July 17, 1962 S. SPEROWITZ 3,045,084

FLOAT SWITCH

Filed Sept. 22, 1959

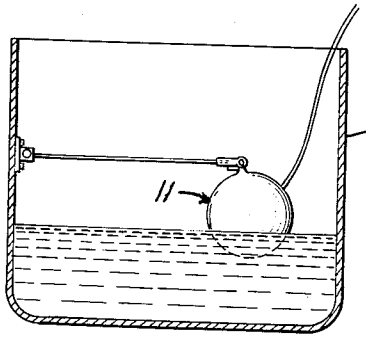


FIG. 1

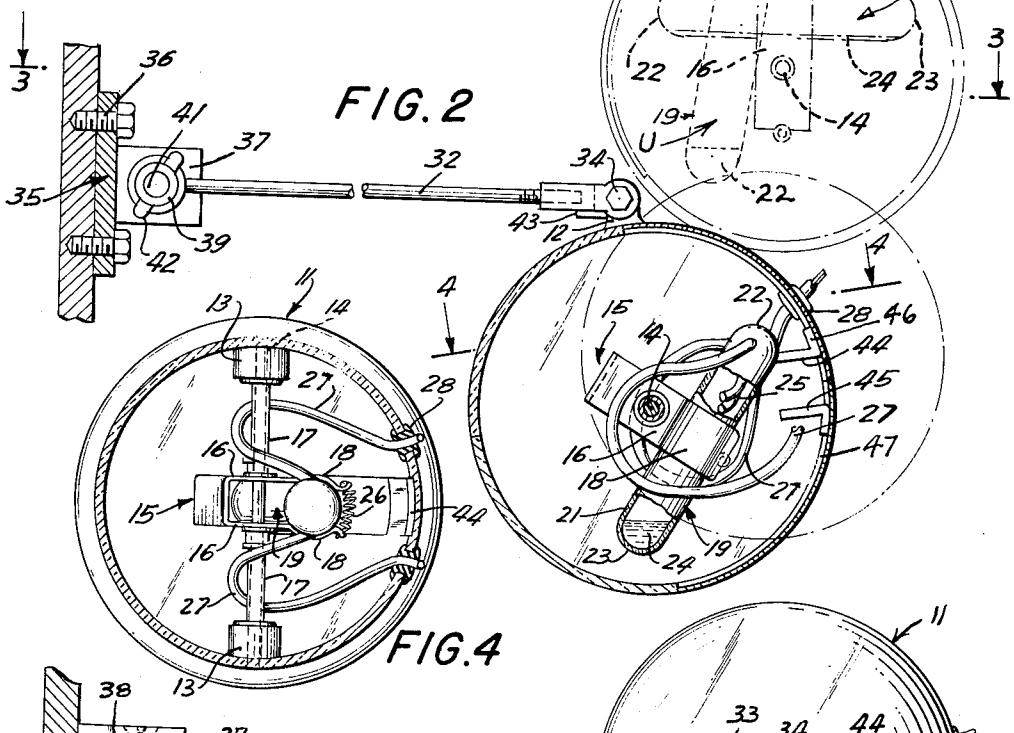


FIG. 2

FIG. 4

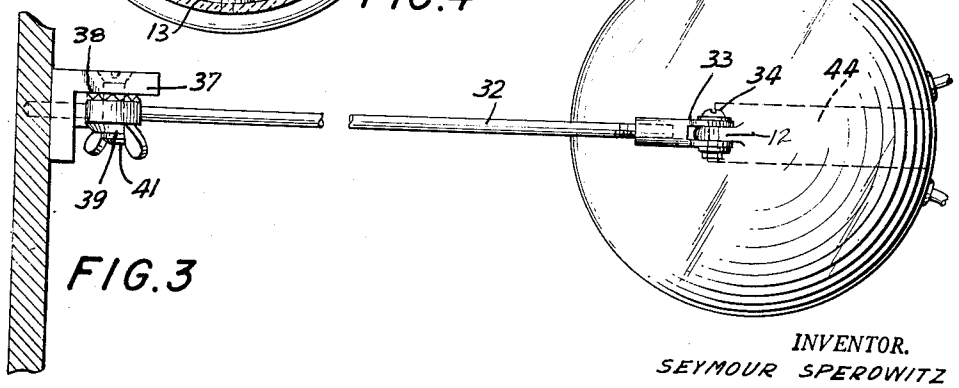


FIG. 3

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United States Patent Office 3,045,084 Patented July 17, 1962

3,045,084

FLOAT SWITCH

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Filed Sept. 22, 1959, Ser. No. 841,582
7 Claims. (Cl. 200—84)

This invention relates to the art of float switches, more particularly of the hermetically sealed type.

It is among the objects of the invention to provide a hermetically sealed float switch which may control the level of any type of liquid even if highly inflammable, which has relatively few simple parts that may readily be assembled at low cost, which is dependable in operation to retain the level of the liquid between predetermined limits and the control elements of which are isolated from the liquid medium so that their control functions will not be damped even when used in conjunction with a highly viscous liquid.

According to the invention, these objects are accomplished by the arrangement and combination of elements hereinafter described and more particularly recited in the claims.

In the accompanying drawings, in which is shown one of various possible embodiments of the several features of the invention,

FIG. 1 is a view illustrating the general location of the float switch,

FIG. 2 is a side elevational view of the float switch partly in cross section,

FIG. 3 is a top plan view of the float switch, and

FIG. 4 is a sectional view taken along line 4—4 of FIG. 2.

Referring now to the drawings, the float switch comprises a hollow lightweight ball 11, which preferably is of rigid plastic and which has a lug 12 projecting from the outer surface thereof, said ball desirably being formed from two hemispherical sections to facilitate assembly and adjustment of the mechanism contained therein.

Journalled in suitable bearing bores in blocks 13 extending radially inward from diametrically opposed sides of the ball 11 is a rod 14, the lug 12 projecting from the outer surface of the ball 11 along a line extending perpendicular to the center of said rod.

Rotatably mounted on rod 14 is a U-shaped clamp member 15, the parallel legs 16 of which have transversely aligned openings between the ends thereof through which rod 14 extends.

As is clearly shown in FIG. 4, the clamp member 15 is centrally located on the rod 14 by means of sleeves 17 encompassing the rod on each side of the clamp member 15.

The free ends of the legs 16 of clamp member 15 are curved as at 18 to receive a mercury switch 19 of conventional type. This switch 19 comprises a hollow cylindrical tube 21 closed at both of its ends 22, 23. The tube 21 is of insulating material such as glass, and contains a quantity of mercury 24, and the end 22 of the tube 21 has a pair of spaced contacts 25 positioned therein.

The tube 21 is positioned between the curved leg portions 18 so as to extend at right angles thereto and is clamped in position as by a coil spring 26, secured at its ends to the ends of the legs 16 to urge them together, said legs clamping the tube 21 at substantially the mid portion thereof.

Suitable insulated leads 27 are connected to the spaced contacts 25 and extend through openings 28 in the ball, suitable insulating material being provided around the openings 28 to make a liquid-tight seal.

The ball 11 is mounted for pivotal movement in a

tank 31, for example. To this end, as shown in FIGS. 2 and 3, a rod 32 is provided which has a yoke 33 at one end, the legs of which straddle the lug 12 and are pivotally secured thereto as at 34.

The other end of the rod 32 may be secured in any suitable manner to the wall of tank 31 so as to extend outwardly therefrom. To this end a bracket 35 is secured to the wall of the tank 31, as by screws 36. The bracket has a vertical plate 37 with a toothed surface 38 which is engaged by the correspondingly toothed surface of a disc 39 extending in a vertical plane and secured to the end of rod 32. By means of a bolt 41 extending through plate 37 and disc 39, the disc 39 may be locked in any desired position with respect to plate 37 by tightening a nut 42 mounted on the bolt 41.

In the operation of the unit it is positioned, for example, in the tank 31 in the position shown in FIG. 2, the yoke 33 having a projection 43 which engages lug 12 so that a line extending diametrically through the ball 11 from the pivot 34 will form a small angle with respect to a line extending vertically downward from said pivot 34. This ensures that the ball 11 will pivot in a counter-clockwise direction about its pivot 34 when the level of the liquid in the tank 31 rises.

With the ball thus positioned, with the mass of mercury 24 at the end 23 of tube 21, due to the weight of the mercury and the fact that the pivotal axis 14 of the tube is laterally displaced from the longitudinal axis of the tube 21, the tube 21 will be inclined from the vertical with the contacts 25 open.

As the level of liquid in the tank rises, the ball 11 will start to pivot in a counter-clockwise direction. Since the tube 21 is idly mounted on rod 14, it would tend to maintain the position shown in FIG. 2, i.e., inclined from vertical. However, a pair of spaced abutment members 44 and 45 is provided in the ball extending radially inward therefrom. The bases 46 of the abutment members are secured by force fit in a circumferential groove 47 in the ball 11 so that the position of the abutment members may be adjusted. The abutment member 44 is designed to engage the end 22 of the tube to cause the latter to move with the ball 11 as the latter pivots in a counter-clockwise direction.

When the liquid level has risen sufficiently so that the tube is in substantially horizontal position shown at H in FIG. 2, any slight further rise in the liquid level will cause the tube to move slightly past horizontal position so that the mass of mercury will roll down the tube toward the end 22 thereof. As a result of the weight of the mass of mercury, the tube 21 will quickly rotate to the position shown at U in FIG. 2, the rotating movement of the tube being limited by the abutment member 45 which is engaged by end 23 of the tube.

With the mercury at the end 22 of tube 21, a circuit will be completed across contacts 25 to energize a pump (not shown) to which leads 27 are connected. As a result, liquid will now be drawn from the tank 31 and the level of the liquid will drop.

As this occurs, the ball 11 will now rotate in a clockwise direction about pivot 34 and as the abutment member 45 is now engaging the end 23 of tube 21, the latter will move with the ball until it is in horizontal position. With slight further fall in the liquid level, the tube will move slightly past horizontal position so that the mass of mercury will roll down the tube toward the end 23 thereof away from the contacts 25 to open the circuit to the pump.

As a result of the weight of the mass of mercury, the tube 21 will quickly rotate in a clockwise direction, its movement being limited by the abutment member 44 which is engaged by the end 22 of the tube.

From the foregoing it is apparent that by mounting the abutments 44 and 45 so that the spacing therebetween can be adjusted, the amount of pivotal movement of tube 21 can be set as desired so that the amount of movement of the tube on each side of horizontal may be set as desired. Thus, if only slight movement is permitted, slight change in the liquid level will cause action of the pump, and vice versa.

With the construction above described, it is apparent that once the unit has started its control cycle and the contacts **25** have closed at a predetermined upper level of liquid in the tank when the tube has moved slightly past horizontal position the contacts will remain closed until the liquid level has fallen to a predetermined lower level when the tube again attains such substantially horizontal position.

As the operating elements of the float switch are contained in the ball **11**, even if the liquid in the tank is very viscous, movement of the control elements will not be affected so that the level of the liquid may be dependably controlled.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A float switch comprising a hollow ball, a lug extending outwardly from said ball pivotally to mount the latter, a tubular switch element in said ball, means pivotally mounting said switch element on an axis extending parallel to the pivotal mount of said hollow ball, contact means at one end of said switch element, means movable along the length of the switch element to effect closure of said contact means when at the associated end of the switch, and abutment means in the ball to limit the pivotal movement of said switch element about its axis.

2. A float switch comprising a hollow ball, means pivotally to mount said hollow ball, a tubular switch element in said ball, a rod extending diametrically across said ball, a supporting member rotatably mounted on said rod and extending away therefrom at right angles thereto, means to secure said tubular switch element to the extending end of said supporting member to extend at right angles to said rod, said rod extending parallel to the pivotal mount of said hollow ball, whereby said switch element is pivotally mounted on an axis extending parallel to the pivotal mount of said hollow ball, said tubular switch element having contact means at one end thereof, means movable along the length of the switch element to effect closure of said contact means when at the associated end of the switch element, and an abutment means in the ball to limit the pivotal movement of said switch element about its axis.

3. A float switch comprising a hollow container, means pivotally to mount said container, a tubular switch element in said container, means pivotally mounting said switch element on an axis extending parallel to the pivotal mount of said hollow container, contact means at one end of said switch element, means movable along the length of the switch element to effect closure of said contact means when at the associated end of the switch element, and a pair of abutments coacting respectively with the ends of said tubular switch elements to limit the pivotal movement of said switch element about its axis, said abutments being positioned in the container.

4. The combination set forth in claim 2 in which said abutment means comprises a pair of abutment surfaces extending inwardly from the wall of said ball along a line aligned with the longitudinal axis of said tubular switch element, said abutment surfaces coacting respectively with the ends of said switch element.

5. The combination set forth in claim 1 in which a supporting rod is provided and means are provided pivotally to connect one end of said supporting rod to said lug.

6. The combination set forth in claim 2 in which said supporting member is substantially U-shaped, having a pair of parallel legs, said rod extending transversely through said legs between the ends thereof, and said tubular switch element is positioned between the free ends of said legs.

7. The combination set forth in claim 3 in which means are provided to adjust the spacing between said abutments.

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