April 22, 1941. W. D. COCKRELL 2,239,438

CONDITION RESPONSIVE DEVICE

Filed Feb. 24, 1939

Fig. 1.

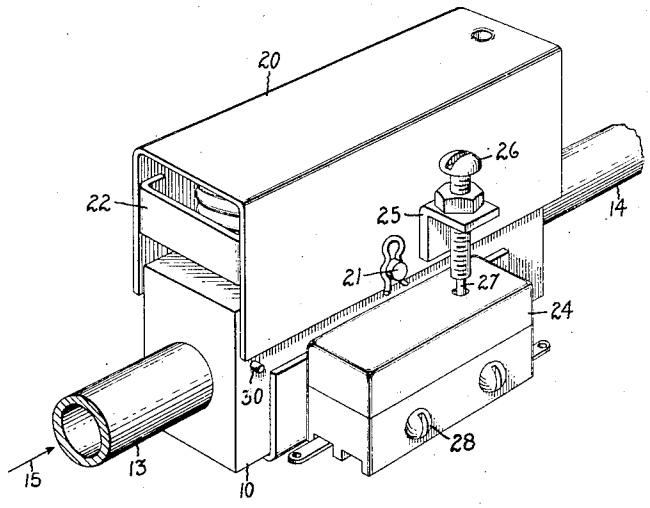


Fig. 2.

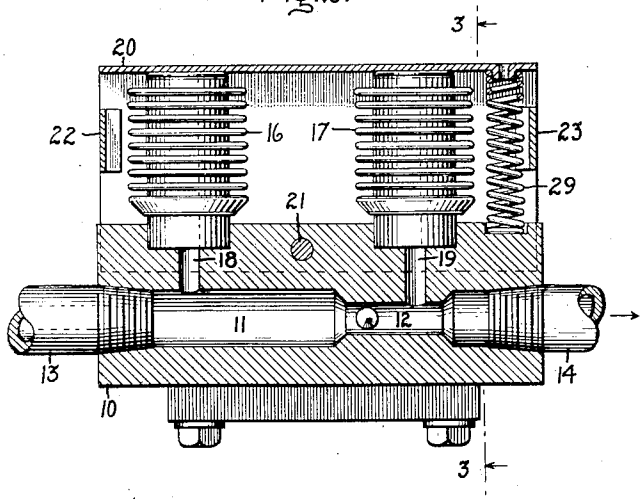
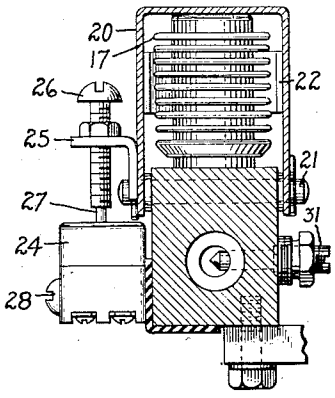


Fig. 3.



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CONDITION RESPONSIVE DEVICE

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9 Claims. (Cl. 200—83)

This invention relates to condition responsive devices and more particularly to devices for controlling an electrical circuit in response to a predetermined rate of fluid flow through a conduit although it is not limited thereto necessarily.

It is an object of this invention to provide a new and improved condition responsive device comprising a simple, compact structure having a minimum number of parts.

For a consideration of what I believe to be novel and my invention, attention is directed to the following description and the claims appended thereto taken in connection with the accompanying drawing.

In the drawing, Fig. 1 is a perspective view of a fluid flow responsive device constructed in accordance with one form of my invention; Fig. 2 is a longitudinal view, partly in section, of the device illustrated in Fig. 1; and Fig. 3 is a transverse view along line 3—3 of Fig. 2.

Referring to the drawing, the device comprises a base portion 10 which is provided with a fluid passage therethrough having an enlarged portion 11 and a throat portion 12 defining a Venturi tube. The base portion may be formed from a rectangular block of suitable metal, the fluid passage being drilled therethrough in any well-known manner and threaded at opposite ends for cooperatively receiving fluid conduit connections 13 and 14. Expansible bellows members 16 and 17 are suitably secured into cooperating recesses provided in the upper surface of the base in a spaced apart and substantially parallel relationship. The bellows member 16 is in communication with the portion 11 of the passage ahead of the throat 12, as regards the direction of fluid flow therethrough, by means of the port 18. The bellows member 17 is in communication with the fluid passage at the throat 12 by means of the port 19. The bellows which respond to the different pressures occurring in the corresponding sections of the Venturi passage are adapted to engage with a suitably pivoted lever for imparting thereto a movement in accordance with the pressure differential. In the preferred embodiment the lever is in the form of a U-shaped cover plate or housing 20 having downwardly depending side walls which are pivotally secured to the base substantially midway between the spaced apart bellows members by means of the transversely extending pin 21. The cover plate, which may be further provided at its opposite ends with strips 22 and 23 suitably secured between the side walls, substantially encloses the bellows members and shields them from foreign objects likely to come into damaging contact therewith. The outer ends of the bellows members engage with the upper portion of the cover plate 20 and rock it about the pin 21 in response to a differential in pressure occurring in the portions 11 and 12 of the Venturi passage.

The lever or cover plate 20 is adapted for actuating a suitable contact means or switch 24 for controlling an electrical circuit (not shown) in accordance with a condition of fluid flow through the device. A bracket 25 suitably secured as by spot welding onto a side wall of the cover plate has an adjustable screw 26 threaded therein for engaging with the push rod 27 extending from the operating mechanism of the switch 24. The switch may be of any suitable type but is preferably one which is sensitive to a relatively small movement of the actuating means. It may be arranged within a self-contained housing which is secured as by screws 28 to the base 10 in an operative relationship with the screw 26. With this arrangement, the switch unit is readily removable for replacement or repair.

If desired, a suitable spring 29 may be arranged between the upper surface of the base 10 and the cover plate 20 adjacent the low pressure bellows member 17 so that the cover plate will be actuated only upon a predetermined pressure difference occurring in the bellows members. The spring may be selected for the desired predetermined characteristic or, obviously, the compression thereof may be adjusted by the arrangement of a suitable adjusting screw between the end of the spring and the plate 20. The movement of the plate 20 under the biasing force of the compression spring 29 may be limited by a suitably arranged stop 30 (Fig. 1) while movement of the cover plate in the opposite direction is limited by the switch mechanism engaged by the screw 26.

The pressure differential for a given rate of fluid flow through the Venturi passage may be controlled by means of an adjustable plug 31 threaded into the base and adapted to vary the constriction of the passage at the throat 12. The adjustable plug is preferably arranged in the throat slightly ahead of the port 19 for greatest effectiveness.

Having described the principle of operation of my invention together with the apparatus which I now consider to represent the best embodiment thereof, I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A condition responsive device comprising a base, a pair of condition responsive bellows secured to said base in spaced apart parallel relationship, a U-shaped lever forming a housing for said bellows and pivotally secured to said base between said bellows, the ends of said bellows engaging with said lever and adapted to actuate said lever in accordance with a differential movement of said bellows, a switch unit removably secured to said base, and adjustable means secured to said lever for actuating said switch unit.

2. A condition responsive device comprising a base, a lever pivoted intermediate its ends on said base, contact means operatively associated with said lever, and a pair of condition responsive bellows mounted on said base in a substantially parallel and spaced apart relationship, one of said bellows engaging with said lever at one side of the pivotal point thereof and the second of said bellows engaging with said lever on the opposite side of the pivotal point thereof with respect to said first bellows, said lever forming a channel substantially enclosing the bellows.

3. A condition responsive device comprising a base, a pair of condition responsive bellows secured to said base in a spaced apart parallel relationship, a U-shaped cover mounted over said bellows and pivoted upon said base between said bellows, the outer ends of said bellows engaging with said cover, said cover being adapted to be rocked in accordance with a differential movement of said bellows, and contact means operatively associated with said cover.

4. A condition responsive device comprising a base, a pair of condition responsive bellows mounted in spaced apart relationship upon said base and extending parallel with respect to each other, a lever pivoted upon said base between said bellows, the lever having end portions substantially enclosing and engaging with the outer ends of said bellows and adapted to be actuated thereby, and contact means operatively associated with said lever.

5. In combination, a Venturi tube, a pair of expansible bellows mounted on said tube in a substantially parallel and spaced apart relationship and communicating with the high and low pressure regions respectively of said tube, a cover for said bellows engaging with the outer ends thereof pivotally secured to said tube between said bellows, and means actuated by said cover in response to predetermined differential expansion movements of said bellows.

6. In combination, a Venturi tube, a pair of expansible bellows mounted in a substantially parallel and spaced apart relationship on said tube and communicating with the high and low pressure regions thereof, a cover plate substantially surrounding said expansible bellows and pivotally secured to said tube between said bellows, the outer ends of said bellows engaging with said cover plate, and means adapted to be actuated by said cover plate in response to differential movements of said bellows.

7. A fluid flow responsive device having a base comprising a substantially rectangular metal block, a Venturi passage through said base comprising an enlarged portion and a throat portion, a pair of bellows members secured to the upper surface of said base in spaced apart and substantially parallel relationship, one of said bellows communicating with the enlarged portion of said passage, the other of said bellows communicating with the throat portion of said passage, a cover substantially surrounding said bellows members and pivotally secured to said base between said bellows members, the outer ends of said bellows members engaging with said cover and adapted to actuate said cover in accordance with the differential expansion movements of said bellows, and contact means adapted to be actuated by said cover.

8. A fluid flow responsive device comprising a base, a Venturi passage through said base having an enlarged portion and a throat portion, a pair of bellows members secured on said base in a spaced apart and substantially parallel relationship, one of said bellows communicating with the enlarged portion of said passage, the other of said bellows communicating with the throat portion of said passage, a housing for the bellows pivoted upon said base and adapted to be actuated in accordance with differential of the pressures occurring in said Venturi passage, means for determining the actuation of said housing, and adjustable means for varying the pressure difference created in said Venturi passage for a given rate of fluid flow therethrough.

9. A device responsive to flow or like condition of a fluid comprising a base forming a channel for receiving such fluid during operation, a bellows having one end secured to the base in communication with the channel, and a housing protecting and substantially enclosing the bellows, said housing being pivotally held on the base and having a portion engaging the upper end of the bellows whereby the housing is turned about its pivotal connection in response to expansion of the bellows.

WILLIAM D. COCKRELL.