Nov. 30, 1954 R. FILLIETTE 2,695,939

ELECTRIC SWITCHING DEVICE

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Fig. 2

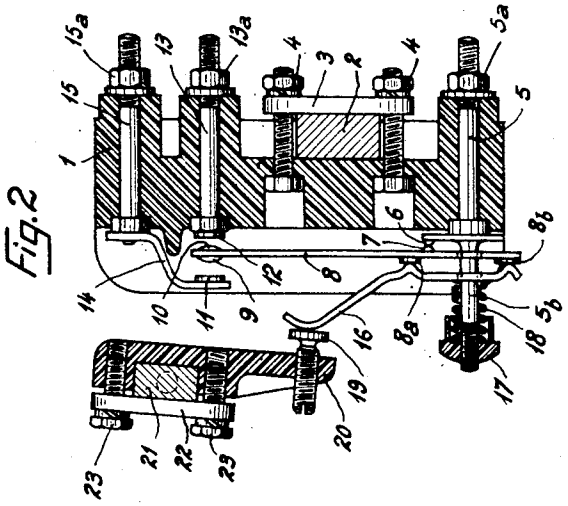
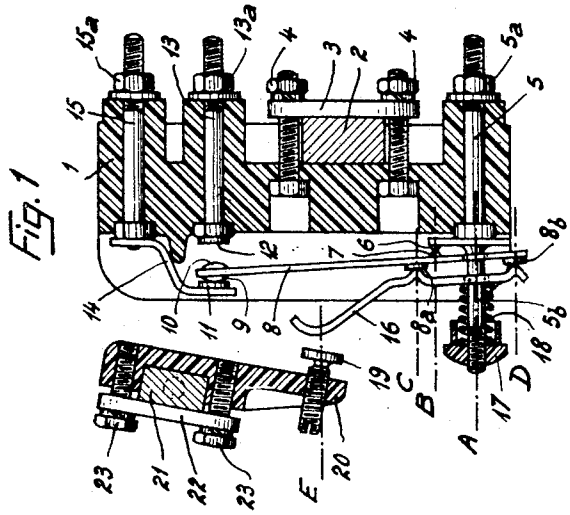


Fig. 1



Raymond Filliette
By Fraser, Myers & Manley
Attys.

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Fig. 4

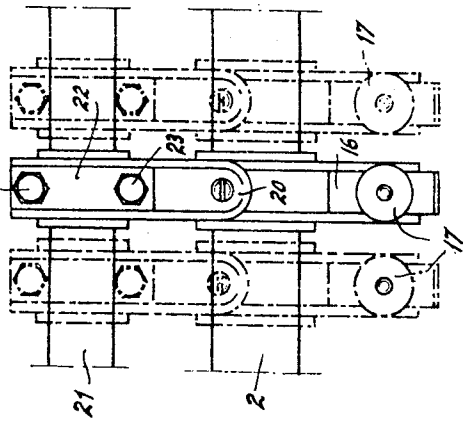
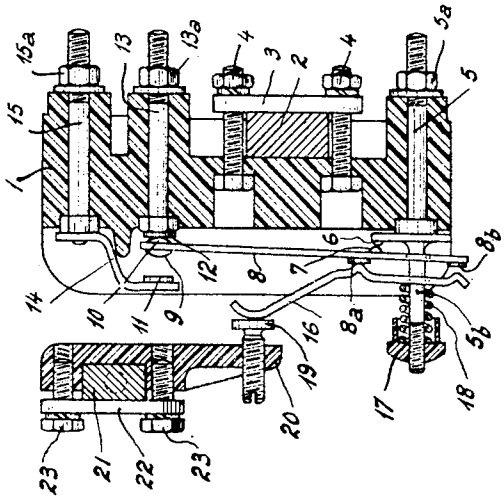


Fig. 3



Raymond Filliette
By Fraser, Myers & Manley
Attys.

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Fig. 6

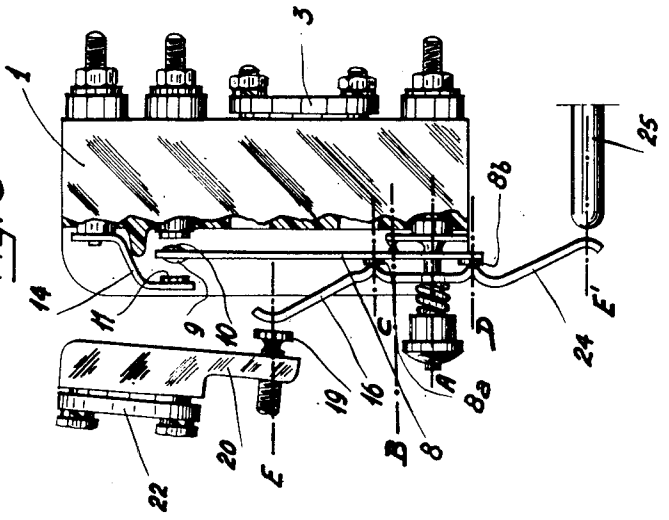
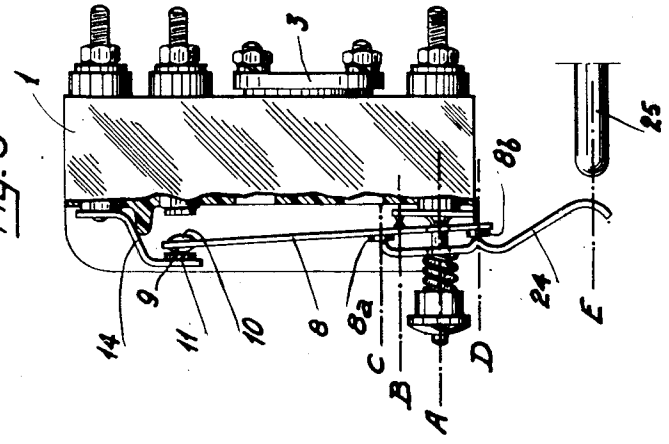


Fig. 5



Raymond Filliette

By Churchill, Rich, Waymouth & Engel

Attys.

United States Patent Office

2,695,939

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2,695,939

ELECTRIC SWITCHING DEVICE

Raymond Filliette, Rueil-Malmaison, France, assignor to La Télémécanique Electrique (Société Anonyme), Seine, France, a French company

Application June 17, 1952, Serial No. 294,086

Claims priority, application France July 25, 1951

13 Claims. (Cl. 200—153)

The present invention relates to electric switching devices and has for an object to provide a switching unit suitable for use in various forms of electric control apparatus, such as contactors and circuit breakers, for example for the control of hoists and lifts, controllers for the control of auxiliary circuits and all such apparatus having a large number of contacts.

According to the invention an electric switching device comprises a lever connected to a current lead-in terminal, which lever is adapted to move between two opposed fixed contacts, and is freely mounted upon and maintained by spring pressure against a fixed bearing member forming a pivot, and against one of the two aforesaid contacts, the pivoted movement of the lever necessary for changing over from one contact to the other being effected by means of a thrust member or other known externally operated mechanical device, a blade or other free element being interposed between the said thrust member and the said lever and maintained by spring pressure against the said lever at a point close to the support or pivot of the said lever.

In one embodiment of the invention, the spring pressure by which the lever is maintained against its pivot and the spring pressure by which the blade is maintained against the lever are effected by a single spring acting on the said blade, the latter bearing against the lever at at least two points situated on either side of the said pivot.

The relative position of the different bearing, pivoting and contact points is determined in such manner that the contact pressure of the lever upon either of the freed contacts is substantially the same.

The blade freely mounted and maintained against the lever by spring pressure imparts to the latter a certain independence with respect to the thrust member. In particular, when the lever abuts against the fixed off-normal contact under the action of the thrust member the movement of the thrust member can continue without causing any shock to or deformation of, the electrical conducting parts of the device. The provision or the blade forming a transmission member between the thrust member and the lever permits a certain amount of lost motion.

The tension of the spring by which the blade is applied against the lever may be adjustable, for example by means of a nut forming an abutment at one end of the said spring. This permits of adjusting the contact pressure while at the same time maintaining the lever firmly applied against its support. This pressure once adjusted, is substantially unsusceptible to appreciable variations, even after a very large number of operations. Nevertheless, if necessary, such variations as may occur may be readily compensated by adjusting the regulating screw. The switching device according to the invention thus affords an appreciable advantage over switching devices comprising a flexible blade which is submitted to successive deformations which are likely to modify its mechanical characteristics and consequently the contact pressure.

The bearing member on which the lever pivots is directly connected to the current lead-in terminal. The lever is thus permanently connected to the said terminal through a good contact which is subjected to practically only negligible friction, whereby a long useful life of the device is ensured. In addition owing to the fact that the lever is applied against the member by spring pressure, any play is automatically taken up.

The various parts of the switching device are mounted in accordance with the invention, on a base of insulating material which is of rectangular shape and of reduced

depth, this being possible owing to the very limited width of the lever and of the blade on the one hand, and owing to the absence of any link pin or locking members on the other hand. The parts are so arranged as not to project laterally at any point beyond the maximum cross-section of the base, and the whole has the form of a flat unit capable of being mounted on a suitable support in juxtaposition with other similar devices. Owing to the reduced dimensions of each device, it is possible to accommodate a large number of such devices in a limited space, so that electrical control arrangements of limited dimensions can be provided.

Finally, since the various parts are subjected to limited forces and practically negligible friction, they may be made of material requiring no especial mechanical properties.

The present invention also includes electric control apparatus comprising switching devices of the type hereinbefore described.

In the accompanying drawing there is shown by way of non-limitative example, one embodiment of the invention as applied to a unipolar reversing switch unit. In the drawing:

Figs. 1, 2 and 3 are vertical sections through the unipolar reversing switch unit, showing the three operating positions thereof, and

Fig. 4 is a front elevation showing a plurality of switch units arranged in juxtaposition.

Figs. 5 and 6 show diagrammatically two modifications of the switch unit.

The switch units illustrated in the drawing comprise a base **1** of insulating material, preferably moulded, which is normally supported by a steel bar **2** on which it is secured by means of a strap **3** and nuts and bolts **4**.

A rod **5** provided with a current lead-in terminal **5***a* and having secured thereto a bearing member **6** provided with a knife edge, and two rods **13** and **15** provided with current lead-out terminals **13***a* and **15***a* and provided with studs **12** and **11** respectively, forming fixed contacts are mounted on the base **1**. The said studs and the bearing member **6** are preferably of silver. The rod **15** is connected to a bent over arm **14** which is so arranged that the studs **11** and **12** lie opposed one to the other.

The movable contact of the switch comprises a lever **8** having at one end, on its opposite faces and at the level of the studs **11** and **12** two contact members **9** and **10**. The said lever is also provided with a raised portion **7** intended to co-operate with the bearing member **6** and, on the face opposite the said portion two studs **8***a* and **8***b* situated on either side of the portion **7**, the stud **8***a* being positioned adjacent thereto. The portion **7** and the contact members **9** and **10** are preferably made of silver, while the studs **8***a* and **8***b* may consist of treated or case hardened steel.

The lever **8** is maintained against the bearing member **6** by a blade **16** pressed against the studs **8***a* and **8***b* by means of a spring **18**, the tension of which may be adjusted by means of a screw **17**. The said spring and the nut are mounted on an extension **5***b* of the rod **5**, which extension extends freely through the lever **8** and the blade **16**.

Thus, the members **8** and **16** are restrained against movement perpendicularly to the line A (Fig. 1) constituting the axis of the extension **5***b*, while they are free to move angularly with respect thereto.

The line B, parallel to the axis A and passing through the bearing **6**, is positioned at a distance from the axis A, while the lines C and D extending through the points at which the blade **16** is applied against the lever **8** are positioned respectively on either side of the axes A and B.

The switch is adapted to be mechanically actuated, for example in the case of a contactor, by an adjustable thrust member **19** mounted on an arm **20** fixed on a shaft **21** by means of a strap **22** and screws **23**. The thrust member **19** is adapted to act on the blade **16** in a direction indicated by the line E, which is relatively remote from the line B extending through the bearing **6**. It will be understood that the thrust member could be replaced by a cam, a dog or any other similar mechanical device.

The contact members and the movable members of

the switch are disposed in a groove or recess formed in the face of the base and of sufficient depth to prevent any substantial lateral movement of the movable parts and to avoid any accidental contact with the adjacent switch units.

The switch operates in the following manner:

In the inoperative position (Fig. 1), the thrust member **19** is free from engagement with the lever **16** which, under the action of the pressure set up by the spring **18** causes the blade **8** to pivot so that the contact member **9** engages the stud **11**.

Rotation of the shaft **21** through a certain angle causes the thrust member **19** to act on the lever **16** and the contact member **9** is thus withdrawn from the stud **11** (Fig. 2), thereby breaking the circuit connected to the terminals **5***a* and **15***a*.

Further rotation of the shaft **21** and the corresponding displacement of the blade **16** and lever **8**, causes the contact member **10** to bear against the stud **12**, thereby closing the circuit connected to the terminals **5***a* and **13***a* (Fig. 3).

The relative position of the various lines B, C, D and E is such that the contact pressure between the contact member **9** and the stud **11** (Fig. 1) is substantially the same as the contact pressure between the contact member **10** and the stud **12** (Fig. 3). It is to be noted, in the latter figure, that any movement of the thrust member **19** beyond the position of the lever **8** in which the contact **10** bears against the stud **12** causes the blade **16** to pivot on the stud **8***a* against the action of the spring **18**. Thus, owing to the flexible manner in which the blade **16** is mounted, the thrust member does not produce any shock which might cause damage to the parts of the switch.

As has hereinbefore been stated, the switch is in the form of a small unit adapted to be mounted in juxtaposition (see Fig. 4) in a small space with other similar units mounted on a common bar **2**.

Each unit has a separate mechanical actuating device. These devices may be independent of one another or associated with one another.

The blade **16** may be turned about the rod **5***b* so as to bring it into the position shown at **24** (see Fig. 5), the thrust member then being positioned at **25** and acting in a direction indicated by the line E′. It will be understood that the blade **16** as shown in the drawing could comprise an extension as indicated at **24***a* (see Fig. 6), in which case the blade would extend from the line E to the line E′. In fact, only the relative position of the studs **8***a* and **8***b* is important, the form and the dimensions of the blade **16** being purely arbitrary.

In addition, the action of the thrust member may be exerted tangentially on the blade **16** instead of being exerted perpendicularly thereto, this being rendered possible due to the sloping form of the said blade. Such an arrangement would permit of the continuous rotation of the shaft **21**, on which a number of arms **20** corresponding to an equal number of switch units may be fixed, the said arms being keyed in well-defined relative angular positions. In such a case, in order to reduce the friction of the thrust member on the blade, the thrust member or the blade may be provided with a roller. Such an arrangement is particularly advantageous in the case of controllers such as those employed for the operation of hoists and lifts.

It will be understood that modifications may be made to the switch unit hereinbefore described, by substitution of equivalent technical means, without departing from the scope of the present invention. In particular, the blade **16** could be replaced by any desired resilient member secured to the lever **8**, for example at the point **8***a*, the spring **18** then bearing directly against the lever, for example at the point **8***b*.

What I claim is:

1. In an electric switch assembly adapted to connect and disconnect a pair of circuit terminals, fulcrum means electrically connected to one terminal, a rigid electrically conductive lever movable about said fulcrum between two positions, a contacting point on the lever spaced from said fulcrum adapted respectively to engage and disengage the other terminal in the two positions of the lever, means for applying spring pressure to the lever at a pair of spaced points thereof located to either side of said fulcrum for normally maintaining the lever in one position, and means for increasing the pressure applied to the lever at that one of said pair of spaced points which is located between the fulcrum and said contacting point over the pressure applied to the lever at the other of said spaced points, in order to bring the lever to its other position.

2. An electric switch assembly as claimed in claim 1, wherein the first mentioned one of said pair of spaced points is substantially closer to said flulcrum than is the other one of the spaced points.

3. An electric switch assembly as claimed in claim 1, wherein the first mentioned one of said pair of spaced points is located in immediate proximity to said fulcrum, and the other one of said spaced points is spaced a considerably greater distance from the fulcrum.

4. In an electric switch assembly adapted for establishing at least two different conditions of an electric circuit, a stationary support, fulcrum means fixed to said support, a rigid lever movable about the fulcrum between two positions in each of which a respective one of said circuit conditions is established, spring means for applying pressure to the lever at a pair of spaced points thereof located on either side of the fulcrum for normally maintaining the lever in one position, and mechanically actuating means for displacing the lever to its other position against the action of said spring means.

5. An electric switch assembly as claimed in claim 4, wherein said fulcrum is electrically connected to one circuit terminal, and said lever is electrically conductive and in one of its said positions is adapted to have a contacting point thereof engage another circuit terminal.

6. An electric switch assembly as claimed in claim 4, wherein said fulcrum is electrically connected to one circuit terminal, and said lever is electrically conductive and in one of its said positions is adapted to have a contacting point thereof engage another circuit terminal, and in its other said position is adapted to have its said contacting point disengage said other circuit terminal and have a further contacting point thereof engage a further circuit terminal.

7. An electric switch assembly as claimed in claim 4, wherein said fulcrum is electrically connected to one circuit terminal, and said lever is electrically conductive and in one of its said positions is adapted to have a contacting point thereof engage another circuit terminal, and wherein said mechanically actuating means acts to increase the pressure applied to the lever at that one of said spaced points thereof which is located between said fulcrum and said contacting point.

8. In an electric switch assembly adapted for selectively establishing at least two different conditions of an electric circuit, fulcrum means, a substantially rigid lever movable about said fulcrum between two positions in each of which a respective one of said circuit conditions is established, a pressure-transmitting member engaging said lever at spaced points thereof lying on either side of said fulcrum, a spring acting on said member for applying pressure therethrough to both said spaced points of the lever normally to maintain the lever in one of its said positions, and an actuating element for selectively actuating said member to bring the lever to its other position.

9. An electric switch assembly as claimed in claim 8, wherein said spring is adjustable.

10. In an electric switch assembly adapted for selectively connecting a first circuit terminal to either one of two other terminals, a furcrum element electrically connected to said first terminal, a rigid electrically-conductive lever movable about said fulcrum between two positions, adjacent contacting points on opposite faces of the lever spaced from said fulcrum and adapted to make contact with respectively related ones of said terminals in each of said lever positions, a pressure-transmitting member engaging said lever at two spaced points thereof on either side of said fulcrum, said member being spaced from said lever intermediate the points of engagement thereof with the lever for applying pressure therethrough to both said spaced points of the lever to maintain the lever in one of its said positions, said member having an extension beyond one of said points of engagement thereof, and an actuating element adapted to engage said extension for selectively actuating said member to bring the lever to its other position.

11. A switch assembly as claimed in claim 10, wherein the relative spacings of said points and said fulcrum are so predetermined that the pressure developed between said

contacting points and the related terminals in both positions of the lever is substantially the same.

12. A switch assembly as claimed in claim 10, which comprises a mounting block of insulating material of narrow elongated generally rectangular form, and means for mounting said fulcrum, said pressure transmitting member and said spring means adjacent one end of the block and for mounting said other terminals adjacent the other end of the block with said lever extending therebetween along the length of the block for engagement with said fulcrum and said member and with either selected one of said other terminals under the action of said spring means.

13. A switch assembly as claimed in claim 10, which comprises a mounting block of insulating material of narrow elongated generally rectangular form, means for mounting said fulcrum, said pressure transmitting member and said spring means adjacent one end of the block and for mounting said other terminals adjacent the other end of the block with said lever extending therebetween along the length of the block for engagement with the fulcrum and with said member and with either selected one of said other terminals under the action of said spring means, and means for mounting a plurality of similar blocks in transversely juxtaposed relationship.

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