Aug. 8, 1939. E. A. LAPHAM 2,169,154

CURRENT COLLECTOR

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Fig. 1.

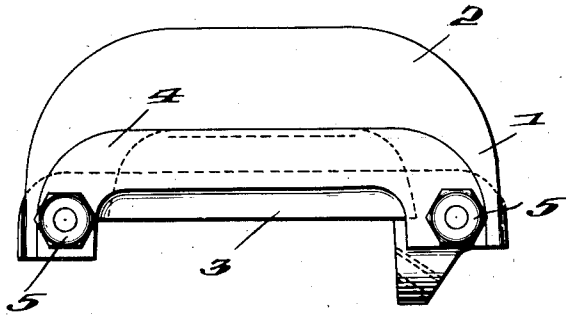


Fig. 2.

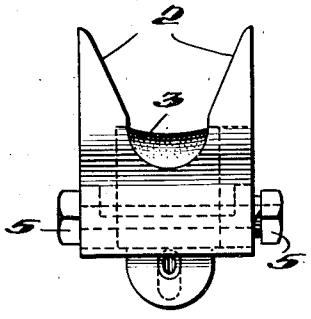


Fig. 3.

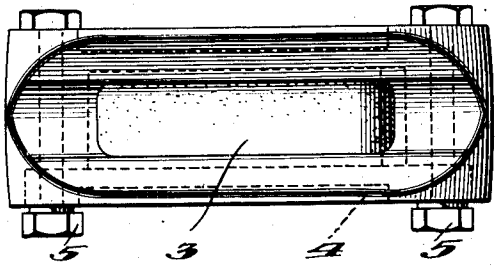


Fig. 5.

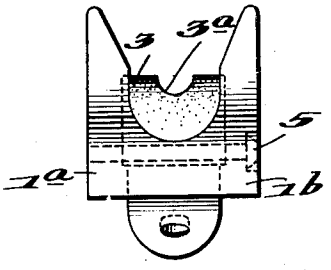


Fig. 4.

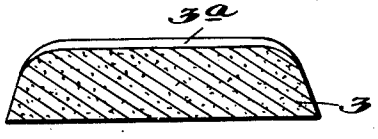
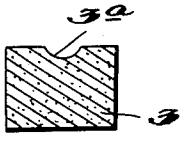


Fig. 6.



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Fig. 7.

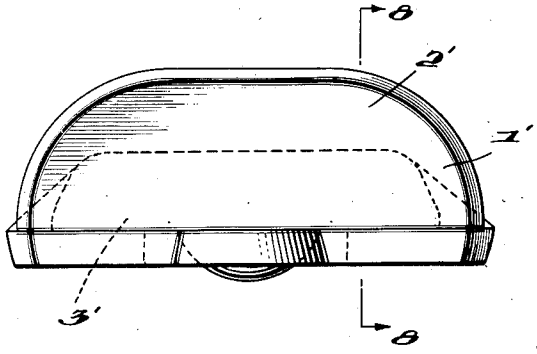


Fig. 8.

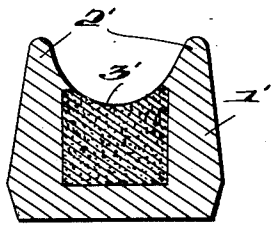


Fig. 9.

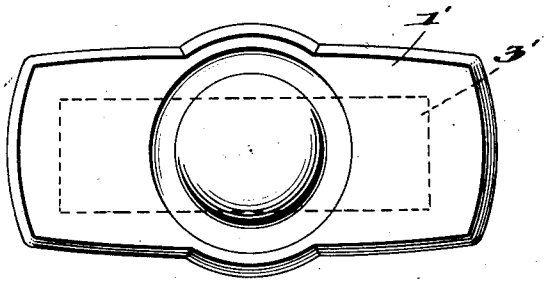


Fig. 10.

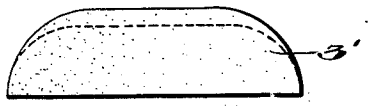
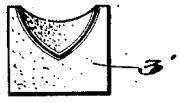


Fig. 11.



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UNITED STATES PATENT OFFICE

2,169,154

CURRENT COLLECTOR

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Application December 16, 1938, Serial No. 246,215

6 Claims. (Cl. 191—59.1)

The present invention is directed to new and useful improvements in trolley shoe inserts used in the collection of electrical current from a trolley wire.

In the past, various types of carbonaceous inserts have been employed in connection with trolley shoes. Some of these have been composed of plain carbon while others consisted of compositions of carbon, graphite, and combinations of these materials along with other powdered substances including metal. It will be noted, however, that when carbon and graphite materials such as these are pressed as a dry substance or in a plastic state, they must be heat treated at very high temperatures in order to set the binders. In this heat treatment, certain of the binders and other volatile materials are driven off, leaving a porous structure throughout the insert which permits moisture to penetrate into the insert.

Although these carbon inserts may be satisfactory in dry weather, serious difficulties have been encountered during wet and rainy seasons, and especially in the wintertime.

By a series of experiments and tests, I have found that the pores of a plain carbon or combined carbon-graphite insert absorb moisture which, with the passage of current through the shoe, causes an electrolysis which rapidly disintegrates the carbon and shortens its life. Furthermore, my experiments showed that in winter months, the accumulated moisture in the insert freezes and actually causes a fracture of the insert.

It is therefore the primary object of my invention to overcome the disadvantages above noted and to this end I have provided an insert for trolley shoes which is impervious to all liquids and as a result I have prevented rapid disintegration of the inserts during wet and rainy weather and greatly increased the useful life of the insert.

According to my invention, carbon, graphite, or compositions of either of these materials along with other substances, are formed into inserts in the usual manner and then impregnated with molten metal so as to completely fill the porous structure of the insert with metal, thus rendering the insert impervious to liquids and at the same time, increasing the tensile strength.

With the above and other objects in view which will appear as the description proceeds, my invention resides in the novel features hereinafter set forth, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

Referring to the drawings in which numerals of like character designate similar parts throughout the several views.

Fig. 1 is a view in side elevation of one form of trolley shoe provided with an insert made in accordance with my invention.

Fig. 2 is an end view of the same.

Fig. 3 is a top plan view of the trolley shoe illustrated in Figs. 1 and 2.

Fig. 4 is a sectional detail of the insert per se.

Fig. 5 is an end view similar to Fig. 2 but illustrating a modified form of shoe and insert.

Fig. 6 is a transverse sectional detail of the insert shown in Fig. 5.

Fig. 7 is a view similar to Fig. 1, illustrating a modified form of trolley shoe equipped with an insert made in accordance with my invention.

Fig. 8 is a transverse section taken on line 8—8 of Fig. 7.

Fig. 9 is a view from the underside of Fig. 7.

Fig. 10 is a view in side elevation of the insert embodied in Fig. 7, and

Fig. 11 is an end view of the same.

In Figs. 1 to 4, the numeral 1 represents the main body portion of a trolley shoe usually composed of brass, having upwardly extending and oppositely disposed flanges 2 along its upper edge. The interior of the body is provided with a substantially rectangular recess adapted to receive my improved metal impregnated carbon insert 3, the latter being held in place by a removable side plate 4 secured to the body by nuts and bolts 5.

The insert 3 in this particular adaptation of my invention is composed wholly of carbonaceous material impregnated throughout with molten metal and its upper surface is preferably transversely concave as shown in Fig. 2 to receive the trolley wire. In the manufacture of this type of insert, the carbonaceous material either in the form of pure carbon or a combination of graphite with other powdered substances, is pressed together with a suitable binder under high pressure and then kilned, which latter operation drives off the binding material of the ingredients and leaves a porous structure. This structure is then impregnated by any suitable method with molten metal introduced under a pressure sufficient to thoroughly fill the pores and form a strengthening network throughout the insert which not only increases its tensile strength many times and increases the wearing qualities of the material, but renders the entire insert impervious to all liquids and moisture. Furthermore, depend-

ing upon the type of metal used as the impregnant, the co-efficient of friction of the insert may be lowered or increased as desired to meet the exigencies of the selected use to which the trolley shoe is to be put.

Thus, on systems where the travel is extremely heavy, it is important to maintain as low a co-efficient of friction as possible in order to minimize wear on the trolley and increase the life of the shoe, and in this event, a low friction babbitt material may be employed as the impregnant for the inserts. In other localities where there are considerable fumes or gases in the air and the travel is light, trouble has developed due to oxidation of the trolley wire, and when ordinary carbon or graphite inserts are used, the oxidation causes rapid wear and excessive sparking. By impregnating the carbon insert with a slightly abrasive metal, it is possible to clean the trolley wire at the same time current collection is being effected. In either even, the method of impregnation and the general proceuure followed in forming the inserts is the same.

A modified form of trolley shoe of this same general nature is shown in Fig. 5 wherein the side plate is eliminated and the trolley shoe is composed of two longitudinally split sections *1a* and *1b* clamped together with the insert **3** secured in place by means of bolts **5**. In this instance, I may provide a longitudinally extending groove **3a** in the upper face of the insert instead of employing a concave surface across the entire upper face of the insert.

It will be noted that the metal impregnated into the carbon body reduces the contact drop between the insert and the shoe, thus reducing electrical loses.

Instead of the replaceable type of insert illustrated in Figs. 1 to 6 heretofore described, the inserts may be molded into a solid shoe as illustrated in Figs. 7 to 9. In this case, it is possible to cast the metal impregnated insert directly into the shoe, the metal content of the insert being such that the molten metal used for the shoe will intermingle with it, thus making a perfect bond between shoe and insert. It will be noted that in the case of an ordinary carbon or graphite insert, the difference in the co-efficient of expansion between the insert and the metal used for the shoe is such that it is extremely difficult to effect a solid bond in attempting to cast an insert directly into a shoe.

Referring to Figs. 7 to 9, the metal impregnated insert **3'** will be seen encased within the cast metallic shoe body *1'* with its upper concave face exposed between the flanges **2'** for contacting the trolley wire.

In connection with this form of my invention, it will be noted that my improved insert may be cast, soldered, brazed, or otherwise permanently secured within the metallic shoe *1'* without the use of any additional clamping means such as in the other forms described.

While I have shown and described several embodiments of my improved metal impregnated carbon shoe insert, it will be understood that I do not intend to confine myself in any way to the illustrated uses. The essence of my invention lies broadly in the use of a metal impregnated carbon current collector for use in connection with trolley wires or the like and wherein the porous structure of the carbon collector is sealed and rendered impervious to moisture.

It will be apparent that a current collector made in accordance with my invention, regardless of the particular type of adaptation, will receive and maintain a very high polish from continued use and will possess an increased tensile strength in addition to being impervious to moisture and liquid. In other words, it possesses all of the advantages of collectors heretofore known, and overcomes the objectionable features which have always been present in such collectors.

From the foregoing it is believed that the construction and advantages of my invention may be readily understood by those skilled in the art without further description, it being borne in mind that numerous changes may be made in the details disclosed without departing from the spirit of my invention as set out in the following claims.

What I claim and desire to secure by Letters Patent is:

1. An electric current collector for trolley wires consisting of a body portion composed of compressed carbonaceeous material impregnated with molten metal, whereby the normally porous structure of said body is rendered impervious to fluids.

2. A current collecting insert for trolley shoes consisting of a body portion composed of compressed carbonaceous material impregnated with molten metal, whereby the normally porous structure of said body is rendered impervious to fluids.

3. In a trolley shoe, a current collecting insert composed of compressed carbonaceous material impregnated with molten metal, whereby the normally porous structure of said insert is rendered impervious to fluids.

4. In a trolley shoe, a replaceable current collecting insert composed of compressed carbonaceous material impregnated with motlen metal, whereby the normally porous structure of said insert is rendered impervious to fluids.

5. A trolley shoe including a metal body portion, a current collecting insert embedded in said body, said insert being composed of compressed carbonaceous material impregnated with molten metal, whereby the normally porous structure of said insert is rendered impervious to fluids.

6. A trolley shoe including a cast metal body portion having embedded therein a current collecting insert, said insert being composed of compressed carbonaceous material impregnated with molten metal, whereby the normally porous structure of said insert is rendered impervious to fluids, the metal content of said insert being such that the molten metal used in casting the shoe intermingles therewith to form a perfect bond between shoe and insert.

EDWARD A. LAPHAM.