Sept. 30, 1930. G. A. BURNHAM 1,777,073

INSULATING BUSHING

Original Filed Aug. 20, 1927

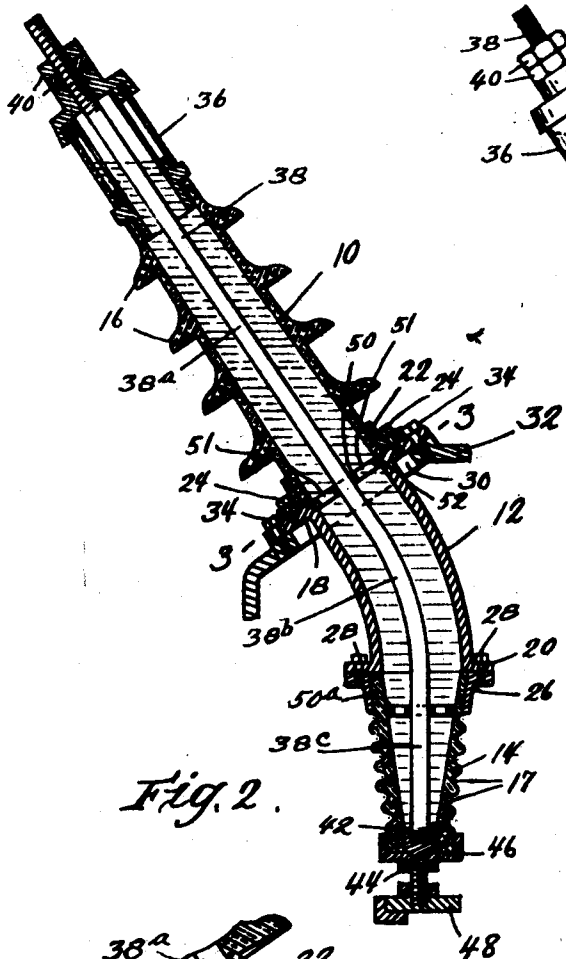


Fig. 2.

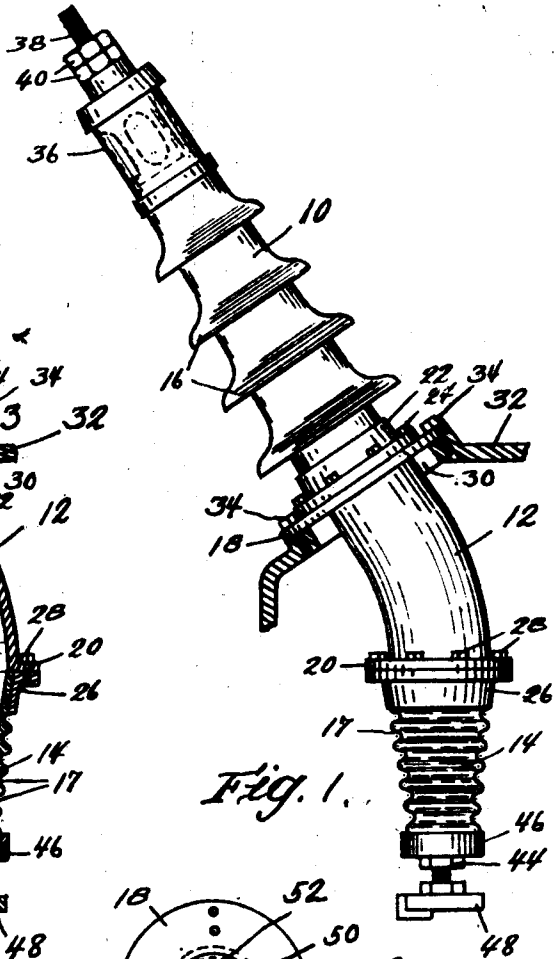


Fig. 1.

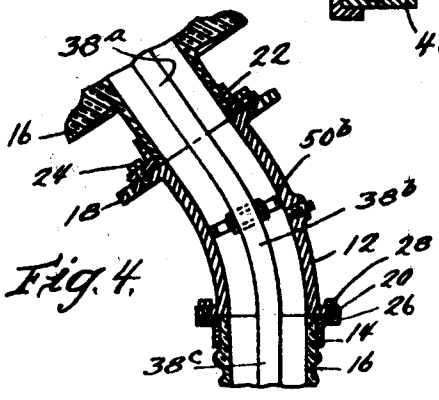


Fig. 4.

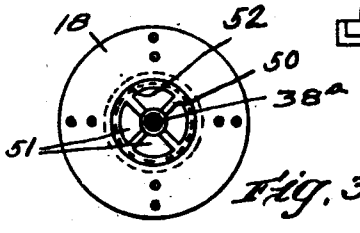


Fig. 3.

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UNITED STATES PATENT OFFICE

GEORGE A. BURNHAM, OF SAUGUS, MASSACHUSETTS, ASSIGNOR TO CONDIT ELECTRICAL MANUFACTURING CORPORATION, OF SOUTH BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

INSULATING BUSHING

Application filed August 20, 1927, Serial No. 214,275. Renewed March 5, 1929.

This invention relates to electric insulators as insulating bushings especially adapted, although not necessarily limited, for use in high tension oil immersed switches and is a continuation in part of my copending application Serial No. 102,069, filed April 14, 1926.

The terminals of an electric switch must have sufficient spacing to prevent flash-overs between them, and where air is the insulating medium, the terminals must necessarily be spaced widely apart to provide sufficient insulation, if high voltages are employed. To provide the requisite spacing with vertically disposed insulating bushings would necessitate switch casings of a prohibitive size; so it has been common practice to obtain the desired spacing at the upper exposed ends of the bushing by inclining the bushings outwardly. This construction, while providing an increased spacing at the top of the insulator, must necessarily decrease the spacing at the lower end of the insulator. To a certain extent, this may be permissible since the lower exposed terminals of the insulator are immersed in oil; but it is evident that if the bushings are inclined to any great extent, the lateral dimensions of the switch casing must be increased to maintain a safe spacing of the lower terminals.

Consequently, an object of this invention is the provision of an insulating bushing so arranged that, when two or more of them are used as the terminals of an oil immersed electric switch or other similar apparatus, a suitable close spacing is provided between them at the lower ends thereof under the oil while a suitable wide space is provided between them at their upper and air-exposed ends.

A further object of the invention is the provision of an oil or compound filled insulating bushing comprising two angularly related tubular insulating sections connected rigidly together in communication with a bare conductor extended through said sections and bent in correspondence with said sections, and provided with exposed circuit terminals at the ends of the bushing, combined with means disposed in the interior of the bushing and in engagement both with the bare conductor and the wall of the bushing to maintain the conductor in axial position therein and to prevent it from being displaced.

A further object of the invention is generally to improve the construction and operation of insulating bushings.

Fig. 1 is an elevation of the insulating bushing embodying this invention.

Fig. 2 is a sectional elevation through the insulator of Fig. 1.

Fig. 3 is a section along line 3—3 of Fig. 2.

Fig. 4 is a sectional detail illustrating a modification in the position of the conductor spacing member within the bushing.

The insulating bushing embodying this invention comprises the straight upper tubular insulating body or shell 10, the intermediate tubular attaching member or sleeve 12 and the lower straight tubular insulator body or shell 14. The upper shell 10 is adapted to be exposed to the atmosphere and may be provided with the usual petticoats 16. The lower shell 14 is adapted to be immersed in oil and may be provided with the usual corrugations 17. In accordance with this invention, the tubular sleeve 12 is bent intermediate its ends to follow a regular curve and to provide angularly-related upper and lower sections so that said insulating shells connected with the ends thereof are angularly inclined with respect to each other. The upper end of said bent metal sleeve 12 is provided with an attaching flange 18 and the lower end of said shell is provided with an attaching flange 20. A clamping flange 22 is cemented or otherwise secured to surround the bottom end of the upper insulating shell 10 and is rigidly secured detachably upon the flange 18 of said sleeve 12 and in alignment with the passage through said sleeve by bolts 24. The upper end of the lower insulating shell 14 has a similar clamping flange 26 cemented thereto; and said flange is secured to the flange 20 of the sleeve 12 by bolts 28 so that the passage in said tube 14 is in alignment with the passage in said sleeve 12. The joints between the insulating shells and the sleeve 12

are made fluid tight in any suitable or usual manner.

The bushing is adapted to be received in the aperture 30 of the containing casing 32 of some suitable electrical apparatus which may be an electric switch and the flange 18 of the sleeve is bolted to said casing by suitable bolts 34. The insulating bushing thus described is adapted to be filled with oil and is provided with an oil reservoir 36 at the upper end of the upper insulating shell 12 which oil reservoir may be secured to said shell in any suitable manner and is characterized by having a transparent side wall through which the height of oil in the insulator is visible as is usual in some types of oil filled bushings.

A conductor 38 is extended through said bushing in axial alignment therewith and said conductor is provided with an upper straight portion 38^a which is conformed with the straight portion of the shell 10 and the sleeve 12; an intermediate bent portion 38^b which lies axially within the sleeve 12 and is conformed with the bent portion thereof; a lower straight portion 38^c which lies axially within the straight lower shell 14 and the straight portion of the sleeve 12. Said conductor may be either solid or tubular but preferably is relatively rigid and self-supporting although it can be otherwise as will be set forth hereinafter. The upper end of said conductor can be externally screw-threaded as shown and pass through the upper end of the oil reservoir 36 and be provided with clamping nuts 40 thereon for connection with a line conductor. The lower end of said conductor is provided with screw threads 42 and is threaded into a shouldered stud 44 which is secured in an oil tight manner through a metal cap 46 which is cemented or otherwise secured in an oil tight manner to the lower end of the insulating shell 14. The lower end of said stud is externally screw threaded and provided with a contact block 48 to be engaged by the movable switch member of an electric switch or it may be arranged for connection with the circuit lead of some suitable electrical apparatus, as the case may be.

Means are provided to hold the conductor in its axial position within the bushing and against undue lateral displacement therefrom. As shown in Fig. 2, said means comprises a disk 50 of some suitable insulating material which is received in an annular recess 52 formed in the upper face of the flange 18 of the metal sleeve 12 and held in such location by the insulating shell 10 which is disposed thereabove. Said insulating disc 50 is provided with an aperture therein through which the conductor is passed and consequently holds said conductor from displacement out of the axial position illustrated. The bushing is adapted to be filled with oil to some level which will be visible in the oil reservoir 36 thereby to insulate the conductor, especially from the metal sleeve 12, and also to exclude air from the interior of the bushing about said conductor. The disc 50 is provided with one or more passages 51 therethrough which provides for free communication of the bodies of oil above and below said discs. But one disc 50 is necessary to maintain the conductor in position within the walls of the bushing, although it is obvious that more than one disc can be used if desired. While I prefer to locate the disc as shown in Fig. 2, it may be convenient to place it in one of the insulating shells and I have shown a disc 50^a similar in its vital aspects to the disc 50 disposed in the lower insulating shell 14 and in engagement both with said shell and with the conductor 38 and held in position within said shell by engagement with the tapered inner face thereof.

In Fig. 4, the disc 50^b is disposed within the metal shell 12 at the bend thereof as is shown in my above named copending application.

While I prefer to use a rigid conductor, I can, if convenient, use a more or less flexible conductor and support it against displacement from axial position by the use of a plurality of insulating spacing discs 50 and 50^a.

The construction may be otherwise modified without departing from the spirit of the invention.

I claim:

1. An insulating bushing having a bend intermediate its ends, a conductor extended axially through said bushing and having a bend conformed with the bend of said bushing and having terminal members at the ends of the bushing, and a spacer member disposed within said bushing and in engagement both with the wall of said bushing and with said conductor and arranged to hold said conductor against lateral displacement within said bushing.

2. An insulating bushing having a bend intermediate its ends, a conductor extended axially through said bushing and having a bend conformed with the bend of said bushing and having terminal members at the ends of the bushing, and a spacer member disposed within said bushing and in engagement both with the wall of said bushing and with said conductor and arranged to hold said conductor against lateral displacement within said bushing, said spacer member being provided with a passage therethrough between said conductor and the wall of said bushing to admit of free fluid communication of the fluid bodies above and below said spacer member.

3. An oil filled insulating bushing having a bend intermediate its ends, a conductor ex-

tended axially within said bushing having a bend conformed with the bend of said bushing and having exposed terminal members at the ends of the bushing, and an insulating spacer member disposed within said bushing intermediate its ends and having engagement with the wall of said bushing and also with said conductor intermediate its ends and arranged to restrain said conductor in its aforesaid position.

4. An oil filled insulating bushing having a bend intermediate its ends, a conductor extended axially within said bushing having a bend conformed with the bend of said bushing and having exposed terminal members at the ends of the bushing and an insulating spacer member disposed within said bushing intermediate its ends and having engagement with the wall of said bushing and also with said conductor intermediate its ends and arranged to restrain said conductor in its aforesaid position, said insulating spacer member having a passage therethrough providing free oil communication between the bodies of oil above and below it.

5. An oil filled bushing having a bend intermediate its ends, a rigid conductor extended axially within said bushing and having a bend intermediate its ends conformed with the bend of said bushing and having terminal members at the end of the bushing, and a spacer disc disposed within said bushing and in engagement with the wall thereof and also with said conductor and arranged to restrain said conductor against displacement from the aforesaid position, said conductor being bare, and a body of oil disposed within said bushing around said conductor providing the insulation therefor.

6. An oil filled insulating bushing comprising a tubular metal sleeve having a bend intermediate its ends, tubular insulating shells attached to the ends of said sleeve and angularly inclined with respect to each other, a bare conductor extended axially within said bushing and having a bend therein conformed with the bend of said bushing and having exposed terminal members at the ends of the bushing and in contact with the oil in the bushing, and an insulating spacer disc carried by said metal sleeve and arranged in engagement with said conductor to restrain it against lateral displacement.

7. An insulating bushing comprising upper and lower tubular insulating shells, a metal sleeve connecting said shells, an insulating disc disposed in the upper end of said metal sleeve, a conductor extended axially through said bushing and said disc and having exposed terminal members at the ends of the bushing, and a body of oil in said bushing providing the insulation for said conductor.

In testimony whereof I have signed my name to this specification.

GEORGE A. BURNHAM.