invention, the extent of which is indicated by the appended claims.

I claim:

1. A circuit closing device comprising a casing having side walls, top and bottom walls, and a front wall, one of said walls being of increased thickness within said casing and being provided with a bore, a tube extending through an aperture in another of said walls and communicating with said bore, aligned apertures in opposing walls of said bore, a U-tube having one leg thereof received within one of said apertures, an insulating sleeve in the other of said apertures, a screw threaded into said sleeve, a current conducting pin carried with said screw and extending downwardly into said leg of the U-tube, a quantity of mercury in said U-tube, and means in the other leg of the U-tube adapted to be contacted by said mercury upon movement thereof.

2. A casing for a fluid pressure responsive circuit closing device comprising a unitary member having side walls, top and bottom walls, and a front wall, one of said walls being of increased thickness within the casing and being provided with a bore for the passage of fluid under pressure, an aperture in a side wall of said bore, an aperture in another wall of said casing aligned with said first mentioned aperture whereby a tube may be extended from outside said casing to within said bore, and means on said casing to releasably support the same.

3. A circuit closing device comprising a unitary casing having an integral block beneath a portion of its top wall, a horizontally extending bore in said block, means to conduct fluid under pressure to said bore, vertically aligned apertures in the top and bottom walls of said bore, an aperture in said top wall at a point spaced from said block, an internally bored and threaded member extending through said last mentioned aperture and being provided above said wall with an enlarged portion having a conical-shaped depression in its upper surface, a U-shaped tube having one of its ends positioned in the aperture in the bottom wall of said bore and its other end abutting the bottom surface of said member, a sleeve overlapping the bottom portion of said member and the adjacent upper portion of said tube, an insulating bushing in the aperture in the top wall of said bore, a screw threaded into said bushing and carrying at its lower end a pin extending into said U-tube, a second screw threaded into said member and carrying at its lower end a second pin extending into said U-tube, and a quantity of mercury in said U-tube.

4. A circuit closing device comprising a unitary casing having a hollow block integral therewith, aligned apertures in the top and bottom walls of said block, a U-tube having one of its ends positioned in the lower of said apertures, an insulating bushing in the other of said apertures, a current conducting member held by said insulating bushing and extending downwardly into said tube, means to conduct fluid under pressure to the space within said block, a quantity of mercury within said tube, and means extending into said tube from the other end thereof adapted to be contacted by said mercury upon movement thereof.

5. A circuit closing device for a signaling system of the kind employing a pulsator tube and a fluid connection between said tube and device comprising a pressure chamber in communication with said fluid connection, a pair of switch contacts, means responsive to the pressure within said chamber to close said contacts, an aperture in the wall of said chamber, a member having less cross-sectional area than said aperture extending through said aperture, and means connected with said member beyond each end of said aperture to normally prevent removal of said member.

6. A circuit closing device comprising a duct sealed at either end by a distensible diaphragm, means to conduct fluid under pressure to the outer side of one of said diaphragms, the outer side of the other of said diaphragms being open to the atmosphere and means within said duct responsive to movement of the fluid within said duct in a direction away from said first specifically mentioned diaphragm to close a circuit.

7. A circuit closing device comprising a duct sealed at either end by a distensible diaphragm, means to conduct fluid under pressure to the out-

ter side of one of said diaphragms, the outer side of the other of said diaphragms being open to the atmosphere, a fixed contact within said duct, and a body of mercury within said duct movable into engagement with said fixed contact by the pressure within that portion of said duct adjacent the said one of said diaphragms generated by inward movement of said diaphragm.

8. A circuit closing device comprising a duct closed at either end by a distensible diaphragm, means to conduct fluid under pressure to the outer side of one of said diaphragms, the outer side of the other of said diaphragms being open to the atmosphere, and means within said duct responsive to the inward movement of said pressure actuated diaphragm to close a circuit.

9. A circuit closing device comprising a unitary casing having spaced apertures in its top wall, a U-shaped tube having its ends aligned with said apertures, a quantity of mercury in said tube, means to conduct an impulse of fluid under pressure to one of the legs of said tube, an elongated means extending through said apertures and into the legs of said tube to contact said mercury, the two elongated means being insulated from each other.

10. A circuit closing device comprising a duct sealed at either end by a distensible diaphragm, means to conduct fluid under pressure to the outer side of one of said diaphragms, the outer side of the other of said diaphragms being open to the atmosphere, said duct including a U-shaped portion intermediate said diaphragms, a quantity of current conducting fluid in said portion, means to conduct current to said quantity of fluid, and means in said duct to conduct current from said quantity of fluid upon the application of pressure to one of said diaphragms.

11. A circuit closing device for a signaling system having a condition responsive fluid pressure generating means comprising a casing adapted to be detachably connected to a wall or other suitable support, said casing being provided with a portion projecting outwardly from said wall or support, a U tube mounted on said portion, a body of mercury and switch contacts in said tube, means to connect one leg of said tube with said fluid pressure generating means, said casing comprising a unitary cup-shaped member having flanges in the plane of its open end for engagement with the wall or support, the U tube being housed within the cup.

JOHN THOMAS STUBBINS.