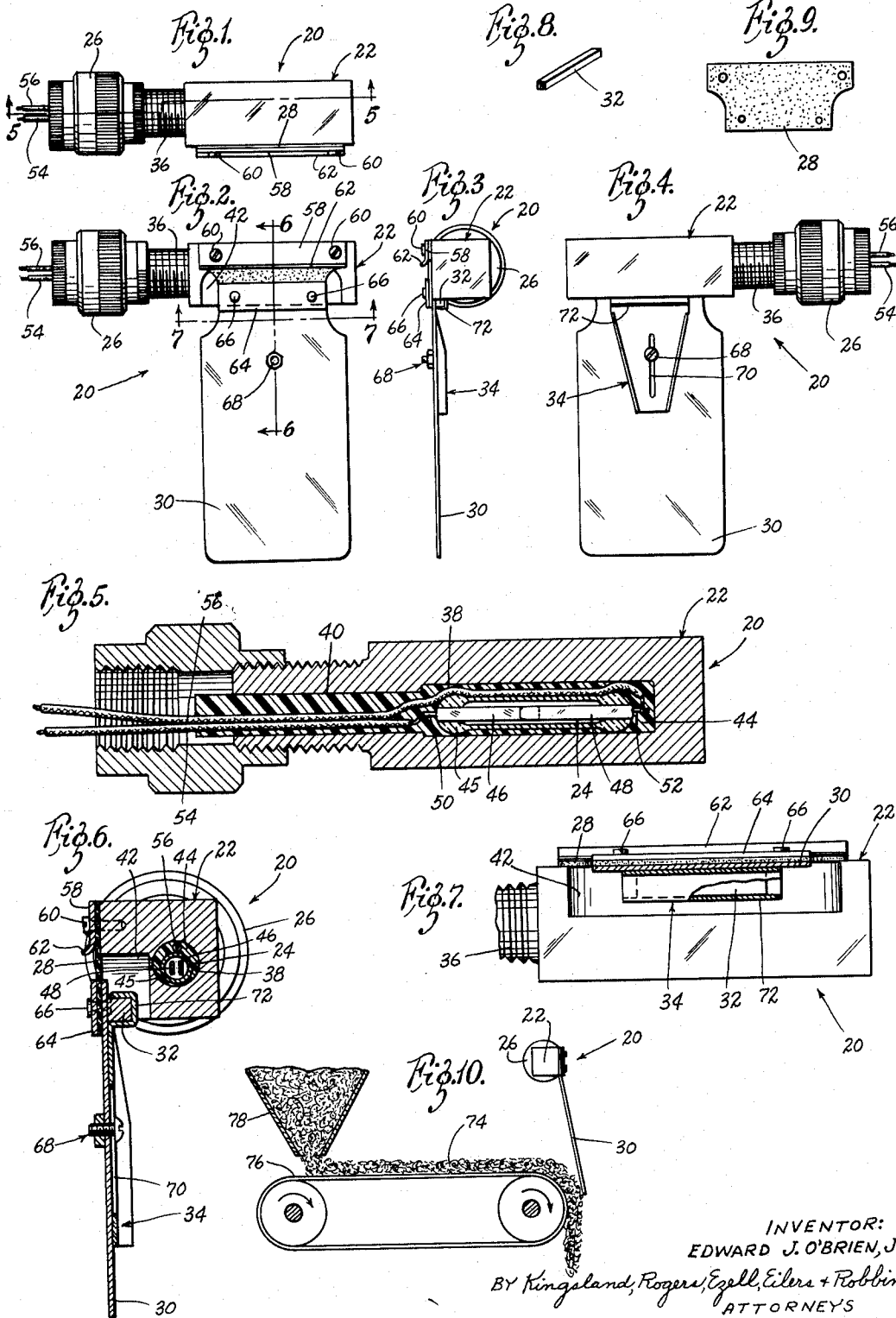


July 12, 1966

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MAGNETIC FLOW SWITCH

3,260,820

Filed Sept. 8, 1964



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3,260,820

MAGNETIC FLOW SWITCH

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Filed Sept. 8, 1964, Ser. No. 394,940

3 Claims. (Cl. 200—87)

The present invention relates generally to flow switches, and more particularly to a novel, explosion-proof flow switch adapted for use with a wide range of dry and fluid materials or substances.

There has long existed the need of a sensitive, long-lived explosion-proof flow switch which is adapted for use with both dry materials and fluids. Heretofore, many structures have been devised for specific use with a particular material, but in the applicant's experience, wider adaptation of such switches is not feasible. Additionally, any flow switches available through patent disclosures or on the market are expensive to construct because of complexity of structure. More important, they are not suitable for operation in dust-filled atmospheres, dust having a tendency to choke the bearings. In the explosion-proof flow switch field, commercially acceptable devices are few in number.

Therefore, an object of the present invention is to provide a novel explosion-proof flow switch which satisfies the long-felt above-noted need.

In brief, the present novel explosion-proof flow switch includes a casing in which is sealed a magnetic reed switch. Hingedly suspended from the casing is a paddle which is engaged by flowing material or substances. A permanent magnet is mounted adjacent the hinge for movement toward and away from the casing and enclosed magnetic reed switch for actuation of the latter by the former. Electrical wiring is provided for the switch and adjustable mounting structure is provided for the casing and supported parts.

Therefore, another object is to provide a novel explosion-proof flow switch which is of simple construction, yet is highly effective in responding to a predetermined efficiency in the flow of material with which the switch is associated.

Other objects are to provide a novel explosion-proof flow switch which is operationally sensitive, which will continue to operate over a long period of time with substantially no maintenance, which is adjustable in respect to the relationship of the paddle and the opening and closing of the reed switch, which is adjustable in respect to positioning of the flow switch in respect to material with which it is used, which protects the contacts of the reed switch from all dust, which separates the electrical switch one hundred percent from the area of the material thereby avoiding all possibility of explosions caused by sparking of the contact points, and which otherwise fulfills the objects and advantages sought therefor.

The foregoing and other objects and advantages are apparent from the following description taken with the accompanying drawings, in which:

FIGURE 1 is a top plan view of an explosion-proof flow switch incorporating the principles of the present invention;

FIGURE 2 is a side elevational view thereof, looking upward in FIGURE 1;

FIGURE 3 is an end elevational view thereof, looking from right to left in FIGURE 1;

FIGURE 4 is a side elevational view thereof, looking downward in FIGURE 1;

FIGURE 5 is an enlarged vertical longitudinal cross-sectional view taken on substantially the line 5—5 of FIGURE 1;

FIGURE 6 is an enlarged vertical longitudinal cross-

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sectional view taken on substantially the line 6—6 of FIGURE 2;

FIGURE 7 is an enlarged horizontal cross-sectional view taken on substantially the line 7—7 of FIGURE 2;

FIGURE 8 is an isometric view of a permanent magnet forming part of the present switch;

FIGURE 9 is a plan view of the hinge element; and

FIGURE 10 is a diagrammatic view showing the present novel switch operatively installed in connection with flowing solid materials.

Referring to the drawings more particularly by reference numerals, 20 indicates generally an explosion-proof flow switch made in accordance with the teachings of the present invention. Broadly, the flow switch 20 includes a casing 22, a magnetic reed switch 24 sealed or potted therein, a union fitting or mounting coupling 26, a hinge member 28, a paddle 30, a permanent magnet 32, and a magnet holder or support 34 adjustably mounted on said paddle 30.

The casing 22 may be of the configuration clearly shown in the drawings and includes a threaded annular extension 36, a chamber 38 opening to the outside through a bore 40 in the extension 36, and a cutout 42. The magnetic reed switch 24 is disposed in the chamber 38 and is sealed or potted against entry of fluids and solids by any suitable material 44. The switch 24 is of any manufacture and of any selected type, and includes a glass casing 45 normally closed, switch blades 46 and 48 mounted therein and terminals 50 and 52 extending through the glass casing 45 in sealed relation (FIG. 5). The size of the switch 24 depends on the particular installation. Suitable wires 54 and 56 lead to the terminals 50 and 52, respectively, through the coupling 26 which is threaded onto the extension 36 and is internally threaded to adjustably receive a mounting post, or the like, not shown.

The hinge member 28 is secured to one side of the casing 22 from which the cutout 42 is formed by means of an aluminum strip plate 58 and stainless steel screws 60 (FIGS. 2 and 6). The lower edge of the strip plate 58 is turned out at 62 to permit the hinge member 28 to move back and forth without a sharp bend effect. The hinge member 28 may be of neoprene with a nylon insert, an explosion-proof composite structure having long flexing life. It is clear that this hinge member 28 overcomes the dust clogging problem long existing with bearings and the like where the flowing material is grain and the like.

The paddle 30, which may be of aluminum as is the casing 22 and coupling 26, is secured to the hinge member 28 by an aluminum strip plate 64 and aluminum brads or screw 66. The magnet holder 34, which is of aluminum and of the configuration clearly illustrated, is removably mounted on the paddle 30 by an aluminum nut and bolt assembly 68. The magnet holder 34 is vertically and pivotally adjustable about the nut and bolt assembly 68 to position the magnet 32, the former adjustment by means of a slot 70 in the holder 34. This adjustment allows for close tuning of sensitivity. Adjustment of the magnet in this manner can change the set point and also the span of the instrument. The holder 34 has a channel 72 formed at the top which receives the permanent magnet 32, which may be an alnico bar, in clamping engagement against the face of the paddle 30 (FIG. 6). The paddle 30 and magnet holder 34 may take other desired forms.

It will be understood that the flux from the permanent magnet 32 is effective to close and hold closed the switch blades 46 and 48 of the magnetic reed switch 24 in the well known manner thereof when the magnet 32 is in a predetermined position in relation to the switch blades 46 and 48, here illustrated as substantially vertical or depending. Upon movement of the magnet 32 out of

switch blades 46 and 48 closing range, as by flowing material, the latter open under predetermined bias.

In FIGURE 10, the flow switch 20 is shown diagrammatically in respect to a flow of dry solid material 74, as grain, on a belt 76 fed from a hopper 78. Should the hopper 78 clog and material 74 fail to feed onto the belt 76, the paddle 30 will move by gravity towards a vertical position. Assuming the switch blades 46 and 48 as opened with the paddle 30 in the position of FIGURE 10, they will close as the paddle 30, due to failure of material 74, reaches some selected position between that of FIGURE 10 and a vertical position to shut off machinery feeding and packaging or otherwise handling the material 74. The permanent magnet 32 pivots or swings with the paddle 30. This relationship of closed-opened switch blades 46 and 48 can be reversed in respect to the positions of the paddle 30, if desired. As indicated, the several parts, except the switch blades 46 and 48, are of aluminum or other suitable, substantially nonmagnetic material.

It will be noted that the paddle 30 is hinged to swing out with material flow even to a horizontal position, which protects the switch 20 against damage from overflowing material.

Two or more paddles 30 in side by side relation may be employed as parts of a switch 20. Such structure remains operative should one paddle 30 become lodged in raised position from some cause. Two or more switches 24 may also be employed if desirable.

The present novel flow switch 20 also will function with flowing fluids to stop associated mechanisms upon diminishing of the cross section of the flowing liquid or of the pressure of flowing gas.

It is apparent that the present novel flow switch fulfills the objects and advantages sought therefor.

It is to be understood that the foregoing description and the accompanying drawing have been given by way of illustration and example. It is also to be understood that changes in form of the elements, rearrangement of parts, and substitution of equivalent elements, which will be obvious to those skilled in the art, are contemplated as within the scope of the present invention which is limited only by the claims which follow.

What is claimed is:

1. In combination, an explosion-proof flow switch comprising a compact casing, supporting means connected to said casing, a magnetic reed switch sealed within said casing, electrical wires operatively connected to said magnetic reed switch and extending from said casing, a flexible hinge member connected to said casing and extending therefrom, a materials engaging paddle connected to said hinge member and extending therefrom, a permanent magnet mounted on said paddle for movement therewith adapted to move the magnetic reed switch in one position thereof, and a magnet holder removably and adjustably trapping said permanent magnet against said paddle for quick removal and adjustment, the magnet holder being adjustable vertically on the paddle to vary the swinging moment.

2. The combination of claim 1 in which said paddle is mounted for pivotal movement through an arc of at least half a circle from a normal operative position in at least one direction of movement, with divergent mouth clamping means connecting the hinge member to the casing to permit said pivotal movement without causing localized sharp bending of the hinge member.

3. The combination of claim 2 in which said casing includes a cutout along one longitudinal corner and said permanent magnet is disposed therein when in normal position.

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