





## UNITED STATES PATENT OFFICE

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SWITCH FOR REFRIGERATING  
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4 Claims. (Cl. 200—83)

This invention relates to refrigerating apparatus and more particularly to control means for refrigerating apparatus and other apparatus.

Control means used for controlling different types of apparatus are usually open to the atmosphere and, therefore, are subject to corrosion and accumulations of dirt. Furthermore, when such controls are wholly or partially open, they are subject to tampering. Any one of these three things may cause a complete or a partial failure of the control means.

Where the control means has no external adjustment, the problem is relatively simple since it is usually only necessary to provide a sealed outer casing. However, where an external adjustment need be provided, the problem of providing the seal switch means is rather difficult.

It is an object of my invention to provide a hermetically sealed control means having a sealed external adjustment means.

It is another object of my invention to provide a hermetically sealed control means with a diaphragm means in the sealed casing and a means acting through the medium of said diaphragm means for adjusting the control means without breaking the seal of the casing.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of the present invention is clearly shown.

In the drawing:

Fig. 1 is a sectional view of one form of my control means taken along the line 1—1 of Fig. 2;

Fig. 2 is a sectional view taken along the line 2—2 of Fig. 1; and

Fig. 3 is a perspective view of the outside of the control means.

Briefly, I have shown a switch means provided with a sealed casing which is adapted to be fastened in heat exchange relation with the cooling unit or in the medium to be cooled by a refrigerating system. An external adjustment is provided which acts through a bellows provided in the casing wall to adjust the casing of the main spring of the switch.

Referring now to the drawing, there is shown a switch means having a box-shaped portion 20 formed of a non-metallic electrical insulating material such as a phenolic condensation product. At one side of this casing is a metal casing portion 22 fastened to the casing 20 by screws 24 and sealed to the casing by an asphalt or other suitable type of sealing means 26. The portion

20 has a removable metal cover 28 upon one side for access to a portion of the switch mechanism. The gasket 30 is provided between the metal plate and the open face of the portion 20.

Within the metal portion 22 of the casing is provided a metal bellows 30 which is fastened to the bottom wall of the metal casing member 22 by a thin nut 32 which is threaded onto a hollow stem 34 projecting from the interior of the bellows 30. A tube 36 extends from the threaded portion 30 and may be employed for charging the bellows. It is shown sealed as at 38, but may, if desired, be connected by a tube to a thermostat bulb which may be mounted upon the cooling unit of the refrigerating system.

The bellows 30 is surrounded at the top and one side by a cage 40 which is fastened by rivets 42 and 44 to the bottom and end walls of the metal casing portion 22. The upper end of the bellows 30 is provided with a projection 46 which extends through the cage 40 and bears against the main lever 48 of the switch mechanism which is provided with an aperture 50 at one end provided with knife edges and threaded upon a depending pivot support 52 which is riveted to the top wall of the metal casing portion 22 by rivets 54. The main lever 48 is prevented from moving upwardly upon the member 52 by a shoulder upon the member 52, and the main lever is supported from beneath by a cotter pin 56 which extends through the lower portion of the member 52 beneath the main lever 48.

The main lever 48 is provided with a molded extension 58 of an insulating material provided with notches 60 at its end portion which receive one end of a secondary lever 62 having a tension coil spring 64 connected to its opposite end and stretched to a post 66 provided upon a contact carrying lever 68 pivoted upon a pin 70 and which in turn is supported by a bracket 72 extending from the end wall of the casing portion 20. The contact carrying lever 68 has a downwardly extending contact arm 74 carrying a contact bar 76 at its lower end which is adapted to bridge a pair of contacts 78 located side by side and connected through the wall of the insulating portion 20 to binding screws 80 which connect the contacts to the electrical conductors 82 and 84. The contacts 78 limit the closing movement of the contact arm 74 and the switch mechanism. The contacts 78 are molded into the casing portion 20 so that no leakage can take place through its connection with the binding screws 80.

The opening of the contact carrying lever 74 is controlled by a set screw 86 extending down-



wardly from the top wall of the insulating portion 20 for limiting the opening movement of the contact carrying lever 68 in order to control the differential of the switch. The contact carrying lever 68 is provided with stop portions 88 and 90 above and below the secondary lever 62. The location of these stop portions determines the tripping points of the switch, and since the location of these stop portions is determined by the location of the contacts and the position of the differential screw 86, the differential of the switch may be controlled by adjusting the screw 86.

The bellows 30 is charged with a suitable volatile liquid which causes the bellows to expand and contract with changes of temperature. Where the bellows is connected to a thermostat bulb, the bellows will respond to the temperature of the thermostat bulb. Where the casing is mounted in heat exchange relation with the object or medium to be cooled or heated, as the case may be, the bellows will respond to the temperature of the metal casing 22.

The force provided by the volatile fluid within the bellows 30 is controlled by a tension coil spring 92 connected at its upper end to an ear 94 depending from the main lever 48 and connected at its lower end to a lever 96 pivoted upon a pin 98 and connected at its other end to a bracket 102 provided with a threaded aperture which receives the threaded lower end of the stem 104. The end plate 106 of a bellows 108 is sealed to the stem 104. The upper end of the bellows 108 is sealed to the edges of an aperture 110 in the walls of the metal casing portion 22. The upper portion of the stem 104 is provided with an eye 112 which receives an eccentric 114 provided upon the end of a shaft 116 which is rotatably mounted in a bearing 118 provided upon the top wall of the metal casing portion 22. The opposite end of the shaft 116 is provided with an adjusting knob 120 by which the eccentric may be turned to raise or lower the stem 104 and thereby cause the lever 96 to be pivoted to stretch or contract the tension spring 92 in order to raise or lower both the cut-in and cut-out points.

In this switch, all of the connections through the walls are hermetically sealed. All of the screws are provided with gaskets, and all of the rivets are made sufficiently tight to prevent any leakage. The differential screw may be covered with asphalt in order to make sure that no leakage will take place. The bracket 72 is mounted in the wall of the portion 20 so that no leakage will take place. The casing may be charged with air or any suitable gas. The casing may be mounted in direct heat exchange relation with the cooling unit of a refrigerating system, or a steam radiator or a fluid to be heated or cooled. By this apparatus, I have provided a sealed con-

trol means with a convenient external adjustment.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A control means including a sealed casing containing a means to be operated, a pressure operated means having a movable portion within said sealed casing for operating said means to be operated, external adjustment means for said control means, and hermetically sealed means operated by said external adjustment means for adjusting the operation of said means to be operated by said pressure operated means.

2. A control means including a sealed casing containing a mechanical switch means to be opened and closed for controlling the flow of electric energy through an electric circuit, said switch means being connected to electrical conductors extending through the wall of the sealed casing, said conductors being hermetically sealed in the wall of the casing, a temperature responsive means including a mechanical operating portion within said sealed casing for opening and closing said switch means, external adjustment means for said control means, and hermetically sealed means operated by said external adjusting means for adjusting the operating portion of said temperature responsive means.

3. A control means including a sealed casing containing a switch means to be opened and closed for controlling the flow of electric energy through an electric circuit, said switch means being connected to electrical conductors extending through the wall of the sealed casing, said conductors being hermetically sealed in the wall of the casing, a pressure operated means including a separately enclosed operating portion within said sealed casing for opening and closing said switch means, external adjustment means for said control means, and hermetically sealed means operated by said external adjusting means for adjusting the operating portion of said pressure operated means.

4. A control means including a sealed casing, means forming a closed flexible chamber within said sealed casing, a switch means within the sealed casing operated by the expansion and contraction of the means forming the closed flexible chamber, spring means for opposing the expansion of the closed flexible chamber, external adjusting means for said control means and hermetically sealed means operated by said external adjusting means for adjusting the tension of said spring means.

EDWARD B. NEWILL.

## DISCLAIMER

2,184,241.—*Edward B. Newill*, Dayton, Ohio. SWITCH FOR REFRIGERATING APPARATUS. Patent dated December 19, 1939. Disclaimer filed September 20, 1940, by the assignee, *General Motors Corporation*.

Hereby disclaims claim 2.

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