Jan. 27, 1959 D. H. SURGEONER 2,871,316

MAGNETIC SNAP ACTION SWITCHES

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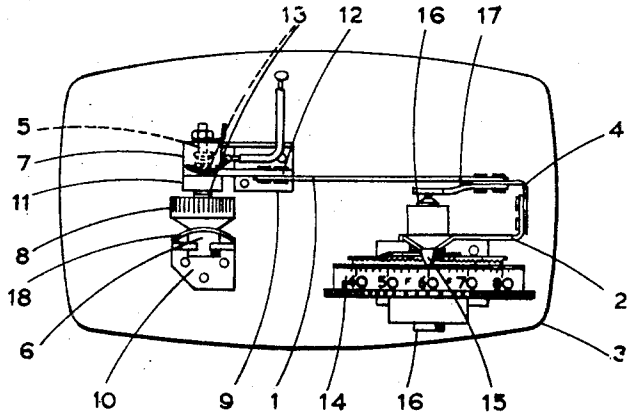
FIG. 1.



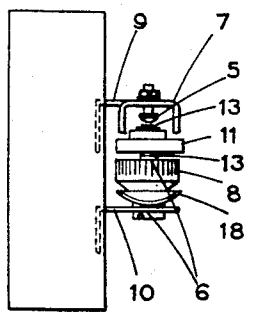


FIG. 2.

INVENTOR

David H. Surgeoner

BY

Pennie, Edmonds, Morton, Barrows and Taylor

ATTORNEYS

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MAGNETIC SNAP ACTION SWITCHES

David H. Surgeoner, Beaconsfield, England, assignor to The Rheostatic Company Limited, Stough, England, a British company

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2 Claims. (Cl. 200—138)

This invention is concerned with magnetic snap action switches of the micro-gap type such as may be operated by the deflection of a bimetal strip with change of temperature, by the difference in expansive movement of a rod- and tube-type thermal member, or by the movement of a bellows or a diaphragm with pressure change or by any other operator the movement of which is required to result in precise switch operation at a particular value of temperature, pressure and the like.

Such switches usually consist of a moving contact associated with a magnet or an armature, moving between stops which may also form the contacts of the switch and a resilient member in which the gradually changing initiating movement is stored to generate the force required for switch operation, or the resilient member such as a strip of bimetal may itself be the member sensitive to a changing physical value, i. e. the temperature of a space.

In such switches adjustment of the magnetic snap-action has usually been accomplished by the adjustment of a first movement-limiting stop (this stop often being also one contact of the switch) which determines the proximity of an armature to a permanent magnet in the closed contact position of the switch and the adjustment of a second movement-limiting stop to determine the total contact separation in the open position of the switch.

These adjustments are made in the assembly of the switch and are used to set the movement or pressure differential or change of temperature necessary to move the switch from just closed position to open and vice versa. This differential will vary both with the variation of the distance between the magnet and armature in the closed position of the switch and with the total contact movement allowed.

From the above description it will be understood that if for electrical reasons it be desired to keep the total contact movement a constant value then each adjustment of the first contact screw, setting the armature-magnet gap must be followed by an adjustment of the second movement limiting stop to re-establish the correct contact movement, both adjustments being necessary as the differential setting depends on both proximity of the armature to the magnet in the closed position of the switch and on the total movement.

Where precise setting is required this process can become lengthy and tedious and unsuited to rapid production.

This is particularly evident with single armature snap switches as described above in that only very small changes in the position of the main contact or setting screw give relatively large changes in magnetic cling.

In the present invention a permanent magnet and the moving contact of the switch are together carried on one end of a switch arm or strip. The movement of this contact and magnet is limited by two adjustable stop screws, one or both of which may also be formed as electrical contacts, mounted one on each side of the strip

and in the axis of movement of the contact carried by the strip. Two armatures are mounted also one on either side of the magnet.

One of these armatures is mounted with its axis along the magnetic axis of the magnet and may be of U formation, the open ends of the U facing the magnet, with one contact screw passing through the centre of the U.

The other armature is cup-formed, the open end of the cup facing the magnet. This armature is supported by the second contact screw and is in screw engagement with it, the screwed shank of this contact passing through a screwed hole in the bottom of the cup.

After assembly, the operating differential (temperature pressure, or movement) of the switch is set by adjustment of the magnetic cling between magnet and armature.

For a switch constructed in accordance with this invention this is carried out as follows:

The contact screw passing through the U-shaped armature is adjusted to give a predetermined distance between the magnet and the open end of the U-shaped armature. The second stop screw or contact is then adjusted to set the total movement of the moving contact at the required value for switching. The value of the magnetic cling between the two armatures and the magnet is then set by the rotation of the cup formed armature on the screw engagement between it and the second stop screw. With the construction described the differential of the switch can be set by making three simple consecutive adjustments instead of the alternating adjustment of the first and second movement-limiting stops of the previously known constructions.

The invention is illustrated in the accompanying drawings in which the magnetic snap action switch is embodied in a bimetal operated thermostat. Fig. 1 is an elevation of such a thermostat embodying the adjustments described in Fig. 2 is an elevation looking into the U-shaped armature from one side of the switch. For the sake of clarity in this second figure the bimetal support, the temperature adjusting screw and associated support brackets have been omitted.

Referring to the drawing, the bimetal element **1** is supported on a bracket **2** attached to a base **3**. The attachment member **4** is made in spring material pressing a tongue **17** to which it is also riveted on to an adjusting screw **16**. The member **4** also forms the pivot for the adjustment of the position of the bimetal relative to the fixed contact screws **5**, **6** and armatures **7**, **8**. These latter parts (the screws **5**, **6** and armatures **7**, **8**) are independently supported from the base **3** by brackets **9**, **10**. Interposed between the bimetal **1** and the magnet **11** is a strip of insulating material **12**.

The magnet **11** is fixed to the insulating strip by a rivet-formed contact **13** passing through the magnet and the strip and presenting contact surfaces on both sides of the magnet.

A member **14** is carried by the adjusting screw **16** which therefore rotates with it. Adjustment of the operating temperature of the thermostat is obtained by the setting of the scale on the member **14** against an indicator **15**. Axial movement of the adjusting screw **16** sets the initial position of the bimetal and determines the temperature at which the switch will be operated. Movement of the bimetal with the adjusting screw is assured by the pressing of tongue **17** on to the end of the adjusting screw **16** by the spring pivot member **4**.

After the assembly of the parts to the base the operating differential of the thermostat is set by adjustment of the magnetic cling between magnet and armature.

The procedure for thermostatically operated switches constructed in accordance with this embodiment of the invention is as follows:

Contact screw **5** is adjusted so that when touching the

contact 13 a predetermined gap exists between the magnet 11 and armature 7.

Contact 6 is then screwed up or down in its fixing bracket 10 to set the gap between it and contact 13 at the required value for switching.

The operating differential of the thermostat is then set by adjusting the cling between the magnet 11 and the cup-shaped armature 8 by the rotation of armature 8 on contact 6. A spring washer 18 gives pressure between armature 8 and contact screw 6 and also between contact screw 6 and its support bracket 10 to guard against accidental movement of either adjustable part.

I claim:

1. A magnetic snap action switch including a base for the switch, a resilient contact arm, a permanent magnet and movable contacts carried on one end of the resilient contact arm, two adjustable stops positioned one on each side of the magnet, and an armature associated with each stop, the movement of the contact arm and magnet being limited by the two adjustable stops, characterized in that one armature is fixed relative to the base for the switch, a contact in screw engagement with said armature, the gap between said armature and the magnet being set by adjustment of the contact in screw engagement with the armature, and a contact associated with the other armature and with which said other armature is in screw engagement, the gap between said other armature and the magnet being adjusted by movement of the armature by its screw engagement with the contact associated therewith.

2. A magnetic snap action switch as claimed in claim 1 in which the resilent contact arm comprises a bimetal strip flexibly supported from a bracket upstanding from the base, the permanent magnet and the movable contacts being carried with interposed insulation on the end of the bimetal strip remote from its attachment to the bracket, the two adjustable stops being formed as contacts respectively associated with said armatures and each supported by a bracket upstanding from the base one on either side of the magnet.

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