Dec. 29, 1953

J. C. JOUBLANC

2,664,457

TRANSFORMER BUSHING

Filed June 9, 1951

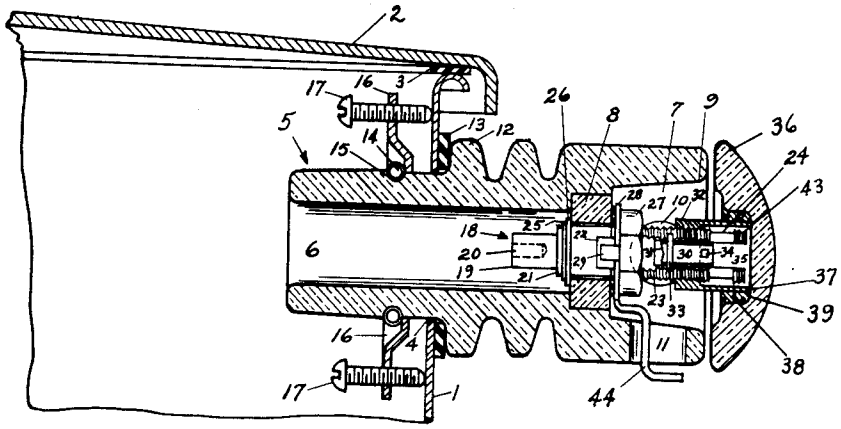


Fig. 1

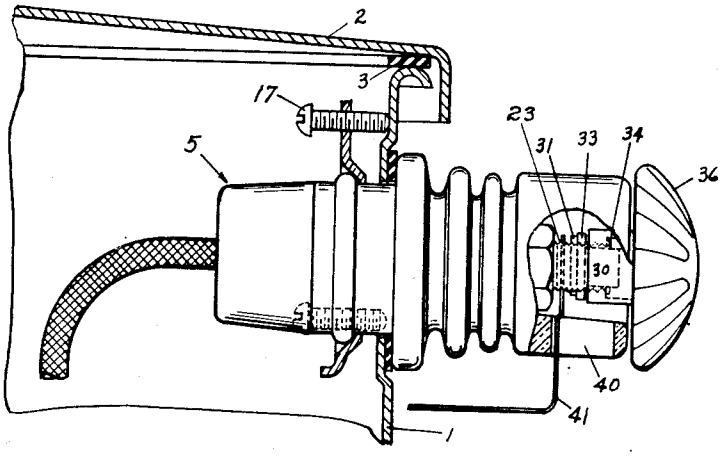


Fig. 2

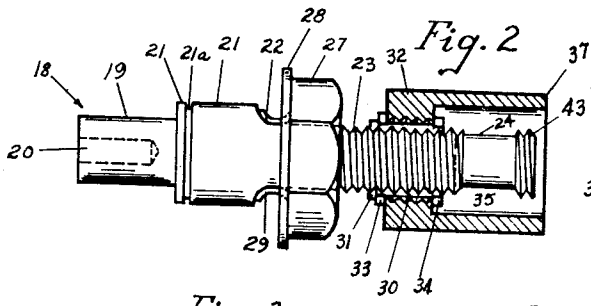


Fig. 3

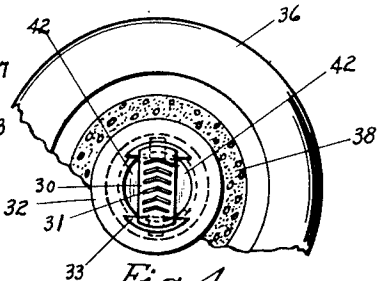


Fig. 4

INVENTOR.

Joseph Charles Joublanc

BY Chester W. Brown

Attorney

Patented Dec. 29, 1953

2,664,457

# UNITED STATES PATENT OFFICE

2,664,457

## TRANSFORMER BUSHING

Joseph C. Joublanc, Zanesville, Ohio, assignor to McGraw Electric Company, Milwaukee, Wis., a corporation of Delaware

Application June 9, 1951, Serial No. 230,733

6 Claims. (Cl. 174—153)

1

My invention relates to a combination terminal connector and a bushing for electrical apparatus such as transformers, etc.

One object is to provide a bushing that is completely coordinated with the transformer insulation and incorporates a bifurcated bolt connector for clamping the end of a lead in a non-slipping, vise-type engagement.

Another object is to provide a transformer bushing that will give greater protection to linemen because of the enclosure of all live parts and including a connector to which line leads can be attached without the aid of tools.

And finally it is an object of this invention to provide a bushing assembly for electrical circuits which will serve as seal against the entrance of moisture into and the egress of oil from an electrical apparatus tank, which will reduce to a minimum resistance in the connection between internal and external leads, and in which the connector operating handle will not be accidentally removed but can easily be removed by intent.

Other objects will appear from time to time in the course of the specification and claims.

An embodiment of my invention is illustrated in the accompanying drawing in which:

Fig. 1 is a sectional view taken on the axis of a bushing as it appears when mounted in a horizontal position relative to the casing shown in fragentary section.

Fig. 2 is a view similar to Fig. 1 illustrating a second version of my improved bushing with a part in section.

Fig. 3 is an enlarged detail illustration partly in section of the bifurcated bolt and associated parts as viewed from the top relative to Fig. 1.

Fig. 4 is a fragmentary view of the knob assembly as viewed from the left relative to Figs. 1 and 2.

Like reference characters indicate similar parts in the various figures of the drawing.

Referring to Fig. 1, I show a fragment of a transformer casing 1 with a cover 2 and a sealing member 3 between them. Extending perpendicularly through an opening 4 in the side wall of the casing 1 is a bushing 5. This bushing 5 is preferably made of porcelain and extending therethrough from end to end is a bore 6 having at one end a portion 7 of enlarged diameter providing an annular shoulder upon which an insulating ring 8 is supported and firmly secured. The enlarged bore portion 7 terminates at one end in an outwardly flared portion 9 which has a pair of radial openings 10 and 11 positioned at 90° from each other.

A bushing flange 12 on the bushing 5 rests on a resilient washer 13 held in air and fluid tight

2

contact with the washer by securing means comprising a coil spring 14 surrounding the bushing and positioned in the annular groove 15 on the periphery of the bushing, a plate 16 surrounding the bushing and engaging the spring 14, and a plurality of bolts 17 threaded through the plate 16 and engaging the inner wall of the casing 1.

Secured in the bore of the bushing 5 is a connector 18 comprising an end 19 having a socket 20 for attaching the transformer terminal, an enlarged portion 21 having an annular groove 21a and diametrically opposed flattened faces 22, and threaded bifurcated portions 23 having the threads removed at 24.

As shown in Fig. 1, the enlarged portion 21 of the connector is positioned in the bore of the insulating ring 8. A resilient retaining ring 25 positioned in the annular groove 21a engages a resilient sealing ring 26, and nut 27 threaded on the connector clamps a locking ring 28 to the insulating ring 8 with tabs 29 on the ring 28 engaging the faces 22. Integral with and extending outwardly from the locking ring 28 and through the opening 11 is an electrode 44.

Positioned between the bifurcations of the connector and slidable longitudinally thereof is a clamping jaws 30 having a serrated pressure surface 31. Threaded on the bifurcations is a sleeve 32 which is rotatable relative to the clamping jaw but held in engagement therewith by means of tabs 33 engaging one side of the sleeve portion 32 and tabs 34 engaging the inner side 35 of the sleeve portion 32.

A handle or knob 36 is secured to the end 37 of the sleeve 32 by means of cement 38 in the socket 39 of the handle.

In Fig. 2 I show in elevation with a part broken away, a similar bushing except that it has only one wire entrance opening 40 positioned radially from the inner bore. This opening 40 is sufficiently large to accommodate several wires. In this view the connector 18 is turned 90° from its position shown in Fig. 1 so that the space between the legs of the threaded bifurcated portion 23 is in line with the wire entrance 40 of the bushing 5. A "spill-gap" electrode 41 also extends through this entrance from the acting space of the clamping jaw 30 to the outside of the bushing.

Fig. 3 is an enlarged view of the connector 18 turned 90° from the position shown in Fig. 1 and illustrates how the tabs 29 of the locking ring 28 engages the faces 22 in conjunction with the nut 27. This view also illustrates the sleeve 32 in threaded association with the bifurcated portions 23 and in rotatable relation to the slidable clamping jaw 30.

Another view of the sleeve 32 and clamping

jaw 30 attached to the knob 36 can be seen in Fig. 4. The end 37 of the sleeve 32 is fastened into the socket 39 of the knob 36 by some desirable cementitious material 38. The openings 42 on each side of the clamping jaw 30 and within the sleeve 32 are adapted to receive the threaded bifurcated legs 23 when mounted as shown in Fig. 1.

The use and operation of my invention are as follows:

It is the constant aim of everyone in the electrical field to safeguard the lives of the linemen. With this in mind I devised an improved bushing for transformers which can be used on either the primary or secondary line by varying the size. The advantages of this bushing are an improvement in appearance, a reduction in overall size, and a means of attaching the cables to the bushing whereby the lines are completely enclosed in the bushing. The linemen can connect the cables without contacting the dangerous live wires and without the use of tools. Any size cable can be attached because I use a vise-type jaw 31 to hold the cables in the connector 18. The connector 18 is designed as a bifurcated bolt which reduces contact resistance between internal lead and line lead.

To attach a line to the bushing 5 the lineman inserts the cable into the entrance 10 near the knob. This opening is in line with the slot between the bifurcated portions 23 of the connector 18. It is easily visible to the lineman as to where to thread the cable.

A pressure shoe 30 with a grooved surface 31 is carried by a sleeve 32 and knob 36 assembly on the threads of the bifurcated portion 23 of the connector 18. This pressure shoe 30 forms a jaw with the seat between the legs of the bifurcated portions 23 so that when the knob 36 is turned and the threaded section of the sleeve 32 travels on the threaded section of the bifurcated bolt the grooved surface 31 of the pressure shoe 30 clamps the cables firmly in jaw-like manner. Thus, it can be seen that the jaw can be adjusted by means of the knob to fit various sized cables and that its grooved surface prevents slipping.

The bifurcated portion of the connector 18 has a section 24 where the threads have been removed. This is to prevent accidental removal of the knob. When the lineman is turning the knob 36 to move the jaw 30 to release position and the threaded portion of the sleeve 32 reaches the place where the threads are disengaged from the threads on the bifurcations and positioned in the unthreaded sections 24, he knows that the jaw 30 is out of obstructing relation to the opening 10. If for some reason, he should wish to remove the knob 36 and clamping jaw 30 from the bushing 5 he will engage the threaded sleeve 32 with threads 43 at the outer end of the unthreaded section 24 and with a few turns on these threads 43, the knob 36 can be removed.

From the foregoing, it will be apparent that I have provided a novel combination terminal bushing and connector which affords easy manipulation of the connector with a minimum risk that the operator will contact live parts. Further, the construction is relatively simple, is easily assembled, can be quickly repaired, and is suitable for use with standard apparatus casings without requiring alterations thereof.

I claim:

1. The combination with a lead-in bushing for an electrical apparatus casing, the bore of said bushing having intermediate its ends an inwardly extending annular shoulder dividing said bore into inner and outer chambers and further having a radial aperture opening into said outer chamber between said shoulder and one of said ends of a connector bolt in the bore of said bushing having a socketed shank portion disposed in said chamber and projecting toward the other of said ends, means secured on and projecting laterally from said shank and engaging said shoulder within said inner chamber, said bolt having a threaded bifurcated end in said outer chamber, the portion of said bolt intermediate said shank portion and bifurcated end being embraced by said shoulder, a nut threaded on said bifurcated end and engaging said shoulder within said outer chamber, said means and nut clampingly engaging said shoulder and anchoring said bolt against longitudinal movement within said bushing, the bifurcations of said bolt being disposed on opposite sides of a plane substantially coincident with the axes of said bore and aperture, and clamping means, said clamping means comprising a jaw slidable between said bifurcations, an actuator threaded on said bifurcations and rotatably secured to said jaw, and an insulating handle on said actuator overlying said outer chamber and serving as a closer therefor.

2. The combination with a lead-in bushing for an electrical apparatus casing, the bore of said bushing having intermediate its ends an inwardly extending annular shoulder dividing said bore into inner and outer chambers and further having a radial aperture opening into said outer chamber between said shoulder and one of said ends, of a connector bolt in the bore of said bushing having a socketed shank portion disposed in said chamber and projecting toward the other of said ends, means secured on and projecting laterally from said shank and engaging said shoulder within said inner chamber, said bolt having a bifurcated end in said outer chamber and being provided with spaced threaded portions substantially co-extensive with said bifurcated end, said spaced threaded portions defining an unthreaded annular section therebetween, said bolt having a portion intermediate said shank portion and said bifurcated end embraced by said shoulder, a nut threaded on said bifurcated end and engaging said shoulder within said outer chamber, said means and nut clampingly engaging said shoulder and anchoring said bolt against longitudinal movement within said bushing, the bifurcations of said bolt being disposed on both sides of a plane substantially coincident with the axes of said bore and aperture, and clamping means, said clamping means comprising a jaw slidable between said bifurcations, and an actuator threaded on said bifurcations and rotatably secured to said jaw, said actuator being disengageable with said threaded portions at said unthreaded annular section, and an insulating handle on said actuator overlying said outer chamber and serving as a closer therefor.

3. The combination with a lead-in bushing for an electrical apparatus casing, the bore of said bushing having intermediate its ends an inwardly extending annular shoulder dividing said bore into inner and outer chambers and further having a radial aperture opening into said outer chamber between said shoulder and one of said ends, of a connector bolt in the bore of said bushing having a socketed shank portion disposed in said chamber and projecting toward the other of said ends, means secured on and projecting

laterally from said shank and engaging said shoulder within said inner chamber, said bolt having a bifurcated end in said outer chamber and a portion intermediate said shank portion and bifurcated end being embraced by said shoulder, a nut threaded on said bifurcated end and engaging said shoulder within said outer chamber, said means and nut clampingly engaging said shoulder and anchoring said bolt against longitudinal movement within said bushing, the bifurcations of said bolt being disposed on opposite sides of a plane substantially coincident with the axes of said bore and aperture, rotational restraining means interacting between said bolt and said bushing for preventing relative rotation therebetween, and clamping means, said means comprising a jaw slidable between said bifurcations, an actuator threaded on said bifurcations and rotatably secured to said jaw, and an insulating handle on said actuator overlying said outer chamber and serving as a closer therefor.

4. The combination with a lead-in bushing for an electrical apparatus casing, the bore of said bushing having intermediate its ends an inwardly extending annular shoulder dividing said bore into inner and outer chambers and further having a radial aperture opening into said outer chamber between said shoulder and one of said ends, of a connector bolt in the bore of said bushing having a socketed shank portion disposed in said chamber and projecting toward the other of said ends, means secured on and projecting laterally from said shank and engaging said shoulder within said inner chamber, said bolt having a bifurcated end in said outer chamber and being provided with spaced threaded portions substantially co-extensive with said bifurcated end, said spaced threaded portions defining an unthreaded annular section therebetween, said bolt having a portion intermediate said shank portion and said bifurcated end embraced by said shoulder, a nut threaded on said bifurcated end and engaging said shoulder within said outer chamber, said means and nut clampingly engaging said shoulder and anchoring said bolt against lateral movement within said bushing, rotational restraining means interacting between said bolt and said bushing for preventing relative rotation therebetween, the bifurcations of said bolt being disposed on both sides of a plane substantially coincident with the axes of said bore and aperture, and clamping means, said clamping means comprising a jaw slidable between said bifurcations, and an actuator threaded on said bifurcations and rotatably secured to said jaw, said actuator being disengageable with said threaded portions at said unthreaded annular section, and an insulating handle on said actuator overlying said outer chamber and serving as a closer therefor.

5. The combination with a lead-in bushing for an electrical apparatus casing, the bore of said bushing having intermediate its ends an inwardly extending annular shoulder dividing said bore into inner and outer chambers and further having a radial aperture opening into said outer chamber between said shoulder and one of said ends, of a connector bolt in the bore of said bushing having a socketed shank portion disposed in said chamber and projecting toward the other of said ends, a stop fixedly mounted on and projecting laterally from said shank and engaging said shoulder within said inner chamber, said bolt having a threaded bifurcated end in said outer chamber and further having a



portion providing opposed flat sides, rotational restraining means on said bolt and slidably engageable with said opposed sides and interacting between said bolt and said bushing to prevent relative rotation therebetween, said bolt having a portion intermediate said shank portion and said opposed flat sides embraced by said shoulder, a nut threaded on said bifurcated end and engaging and holding said restraining means clamped to said shoulder within said outer chamber, said stop and nut clampingly engaging said shoulder and anchoring said bolt against lateral movement with said bushing, the bifucations of said bolt being disposed on opposite sides of a plane substantially coincident with the axes of said bore and aperture, and clamping means, said clamping means comprising a jaw slidable between said bifurcations, an actuator threaded on said bifurcations and rotatably secured to said jaw, and an insulating handle on said actuator overlying said outer chamber and serving as a closer therefor.

6. The combination with a lead-in bushing for an electrical apparatus casing, the bore of said bushing having intermediate its ends an inwardly extending annular shoulder dividing said bore into inner and outer chambers and further having a radial aperture opening into said outer chamber between said shoulder and one of said ends, of a connector bolt in the bore of said bushing having a socketed shank portion disposed in said inner chamber and projecting toward the other of said ends, a stop fixedly mounted on and projecting laterally from said shank and engaging said shoulder within said inner chamber, said bolt having a threaded bifurcated end in said outer chamber and further having diametrically opposed flat sides substantially co-extensive with said end, rotational restraining means on said bolt and slidably engageable with said opposed sides and interacting between said bolt and said bushing to prevent relative rotation therebetween, said bolt having a portion intermediate said shank portion and opposed flat sides embraced by said shoulder, a nut threaded on said bifurcated end and engaging and holding said restraining means clamped to said shoulder within said outer chamber, said stop and nut clampingly engaging said shoulder and anchoring said bolt against lateral movement with said bushing, the bifurcations of said bolt being disposed on opposite sides of a plane substantially coincident with the axes of said bore and aperture, and clamping means, said clamping means comprising a jaw slidable between said bifurcations, an actuator threaded on said bifurcations and rotatably secured to said jaw, and an insulating handle on said actuator overlying said outer chamber and serving as a closer therefor.

JOSEPH C. JOUBLANC.

References Cited in the file of this patent

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 2,029,140 | Treanor (1) | Jan. 28, 1936 |
| 2,311,852 | McFarlin | Feb. 23, 1943 |
| 2,339,488 | Kratoville | Jan. 18, 1944 |
| 2,441,457 | Treanor (2) | May 11, 1948 |

FOREIGN PATENTS

| Number | Country | Date |
|---|---|---|
| 225,414 | Switzerland | Jan. 31, 1943 |
| 715,704 | France | Sept. 20, 1931 |