Jan. 21, 1936. S. R. DU BRIE 2,028,196

SWITCH

Filed Oct. 8, 1934 2 Sheets-Sheet 1

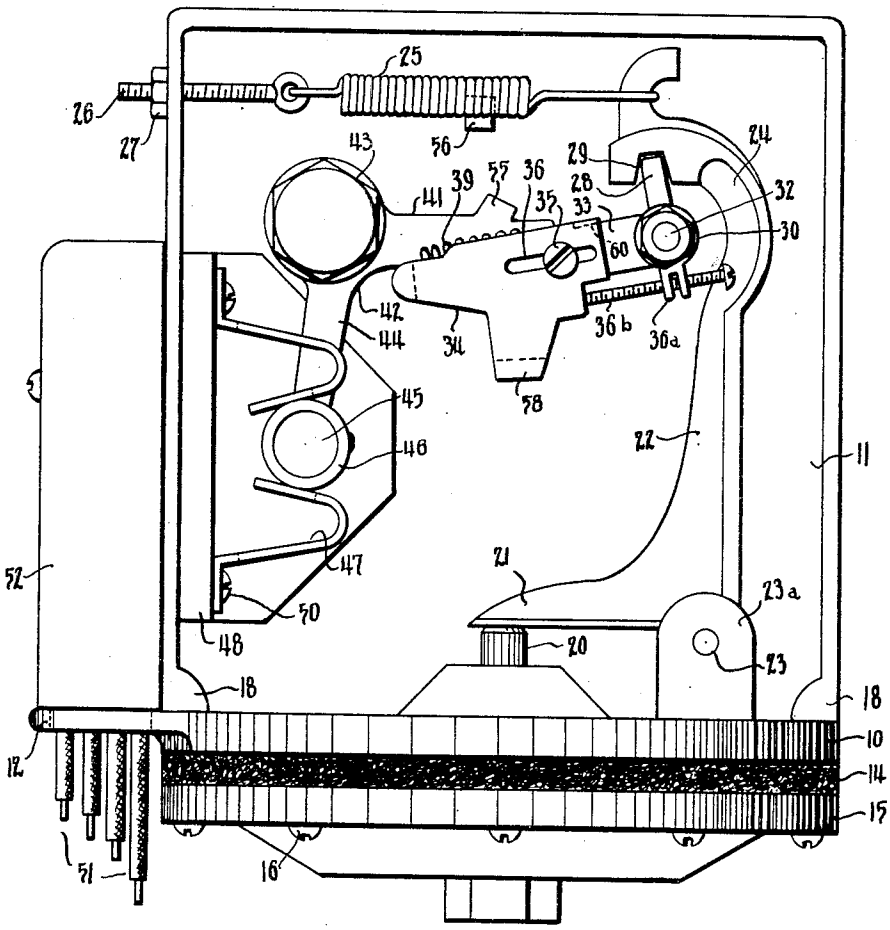


Fig. 1

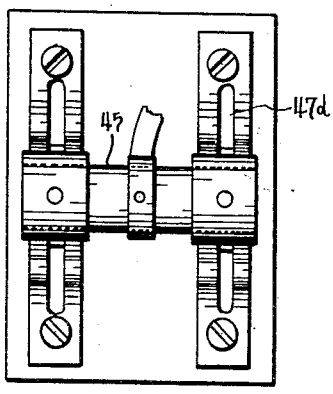


Fig. 2

INVENTOR.
Stanley R. DuBrie
BY Daniel G. Cullen
ATTORNEY.

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SWITCH

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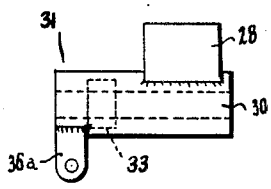


Fig. 5

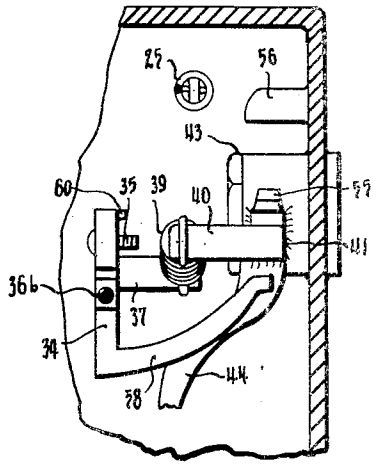


Fig. 4

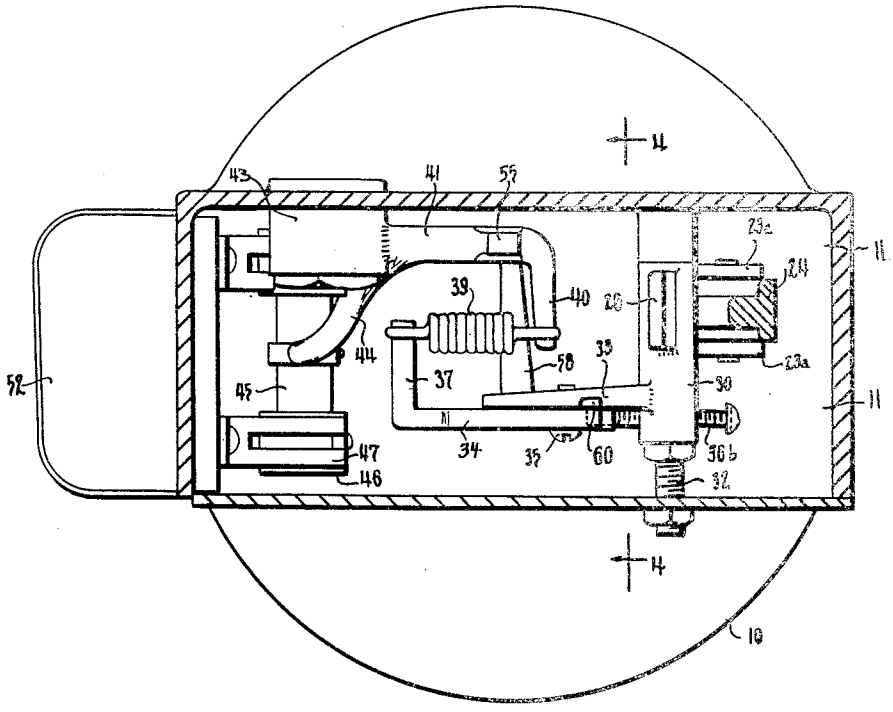


Fig. 3

INVENTOR.
Stanley R. DuBrie
BY
Daniel E. Fuller
ATTORNEY.

Patented Jan. 21, 1936

2,028,196

UNITED STATES PATENT OFFICE

2,028,196

SWITCH

Stanley R. Du Brie, Detroit, Mich.

Application October 8, 1934, Serial No. 747,413

5 Claims. (Cl. 200—83)

The switch disclosed in this application is of the pressure type and is operated automatically for circuit breaking when the pressure within a line or vessel connected to the switch exceeds a predetermined limit and operates automatically for circuit making when the pressure within that vessel drops below a predetermined limit, the differential between those limits being called the operating range or differential of the switch.

The switch here shown is characterized by its being provided, in addition to the usual means for bodily shifting the differential or range of opening and closing pressure limits, with a means for increasing or decreasing that differential or range, the last mentioned means being adjustable without reference to the first mentioned means.

The switch here shown is also characterized by its having an interlock type interconnection between operating parts or bell cranks of the switch, the interconnection being formed by a tooth on one bell crank riding in a slot in the other, the operation being such that the slotted bell crank normally causes movement of the toothed bell crank. The interconnection is characterized by the feature that it cannot possibly cause locking of the connection between the bell cranks, in any relative position of the parts.

The switch is further characterized by the provision of a snap action spring connection between operating parts of the switch, which spring functions to provide quick make-and-break; these same operating parts are provided with a means for insuring positive break in the event the spring becomes broken or injured, or fails to function properly, the positive break means becoming operable at a pressure higher than the normal or spring opening pressure of the switch, so as not to interfere with the normal spring break means of the switch.

The switch is further characterized by the fact that the snap action spring is adjustably mounted so as to provide an adjustment for increasing or decreasing the differential or range between the pressure limits, and it will be observed that the spring adjustment also functions to adjust the opening limit of the positive break means.

The switch is also characterized by its being provided with a contact set of novel construction, whose details will be more particularly described at a later stage of this specification.

For an understanding of the switch disclosed herein, the following specification should be read in connection with the appended drawings. In these drawings,

Fig. 1 is an elevational view of the switch with the cover removed;

Fig. 2 is a view of the contact set per se as if from the right of Fig. 1;

Fig. 3 is a top plan section view of the switch with parts removed for purposes of clarity;

Fig. 4 is a detailed section view as if on the line 4—4 of Fig. 3;

Fig. 5 is a view as if from the right of Fig. 1, showing an important operating part of the switch.

Referring to the drawings, it will be observed that the switch therein shown comprises a base plate 10 and a casing 11. Under the base plate, which is circular in form, but which has an apertured radially extending part 12 projecting therefrom, is a circular diaphragm 14 of heavy rubber or the like, and immediately under this diaphragm is a chambered diaphragm plate 15. The base plate, the diaphragm, and the diaphragm plate are relatively secured in assembly to provide a pressure chamber by means of the series of bolts 16. Two of the bolts are passed through the base plate and into bosses 18 of the casing walls 11a to secure the casing to the base plate, and thus to secure the casing and the pressure chamber in assembly.

Disposed within the pressure chamber and above the diaphragm is a pressure plate (not shown) provided with an upwardly extending pin 20 engaging the horizontal arm 21 of the pressure bell crank 22, the latter being pivoted at 23 to bosses 23a formed integral with the base plate 10. The vertical arm 24 is hooked over and has its upper end connected to the side wall of the casing by a coiled tension spring 25 and an adjusting bolt 26 threaded through a nut 27. The last mentioned parts provide a well-known means for bodily shifting the differential or range of opening or closing pressure limits of the switch, and adjustment of these parts for shifting the range is accomplished by movement of the nut 27 on the bolt 26.

The operating mechanism of the switch, as a whole, is connected to the vertical arm 24 of the pressure bell crank 22 through the tooth and slot connection provided by a tooth 28 received within a slot 29 in the lower surface of the hooked upper end of the bell crank 22. The tooth 28 is integral with and projects upwardly from the hub 30 of a bell crank 31, and this hub is secured to a threaded bolt or pin 32 which forms a fixed pivot or journal for the hub, the pin being secured to the casing wall 11b.

The tooth 28 forms one arm of the bell crank

31. The other arm, which is more properly the switching arm, comprises two parts 33—34, adjustably interconnected through the medium of the screw 35 threaded into the part 33 through an elongated slot 36 of the part 34, this construction providing an adjustment means whereby the length of the arm 33—34 may be varied to increase or decrease the differential or operating range of the switch.

For facilitating the adjustment when the screw 35 is loosened, there are formed on the hub 30 two integral tapped-hole lugs 36a through which is threaded an adjusting screw 36b. It will be observed that when the screw 36b is rotated in the tapped lugs 36a, after the screw 35 is loosened slightly, the part 34 may move or be moved with respect to the part 33, all subject to the control of the operator.

On the end of arm 33—34 is a pin 37, and a coiled tension spring 39, which forms an over center spring for the quick make-and-break or snap mechanism, has one end hooked around the pin 37. The other end of this spring is hooked around a pin 40 projecting from the arm 41 of a bell crank 42, the latter being journalled at its elbow on a fixed pivot 43 in the form of a bolt threaded into the wall 11b of the casing 11. The vertical arm 44 of the bell crank 42 is the switch contact arm and has at its lower end a hole through which passes a rod 45 of insulating material such as fiber or the like, on the opposite ends of which are disposed metallic sleeves 46 which form the movable contacts of the contact mechanism, and which engage the stationary spring contacts 47 mounted on the insulating block 48 disposed against the side wall 11a of the casing 11.

The block 48 is held in place by screws 50 which mount the contacts 47, these screws projecting through the casing wall to form externally accessible binding posts, whereby the load and line conductors 51 may be secured in electrical and physical connection with the contacts 47, the conductor terminals and the binding screws being protected by a shield 52 secured over them and to the side wall of the casing, over the apertured extending part 12 of the base plate.

It will be observed that when the pressure bell crank 22 rocks clockwise (Fig. 1) on an increase in pressure, the bell crank 31 will rock clockwise on its fixed pivot 32 until the arm 33—34 and coil spring 39 move over center with respect to the pin 40 and the fixed pivot 43 of the bell crank 42. Such movement causes the bell crank 42 to move for quick break, from the position shown, counterclockwise on its fixed pivot 43 and move the contact sleeves 46 out of contact making position and from the stationary contacts 47. Conversely, a decrease in pressure will cause the switch to close, if it had been opened, the over center arrangement providing quick make movement for the parts.

The stationary contacts 47, of which there is a pair for each sleeve 46, or four contacts in all, comprise copper spring members bent to the formation shown in Fig. 1.

The contacts 47, at their bights, are slotted as indicated at 47d for the purposes of maintaining proper alignment of the portions of the contacts and for insuring proper make between the stationary contacts 47 and the movable contacts 46.

It will be observed that the arm 41 of the bell crank 42 is provided with a lug 55 for engagement with a lug 56 formed on the wall 11b of the casing to act as a stop for the switch parts when the switch is opened on an increase in pressure. The relative position of the parts 55—56 is such that they will not be mutually engaged until the bell crank 42 has moved sufficiently to have the sleeve 46 clear the contact 47 a considerable distance.

In order to provide a positive break means which is normally inoperative but which can be relied upon to cause break in the event the spring 39 becomes broken or injured or otherwise fails to function, the part 34 of the switching arm is provided with an extension 58 which will engage the arm 41 of the bell crank 42 on an increase in pressure to a point beyond the normal opening pressure of the switch and cause positive break. It will be observed that the adjustment provided by the screws 35 and 36b, which increases or decreases the operating range or differential of the switch, also automatically and correspondingly changes the positive break opening pressure of the switch, so that the differential between the normal opening pressure of the switch and the positive break pressure is a constant.

It will also be observed that the interlock interconnection between the bell cranks 22 and 31, provided by the tooth 28 and the slot 29 receiving it, is an efficient, non-binding, and otherwise satisfactory two-way connection between these bell cranks, and is not affected by cocking of the bell cranks with respect to each other as might be the case if a floating pivot were relied upon as a connection between the bell cranks 22 and 31. Further, the engagement of a tooth side with a slot side prevents overtravel of the switch arm 33—34.

It will also be observed that part 34 of the switching arm is provided with a lug 60 riding over the upper surface of the part 33, which prevents pulling of the switching arm as a whole when the adjusting screw 35 is loosened, such buckling being due to the pull of spring 39 which tends to cause movement of the part 34 clockwise around the screw 35. Buckling in the opposite direction is, of course, prevented by the adjusting screw 36b.

Now having described the switch that is disclosed in the appended drawings, reference will be had to the appended claims which determine the scope of the monopoly claimed herein.

What I claim is:

1. A pressure switch means comprising an operating bell crank, means tending to rotate the same in one direction on an increase in pressure, adjustable resilient means tending to rotate the same in the opposite direction, the two means being in opposition, a contact making bell crank, and a connector bell crank having one arm operatively connected to an arm of the operating bell crank through a positive connection and having another arm operatively connected to an arm of the contact making bell crank through an adjustable resilient connection which provides an over center snap action for the contact carrying bell crank.

2. A pressure switch means comprising an operating bell crank, means tending to rotate the same in one direction on an increase in pressure, adjustable resilient means tending to rotate the same in the opposite direction, the two means being in opposition, a contact making bell crank, and a connector bell crank having one arm operatively connected to an arm of the operating bell crank through a positive connection and having another arm operatively connected to an arm

of the contact making bell crank through an adjustable resilient connection which provides an over center snap action for the contact carrying bell crank, the adjustment for the resilient means of the operating crank providing means for bodily shifting the differential or pressure range of the switch without varying that differential.

3. A pressure switch means comprising an operating bell crank, means tending to rotate the same in one direction on an increase in pressure, adjustable resilient means tending to rotate the same in the opposite direction, the two means being in opposition, a contact making bell crank, and a connector bell crank having one arm operatively connected to an arm of the operating bell crank through a positive connection and having another arm operatively connected to an arm of the contact making bell crank through an adjustable resilient connection which provides an over center snap action for the contact carrying bell crank, the adjustment for the resilient connection providing means for varying the differential or pressure range of the switch without bodily shifting that differential.

4. A pressure switch means comprising an operating bell crank, means tending to rotate the same in one direction on an increase in pressure, adjustable resilient means tending to rotate the same in the opposite direction, the two means being in opposition, a contact making bell crank, and a connector bell crank having one arm operatively connected to an arm of the operating bell crank through a positive connection and having another arm operatively connected to an arm of the contact making bell crank through an adjustable resilient connection which provides an over center snap action for the contact carrying bell crank, the adjustment for the resilient means of the operating crank providing means for bodily shifting the differential or pressure range of the switch without varying that differential, the adjustment for the resilient connection providing means for varying the differential or pressure range of the switch without bodily shifting that differential.

5. A pressure switch means comprising an operating bell crank, means tending to rotate the same in one direction on an increase in pressure, adjustable resilient means tending to rotate the same in the opposite direction, the two means being in opposition, a contact making bell crank, and a connector bell crank having one arm operatively connected to an arm of the operating bell crank through a positive connection and having another arm operatively connected to an arm of the contact making bell crank through an adjustable resilient connection which provides an over center snap action for the contact carrying bell crank, the adjustment for the resilient means of the operating crank providing means for bodily shifting the differential or pressure range of the switch without varying that differential, the adjustment for the resilient connection providing means for varying the differential or pressure range of the switch without bodily shifting that differential, with the first mentioned one being accessible from outside the switch casing and with the second mentioned one being accessible only from inside the switch casing.

STANLEY R. DU BRIE.