Nov. 14, 1939. A. J. BOWIE 2,179,539

ELECTRICAL SWITCH

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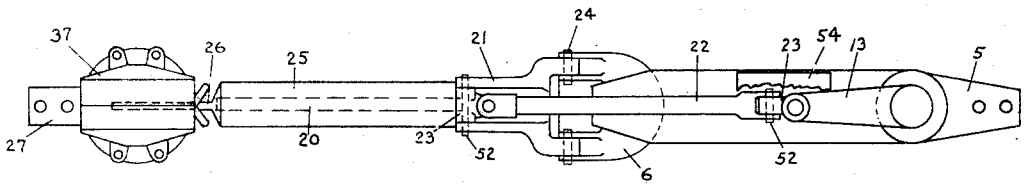


Fig. 2

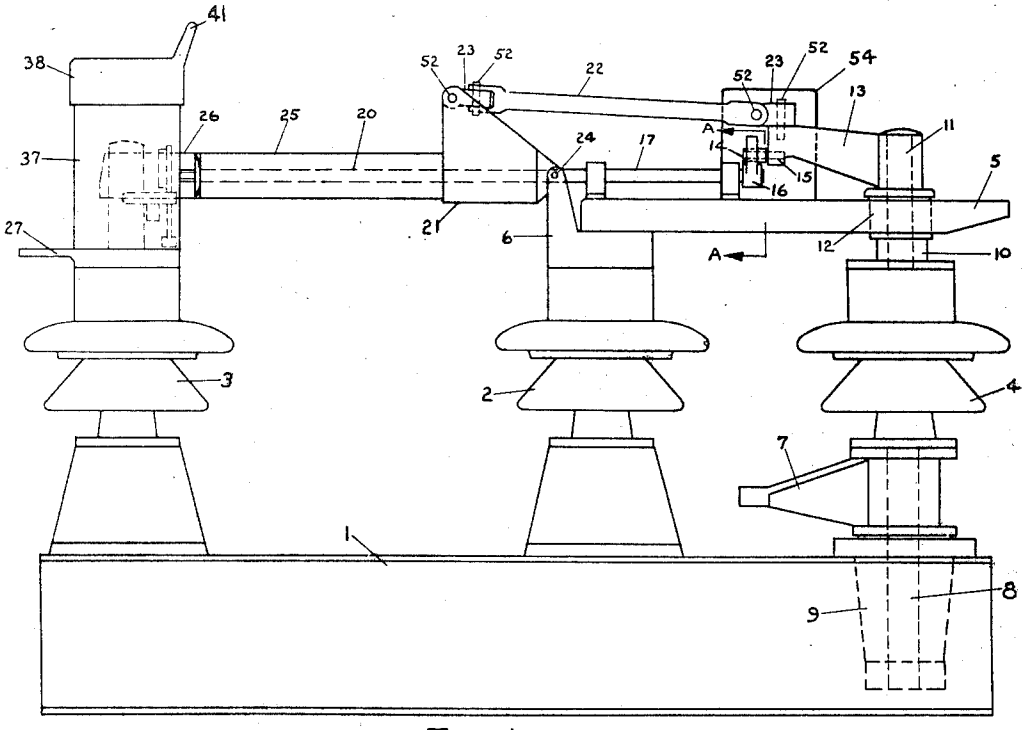
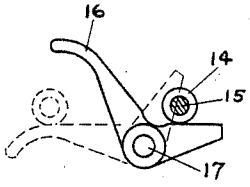


Fig. 1



SECTION A-A

Fig. 3

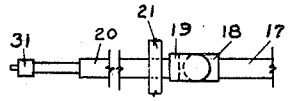


Fig. 4

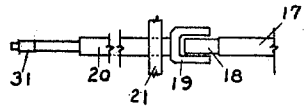


Fig. 5

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ELECTRICAL SWITCH

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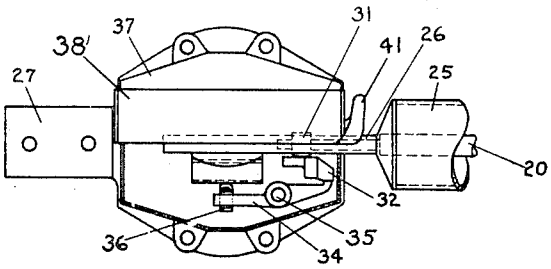


Fig. 8

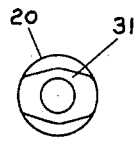


Fig. 9

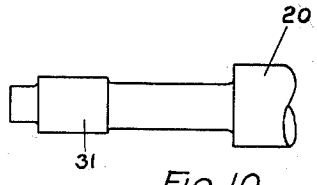


Fig. 10

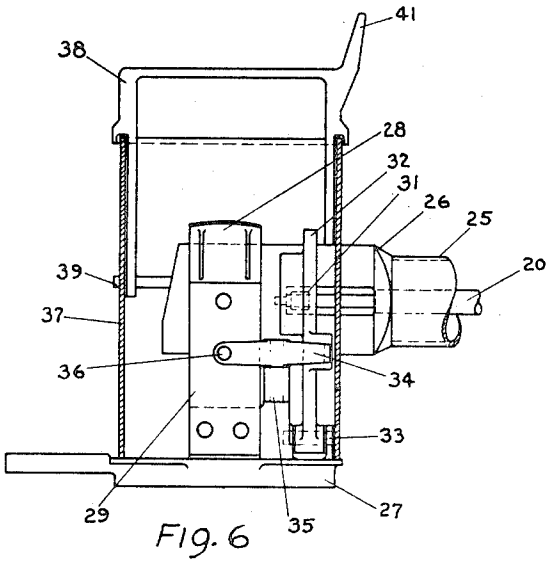


Fig. 6

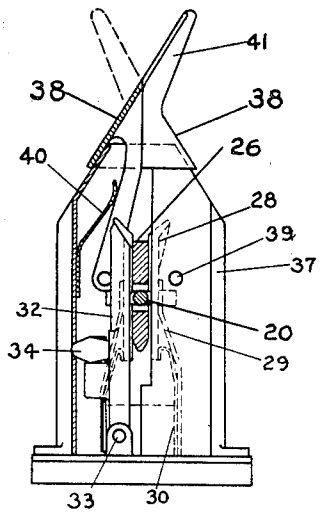


Fig. 7

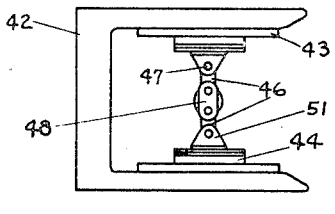


Fig. 12

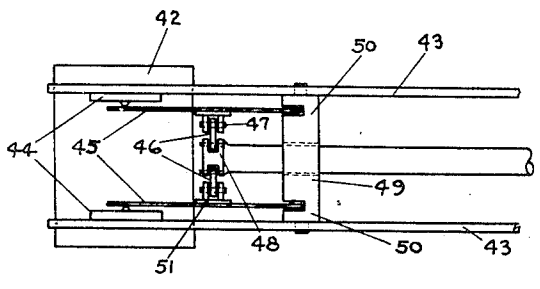


Fig. 11

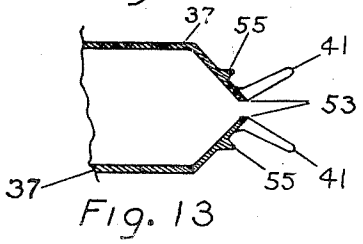


Fig. 13

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UNITED STATES PATENT OFFICE

2,179,539

ELECTRICAL SWITCH

Augustus Jesse Bowie, San Francisco, Calif.

Application September 26, 1938, Serial No. 231,672

20 Claims. (Cl. 200—48)

It is an object of this invention to provide improved contacts for electrical switches particularly with reference to outdoor use and to the protection of the switch parts against ice and snow.

The most efficient contact surface is silver since its oxide is a conductor whereas the oxide of copper is an insulator. However, to secure proper operation, the silver contact must be engaged with only a light wiping pressure since any heavy pressure will abrade the relatively soft surfaces. Hence to secure proper operation the contact pressure which is essential for good contact must be applied after the contacts have engaged and have ceased relative motion. In the preferable form the contacts first move into full engagement with only a light wiping pressure and then a materially increased pressure is applied to them after relative motion has ceased.

It has been one of the important requirements in the countries subject to ice and snow to protect from ice not only the contacts but also the mechanism through which pressure is applied to the clip contact. Usually the switches are mounted with their bases horizontal and with upright insulators and for this reason it has been difficult to protect the clip contact from the weather. Some methods have been employed to bring the blade to a horizontal position and then to extrude it into the contact which is covered above by a protective shield. But this is open to serious objection particularly if ice adheres to an entering contact since it will subject the insulators to bending stresses which are apt to break them since they are weakest in bending. It is an object of this invention to provide for breaking off the ice in a manner to subject the insulators to compressive stresses which they are most capable of resisting. For this purpose I normally provide a sleethood for the clip which, when the switches are used in upright position is covered by two small shutters which will open wide enough to admit the blade and then close behind it, the shutters being provided with a scraping edge surrounding the opening and closely fitting the switch blade, so as to remove the ice as the blade enters and to protect the clip and associated parts against ice when the switch is either open or closed. When the switch is used in inverted position the shutters may be omitted the sleethood being provided with a fixed opening with scraping edges.

In order to secure best electrical operation it is preferable that the blade portion entering the sleethood for the contact with the clip be of relatively thin section of the customary thickness for a blade contact. Such a blade section gives a relatively large area contact surface with maximum economy in weight and metal. Excessive weight at the end of the blade necessitates heavier operating equipment and larger counterbalances particularly in the higher voltage switches now in use. I preferably use self-aligning shoes in the clip contact which is possible because of the thorough protection against freezing and ice and snow given by the type of sleethood which I employ.

My invention has for a particular object the provision of means which will be practical for applying high pressure to the contact surfaces of a switch utilizing such a thin section blade and further to provide such a mechanism which can be thoroughly protected and from which adhering ice and snow can be automatically substantially entirely removed in the operation of the switch.

A further object is to provide such a mechanism in which the pressure will be applied through a resilient member. Should a thin film of ice still remain upon the blade such as to increase the thickness thereof slightly, the parts of the pressure mechanism will not then be overstressed and such resilient pressure application will force the contact surfaces together as the thin film of ice melts.

The method which I prefer to use in applying pressure to the contact surfaces after engagement is by means of a torsion rod running lengthwise of the blade and usually on its axis. This rod, adjacent to the engaging portion of the blade is preferably formed with a cam which in its non-operative position has slightly less width than the blade and which when rotated projects beyond the blade surface to cooperate with that portion of the pressure applying means which is associated with the clip contact. The use of this construction is an important feature as it provides for practical protection from ice and snow, requires a minimum space and is most easily broken loose when frozen.

The clip contact, the pressure applying mechanism associated with it, and the cam are well shielded from such ice as might interfere with its operation. As ice may collect on the blade when it is open, the sleethood is constructed as described so as to remove any ice adhering to it and to the cam as the blade enters the sleethood thus freeing the cam for proper operation and removing such ice from the blade as would interfere with proper electrical contact.

Two other important considerations affecting the successful operation of such a switch are (1) that the normal closed position of the blade will vary upward or downward from the desired central position and (2) the pivot center of the blade may vary in the desired distance from the clip. These conditions are due to slight variations in the squareness of the rack structure on which such switches are mounted and deflections on such structure overload. It is an object of this invention to provide for such variations without materially affecting the operation of the switch and in particular the pressure applied to the contacts.

With the above and other objects in view, as will be obvious to those skilled in the art from a reading of the attached specification and drawings, my invention consists in the provision of a switch with superior electrical and mechanical operating characteristics which will be inexpensive to construct and foolproof in operation and in the combination of the various parts, members, and features as pointed out in the appended claims.

While the invention is showed applied to a switch of the vertical break type operated by a rotating insulator, crank, and connecting rod it is obvious that simple modifications may be made by one skilled in the art to easily adapt my invention to other types of switches operated by other means, by utilizing the teachings hereof and without departing from the scope of the invention as expressed in the claims.

Fig. 1 shows a side elevation of the switch. Fig. 2 shows in plan a top view thereof. Fig. 3 shows a transverse elevation of the hinge cam, which operates the high pressure. Fig. 4 is a side view of the high pressure rod and hinge joint which is located substantially on the centerline of the blade pivot. Fig. 5 is the plan view of Fig. 4. Fig. 6 is a cross-sectional elevation of the sleethood showing the clip in side view. Fig. 7 is an end view of the clip showing a half-section through the sleethood and a half elevation. Fig. 8 is a corresponding plan view of the clip in half section and half projection. Fig. 9 is the cam in an end view, and Fig. 10 is a side elevation thereof. Fig. 11 shows the plan, and Fig. 12 shows an end elevation of modified bifurcated high pressure blade end. Fig. 13 is a sectional view of the sleethood for an inverted or vertically mounted switch.

1 is switch base. 2 is a hinge insulator. 3 is clip insulator. 4 is a moving insulator which operates the switch. 5 is the bridge rigidly mounted on hinge cap 6 which is secured to insulator 2. 7 is a base crank on insulator 4 mounted on shaft 8 swivelling on bearing 9 which is rigidly attached to base 1. 10 is a top cap mounted rigidly on moving insulator 4 and provided with shaft 11 which swivels in top bearing 12 which is mounted on bridge 5. 13 is a crank rigidly mounted on shaft 11 which turns with insulator 4. 14 is a roller journaled on shaft 15 which is carried by crank 13. This roller engaged high pressure cam 16 which mounts on shaft 17 and is rotatably mounted on bridge 5. The outer end of this shaft has a spatulated end 18 which engages a clevis end 19 attached to the high pressure shaft 20 which runs through the blade to the clip contact. 21 is a blade base pivoted on hinge cap 6 and operated by connecting rod 22 provided with universal joints 23, 23 operating on pins 52, 52 at each end. This connecting rod operates the blade which is pivoted on pins 24, 24 in the hinge cap 6. The blade is actuated by the rotation of top crank 13.

Fig. 3 shows the side view of hinge cam 16 which is operated by roller 14 mounted on top crank 13. The arrangement is such that the cam is operated only when the moving cap is on or very near center, hence this cam is operated only when the blade is substantially closed under conditions that no appreciable blade motion will exist while the high pressure is being set. 25 is the tubular blade provided with a flat blade end 26 which contacts with the clip. At the time when the high pressure is not on and the blade swivels the end 18 and clevis end 19 of the high pressure rod lie in a plane through the centerline of the switch insulators, hence the switch blade may be freely operated under these conditions. Moreover once the blade has started to move away from the clip the angular relationship of these surfaces locks the high pressure rod in position and prevents accidental or intentional turning of the high pressure rod until the blade is practically in closed position. When the switch blade is closed the motion of cam 16 then turns and rotates the high pressure shaft 20 through approximately 90° or whatever lesser angle is desired and will cause high pressure to be set. It is not necessary nor advisable to have a pin joint in this position in order to operate the high pressure since the clevis end fit will develop the necessary torsion. While it is not necessary to have the centerlines of these two high pressure ends exactly on the centerline of the blade hinge such an approximate location is desirable to keep the rod ends 18 and 19 always in engagement. Fig. 6 shows a side elevation of the clip with cross-section on the centerline through the protective sleethood. Fig. 7 shows the clip, half in end view, and half in section through the sleethood. Fig. 8 shows a plan of the clip with half section of sleethood thereon. 27 is the clip base. 28, 28 are clip faces flexibly mounted in spring levers 29, 29 which are rigidly secured to the clip base. 30, 30 are shunts from the clip faces to the clip base. 31 is the clip cam which is an integral part of the high pressure shaft.

Fig. 9 shows an end view of the cam. Fig. 10 shows the corresponding side view. When the cam is rotated it will set the high pressure through levers 32, 32 which are pivoted on pins 33, 33 mounted on base 27 and which in turn engage the ends of horizontal levers 34, 34 mounted on pins 35, 35 and apply pressure through the adjusting screws 36, 36 to the spring levers 29, 29. The adjustment is made so that when the cam is parallel to the blade only a light pressure will be exerted by levers 34, 34 on spring levers 29, 29 but when the cam is rotated heavy pressure will be applied to the springs and thence to the clip faces.

Hence to apply pressure between the contact surfaces I utilize the pressure applying means consisting, for example of a torsion rod 20 and clip cam 31, and the translating means consisting of levers 32 and 34 which cause the torque of the rod 20 to create a pressure between contact surfaces 28, 28 and blade 26. Operation is effected through cam 16 which is operated through roller 14 mounted on crank 13 and conveys the torsion motion through rod 20 and clip cam 31 to contacts 28, 28 and 26.

Levers 32, 32 are provided with extended platforms for the engagement of clip cam 31 which allow the important functions of a material variation of the centerlines of the clip insulators toward or away from each other or which allow a material upward or downward position of the

blade from its assumed central position and still insure definite engagement of the high pressure cam and its cooperating surfaces. These features are essential for securing proper high pressure operation. Moreover the cam when the switch is closed is entirely within the sleethood housing hence is thoroughly protected from the weather. As the cam is substantially the same width as the switch blade any ice or snow adhering to the sides when the blade is open will be instantly removed by the edges of the sleethood when the blade passes through the enclosure. This gives definite assured protection for the high pressure operation of the clip end. The cam 16 on the hinge end can if desired be provided with a protective cover 54 on top, although experience has shown ice and snow will be instantly removed by the powerful blow when closing the switch and such additional protection is unnecessary.

37 is a sleethood case which is mounted on the clip base and is closed except for a narrow slot in the front face and also in the top. In the case of switches mounted vertically or underhung no shutters are provided and the top slot of the sleethood is made to fit closely to the width of the blade so that any ice adhering to the blade will be shattered when it enters this slot. In the inverted or vertically mounted switches suitable drip shields prevent the formation of ice on these edges and fixed guides insure cooperation of the blade and clip. In the horizontal switch, shown in the drawings, the two shutters 38, 38 are pivoted on pins 39, 39 and are always kept closed by springs 40, 40 unless the blade is entering or leaving the clip. The guides 41, 41 are part of the shutters in the switch as shown.

Fig. 11 is a plan, and Fig. 12 is an end view of modified type of high pressure application through a torsional shaft. 42 is a U-shaped clip. 43, 43 are blade ends contacting therewith by internal pressure applied through shoes 44, 44 by means of spring levers 45, 45 through the toggle links 46, 46 mounted on pins 47, 47 operated through a rotating toggle center 48 which journals on a bearing 49. The spring levers 45, 45 are held in position by supports 50, 50. The links 46, 46 are attached to members 51, 51 through which pressure is applied to the spring levers 45, 45. When the shaft is rotated the spring levers 45, 45 in turn transmit pressure to the blade ends pressing them against the clip. This is another type of application of the rotational means of applying the high pressure to the contacts.

Fig. 13 shows a partial cross-section of an inverted sleethood 37 with scraping edges 53, 53 through which the blades must pass. 55, 55 are drip projections for the sleethood.

In the preferred form of my invention as shown and described herein the pressure applying means includes the shafts 17 and 20 with the connecting joint 18, 19, and the lever 14 comprising a torsion member assembly; and the cam 31 or toggle center 48 (Figures 11 and 12) and the transfer means for converting rotary motion of the cam into transverse movement of the contacts, together comprising the translating means. The transfer means in Figures 1 to 10 inclusive includes the levers 32, 34, and 29 and in Figures 11 and 12 the toggle links 46 and spring levers 45.

While the specifications and drawings show and describe the preferred forms of these means it is obvious that many changes in the form, shape, and location of the various parts may be made by those familiar with the prior art, and that equivalent devices may be substituted for the particular means shown, all without departing from the true spirit of my invention as set forth in the accompanying claims.

What I claim is:

1. In an electric switch including a pair of relatively movable contacts, and operating means adapted to effect engagement thereof, a pressure applying mechanism including a torsion member adapted for rotational movement and translating means associated therewith and with one of said contacts, whereby the torque created by rotational movement of said torsion member is converted into forces acting upon said contacts to create pressure therebetween, said torsion member being independent of said operating means but adapted for operation thereby to create such pressure subsequent to substantially full engagement of the contact surfaces and responsive to continued motion of the operating means.

2. In combination with an electric switch, a pressure applying mechanism therefor as described in claim 1 in which said translating means includes a resilient member adapted for predetermining the contact pressure.

3. In combination with an electric switch, a pressure applying mechanism therefor as described in claim 1 in which said translating means includes a cam and follower mechanism actuated by said torsion member.

4. In combination with an electric switch, a pressure applying mechanism therefor as described in claim 1 in which said translating means includes a cam and follower mechanism, actuated by said torsion member, said mechanism including a resilient member adapted for limiting the contact pressure.

5. In combination with an electric switch, a pressure applying mechanism therefor as described in claim 1 in which said translating means includes a toggle member actuated by said torsion member.

6. In combination with an electric switch, a pressure applying mechanism therefor as described in claim 1 in which said translating means includes a toggle member actuated by said torsion member and a resilient member interposed between said toggle member and said contact.

7. In combination with an electric switch including a pair of relatively movable contacts and operating means adapted to effect engagement thereof, a pressure applying mechanism independent of said operating means but operable thereby including a cam, rotary means adapted to operate said cam and adapted for actuation by the operating mechanism effective, in engaged position of the contacts to actuate said cam responsive to continued motion of said operating mechanism, and transfer means adapted to force the contacts together under pressure responsive to actuation of said cam.

8. An electric switch including a pair of relatively movable contacts, one of said contacts having an engaging portion relatively thin with respect to the width thereof, operating means for effecting engagement of said contacts, a pressure applying mechanism including a cam carried by such said last named contact of such dimensions as to lie wholly between the extended planes of the sides of said contact engaging portion in one position thereof, actuating means for said cam and transfer means associated with the other of said contacts and engageable with said cam, said transfer means being adapted to force the con-

tacts together under pressure responsive to actuation of said cam.

9. An electric switch as described in claim 8 in which the other of said contacts comprises a clip for engagement with said relatively thin portion of the first named contact, and including a sleethood adapted to inclose said clip and said transfer means, said sleethood having an opening therein closely fitting said thin contact engaging portion whereby adhering material is removed therefrom prior to engagement with said clip.

10. In an electric switch including a fixed contact and a movable contact adapted for coengagement and operating means for effecting such engagement, a pressure applying mechanism including a first lever, a second lever operated thereby to press one contact against the other, said levers being pivoted in fixed relation to said fixed contact, and means for operating said first lever, including a member, associated with said movable contact, so positioned and arranged as to engage said first lever when said contacts are in substantially full engagement and a cooperative connection between said member and said operating means for operation of the former responsive to operation of the latter.

11. In an electric switch including a fixed contact and a movable contact adapted for coengagement and operating means for effecting such engagement, a pressure applying mechanism as described in claim 10 in which said cooperative connection includes a tongue and clevis joint whereby said pressure applying mechanism is locked upon movement of said movable contact out of engagement with said fixed contact.

12. In an electric switch including a fixed contact and a movable contact adapted for coengagement and operating means for effecting such engagement, a pressure applying mechanism as described in claim 10 and including a resilient member between said means for operating said fixed lever and said contact.

13. In an electric switch including a pair of relatively movable contacts adapted for coengagement one of said contacts being bifurcated, and operating means adapted to effect such engagement, a pressure applying mechanism including a pair of resilient levers associated with said bifurcated contact member, said levers having one portion thereof relatively fixed and another portion thereof adapted to bear against the portions of said bifurcated contact to press the same transversely against the other contact, and means for effecting deflection of said levers to create pressure between said contacts, said last named means being adapted for operation responsive to operation of said operating means subsequent to subtantially full engagement of the contacts.

14. In an electric switch including a pair of relatively movable contacts adapted for co-engagement one of said contacts being bifurcated, and operating means adapted to effect such engagement, a pressure applying mechanism as described in claim 13 in which said deflecting means includes a toggle member associated with said levers and connecting means associated with said toggle member and with said operating means.

15. In an electric switch including a pivotally mounted contact member, a second contact member adapted for engagement therewith, and operating means for effecting such engagement, a pressure applying mechanism including a torsion member adapted for operation by said operating means and translating means associated with one of said contacts and with said torsion member whereby the torque created by rotational movement of said torsion member is converted into force acting upon said contacts to create pressure therebetween, said torsion member including two portions, one of said portions being carried by said pivotally mounted contact, the other of said portions being journalled in fixed relation to the pivot of said pivotally mounted contact, and a tongue and clevis joint between said portions whereby operation of said pressure applying means is prevented excepting when said two portions of the torsion member are in substantial alignment.

16. In an electric switch, a pair of relatively movable contacts, operating means for effecting engagement thereof, a pressure applying mechanism, including a torsion member independent of said operating means, means operated by rotation thereof, and associated with one of said contacts to press the same against the other of said contacts, said torsion member being provided with a projection cooperative with said operating means only at a predetermined position thereof to apply pressure to said contacts.

17. A switch as described in claim 16 in which said operating means includes a crank and connecting rod, said projection on said torsion member being positioned to be actuated by said operating means only when said crank and connecting rod are substantially in dead center relation.

18. A switch as described in claim 16 in which said operating means includes a crank, said projection comprising a bell crank lever so positioned relative to said crank that actuation of said torsion member to apply pressure to said contacts by engagement of said crank with one arm of said bell crank lever will position the other arm thereof for reverse actuation of said torsion member on reversal of said crank, whereby pressure is positively released prior to substantial reverse movement of said operating means.

19. In an electric switch, a pair of relatively movable contacts, operating means for effecting engagement thereof, a pressure applying mechanism, including a torsion member, means operated by rotation thereof and associated with one of said contacts to press the same against the other of said contacts, one of said contacts being pivotally mounted, said torsion member comprising two portions, one of said portions being carried by one of said relatively movable contacts and one of said portions being journalled in fixed relation to said operating means, said portions being jointed to permit relative movement of that portion carried by the contact, and means cooperatively connecting said operating means with said torsion member to actuate said pressure applying mechanism at a predetermined position of said contact member.

20. A switch as described in claim 19 in which said operating mechanism includes a crank and connecting rod and in which said means connecting said operating mechanism with said torsion member is effective to operate said pressure applying mechanism only when said crank and connecting rod are in substantially dead center relation.

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