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CIRCUIT MAKER BUSHING
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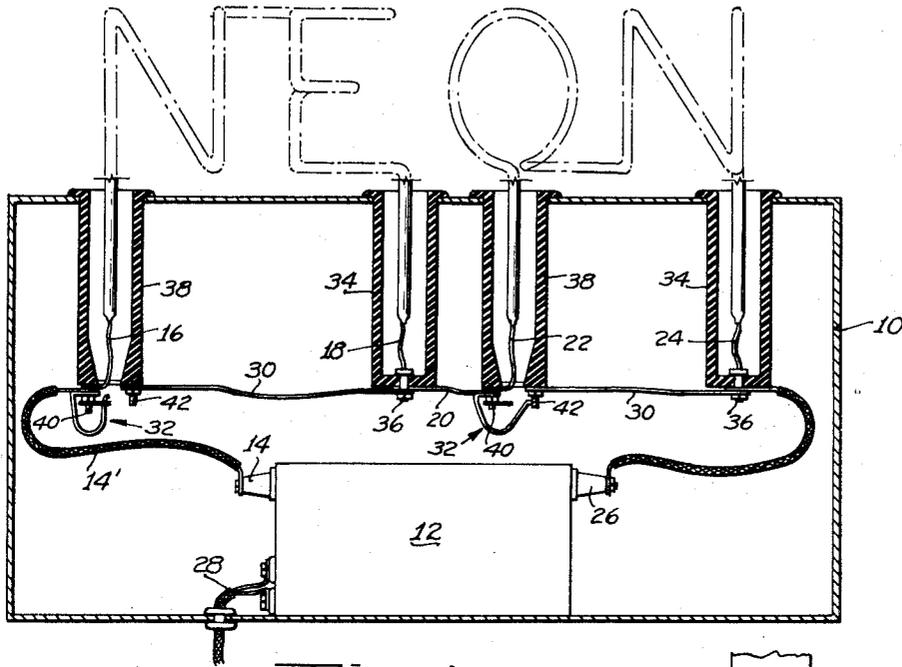


Fig. 1

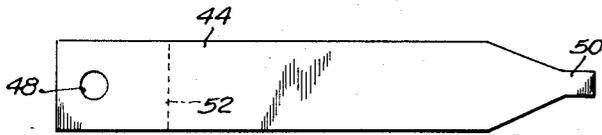


Fig. 4

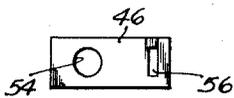


Fig. 5

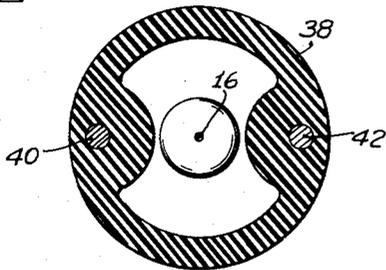
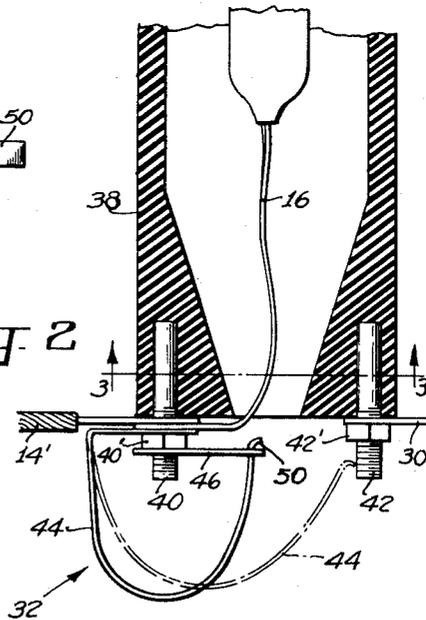


Fig. 3



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CIRCUIT MAKER BUSHING

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2 Claims. (Cl. 200—118)

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This invention relates to electric circuit bushings and protective devices useful in neon sign circuits and the like. Its principal object is to provide an extremely simple and inexpensive device adapted to be incorporated in a conventional neon sign installation, for example, and capable of protecting the high voltage neon tube energizing circuit and components thereof against destructive over-voltage conditions caused by failure of one or more of the neon sign tubing sections.

One costly result of an over-voltage condition caused by an open circuit in an inoperative sign section is the destructive effect on insulation of the high-voltage transformer. With its load current removed the transformer secondary winding voltage increases to a value which is undesirably high. Also, the entire neon sign is darkened when only one section of tubing becomes defective.

Prior to the present invention others working in this field have devised automatic circuit makers, attempting to solve this problem. In them, as in the present invention, a spring conductor was held under tension away from a circuit terminal by a fusible metallic element capable of fusing immediately upon the striking of an arc from over-voltage between it and such circuit terminal to release the spring conductor for snapping over into contact with such terminal and thereby completing a by-pass circuit around a defective neon sign section. However, such prior proposals have been difficult to adapt to commercial use, largely because of their excessive complexity and manufacturing cost, and also for lack of suitable circuit mountings for them in conventional neon sign installations.

Another practical consideration involved is the problem of replacements, as to both time and cost of restoring the automatic circuit maker into operative condition upon repairing or replacing the defective neon sign section. According to my invention the circuit maker has a single replacement element which may cost as little as a fraction of one cent to manufacture and may be rapidly installed. The invention may be incorporated in existing installations with little change, or included as a part of new installations at a minimum cost. The only significant change in a conventional installation required by the present invention is a slight but important change in the construction of certain terminal bushings for the respective electrode terminal ends of the neon tubing sections, being so adapted that the circuit maker elements may be mounted directly on such bushings.

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Various other features and advantages of the invention will become further evident from the following detailed description of a preferred form thereof, based upon the accompanying drawings.

Figure 1 is a simplified vertical sectional view of a typical neon sign installation incorporating the invention.

Figure 2 is an enlarged detail of the novel combination electrode bushing and circuit maker, according to a preferred form of the invention.

Figure 3 is a cross-sectional view of the bushing taken on line 3—3 in Figure 2.

Figure 4 is an enlarged detail of the spring conductor element used in the automatic circuit maker; and Figure 5 is a similar view of the fusible metal element of the circuit maker.

In Figure 1 the high voltage electric circuit components serving the sections of neon sign tubing are shown mounted within a protective housing 10, which is preferably of metal and maintained at ground potential according to conventional practice. In the illustrated case the sign includes only two sections of neon tubing, spelling out the word "NEON," one section including the letters "NE" and the other section the letters "ON," connected in series in the circuit. Thus the high voltage circuit supplied from the secondary winding of high voltage transformer 12 extends from transformer secondary terminal 14 to the electrode 16 of the "NE" section, through the sinuous, gaseous discharge path of that section to the electrode 18 at its opposite end, through the bridging conductor 20 to electrode 22 of the "ON" section, through the latter to its opposite electrode 24, and then back to the opposite transformer secondary terminal 26. Primary voltage is supplied to the transformer over the pair of electric conductors 28.

With a neon sign circuit arranged in the manner just described, it is obvious that a defect in any portion of the neon tubing would normally open the high voltage circuit and thereby extinguish the entire sign. This might occur if any part of the tubing develops a leak, or if it is broken or for any reason fails to ignite upon application of transformer secondary voltage to the tubing circuit. The consequences of such a failure are often damaging to the installation, and especially to the high voltage transformer which produces an abnormally high secondary voltage when its normal current load is removed.

According to the invention this possibility of damage is completely eliminated by providing each section of the neon sign tubing with separate by-pass circuit branches each including a shunt conductor 30 and a circuit maker device 32 con-

nected in series. The device 32 completes the by-pass circuit path automatically in the event the particular neon sign section fails and is thereby subjected to the full circuit voltage.

The most important feature of my invention is the convenient and commercially practical embodiment of my circuit maker device. Neon sign terminals are conventionally formed as cylindrical insulating electrode bushings 34, shown in Figure 1. Projecting centrally from the inner end of each is a suitable binding post 36, to which the proper circuit wires and neon tubing electrode wire are connected, as shown. Even where my invention is employed one of the terminals for each of the two neon sign sections may utilize the conventional single terminal post.

Each sign section also has an insulating bushing of special construction adapted, according to the invention, not only to provide the necessary means for making the usual circuit connections to the neon tube electrodes, but also to serve as a novel mounting for the by-pass circuit elements, including the circuit maker 32. The important characteristic or feature of these special bushings 38 is that each has, instead of a single binding post, two such elements 40 and 42. Preferably these project in spaced relation axially from one end of the bushing at diametrically opposite locations thereon. A nut 42' threads on the terminal bolt 42 to bind the shunt conductor 30 to it and against the end face of the bushing. The ends of transformer circuit wire 14' and electrode wire 16 are similarly secured to the binding post 40 by clamping action of a nut 40' threaded on post 40.

Binding post 40 also carries the elements of a circuit maker 32, including a spring conductor 44 and a fusible metal element 46. The spring conductor may assume various forms, but is preferably made from a flat strip of metal such as that shown in Figure 4, having an aperture 48 at one end to fit over the binding post 40, and its opposite end being reduced in width to form a tab or tongue 50. This spring strip, of conductive material such as a copper alloy, is bent approximately at right angles along the broken line 52 near its apertured end. Between this bend and its tab end it is then bent in the same direction in a gradual bow or U curve. Its tab is next bent in the opposite direction to form a hook.

The turned apertured end of the formed strip is then installed on the bushing 38 with the binding post 40 passing through such aperture and such end clamped down against the end face of the bushing or against the circuit wires also encircling the binding post at its base, by tightening the nut 40'. Theoretically it is, of course, immaterial which binding post, 40 or 42, supports the spring conductor, but if it were mounted on post 42 its tab 50 would be too close to the wire 16 if it were not insulated. The plane of curvature of the bowed strip is then contained in the plane common to the terminal posts 40 and 42. In this arrangement the inherent force of the spring conductor 44, arched over post 40 on which it is mounted, tends to spring it over against the opposing terminal post 42.

The second element of the circuit maker comprises a short strip 46 of fusible metal, such as babbitt or hardened solder, one end of which has an aperture 54 to receive the binding post 40, and the opposite end of which has a narrow aperture 56 engageable by the hooked tab 50 on the

strip 44. Installation of this fusible metal strip is accomplished by first inserting the tab hook 50 through its aperture 56 with the main body portion of the strip projecting in the direction of the terminal post 40. Next by bending the spring conductor 44 into a sharper bow the aperture 54 in the opposite end of the strip 46 may be slipped over the end of the binding post 40 and then slid along the post to rest against the outer face of the binding nut 40', as shown in Figure 2. The tension of spring strip 44 of itself holds the strip 46 securely in this position by the tension placed on it, while the spring conductor is retained by engagement of its hooked tab 50 through the strip's aperture.

With the spring strip 44 thus held bowed under tension to form a short arc gap between the junction of the interlocked ends of the two strips and terminal post 42, should an over-voltage condition develop between the two electrode terminals of the neon sign section, arc-over will occur between terminal post 42 and the strip ends. The intense heat developed by this arcing will melt the thin marginal section of metal between the aperture 56 and the adjacent end of the fusible strip 46, which, as it gives way, will release the tab 50 of the spring conductor 44 to be snapped by such conductor over into contact with the binding post 42, automatically completing a by-pass circuit through such spring conductor and the shunt conductor 30 around the defective neon tubing section. In Figure 1, the circuit maker 42 for the "ON" section is shown in its released or closed position, while that for the "NE" section is still open.

A closed by-pass circuit will continue to carry the current necessary to illuminate the remainder of the neon sign so that it will not be extinguished merely by the failure of one sign section to ignite. In the case illustrated in Figure 1 the letters "NE" will be illuminated though the letters "ON" are dark. A service man can readily identify the section which is defective. Upon replacing that section or repairing the defect, the circuit is placed in operative condition again simply by removing from the terminal post 40 of the "tripped" circuit maker what may remain of the expendable fusible strip 46, and substituting a new fusible strip of the same form. After this has been done the circuit is ready for application of high voltage to it once again.

It is contemplated that the cost of the circuit maker elements, as such, should be in the order of a few cents, whereas the cost of manufacturing bushings having two instead of one terminal element or binding post should be very little greater than the cost of the present conventional bushings. An important saving is derived from the service of these binding posts in several capacities. It is to be noted that these modified or special bushings may be manufactured for the most part by using the same techniques and materials as are presently in use, and that the bushings may be installed in the same mounts as those now used in most neon sign installations. Thus the cylindrical body 38 in Figure 1 is of a size and shape like that of the body 34 of the single terminal bushing and has a supporting flange on its upper end just like the bushing body 34.

The features which I regard as of particular importance in the invention are the provision of an electrode bushing for neon signs or other similar high-voltage installations, not necessarily of

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the particular shape herein illustrated, which incorporates two spaced-apart terminal connecting elements instead of the usual one, upon one of which elements may be mounted a spring conductor of a form adapted to be placed under tension and when released to spring over into contact with the opposing terminal connecting element, and a fusible strip or element on the first terminal element normally holding such spring conductor under tension away from the second terminal element. Within this concept it will be obvious that a number of variations are possible, both in the form of the bushing and of its terminal elements, and in the form of the spring conductor and fusible metal element cooperating therewith. However, the extreme simplicity and economy of the preferred arrangement herein illustrated should be evident.

I claim as my invention:

1. In a neon tube sign having an insulating housing receiving the electrode end of a neon tube sign section, having a first terminal binding post mounted on said insulating bushing and electrically connected to said electrode end, having a second insulating housing receiving, and a like terminal binding post connected to, the opposite terminal end of the neon tube sign section, and having a by-pass conductor for by-passing such section, the combination comprising a second terminal binding post mounted on said first insulating housing in spaced relation to the first binding post thereon, a spring conductor strip apertured at one end to be received on and projecting laterally from one binding post on the first housing, a fusible metal tension element of a shorter length than said strip but similarly apertured and received on such binding post to project laterally therefrom toward but not to the

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other terminal binding post on such housing, and means interconnecting the projecting ends of the tension element and spring strip to bow and thereby tension the spring, and hold the same out of contact with, but urged by its tension toward, said other binding post, to be released for contact therewith by fusion of said tension element by striking of an over-voltage arc between the same and said second binding post, said by-pass conductor being connected between the binding post on the second insulating housing and one of the binding posts on the first housing to form a by-pass circuit through said by-pass conductor, said first and second binding posts and said spring conductor strip bridging therebetween, and the binding post on the second insulating housing.

2. The combination defined in claim 1 wherein the fusible metal tension element is received on the binding post between its outer end and the spring strip received on such post, and is held thereon substantially solely by friction created by tension of the spring strip creating tension in such tension element and thereby urging its aperture wall against the side of the binding post.

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