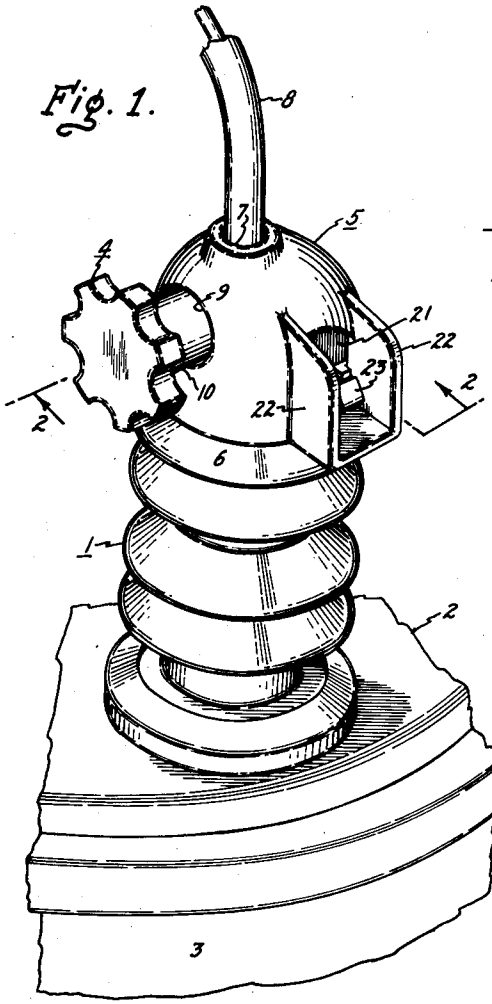
May 17, 1960 M. BROVERMAN 2,937,361

BUSHING TERMINAL GUARD

Filed Dec. 20, 1955

Fig. 1.



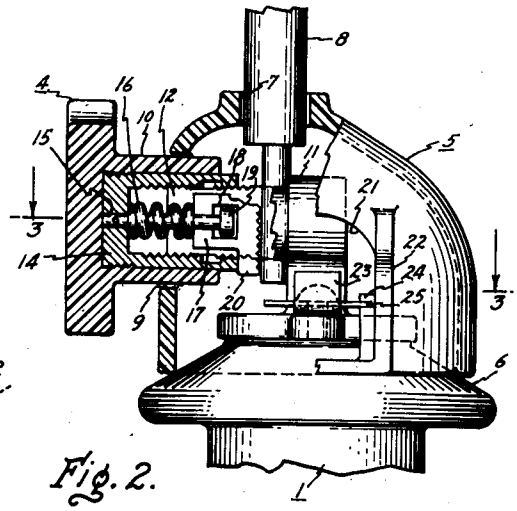


Fig. 2.

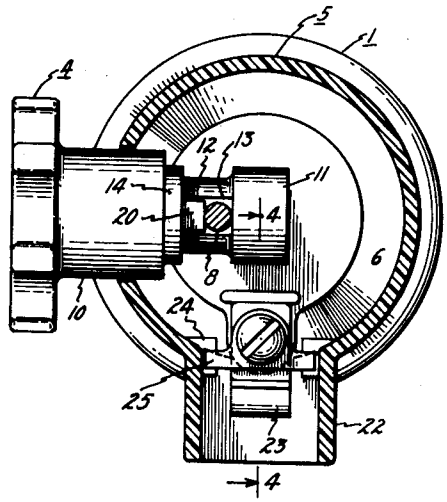
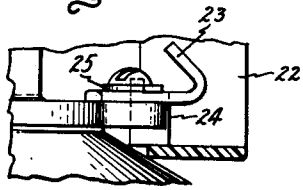


Fig. 3.

Fig. 4.



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United States Patent Office 2,937,361 Patented May 17, 1960

2,937,361

BUSHING TERMINAL GUARD

Michael Broverman, Pittsfield, Mass., assignor to General Electric Company, a corporation of New York

Application December 20, 1955, Serial No. 554,178

2 Claims. (Cl. 339—202)

This invention relates to a bushing terminal guard, and more particularly, to a protective cap for the terminal clamp and terminal end of an electrical terminal bushing.

In my copending patent application Serial No. 554,170, entitled Bushing Terminal Guard, filed December 20, 1955, and now Patent Number 2,834,829 and assigned to the same assignee as the instant case, is disclosed a protective cap for the terminal end of an electrical terminal bushing which substantially completely encloses said terminal end as well as the terminal clamp hardware. Additionally, means is provided for securely fastening the cap with respect to said terminal end and said terminal clamp hardware. Said means does not depend for its operation on elastic snapping on of the cap with respect to the bushing which means that the cap need not necessarily be constructed from elastic compositions which may have poor weathering characteristics. Also, in said copending patent application the arrangement is such whereby the lead connected to the terminal clamp leaves the terminal clamp vertically through the upper end of the cap instead of horizontally through a side wall of the cap. A vertical take off of the lead from the clamp provides better bird or other animal proofing of the electrical installation than a horizontal take off. For instance, the terminal bushing may be vertically mounted on the top cover of the grounded main tank of an electrical apparatus such as a transformer. With a horizontal take off of the lead, which may be completely bare of electrical insulation, there is greater likelihood that a bird or other animal standing on the cover will reach the lead and short circuit the apparatus to ground even though the terminal end of the bushing and terminal clamp may be protected by an insulating cap.

It is an object of the instant invention to provide a bushing terminal guard which will have all the heretofore discussed advantages of my copending invention as well as the further advantage of an electrically insulated operating knob for the guarded terminal clamp.

In my copending invention the cap is first slipped on the lead, then the lead is connected to the clamp while the cap is held in a raised position, and then the cap is lowered along the lead toward the upper terminal end of the bushing for fastening with respect to said terminal end and said clamp. This means that the cap cannot be shipped in its final assembled position, or if it is, it must be removed to clamp the lead. By contrast, in the instant invention the cap can be shipped in its final assembled position and the lead can be quickly and conveniently clamped merely by operating the electrically insulated hand operating knob of the clamp. Additionally, the provision of a manual operating knob for the clamp means that no tools are required to clamp the lead.

In one form of my instant invention the terminal end of an electrical terminal bushing is provided with a hollow generally cup-shaped electrical insulating member which is snugly seated at its wide open end on said terminal end whereby the terminal clamp at said terminal end is substantially completely enclosed. The axis of

the clamp is generally perpendicularly disposed with respect to the axes of the cup-shaped member and bushing. The clamp is provided with an electrically insulated operating knob which extends through an aperture formed in a side wall of the cup-shaped member, and another aperture is formed in the opposite end of the cup-shaped member so that a lead which is generally parallel to the axis of said bushing can be inserted into the lead receiving opening of the clamp and be clamped in the clamp. The cup-shaped member may be secured with respect to the clamp and said terminal end merely by the interlocking or abutting disposition of the knob and the peripheral portions of said side wall aperture with respect to each other. However, additional securing means may also be used if so desired.

My invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

In the drawing Fig. 1 is a view in perspective of one form of my invention. Fig. 2 is an enlarged broken away sectional view taken along the line 2—2 of Fig. 1. Fig. 3 is a sectional view along line 3—3 of Fig. 2, and Fig. 4 is a broken away sectional view along line 4—4 of Fig. 3. Like reference numerals will be used throughou the various figures to indicate identical parts.

Referring now particularly to Fig. 1, shown therein is a vertically disposed electrical terminal bushing 1 which is constructed from porcelain or other electrical insulating material and has a plurality of petticoats formed thereon. Bushing 1 is mounted on a cover 2 of a main tank 3 of an electrical apparatus such as a transformer. The upper terminal end of bushing 1 has a terminal clamp mounted thereon which is provided with an electrically insulated manual operating member or hand knob 4. The terminal clamp is probably best shown in Fig. 2, and the terminal clamp as well as the upper terminal end of bushing 1 is substantially completely enclosed by a hard rubber or other electrical insulating material hollow member 5. Member 5 is generally cup-shaped and is inverted whereby its wide open end is snugly seated on the frusto-conical surface 6 of the upper petticoat of bushing 1. The opposite or upper end of member 5 has a small aperture 7 formed therein for the passage of an electrical lead 8 therethrough which is clamped in the terminal clamp. The lead 8 and the axes of member 5 and bushing 1 are generally parallel to each other and vertically disposed whereas the axis of the terminal clamp is generally horizontal and perpendicular to the lead 8 and the axes of member 5 and bushing 1. An aperture 9 is formed in a side wall of member 5 for the knob 4. The aperture 9 is only slightly larger than a hollow cylindrical portion 10 of the knob 4 so that projection of portion 10 through aperture 9 results in interlocking of the member 5 with respect to the terminal clamp and the upper terminal end of bushing 1 with a minimum of looseness.

A wide variety of terminal clamps can be used in my invention, and the specifically illustrated terminal clamp is claimed and described in detail in my patent 2,740,100, entitled Electrical Cable Clamp, issued March 27, 1956, and assigned to the same assignee as the instant case. Broadly, the terminal clamp comprises a clamping block 11 which is fixed to the upper terminal end of bushing 1. An externally threaded stud 12 or other equivalent member is integrally or otherwise connected to block 11. Stud 12 is horizontally disposed and is split along the length thereof by a notch 13. Notch 13 extends through opposite sides as well as opposite ends of the stud 12 up to block 11.

The hollow cylindrical portion 10 of knob 4 has an internally threaded cylindrical nut 14 of the like fixed

therein which threadably cooperates with stud 12 Also, stud 12 and nut 14 have provision for spin free engagement therebetween by virtue of the fact that the threads on both stud 12 and nut 14 are divided into two spaced threaded sections The left-hand end of nut 14 is preferably integrally closed so that a pin 15 can be securely fixed inside of nut 14 coincidental with the axis thereof. A spring 16 surrounds the pin 15 and is compressed between the left-hand end of nut 14 and the left-hand end of a stem 17 of a generally T-shaped clamping block.

The stem 17 has a notch 18 formed therein and the right-hand end of pin 15 extends through the left-hand end of stem 17 into notch 18. The right-hand end of pin 15 has an enlargement 19 formed thereon which is smaller than the notch 18 so that the pin 15 and T-shaped clamping block have a lost motion connection therebetween.

In Fig. 2 the terminal clamp is shown in its fully tightened position whereby the lead 8 is clamped between a cross piece 20 of the T-shaped clamping block and the block 11. The cross piece 20 is abutting the right-hand end edge of nut 14 and the spring 16 has been compressed. Since the cross piece 20 abuts the right-hand end edge of nut 14 the spring 16 cannot be overcompressed. The spring 16 and the lost motion connection between pin 15 and the T-shaped clamping block provide a spring follow up clamping action in the event the lead 8 becomes loose in the terminal clamp due to cold flow of the metallic conductor of lead 8. That is, if the lead 8 tends to become loose with respect to the cross piece 20 and block 11 the spring 16 will urge the T-shaped clamping block in a right-hand direction to take up any slack in the lead connection.

In the fully clamped Fig. 2 position of the parts the T-shaped clamping block and the pin 15 and spring 16 are disposed in the notch 13. After the knob 4 is turned to loosen the terminal clamp the threaded section on the end of each of members 12 and 14 will become aligned with the non-threaded portion of the other member. In this position of the device an operator will know by the feel of knob 4 that the clamp is open. Further outward turning of knob 4 will engage the threaded sections on the ends of members 12 and 14 with each other and ultimately result in complete removal of the knob 4 and its attached parts from the stud 12. However, before this occurs the feel of knob 4 during spin free engagement of the parts 12 and 14 will apprise the operator of the fact that the clamp is open whereby the danger of accidental disassembly of the clamp and falling parts is minimized.

The member 5 is installed by removing the knob 4 and its attached parts from the stud 12. Then the member 5 is slipped over the block 11 and stud 12 so that the stud 12 is aligned with aperture 9. Then the nut 14 of knob 4 is engaged with stud 12. In the mounted position of member 5 the aperture 7 is aligned with the notch 13 or the lead receiving opening of the clamp which is defined by the split stud 12 and the spaced cross piece 20 and block 11.

In some electrical installations a lightning arrester is mounted adjacent to the bushing terminal with an external spark gap therebetween. For this purpose the member 5 may have a slot 21 formed in the side thereof about 90° from the aperture 9. The slot 21 is shielded by a generally U-shaped external baffle 22 which may be an integral part of member 5. An electrode member 23 which is electrically connected to the terminal clamp projects through the slot 21 into the baffle 22. When an external spark is established between electrode member 23 and another electrode member of an adjacent lightning arrester there is a danger that the arc will play on the side walls of the baffle 22 and corrode the same if the electrode member 23 is not spaced sufficiently from said side walls. Therefore, a pair of small shouldered portions 24 are integrally or otherwise formed adjacent the side edges of slot 21 and along the side walls of baffle 22. A small generally T-shaped clip or tab 25 which is fixed with respect to the terminal clamp and upper terminal end of bushing 1 has its cross piece projecting into the slot 21. The opposite ends of said cross piece fit into the shoulders of the shouldered portions 24 whereby the member 5 is interlocked with respect to the terminal clamp and upper terminal end of bushing 1 independent of projection of the knob portion 10 through aperture 9 or the degree of closeness therebetween. Additionally, the opposite ends of the cross piece of tab 25 extend laterally beyond opposite sides of the electrode 23 and are disposed in abutting relationship with respect to the side walls of baffle 22 and the side edges of slot 21 whereby said side walls and side edges and electrode 23 are amply spaced with respect to each other.

While there has been shown and described a particular embodiment of the invention, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention, and therefore it is intended by the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In an electrical bushing having a clamp mounted on one end thereof, a hollow generally cup-shaped electrical insulating material member seated at its wide open end on said one end and substantially completely enclosing said clamp therein, said clamp having an externally threaded member which is disposed generally perpendicular to the axis of said bushing and an electrically insulated nut on said threaded member for clamping an electrical lead in said clamp, said nut extending through an aperture formed in a side wall of said hollow member and having an electrical insulating material hand knob at the outer end thereof which is disposed outside of said hollow member, and another aperture formed in an opposite end of said hollow member, said another aperture and an electrical lead receiving opening of said clamp being aligned with respect to each other whereby an electrical lead which is clamped in said clamp will be disposed generally parallel to the axis of said bushing, and a slot formed in said side wall with a metallic electrode member which is electrically connected to said clamp projecting into said slot in spaced relationship to the side edges thereof, and a tab which is fixed with respect to said clamp and bushing one end projecting into said slot in abutting relationship with respect to said side edges for retaining said side edges and electrode member in spaced relationship.

2. In an electrical bushing having a clamp mounted on one end thereof, a hollow generally cup-shaped electrical insulating material member seated at its wide open end on said one end and substantially completely enclosing said clamp therein, said clamp having an externally threaded member which is disposed generally perpendicular to the axis of said bushing and a nut on said threaded member for clamping an electrical lead in said clamp, said nut having an electrical insulating material hand knob which is disposed outside of said hollow member and extends through an aperture formed in a side wall of said hollow member, and another aperture formed in an opposite end of said hollow member which is aligned with respect to an electrical lead receiving opening of said clamp whereby an electrical lead which is clamped in said clamp will be disposed generally parallel to the axis of said bushing, and a slot formed in said side wall, said slot being shielded by electrical insulating material external walls which extend along the side edges of said slot, a metallic electrode member electrically connected to said terminal clamp extending into said slot in spaced relationship to said side edges and external walls, a pair

of shoulders formed adjacent said side edges, and a clip which is fixed with respect to said clamp and said bushing one end engaging said shoulders to fix said hollow member with respect to said clamp and said bushing one end and to retain said electrode member in spaced relationship with respect to said side edges and external walls.

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