March 16, 1965 P. B. SAGAR 3,174,007

GAS PRESSURE ACTUATED SWITCH WITH CALIBRATION MEANS

Filed March 12, 1962

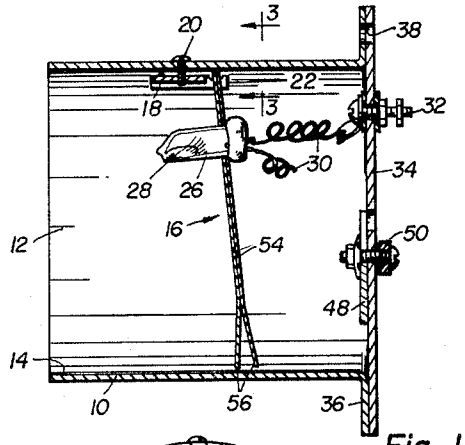


Fig. 1

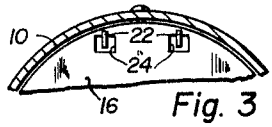


Fig. 3

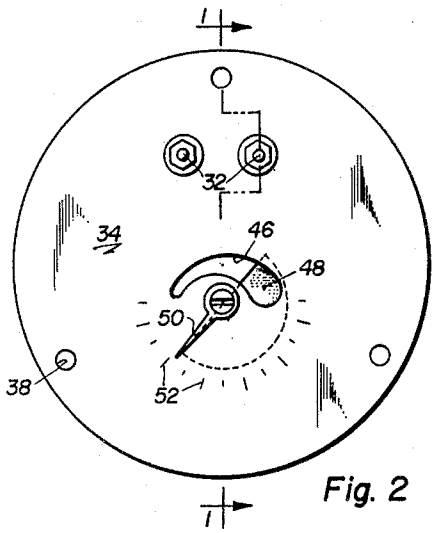


Fig. 2

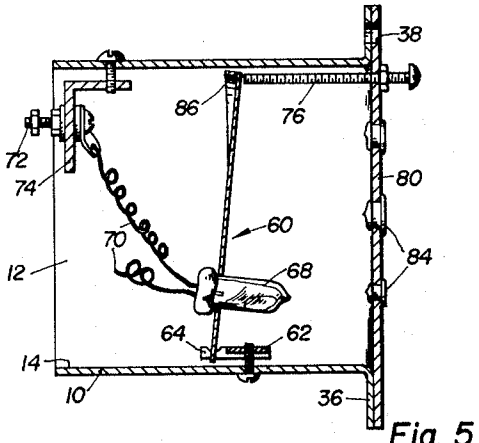


Fig. 5

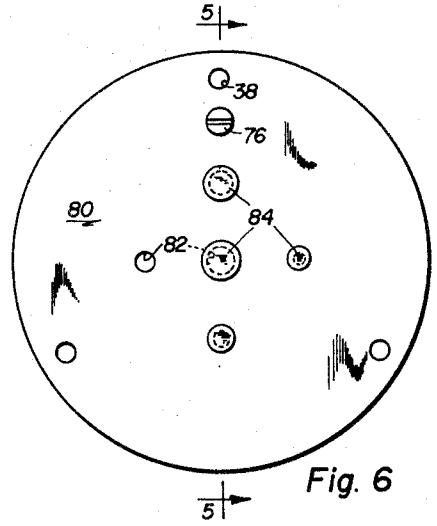


Fig. 6

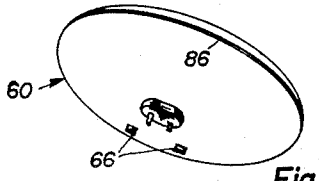


Fig. 7

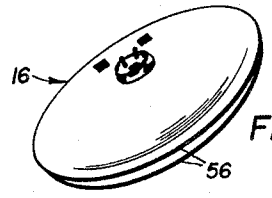


Fig. 4

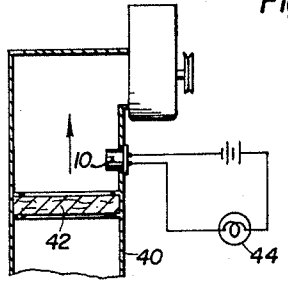


Fig. 8

INVENTOR.

PAUL B. SAGAR

BY

BUCKHORN, CHEATHAM & BLORE

ATTORNEYS

United States Patent Office 3,174,007 Patented Mar. 16, 1965

3,174,007

GAS PRESSURE ACTUATED SWITCH WITH CALIBRATION MEANS

Paul B. Sagar, 1331 SE. 51st Ave., Portland, Oreg.

Filed Mar. 12, 1962, Ser. No. 179,177
5 Claims. (Cl. 200—81.9)

My present invention comprises an improvement upon the structure disclosed and claimed in my prior Patent No. 2,821,592, issued January 28, 1958.

The invention relates to a pressure actuated switch of the general type disclosed and claimed in the aforesaid patent and more particularly to an improved switch having provision for compensating for out of level mounting and for calibration of the switch. The general objects and advantages of this type of switch are set forth in the aforesaid patent.

One object of the present invention is to provide for accommodating a pivoted vane type switch to out of level conditions such as occasioned by sloping floors or upon which equipment may be mounted or the like so that the switch may be utilized when the axis of the cylindrical passage of the switch is at a substantial inclination.

A further object of the present invention is to provide a simple, sturdy, inexpensive pivoted vane type of mercury switch in which improved means are provided for controlling the operating point of the switch. A switch of this character may be employed to open or close a circuit such as an alarm circuit when the pressure differential between air within and without a space, or the pressure differential between gasses in two different spaces, reaches a predetermined point, for example .04 inch of water. By the present invention the switch may be adjusted to operate over a considerable range of pressure differentials and such adjustment can be effected even though the casing for the pivoted operating vane thereof may be considerably out of level due to inaccuracies in mounting the switch on equipment or in mounting the equipment on a supporting structure.

A further object of the present invention is to provide a pressure differential switch of the foregoing character which may be easily and quickly calibrated after it is set into its position of use and the equipment for producing a pressure differential upon which the switch is mounted is set into operation. For example, one use of the pressure differential switch is to sound an alarm or otherwise actuate a signal if the filter of an air conditioning or heating system should become clogged to such an extent that the proper amount of air is not being circulated. When mounted in such a position with the equipment in operation, the calibration mechanism of the switch of the present invention is readily accessible for adjustment.

The objects and advantages of the present invention may be more readily understood by reference to the accompanying drawings taken in connection with the following specification in which like numerals refer to like parts throughout, and in which two forms of the present invention are described and illustrated.

In the drawings,

FIG. 1 is a vertical longitudinal section through a switch of the present invention, taken substantially along line 1—1 of FIG. 2;

FIG. 2 is a view of the right end of the structure of FIG. 1;

FIG. 3 is a partial vertical section taken substantially along line 3—3 of FIG. 1;

FIG. 4 is a view in perspective of an actuating member forming a part of the structure of FIG. 1;

FIG. 5 is a vertical longitudinal section through a modified form of switch taken substantially along line 5—5 of FIG. 6;

FIG. 6 is a view of the right end of the structure of FIG. 5;

FIG. 7 is a view in perspective of an actuating member forming a part of the structure of FIG. 5; and

FIG. 8 is a schematic representation of an air conditioning system having the present invention incorporated therein.

The air pressure actuated switch of FIGS. 1 to 4, inclusive, comprises a sheet metal cylinder 10 forming a passage 12 bounded by the cylindrical internal wall 14 of such cylinder. A disc 16 is pivotally mounted within the passage 12 by a bracket 18 clamped to the upper portion of the interior of the passage by a screw 20. The bracket has a pair of projecting claws 22 thereon which extend through openings 24 in the disc and are notched to provide a horizontal, transverse pivotal axis vertically spaced above the axis of the passage toward the top thereof so that the disc 16 freely swings within the passage. The disc 16 has a diameter less than the internal diameter of the passage, so that a difference of air pressure upon opposite sides of the disc will cause flow of air through the passage between the edge of the disc and the wall 14. The disc 16 has an elongated mercury switch tube 26 mounted therein in which there is provided a drop of mercury 28 adapted to rest at one end of the tube in an off position as illustrated, or to make contact with terminals of leads 30 when the inclination of the tube is reversed. The mercury tube is mounted so as to project beyond one side of the disc 16 to a greater extent than the other so that it and the mercury therein act as a counterweight tending to hold the disc in one direcion of inclination from the vertical.

Leads 30 extend to a pair of posts 32 to enable the switch to be placed in a desired circuit. The posts 32 are mounted upon and insulated from an end plate 34 closing the end of the passage toward which the disc inclines. A flange 36 on the end of the member 10 is soldered or otherwise affixed to the periphery of the plate 34, and a plurality of mounting openings 38 are provided in the peripheral portion of the plate 34 and of the flange 36 to enable the switch to be mounted upon a vertical member such as the wall 40 of the air conditioning system illustrated in FIG. 8.

When the pressure differential between the opposite sides of the disc 16 becomes sufficiently great, for example, by reason of an increase in the vacuum above the filter 42 of FIG. 8 when the amount of air capable of passing through the filter is reduced to such a point that the filter should be cleaned or changed, the disc will swing inwardly to reverse the position of the mercury in the mercury tube switch, thereby energizing a circuit such as the circuit illustrated including a signal light 44. In order to adjust the amount of such pressure differential between the sides of the disc 16 for a given vacuum above the filter 42, the plate 34 is provided with an arcuate slot 46 of increasing width from one end to the other through which air may flow from the space externally of the air conditioning system. The effective area of such slot may be varied by varying the position of a movable plate member 48 pivoted to the plate 34. The plate 48 is fixed to a manually operable positioning lever 50, the tip of which moves past calibrating indicia 52 on the plate 34. Varying the effective size of the slot 46 varies the pressure drop produced by air passing through such slot and therefore varies the pressure differential produced between the two sides of the disc 16 for a given difference between the air pressure in the space above the filter 42 and atmosphere pressure. The switch may thus be calibrated to act at different pressure differences.

Since it is not practical to always align the wall 40 or

similar walls of other type of equipment in which the present switch may be mounted so as to be absolutely vertical, it is obvious that the axis of the passage 12 may vary from the horizontal, thereby varying the angle between the axis of the passage and the plane of the disc 16. In order that the space around the disc and hence the pressure differential between the opposite sides of the disc resulting from flow of air through the device may remain substantially constant in spite of different degrees of angularity of the disc with respect to the axis of the tube in its normal position, the disc is provided with a thickened edge diametrically opposed to its pivotal axis. This thickened edge may be provided by forming the disc of two thin plates 54 in face-to-face relation throughout the greater extent thereof, the lower portions of which are divergent as indicated at 56. The thickened edge thereby provided is at a maximum along the vertical centerline of the passage and progressively tapers toward the horizontal centerline of the passage.

The modification disclosed in FIGS. 5, 6 and 7 includes a passage forming member 10 as previously disclosed, and a disc 60 which is pivotally mounted upon a transverse horizontal axis spaced from the axis of the passage toward the bottom thereof. The pivotal axis is provided by a bracket 62 having upwardly facing notched lugs 64 which engage in openings 66 in the disc. A mercury tube switch 68 is mounted on the disc and included in a circuit as previously described, in this instance the leads 70 going to posts 72 on a bracket 74 at the opposite end of the member 10. The disc 60 is held tipped toward the right end of the passage by the counterweight effect of the overhanging mercury tube as previously described, and normally rests against the adjustable abutment such as the screw 76 herein illustrated. The screw 76 passes through an end plate 80 so that it may be adjusted from outside of the air conditioning space.

In order to adjust the pressure differential between the two sides of the disc 60 for a given total pressure differential between the ends of the device, the plate 80 is provided with a plurality of calibration openings 82 in each of which there is respectively mounted a removable plastic plug 84. By removing or replacing certain ones of the plugs 84 the switch may be calibrated to act at various pressure differences between the ends of the device. The disc 60 is provided with a thickened edge of the same characteristic as previously described by means of a tapered flange 86 having its greatest width at the top of the disc and tapering in both directions toward the horizontal diameter of the disc. The effective area for flow of air around the disc thus remains substantially constant even though the device is adjusted so that the angle of inclination of the disc relative to the cylinder 10 is changed.

The slot 46 and adjusting member 48, as well as the openings 82 and the removable plugs 84, constitute variable orifice means at the end of the passage toward which the switch disc normally inclines. Various other forms of variable orifice means may be substituted therefor. Various other forms of means may be provided to thicken the edge of the switch disc. The disc 16 may be utilized in the switch of FIG. 5 and a pair of discs similar to the disc 60, if provided with opposing flanges, may be utilized in the switch of FIG. 1. Various other modifications such as disclosed in my above-identified patent may be incorporated in a switch embodying the present invention. When I refer to air pressure differential and the movement of air, I mean a gas such as air.

Having illustrated and described various modifications of my invention, it should be apparent to those skilled in the art that the invention permits of modification in arrangement and detail. I claim as my invention all such modifications as come within the true spirit and scope of the following claims.

I claim:

1. A gas pressure actuated switch comprising:
means having an internal wall forming a passage,
a vane pivotally mounted within said passage for swinging movement about a horizontal pivotal axis vertically spaced from the axis of said passage and extending transversely of said passage,
said vane having an area less than the internal area of said passage to provide for flow of gas through said passage so that a pressure differential is produced between opposite sides of said vane,
said vane having a thickened edge along a substantial portion of its perimeter with its greatest thickness remote from the pivotal axis of said vane and tapering to a minimum along the transverse edges of said vane toward said pivotal axis so that the total clearance around the vane remains substantially constant while the vane swings through a considerable arc,
an elongated mercury switch tube mounted on said vane and projecting laterally therefrom whereby to act as a counterweight tending to hold said vane in one direction from the vertical,
said vane being pivotally movable in the opposite direction to such an extent that the mercury in said switch tube reverses its effective position when said pressure differential increases to a predetermined value,
and variable orifice means at one end of the passage for producing an adjustable pressure drop due to said flow of fluid through said passage to adjust said pressure differential between the opposite sides of said vane for a given total pressure difference across said switch.

2. The structure set forth in claim 1 wherein said pivotal axis is at the top of said passage and said vane swings freely within said passage.

3. The structure set forth in claim 1 wherein said pivotal axis is at the bottom of said passage and an adjustable abutment means is mounted within said passage toward the top thereof for adjustably limiting the swinging movement of said vane in said one direction.

4. The structure set forth in claim 1 wherein said variable orifice means comprises a plate extending across one end of said passage and having a slot therethrough and a movable member mounted on said plate and shiftable with respect thereto to vary the effective area of said slot.

5. The structure set forth in claim 1 wherein said variable orifice means comprises a plate extending across one end of said passage, and having a plurality of openings therein and a plurality of removable plugs for selective positioning in said openings.

References Cited in the file of this patent

UNITED STATES PATENTS

2,821,592	Sagar	Jan. 28, 1958
2,981,195	Payne et al.	Apr. 25, 1961

FOREIGN PATENTS

581,478	France	Sept. 29, 1924
743,763	Germany	Jan. 3, 1944