Aug. 11, 1931. A. J. BOWIE 1,818,456

ELECTRIC SWITCH

Filed Aug. 24, 1927

Fig. 1.

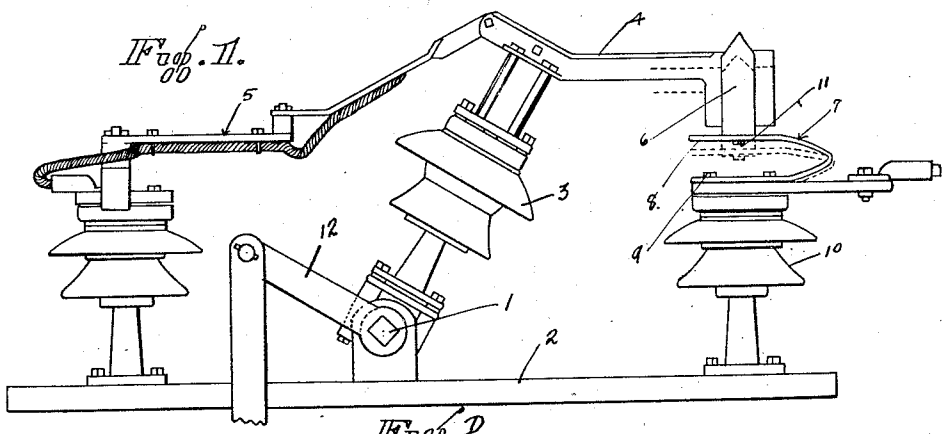


Fig. 2.

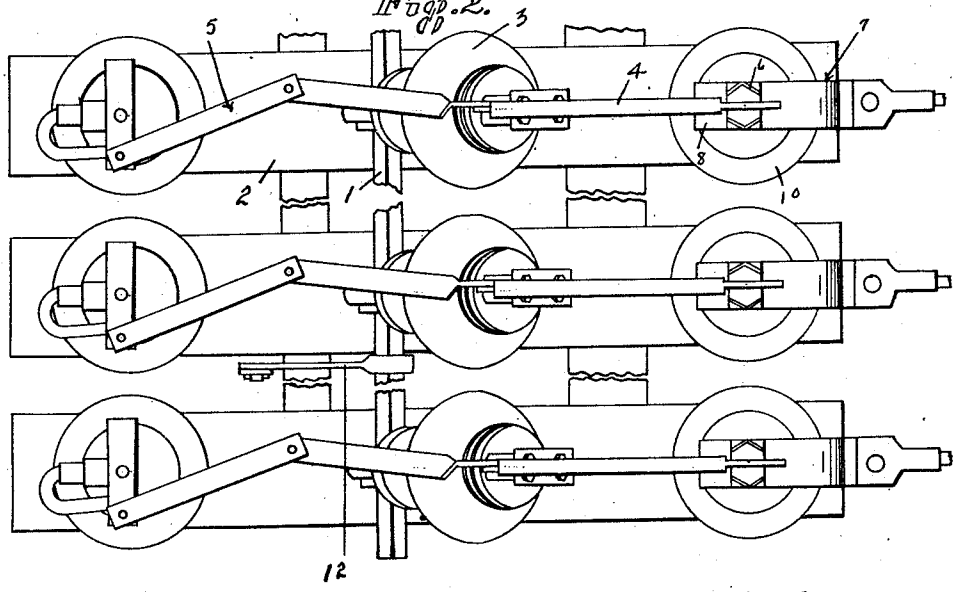


Fig. 3.

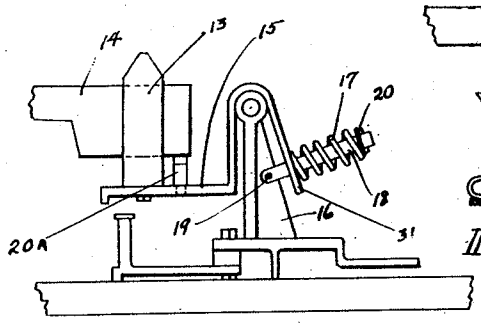


Fig. 4.

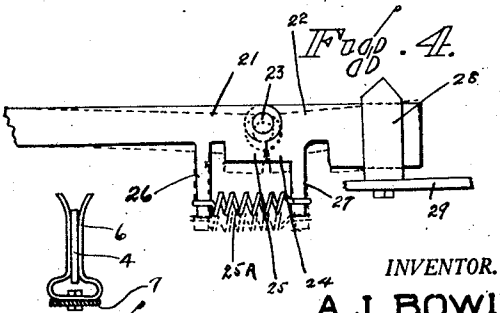


Fig. 5.

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UNITED STATES PATENT OFFICE

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ELECTRIC SWITCH

Application filed August 24, 1927. Serial No. 215,152.

This invention relates to improvements in electrical switches of the heavy duty type and particularly to gang operated switches.

Heavy duty, high voltage switches such as now commonly employed are provided with stationary contact members often referred to as switch clips which are rigidly mounted in place, and movable contact members usually known as blades, which are likewise rigidly mounted on insulators. These switches are usually mounted in groups and are spaced apart considerable distances. Due to this spacing of the switches the means for operating the switches is rendered elastic, that is, the elasticity of the interconnecting parts and operating means is considerably greater where the switches are spaced apart appreciable distances and as a result of this elasticity of the operating mechanism, considerable difficulty is experienced in causing the blades and clips to properly engage in the several switch mechanisms. This difficulty is manifested to the extent that where the contacts of one switch may be in the right position, the contacts of another of the switches may be improperly engaged and provide a very poor contact. Another objection is that in closing the switches, the blades may strike the clips too forcibly and produce hammer effects which frequently damage the equipment. The elasticity, or in other words the torsional effects produced in the operating mechanism, may cause one of the several switches to close properly without hammer blow whereas the other poles may cause serious hammer blows and produce breakage or derangement of the apparatus. These damaging results are particularly liable to ensue when switches of the rock shaft type are employed or, in other words where each pole of the switch includes a moving insulater carrying a switch blade and the moving insulators are mounted on a rock shaft. Under these conditions the rock shaft acts as a long spring due to the torsion dislocation thereof when the force of the turning of the shaft is applied thereto and while one pole may be rigidly controlled and will operate properly if the switch is thrown gently, the other poles may not be able to force their way through the resistance of the clips to make proper contact and poor contacts will result. On the other hand, if the switch is thrown violently the switches farthest removed from the point of application of the moving force to the rock shaft due to the inertia of the moving parts and to the torsional distortion of the rock shafts, may cause a hammer blow with consequent danger of breakage.

The primary object of the switch of my invention is to provide for the proper engagement of the switch blades with the contact clips and to prevent hammer blow difficulties regardless of the torsional distortion of the rock shafts and associated operating mechanism. To provide these improvements and overcome the difficulties hereinbefore mentioned I provide in each switch a yieldable mounting for the contact members, either the blade or the clip, so that on engagement of the contact members and during the movement of the operating means as in closing the switches, said contact members will maintain the proper engagement with one another but will move bodily due to the yieldable mounting and thereby maintain the same area of contacting surfaces without appreciable movement of one contacting surface relative to the other. Furthermore, by this yieldable mounting the shock occasioned in bringing the contact members together will be taken up by the yieldable mounting and damaging hammer blow effects will be eliminated. In other words, the contact members of the switch will remain in definite properly engaged relation throughout a comparatively great range of torsional distortion and better contacts are therefore insured and damaging hammer blow effects are prevented, both by reason of the spring mounting in accordance with this invention.

With the above mentioned and other objects in view, the invention consists in the novel constructon and combination of parts hereinafter described, illustrated in the accompanying drawing, and set forth in the claims hereto appended, it being understood that various changes in the form, proportion, size and minor details of construction within the scope of the claims may be resorted

to without departing from the spirit or sacrificing any of the advantages of the invention.

Referring to the drawings:

Fig. 1 represents a side elevation of switch apparatus of my invention.

Fig. 2 represents a fragmentary top plan view of the gang of switches constructed in accordance with this invention being rock shaft switches.

Fig. 3 represents a fragmentary side elevation of a modified form of the invention.

Fig. 4 represents a fragmentary side elevation of another modified form of the invention.

Fig. 5 represents a front elevation of one of the clips showing the contact blade properly engaged therewith.

The embodiment of the invention as shown in detail in the accompanying drawings is adapted to the rock shaft type of switch which includes a rock shaft 1 mounted on a suitable frame 2 and adapted to operate a plurality of switches, there being three switches in the present instance. Each switch includes a swinging insulator 3 suitably connected with the rock shaft so that it will swing when the rock shaft is turned. Suitably mounted upon the insulator is a switch blade 4 with which is associated the usual means 5 for establishing a flexible electrical connection between the blade and the main line, which latter is not shown. A spring contact clip 6 is provided for cooperation with the blade 4 and is formed in the usual manner of resilient conducting material so that the blade will spring the clip apart and engage between opposite sides of the clip. The essential feature of this invention is the provision of a yieldable mounting means 7 for the spring clip although as will be hereinafter pointed out, it is possible to carry out the invention by yieldably mounting either one of the two contact members, as for example the blade instead of the clip. Any suitable means for supporting the clip may be employed provided that said supporting means will permit the contact members, after they have engaged with one another, to yield against the force of the moving contact member without causing an appreciable change in the relative position of engagement of the two contact members. Another requirement is that when the two contacts are forcibly brought into engagement with one another, one of them will yield sufficiently to prevent damaging hammer blow effects. One way of providing this spring or resilient mounting is to employ a leaf spring 8 bent back upon itself so that one end may be fastened as at 9 to the insulator mounting 10 and the other end secured as at 11 to the clip. In Fig. 1 the dotted lines indicate the position of the spring and contacts upon yielding of the spring mounting.

In the type of switch shown in Figs. 1 and 2, the rock shaft is necessarily quite long due to the requirement of spacing the switches considerable distances apart and in all high voltage heavy duty switches of the rock shaft type it is necessary to provide this spacing and to use relatively long rock shafts. In this type of switch the means for operating the rock shaft, which means is indicated by the numeral 12, is usually located between the ends of the rock shaft and the torsional flexure of the shaft is therefore greater near the terminals thereof. This torsional flexure produces a variance in positions of the blades, particularly in the switches farthest removed from the mechanism 12 so that the greater the torsional flexure the greater the variance in the blade positions. For this reason the switches farthest removed from the mechanism 12 will not operate as smoothly nor as definitely nor also as accurately as the switch or switches located close to the mechanism 12. If the rock shaft is operated so that the switch blades are thrown gently, due to the elasticity of the operating mechanism, that is, the torsional flexure of the rock shaft, certain of the switch blades will not be sufficiently forcibly moved to force them away between the jaws of the contact clips and very poor contacts will result. On the other hand, if the rock shaft is quickly turned to likewise move the switch blades, the switch blades of certain of the switches will be moved so forcibly, due to the insulators being comparatively heavy, that said blades will not only force through between the jaws of the clip but will strike the bottom of the clip and if the clips were rigidly mounted this forcibly striking of the blades would cause considerable damage such as derangement or breakage of the switch apparatus. By reason of the yieldable mounting, for example, the leaf spring 8, the said mounting forms a cushion to take the blow of impact and in that it permits the clip to move under this force, the contact of the switch blade with the clip is not disturbed and a perfect contact is thus insured over a wide range of movement of the blade or clip or both. In this way there is insured a long angle or range of perfect contact between the blade and clip which would not otherwise be obtainable.

Another way of providing the advantages of this invention is shown in Fig. 3 wherein the clip 13 for the blade 14 is supported on a pivoted carriage 15, the carriage being mounted on a suitable support 16. The yieldable mounting of the clip is provided by means of a helical expansion spring 17 which is mounted on a bolt 18 pivoted as at 19 on the support 16. One end of the spring engages the carriage 15 and the other end an abutment 20 on the outer end of the bolt so that when the blade enters the clip 13 it will engage the lug 20[a] and the spring will com-

press and yieldingly resist the downward movement of the clip. The same effect is obtained with this type of clip mounting as with the leaf spring type previously described.

Another way to provide the spring mounting effect and the advantages of this invention is to form the blade as shown in Fig. 4 in sections designated 21 and 22 hinged as at 23. The movement of the outer end of the blade, that is the section 22, is limited by means of the stop lugs 24 and 25. A retractile helical spring 25^a is secured between its ends between two downward projections 26 and 27 provided on the sections 21 and 22 of the blade. The section 22 is adapted to engage in a contact clip 28 mounted on a suitable support 29. The spring 25^a holds the blade against hinging until the outer end of the blade contacts with the clip 28 and sufficient resistance is set up to the blade to overcome the tension of the spring. When the moving force applied to the blade continues after contact of the blade with the clip as would occur when an unusually stiff clip is encountered, and also when the blades were too forcibly brought into contact with the clip, then the outer end of the blade, the section 22 thereof, would swing upward, that is, would yield upward against the action of the spring 25^a, thereby providing the effects previously described, as in maintaining proper engagement of the contacts over a long range of variations of blade position.

It will thus be seen that by the means of this invention the relatively movable contact members, one of them being yieldably mounted, will, after engagement with one another and during further movement of the operating means, maintain the position of contact without material variation in contacted area thereof and will, in so doing, yield bodily. In the case of the type of switch mechanism shown in Figs. 1 and 3, both contact members will move bodily without appreciably changing the position of contact, one with the other, whereas in the type shown in Fig. 4, but one contact member, the switch blade, will move bodily and yieldingly but the effect is the same in providing for maintaining the proper contact of the switch members throughout a wide, long range of varied positions of the movable switch member.

It will be noted that the contact members have co-acting contact faces which are substantially parallel to the plane of motion of the movable contact member and that by having one of the contact members yield in a plane parallel to said plane of motion, the advantages of this invention are secured both as to providing proper contact and as to elimination of damaging hammer blows.

It is desirable in operation that the spring of the spring supported contact member be of sufficient stiffness to allow the blade to force its way into perfect contact with the clip before the spring yields. With the construction shown, the blade should force its way between the clip faces, as shown in Figs. 3 and 5, and into a position of perfect contact therewith, and should then strike a stop 20^a, and on further motion of the blade, the spring will yield and allow motion of the contacts to continue through a distance of relative motion not otherwise obtainable. When the blade is out of the clip the edge 31 of carriage 15 will strike piece 16 which forms an upper limit of the motion of the clip. The tension of spring 17 under these conditions is made sufficiently great to allow the blade to force its way through clip 13 and impinge on limit stop 20^a before it starts to depress the carriage 15.

In general the switches are so set that when they are closed the springs supporting the different flexible moving members are distorted from their normal positions when the switch is open. This results when opening the switch in a slight twisting between the clip and blade, which is an important feature in overcoming adhesions between the blade and clip without corresponding operating stresses.

In Fig. 3, the pivot on which the carriage 15 is mounted is approximately in line with the center of the blade which is of further assistance to the slight torsional movement helping to overcome blade adhesions.

I claim:

1. In an electric switch a pair of relatively movable contact members comprising a blade and a clip, operating means for causing said contact members to engage one another in full contact, means yieldingly supporting said clips which means will after initial contact engagement of the said members and during operation of said operating means permit bodily movement of the yieldably supported clips while maintaining said members in full contact.

2. In an electric switch a pair of contact members comprising a blade and a clip, means for moving said blade into full engagement with said clip, and means which after engagement of said contact members and upon operation of said means for moving said blade will cause said clip to yield in the plane of movement of said movable contact member while maintaining said contact members in full engagement with one another.

3. In an electric switch a pair of contact members comprising a blade and a clip, one of which is movable into and out of contact with the other, each of which is provided with a contact face substantially parallel to the plane of movement of said blade, and means permitting said clip to yield in a plane parallel to said plane of movement of

said blade while maintaining said contact members in full engagement with one another.

4. In an electric switch a pair of contact members comprising a blade and a clip, one of which is movable into engagement with the other and each of which is provided with a contact face substantially parallel to the plane of movement of the movable contact member, and means for supporting said clip in a normally fixed position which means yields in a plane parallel to the plane of movement of said contact members after said contact members engage, said contact members being in full engagement thruout the motion of said supporting means.

5. In an electric switch a contact clip, a switch blade movable into and out of engagement with said clip, means for moving the blade into engagement with the clip, and a spring mounting for the clip which spring mounting normally holds the clip in a fixed position but permits the clip to yield when said blade is fully engaged with the clip and during operation of said operating means after moving the blade into the clip.

6. A multipole electric switch comprising a rock shaft, a plurality of blades mounted on and adapted to be simultaneously moved by said shaft, a plurality of contact clips with which said blades engage, means connected with and for rocking said rock shaft, and means for supporting said clips so that after engagement of said blades with said clips and during the rocking of the rock shaft which means causes the blades to move into the clips, said supporting means permitting the clips to yield bodily while maintaining the full engagement of the blades with the clips.

7. In a multipole electric switch a rock shaft, a plurality of independent insulators mounted on said rock shaft and adapted to operate simultaneously the different poles of said switch, each pole comprising a pair of contact members with yielding means supporting one of said members so as to allow it to move bodily after said members fully engage and thereby insure proper contacts for all poles effectively independent of torsional distortion of said rock shaft.

8. In an electric switch a pair of contact members comprising a blade and a clip, one of which is movable into engagement with the other, yielding means for supporting said clip in a position remaining fixed until said contacts are completely engaged, said supporting means yielding upon further relative motion of said contacts as in moving them together and permitting the yieldably supported clip to move bodily.

9. In an electric switch a pair of contact members comprising a blade and a clip, one of which is movable into engagement with the other, said contact members being provided with contact faces substantially parallel to the plane of motion of said blade, yielding means for supporting said clip in a fixed position until said contact faces are completely engaged, said supporting means then moving bodily said clip during further motion of said moving contact.

10. In an electric switch a pair of contact members comprising a blade and a clip, one of which is movable into engagement with the other, each of which is provided with contact faces substantially parallel to the plane of movement of said movable member, means for supporting said clip in a plane parallel to the plane of movement of said contact member, said supporting means being adapted to yield when said contact members are fully engaged and thereby to give a slight twisting of the surfaces of said contact members after contact is first formed.

11. In an electric switch a pair of contact members comprising a blade and a clip, one of which is moved into contact with the other, and a carriage on which said clip is mounted adapted first to allow the full engagements of said contacts and then to allow further movement together of said contact members without substantial change of contact.

12. In an electric switch a pair of contact members comprising a blade and a clip, one of which is moved into contact with the other, and a carriage on which said clip is mounted adapted first to allow the full engagement of said contacts and then to allow further movement together of said contact members without substantial change of contact, said carriage being mounted on a pivot.

13. In an electric switch a pair of contact members comprising a blade and a clip, one of which is moved into contact with the other, and a carriage on which said clip is mounted adapted first to allow the full engagement of said contacts and then to allow further movement together of said contact members without substantial change of contact, said carriage being mounted on a pivot, said pivot being substantially in line with the blade and clip when in full engagement.

14. In an electric switch a pair of contact members comprising a blade and a clip, one of which is moved into contact with the other, and a carriage on which said clip is mounted adapted first to allow the full engagement of said contacts and then to allow further movement together of said contact members without substantial change of contact, said carriage being mounted on a pivot, said pivot being substantially in line with the blade and clip when in full engagement so as to effect a movement of said blade and said clip after engagement with no appreciable motion of said contacts longitudinally.

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