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ADJUSTMENT LIMITING MEANS

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Fig. 1

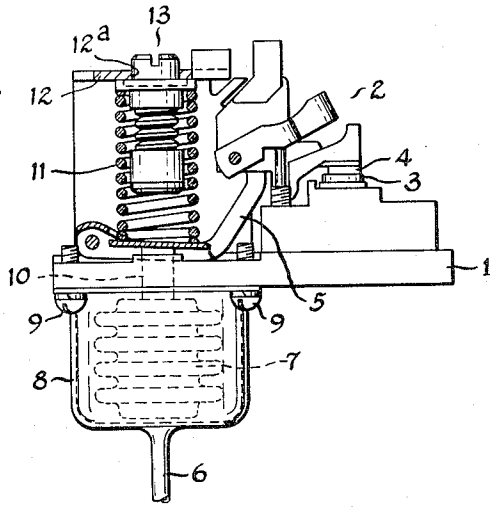


Fig. 2

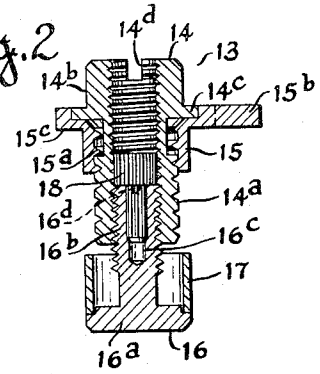
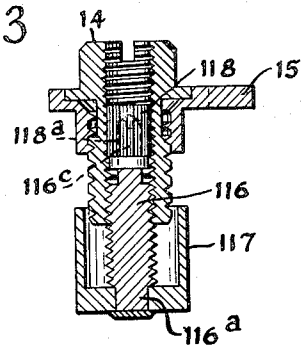


Fig. 3



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ADJUSTMENT LIMITING MEANS

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9 Claims. (Cl. 200—83)

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This invention relates to adjustment limiting means, and while not limited thereto is particularly applicable to pressure responsive switches as are used for controlling electric refrigerators.

Pressure responsive switches, and especially those employing spring biasing means, must necessarily be equipped with means to adjust the pressure at which the switch will operate, or, more specifically, to adjust the spring pressure of those switches employing spring biasing means. Such adjustments are necessary so that the switches can be mass produced and subsequently calibrated and put into final adjustment when the actual operating conditions have been ascertained. Pressure systems require switches which are adjustable to operate at different pressures, but which for safety reasons cannot be tampered with to effect an adjustment which will allow the pressure of the system to exceed a predetermined safe maximum value.

Therefore, this invention has among its objectives to provide an adjusting means which is operable to vary the pressure at which the pressure responsive switch will be actuated, but which is incapable of being adjusted beyond a predetermined safe limit.

Another object is to provide a rugged and compact control device of the aforesaid character which consists of a relatively small number of parts which can be readily and inexpensively manufactured and assembled.

Another object is to provide an adjusting means of the aforementioned character which cannot be forced beyond the maximum safe limit to which it has been set.

The novel features which I consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Figure 1 is a side elevational view, shown partly in section, of a control device embodying the invention;

Fig. 2 is a side elevational view of the adjusting means from Fig. 1, shown partly in section to illustrate the adjustment limiting structure; and

Fig. 3 is a side elevational view, shown partly in section, of a modified form of the device shown in Figs. 1 and 2.

Similar reference characters indicate corresponding parts throughout the several views of the drawings.

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Referring to Fig. 1, the numeral 1 designates a base member having thereon a switch mechanism 2 including a stationary contact or set of contacts one of which is shown at 3 and a movable contactor or bridging contactor 4. Said contactor 4 is responsive to operation of a switch actuating arm 5, and appropriate overcenter snap acting spring arrangements, not shown in detail. Such switch construction and operation is clearly shown and described in Kuhn Patent No. 2,158,824, Circuit Controlling Device, wherefore applicant relies upon said patent for detailed information concerning the switch mechanism 2. Said actuating arm 5 is responsive to fluid pressure in the line 6, or, more specifically, to the fluid pressure within a bellows 7. Said bellows 7 is enveloped by a casing 8, which is attached to the base member 1 by fastening means such as screws or bolts 9.

Base member 1 is formed with an opening affording clearance for a linking member 10 which transmits the pressure of the fluid in bellows 7 to the actuating arm 5 of switch mechanism 2. Said actuating arm 5 is biased into a given position by means of a compression spring 11.

Said spring 11 is held in engagement with said actuating arm 5 by means of a U-shaped cover 12. Said U-shaped cover 12 is formed with flange portions having openings for threadedly receiving bolts 9 so as to hold said cover in rigid engagement with said base member 1. The force of said spring 11 against the actuating arm 5 is varied by means of the adjusting mechanism 13 to thereby permit said switch mechanism 2 to be operable at any desired fluid pressure.

Said adjusting mechanism 13 (see Fig. 2) comprises a stud 14, an adjusting nut 15, a screw member 16, a sleeve 17 and a locking member 18. Said stud 14 has an externally threaded body portion 14^a, and a cylindrical end portion 14^b. Formed integrally with said end portion 14^b is an annular shoulder 14^c and a transverse slot 14^d of such size as to receive the end of an ordinary screwdriver. Said stud 14 is also formed with a centrally located through passage or bore threaded throughout its entire length.

Adjusting nut 15 is constructed with an annular groove of such size as to afford a bearing engagement between said adjusting nut 15 and stud 14, as shown in Fig. 2. Said adjusting nut 15 is also formed with a centrally located threaded opening 15^a for engagement with the body portion 14^a of stud 14. Said adjusting nut 15 is also formed with a projection 15^b of such size and shape as to slidably engage a slot (not shown) in the side wall of the U-shaped cover 12. Such ar-

rangement is also shown and described in the aforementioned Patent No. 2,158,824, wherefore a detailed explanation thereof is omitted. Said adjusting nut 15 is also formed with an annular shoulder 15c of such size as to provide an abutment against which said spring 11 exerts a force.

The screw member 16 is formed with a head portion 16a and an externally threaded main body portion 16b to effect threaded engagement thereof with the centrally located through passage in stud 14. Said main body portion 16a is also formed with a centrally located recess 16c and a screw driver slot 16d. The head portion 16a of said screw 16 is formed with an annular shoulder to receive and centrally locate a cylindrical sleeve 17 of metal or other suitable material.

The adjusting mechanism is assembled between the compression spring 11 and the central portion of said U shaped cover 12 as shown in Fig. 1. Said cover 12 is formed with an opening 12a through which extends the cylindrical end portion 14b of stud 14. The adjusting nut 15, while in threaded engagement with the main body portion 14a of stud 14, receives the upper end of said compression spring 11 against its aforementioned annular shoulder 15c. Due to engagement of projection 15b with the slot (not shown) in cover 12, the adjusting nut 15 is limited to rectilinear movement with respect to said cover. Thus as stud 14 is rotated as by means of a screwdriver in slot 14d, the adjusting nut 15 effects variation of the degree of compression of spring 11 due to the threaded engagement of stud 14 with nut 15.

In order to provide the aforementioned adjusting feature with a definite safe limit beyond which the fluid line pressure would be undesirably high, the following calibration steps should be adhered to:

The stud 14 is first rotated until the adjusting nut 15 is positioned at a predetermined maximum safe compressive value of spring 11. At this point, with the screw 16 partly threaded into the central opening of said stud 14, a small screwdriver is inserted into slot 16d of member 16. It is then a simple matter to rotate the screw 16 until the cylindrical sleeve 17 is brought into abutting relation with the bottom of the adjusting nut 15. When such a point is reached the locking member 18 is thereafter driven down into the through passage in stud 14 until rigid engagement thereof is effected with stud 14 and screw 16 as shown in Fig. 2. Said locking member 18, as shown, is formed with an enlarged end portion having its periphery fluted or knurled and of such shape and dimensions so as to provide a relatively rigid press fit against the wall of the centrally located opening in stud 14. Said member 18 is also formed with an end portion of substantially smaller diameter which is likewise longitudinally fluted or knurled throughout its length so as to effect a rigid press fit or engagement thereof with the centrally located recess 16c of screw 16. It is thus seen that if the locking member 18 is inserted as shown in Fig. 2 when the screw 16 is positioned to prohibit movement of nut 15 beyond the maximum safe limit, it is extremely difficult if not impossible for one to tamper with and change the maximum safe limit of the pressure system. Notwithstanding such limiting feature it is still possible to adjust the compression of spring 11 within certain predetermined safe limits.

Fig. 3 shows an embodiment wherein screw 116 is constructed with a small end portion 116c

rather than the aforementioned recess 16c (Fig. 2). Such modification requires a locking member 118 constructed with a centrally located longitudinally fluted or knurled recess 118a, the surface of which is longitudinally fluted or knurled. With such a construction the locking member 118 is formed or driven into the passage in stud 14 until rigid engagement thereof is effected with the stud 14 and the smaller end portion 116c of screw 116, as shown.

The modification in Fig. 3 also shows screw 116 to be formed with a lower end portion 116a of reduced transverse dimensions which projects through a centrally located aperture in the bottom wall of the cup-shaped abutting member 117. Said abutting member 117 and said screw member 116 are rigidly fastened together as by soldering the exposed part of said lower end portion 116a to the bottom wall of member 117. Except for the slight modifications of screw 16, sleeve 17 and locking nut 18, both embodiments of my invention herein disclosed utilize parts of like construction and function in substantially the same manner.

Although I have shown and described certain specific embodiments of my invention, I am fully aware that many modifications thereof are possible. My invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

We claim:

1. For an electric switch having a set of cooperating contacts and means including an actuating element operable to effect engagement and disengagement of said contacts, adjustable biasing means associated with the actuating element to bias the same in a given direction comprising, a biasing element, a first member associated with said biasing element and movable to effect variation of said bias, a second member associated with said first member and adjustable to effect movement of said first member, limiting means associated with said second member and operable to afford limited movement of said first member, and locking means associated with said limiting means and said second member to lock the same against relative movement therebetween.

2. For an electric switch having a set of cooperating contacts and means including an actuating element operable to effect engagement and disengagement of said contacts, adjustable biasing means associated with said actuating element to bias the same in a given direction and comprising a biasing element, a first member associated with said biasing element and movable to effect variation of said bias, a second member formed with an opening and associated with said first member and being adjustable to effect movement of said first member, limiting means located partially within the opening in said second member and operable to afford limited movement of said first member, and locking means located within said opening in engagement with said second member and said limiting means to lock the same against relative movement therebetween.

3. For an electric switch having a set of cooperating contacts and means including an actuating element operable to effect engagement and disengagement of said contacts, in combination, an adjustable biasing element associated with said actuating element to bias the same in a given direction, adjusting means for said biasing element comprising a first member associated with said biasing element and movable to effect varia-

tion of said bias, a second member formed with an opening and associated with said first member and being adjustable to effect movement of said first member, limiting means having an end portion formed with a recess and located partially within said opening in said second member and being operable to afford limited movement of said first member, and locking means located within said opening and said recess to lock said second member and said limiting means against relative movement therebetween.

4. For an electric switch having a set of cooperating contacts and means including an actuating element operable to effect engagement and disengagement of said contacts, in combination, an adjustable biasing element associated with said actuating element to bias the same in a given direction, adjusting means for said biasing element comprising a first member associated with said biasing element and movable to effect variation of said bias, a second member formed with an opening and associated with said first member and being adustable to effect movement of said first member, limiting means having an end portion formed with a recess and located partially within said opening in said second member and being operable to afford limited movement of said first member, and locking means having a large end portion and a small end portion which are located within said opening and said recess respectively to lock said second member and said limiting means against relative movement therebetween.

5. For an electric switch having a set of cooperating contacts, means including an actuating element operable to effect engagement and disengagement of said contacts, and an adjustable biasing element associated with said actuating element to bias the same in a given direction, in combination, adjusting means for said biasing element comprising a first member associated with said biasing element and movable to effect variation of said bias, a second member formed with an opening and associated with said first member and being adjustable to effect movement of said first member, a limiting device having an end portion of cross sectional area smaller than the rest of such device, and being operable to afford limited movement of said first member, said end portion being located at least partially within said opening, and locking means comprising a plurality of longitudinally fluted or knurled surfaces in engagement with said opening and said smaller cross sectional end portion of said limiting device to lock said second member and said limiting device against relative movement therebetween.

6. In combination, first and second elongated, externally threaded members each having an enlarged portion at one end thereof respectively, said first member having an axial opening therethrough and the other end of said second member being threadably engaged within said axial opening at the other end of said first member, an internally threaded member threadedly engaging the external threads of said first member and movable relatively to the latter between the enlarged portions of said first and said second members, and a locking device disposed within said axial opening and having force-fitted engagement with each of said first and said second members to prevent relative movement therebetween whereby relative movement between said first member and said internally threaded member is restricted to a selected degree.

7. The combination defined in claim 6, in which said locking device is formed with projecting portions on the surface thereof to effect locking engagement with said first and said second members.

8. The combination defined in claim 7, in which said second member is provided with a recess formed in said other end thereof and said locking device is press-fitted within said recess and said axial opening in said first member.

9. The combination defined in claim 7, in which said second member is provided with a protuberance extending from said other end thereof and said locking device is press-fitted within said axial opening intermediate said first member and said protuberance.

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