

Nov. 29, 1949

L. J. LINDE

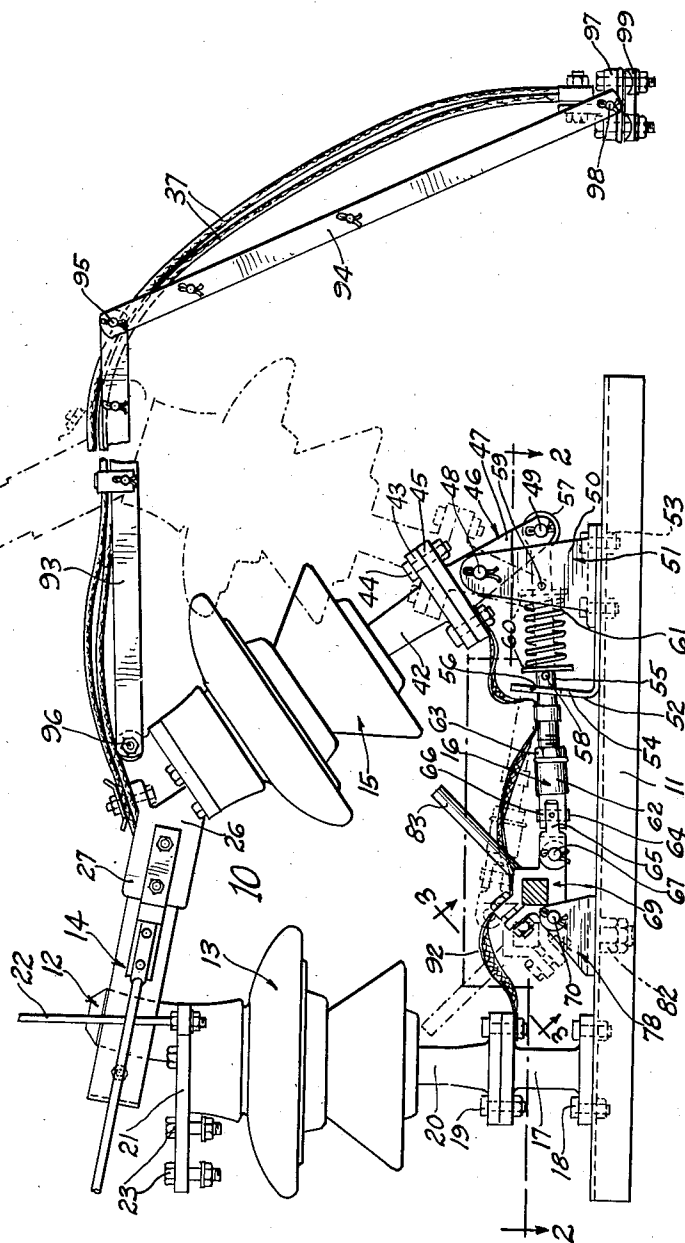
2,489,426

HIGH-POTENTIAL ELECTRIC SWITCH

Filed Sept. 10, 1947

3 Sheets-Sheet 1

Fig. II



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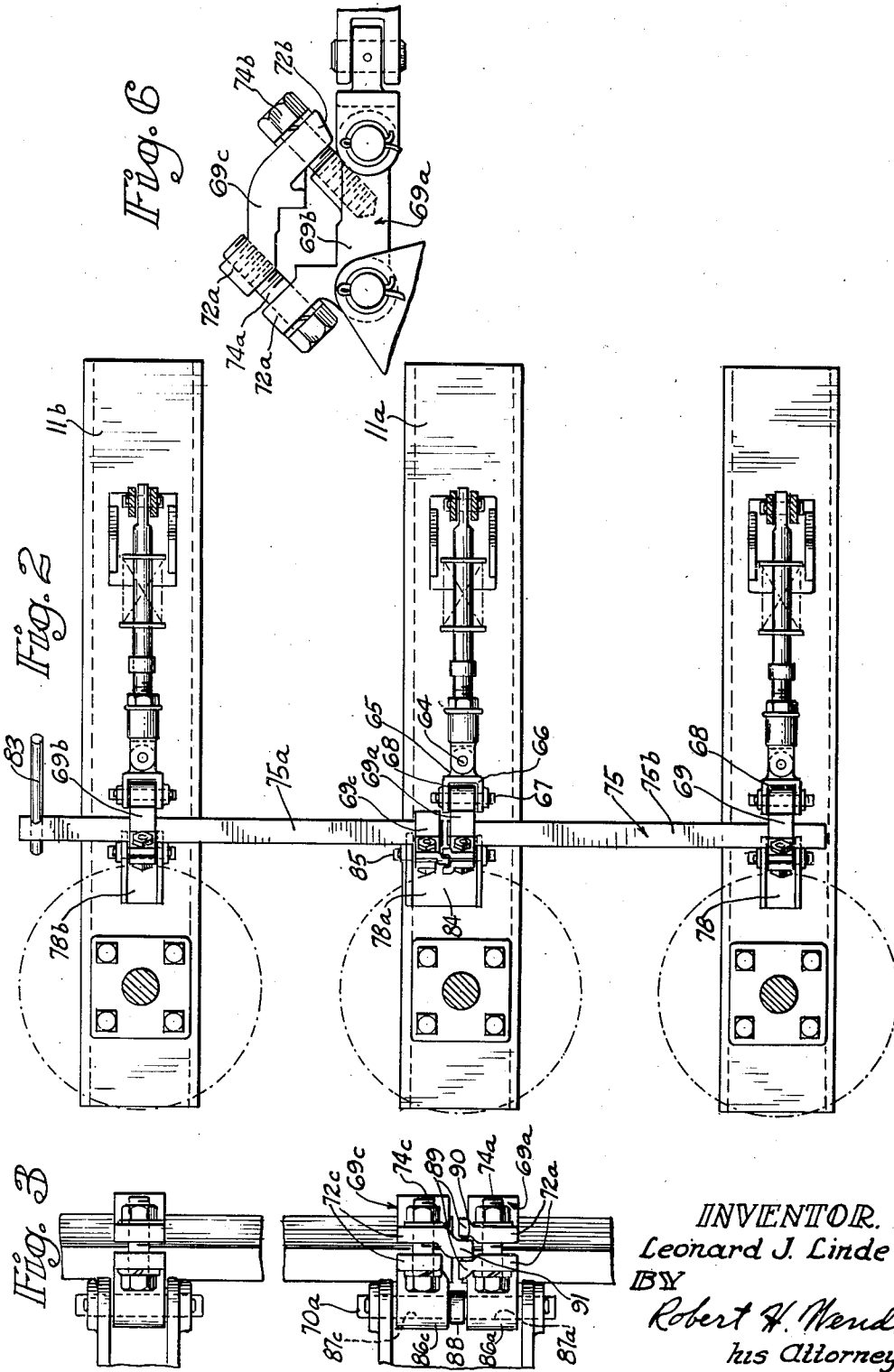
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3 Sheets-Sheet 3

Fig. 4

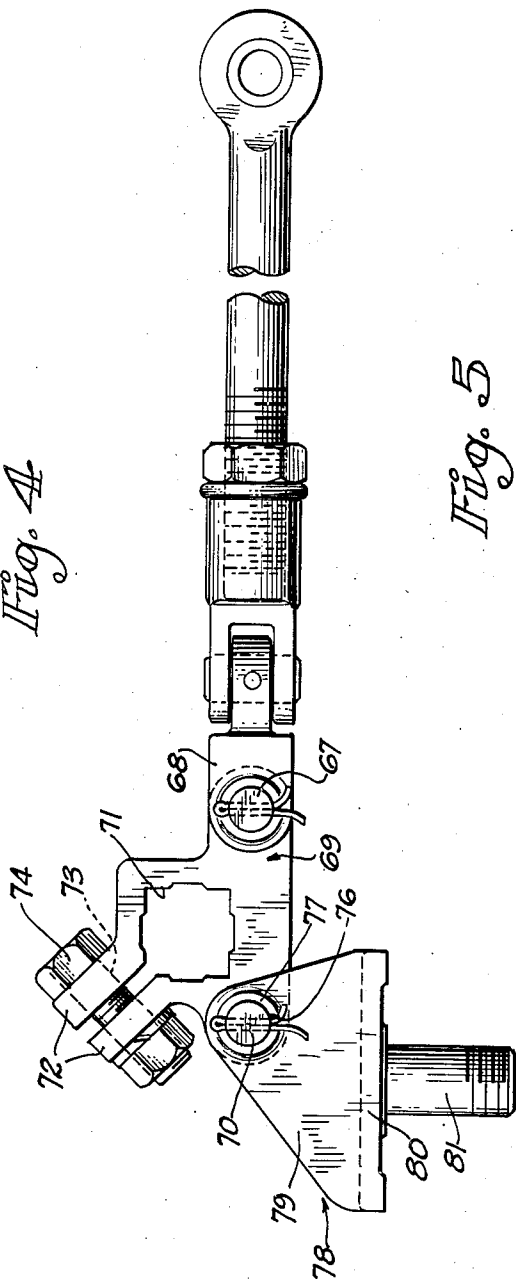
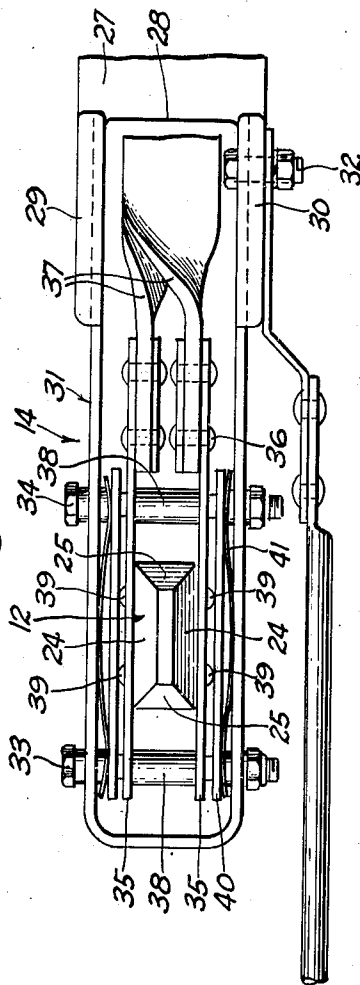


Fig. 5



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UNITED STATES PATENT OFFICE

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HIGH-POTENTIAL ELECTRIC SWITCH

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4 Claims. (Cl. 200—48)

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The present invention relates to electric switches, and is particularly concerned with pole type gang operated switches of the type covered by Patent No. 1,907,141, issued to A. J. Bowie May 2, 1933.

The present invention relates to improvements in the Bowie switch, and is particularly concerned with the simplification of the structure and reduction of the cost of manufacture of such switches.

One of the objects of the invention is the provision of an improved switch of the rocker shaft type, in which the square operating shaft need not be concentric with the main bearing of the toggle so that the bearing itself need not surround the shaft, and so that it is not necessary to use costly and elaborate anti-friction bearings and grease seals.

Another object of the invention is the provision of an improved design of rocker shaft switch which is simpler in structure and capable of being manufactured at a lower cost, and which maintains all of the advantages of the on center toggle arrangement, but in which the square operating shaft is shifted from a concentric position to an off center position, permitting the use of relatively small and inexpensive self-lubricated bearings.

Another object of the invention is the provision of an improved rocker shaft switch in which the shaft is clamped rigidly to the toggle lever and in which it is loaded in torsion and made more rigid by the fact that the shaft is also loaded in bending strain.

Another object of the invention is the provision of an improved gang switch of the rocker shaft type, which is particularly constructed to insure correct contact between the blades and clips, to operate without damage, "slamming," or "hammer blows" in closing, and to provide ample power to operate the movable switch parts after the contacts have become corroded and tend to stick from long periods of disuse, without requiring too great effort by the operator.

Another object is to provide an improved switch of the rocker shaft type which provides for misalignment of the poles and also provides for deviations of the rocker shaft from a straight line.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the drawings, of which there are two sheets,

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Fig. 1 is a side elevational view of a rocker shaft switch embodying the invention, with the parts shown in full lines in the closed position and in dotted lines for the open position;

Fig. 2 is a top plan view of the operating mechanism, taken on the plane of the line 2—2 of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a fragmentary sectional view, taken on the plane of the line 3—3 of Fig. 1, showing the universal connection between separate operating shafts in the mechanism, on a slightly larger scale;

Fig. 4 is a fragmentary side elevational view, showing the operating mechanism;

Fig. 5 is a fragmentary top plan view, showing the engaging contacts of the switch.

Fig. 6 is a fragmentary side elevational view of a modified form of connecting linkage between the switch blades and the actuating shaft.

Referring to Figs. 1 to 3, 10 indicates in its entirety the rocker shaft switch assembly, which may be mounted upon any suitable base 11, such as a channelled metal member. The principal parts of the switch comprise the fixed contact 12 suitably supported by means of an insulator 13 and the movable contact 14 movably supported by means of an insulator 15, and the operating mechanism indicated in its entirety by the numeral 16.

The fixed contact insulator 13 is preferably supported upon a sub-base member 17, which is secured by means of bolts 18 to the base 11 and bolts 19 to the insulator supporting member 20.

Various types of porcelain insulators 13 may be employed, and that illustrated is merely by way of example. This insulator supports a metal connector plate 21, which carries the fixed contact 12, a fixed arcing horn 22, and bolts 23 for connection to the line.

Referring to Fig. 5, the fixed contact carried by plate 21 is preferably substantially rectangular in elevation, and comprises a member made of suitable conducting metal, such as copper, having its end beveled on both sides, as indicated at 24, and also beveled at each end, as indicated at 25.

These beveled surfaces 24, 25 serve to insure the guiding of the movable contact member 14 over and into contacting engagement with the fixed contact 12.

One example of the movable contact structure is shown also in Fig. 5; and this structure is supported by means of a suitable bracket 26 on the movable insulator 15. The bracket 26 has a diagonally and upwardly projecting arm 27, which is provided with a slot 28 separating a pair of channelled legs 29, 30. The channelled legs

29, 30 have their channels inwardly open toward each other, and they are adapted to receive the two legs of a U-shaped metal member 31, which is secured in the channels by means of bolts 32.

The U-shaped metal member 31 is provided with aligned apertures for the parallel bolts 33, 34, which extend from one leg to the other leg of the U-shaped member 31 and provide support for the contacts 35, which actually engage the fixed contact 12.

Each contact 35 comprises an elongated strip of highly conductive metal having pairs of apertures for slidable mounting on the bolts 33, 34. The contacts 35 are resilient metal strips and extend inwardly beyond the bolts 34 to be secured by means of rivets 36 to the twin conductive cables 37, preferably of the braided type.

The contacts 35 are spaced from each other at their ends by spacers 38 on the bolts 33, 34, the spacers being only slightly shorter than the thickness of the fixed contact 12. Each contact 35 is also preferably provided with a pair of partially spherical headed rivets 39 on its outer side for engaging a slidable metal plate 40 that is also slidably mounted on the bolts 33, 34.

The plates 40 are urged inward by the leaf springs 41, which are bowed to engage plate 40 at each end of the spring and to engage U-shaped member 31 intermediate the ends of the spring. Thus the contacts 35 are spring urged against the fixed contact 12, and are self-aligning by virtue of their mounting upon the bolts 33, 34 with enlarged apertures so that full contact is secured between the full engaging areas of the contact 35 and fixed contact 12.

The movable insulator 45 is carried by a metal supporting members 42, which has its lower flange 43 secured by bolts 44 to the flange 45 of a pivot bracket 46. The pivot bracket 46 has a depending arm 47 with an aperture for receiving the shaft 48 close to the flange 45 and another aperture for receiving the shaft 49 by means of which it is actuated.

The shafts 48, 49 may be secured in place by cotter pins at each end. The shaft 48 is supported in an aperture in the upstanding column 50 of a fixed pivot bracket 51, which is carried by the base 11. Thus the movable insulator 45 is pivotally mounted on the shaft 48 and adapted to be actuated by a mechanism applied to the shaft 49.

A bumper bracket 52 is secured between the base of the fixed pivot bracket 51 and the base 11 by means of bolts 53. This bumper bracket comprises a strip of metal having an upwardly turned end portion 54 with an enlarged or oval aperture for passing the connecting rod 55.

The aperture 56 permits lateral as well as axial movement of the connecting rod 55. The connecting rod 55 is provided with an enlarged end 57 having an aperture providing a bearing for the shaft 49. It is also provided with a pair of apertures at the right of the bumper bracket 52 for receiving the fixed pins 58, 59 which provide stops for the washers 60 for engaging a helical compression spring 61.

The pin 58 is adapted to pass through the aperture 56 in the bumper bracket 52 so that when the switch is opened, washer 60 on the left end of the spring 61 engages the bumper bracket 52, so that the spring 61 is compressed and the shock of opening the switch is absorbed before the movable insulator 45 is brought to a stop at the dotted line position of Fig. 1. At its left end the connecting rod 55 is threaded into

a connecting rod end 62 and secured by means of a lock nut and spring washer 63. The connecting rod end member 62 is bifurcated, and its legs have apertures for receiving the shaft 64. The shaft 64 pivotally supports the universal yoke 65 between the bifurcated legs 66.

The yoke 65 is likewise provided with a bifurcated end 66, which receives a shaft 67 for pivotally mounting the nut 68 of a toggle link 69. The shafts 67 and 64 are at right angles to each other so that the yoke 65 provides a universal connection between the connecting rod 55 and the toggle link or crank 69. All of the shafts employed may be provided with apertures and cotter pins at their ends to hold them in place. The toggle link 69 comprises a metal member having its end portion 68 provided with an aperture for the shaft assembly 67 and having at its opposite end another aperture for receiving the shaft assembly 70.

Intermediate its ends the toggle link 69 is provided with an enlargement having a noncircular or square aperture 71, the square being bordered by flanges which terminate in a pair of diagonally extending clamping flanges 72.

The clamping flanges 72 have the aligned apertures 73 for receiving the clamping bolt 74 by means of which the toggle link 69 is clamped upon the square shaft 75. The shaft assemblies 67 and 70, which receive the maximum amount of use, preferably include self-lubricating bearing sleeves surrounding the shafts inside the apertures of the members that are pivotally mounted on the shafts.

The same is true of the shafts 48 and 49; and the cotter pins, which are used for thrust members at the ends of the shafts, are preferably located in grooves 76 provided in a tubular projection 77 at the end of each shaft. Thus the cotter pins not only prevent the shaft from moving axially, but they prevent the shaft from turning so that the bearing bushing may turn on the shaft, which is preferably made of suitable steel to provide a better bearing surface.

The operating shaft 75 may in some embodiments of the invention comprise a single length extending through three such toggle links 69 and actuating simultaneously all of the three toggle links with a similar mechanism in each case.

In such case a single toggle link bearing bracket 78 is employed for each mechanism. Such a bearing bracket comprises a U-shaped upper member 79 with a pair of apertures for receiving the shaft 70. The U-shaped upper portion 79 has its base 80 provided with a depending securing bolt 81 having a threaded end portion for receiving the nut 82 and a suitable lock nut.

Thus the toggle link bearing bracket 78 may be fixedly secured on the base 11 in substantial alignment with similar toggle link bearing brackets on the other bases 11a and 11b. The shaft 75 may project beyond the operating mechanism at either end, such as the top, in Fig. 2, where it is provided with a through aperture for fixedly receiving an operating handle comprising a rod 83 by means of which the shaft may be turned.

In the embodiment illustrated in Figs. 2 and 3, special provision is made for taking care of misalignment of the toggle link bearing brackets 78, 78a, and 78b. In such case the shaft 75 may consist of a pair of sections 75a and 75b; and the toggle link bearing bracket 78a may be of greater width so as to provide room for a universal connecting mechanism 84 between the shaft sections 75a and 75b.

In addition to the toggle link 69a, which is employed upon the central mechanism, and which is clamped on the upper end in Fig. 2 of shaft section 75b, there is another similar clamping member 69c having no connection to the operating mechanism, but clamping the lower end of shaft section 75a and providing for its pivotal support upon the shaft 85 carried by toggle link supporting bracket 78a.

The universal connecting mechanism 84 is shown in greater detail in Fig. 3. It comprises two members 69a and 69c, similar in construction to the toggle link 69 previously described in that each has a square aperture for the shaft 75a and 75b. Each has the diagonally projecting flanges 72a or 72c which are clamped together on the square shaft by a bolt 74a or 74c. Each has the downwardly projecting portion 86a or 86c provided with an aperture 87a and 87c for receiving the shaft 70a.

A spacer 88 keeps the portions 86a and 86c in properly spaced position on the shaft 70a. Thus the members 69a and 69c are pivotally mounted on the shaft 70a, and each is clamped to its shaft section 75b or 75a.

The diagonally extending flanges which receive the bolts 74a and 74c are in this case modified to provide a universal connection between the two shaft sections 75a and 75b. For example, the flanges 72a and 72c may have laterally extending portions 89 spaced by a slot or groove 90 for receiving a laterally projecting portion 91 carried by one of the flanges 72c.

The laterally projecting portion 91 has an offset to bring the flange into central position in the groove or slot 90. When the upper shaft section 72a (Fig. 2) is turned, the flange 91 engaging between flanges 89 turns the lower shaft section 75b of Fig. 2; but due to this universal connection assembly 84 the misalignment of the two shaft portions 75a and 75b is permitted.

Referring to Fig. 6, this is a fragmentary side elevational view of the actuating mechanism, in which the toggle link or crank 69 is of a different form. Instead of the toggle link 69a being slotted and separated at one side only, it comprises two pieces 69b and 69c secured together by two clamping bolts 74a and 74b. The bolt 74 passes through a pair of clamping flanges 72a, while bolt 74b passes through a clamping flange 72b and is threaded into a bore in the part 69b.

The operation of the switch is as follows: When the parts are in the position of Fig. 1, with the handle 83 extending toward the right, the line of centers of the shaft 67 and shaft 49 is such that the axis of the shaft 67 is below this line of centers or substantially in alignment with the line of centers.

In this position a pull on the lever 83 toward the left is adapted to exert a maximum force on the connecting rod 55 because of the relatively small radius at which the pull is exerted by lever 83 on the shafts 75 and on connecting rod 55.

Sufficient power is provided to break the engagement between corroded contacts 12 and 14 after long periods of disuse. As the lever 83 progresses toward the left, however, shaft 67 rises, and the radius of operation between shafts 67 and 70 becomes longer so that less power and more movement is provided for movement of the switch arm 14, which is quickly lifted from the full line position of Fig. 1 to the dotted line position.

The movable switch arm assembly, comprising the insulator 15 and switch arm 14, passes over a central vertical position to the dotted line posi-

tion in Fig. 1, where gravity urges it downward to the open position and holds it in the open position.

When the switch arm is moved to the open position, the connecting rod 55 moves to the left in Fig. 1 until the left washer 60 engages bumper bracket 52 and spring 61 is compressed to absorb the shock of the opening of the switch. With the present structure it is no longer necessary to use complicated anti-friction bearings of size large enough to embrace the square rocker shaft 75. Instead, the smaller shafts 70, 67, 49, and 48 may be provided with bearing bushings of the self-lubricating type, which are relatively small and inexpensive.

In addition to the shaft 75 or its sections being subjected to torsion, they are also subjected to bending strains; and these combined stresses increase the rigidity of the assembly.

The present switch is also preferably provided with a cable connection 92 between the bases 20 and 42 of the insulators; and it is also preferably provided with a pair of links 93, 94 pivotally connected to each other at 95 for supporting the twin cables 37, which lead to the movable contact 14.

The link 93 is pivotally connected to the movable contact bracket 26 at 96; and link 94 is pivotally connected to a fixed support 97 for a connector, by means of shaft or pin 98. The connector 99 is connected to the line on the right hand side of the switch.

It will thus be observed that I have invented an improved gang switch assembly in which the heavy noncircular actuating shaft need not be supported by bearings which embrace it; but the shaft is supported by means of toggle links which themselves are pivotally mounted upon brackets so that the shaft is eccentric.

The present switch structure is simpler and may be manufactured more economically than the devices of the prior art; but it retains all of the advantages of the gang switch shown in the above-mentioned patent to Bowie, upon which it is an improvement.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a switch operating mechanism, the combination of a supporting base with a pivot bracket carried by said base and having upwardly projecting spaced pivot flanges, an insulator carried by a depending metal insulator support, said support being pivotally mounted between said flanges and having an actuating arm depending between said flanges, a connecting rod pivotally connected to said actuating arm and having a threaded end, a universal joint assembly having a bore for said threaded end, said assembly being pivotally connected to a shaft supporting member, a movable contact arm fixedly secured to said first-mentioned insulator, a fixed contact carried by a second insulator fixedly mounted on said base, a second pivot bracket carried by said base between said insulators, said shaft supporting member being pivotally mounted on said second pivot bracket and having an arm extending radially for pivotal connection to said universal joint assembly, said latter pivotal connection passing

dead-center between said connecting rod and the pivot of said shaft supporting member when said contacts are closed, said shaft supporting member having a noncircular through bore bounded on one side by spaced flanges, an independent shaft in said bore, threaded means for drawing said spaced flanges together to secure said shaft in said shaft supporting member, and manual means for rotating said shaft eccentrically with respect to the pivot of said shaft supporting member to exert a maximum force in the initial opening of the contacts and to produce maximum movement thereafter in the opening of said contacts.

2. In a switch operating mechanism, the combination of a supporting base with a pivot bracket carried by said base and having upwardly projecting spaced pivot flanges, an insulator carried by a depending metal insulator support, said support being pivotally mounted between said flanges and having an actuating arm depending between said flanges, a connecting rod pivotally connected to said actuating arm and having a threaded end, a universal joint assembly having a bore for said threaded end, said assembly being pivotally connected to a shaft supporting member, a movable contact arm fixedly secured to said first-mentioned insulator, a fixed contact carried by a second insulator fixedly mounted on said base, a second pivot bracket carried by said base between said insulators, said shaft supporting member being pivotally mounted on said second pivot bracket and having an arm extending radially for pivotal connection to said universal joint assembly, said latter pivotal connection passing dead-center between said connecting rod and the pivot of said shaft supporting member when said contacts are closed, said shaft supporting member having a noncircular through bore bounded on one side by spaced flanges, an independent shaft in said bore, threaded means for drawing said spaced flanges together to secure said shaft in said shaft supporting member, and manual means for rotating said shaft eccentrically with respect to the pivot of said shaft supporting member to exert a maximum force in the initial opening of the contacts and to produce maximum movement thereafter in the opening of said contacts, and a plurality of similar insulators and contacts and similar switch operating mechanism connected to the same shaft to be actuated simultaneously thereby.

3. In a switch operating mechanism, the combination of a supporting base with a pivot bracket carried by said base and having upwardly projecting spaced pivot flanges, an insulator carried by a depending metal insulator support, said support being pivotally mounted between said flanges and having an actuating arm depending between said flanges, a connecting rod pivotally connected to said actuating arm and having a threaded end, a universal joint assembly having a bore for said threaded end, said assembly being pivotally connected to a shaft supporting member, a movable contact arm fixedly secured to said first-mentioned insulator, a fixed contact carried by a second insulator fixedly mounted on said base, a second pivot bracket carried by said base between said insulators, said shaft supporting member being pivotally mounted on said second pivot bracket and having an arm extending radially for pivotal connection to said universal joint assembly, said latter pivotal connection passing dead-center between said connecting rod

and the pivot of said shaft supporting member when said contacts are closed, said shaft supporting member having a noncircular through bore bounded on one side by spaced flanges, an independent shaft in said bore, threaded means for drawing said spaced flanges together to secure said shaft in said shaft supporting member, and manual means for rotating said shaft eccentrically with respect to the pivot of said shaft supporting member to exert a maximum force in the initial opening of the contacts and to produce maximum movement thereafter in the opening of said contacts, said contacts including a rigid tapered member and resilient spreadable plates for engaging said rigid member upon the opposite sides thereof, and auxiliary resilient means for holding said plates in full contact with said rigid member.

4. In a switch operating mechanism, the combination of a supporting base with a pivot bracket carried by said base and having upwardly projecting spaced pivot flanges, an insulator carried by a depending metal insulator support, said support being pivotally mounted between said flanges and having an actuating arm depending between said flanges, a connecting rod pivotally connected to said actuating arm and having a threaded end, a universal joint assembly having a bore for said threaded end, said assembly being pivotally connected to a shaft supporting member, a movable contact arm fixedly secured to said first-mentioned insulator, a fixed contact carried by a second insulator fixedly mounted on said base, a second pivot bracket carried by said base between said insulators, said shaft supporting member being pivotally mounted on said second pivot bracket and having an arm extending radially for pivotal connection to said universal joint assembly, said latter pivotal connection passing dead-center between said connecting rod and the pivot of said shaft supporting member when said contacts are closed, said shaft supporting member having a noncircular through bore bounded on one side by spaced flanges, an independent shaft in said bore, threaded means for drawing said spaced flanges together to secure said shaft in said shaft supporting member, and manual means for rotating said shaft eccentrically with respect to the pivot of said shaft supporting member to exert a maximum force in the initial opening of the contacts and to produce maximum movement thereafter in the opening of said contacts, and a stop bracket carried by said base, said stop bracket having an aperture for passing said connecting rod, and a resilient compression spring carried by the connecting rod and located to engage said stop bracket to absorb the shock and reduce the opening movement of the contacts at the end of the motion of the pivotally mounted insulator.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,907,141	Bowie	May 2, 1933
1,935,597	Koppitz	Nov. 14, 1933
1,949,164	Koppitz	Feb. 27, 1934
2,011,503	Rudd	Aug. 13, 1935
2,303,119	Froland	Nov. 24, 1942
2,354,991	Gussow	Aug. 1, 1944