

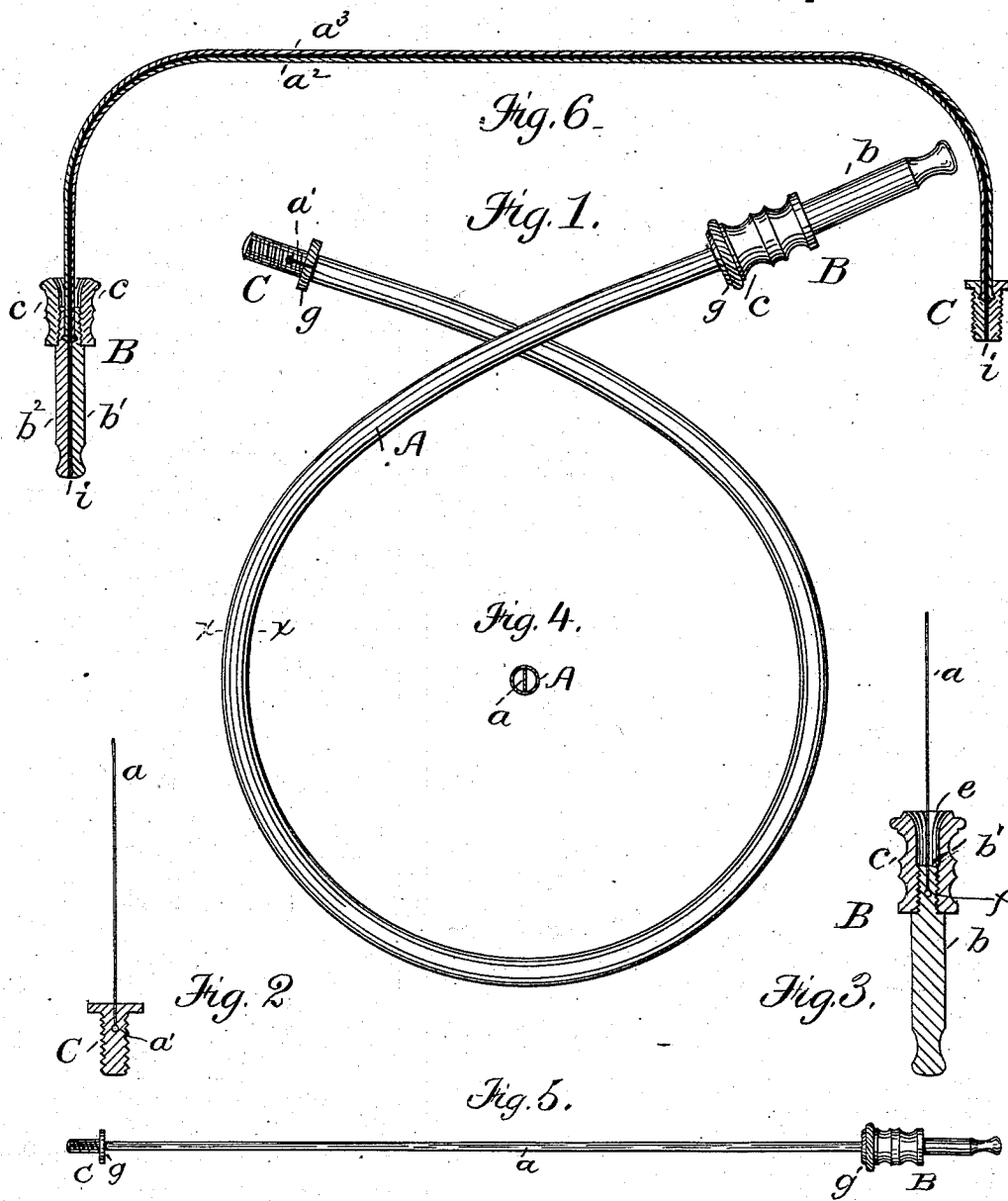
(No Model.)

H. B. LYTTLE.

FLEXIBLE ELECTRICAL CONDUCTOR.

No. 284,216.

Patented Sept. 4, 1883.



Witnesses
Geo. Willis Pierce,
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UNITED STATES PATENT OFFICE.

HENRY B. LYTTLE, OF BOSTON, MASSACHUSETTS.

FLEXIBLE ELECTRICAL CONDUCTOR.

SPECIFICATION forming part of Letters Patent No. 284,216, dated September 4, 1883.

Application filed May 7, 1883. (No model.)

To all whom it may concern:

Be it known that I, HENRY B. LYTTLE, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Flexible Electrical Conductors, of which the following is a specification.

This improvement relates to flexible electrical conductors for connecting portable speaking-telephones to their binding-screw terminals for use in various manipulations of telephonic and telegraphic switch-boards, and for use in connection with many other forms of electrical apparatus. Heretofore such conductors have been made of insulated straight wire, which is too readily broken, of fine wire coiled spirally and covered with insulating-tubing of tinsel, or of a steel spiral inclosing one or more copper or brass conductors. The latter forms, though more durable than the former, are still very fragile, and, moreover, are comparatively costly and expensive in manufacture, and difficult to connect with the metallic tips, which are in every case requisite to form the connection of the cord with the binding-screws to which it is to be attached.

The object of my present invention is to provide an elastic and flexible insulated conductor possessing great strength; to provide simple and durable means of connecting the same to a metallic plug, and to provide a double conductor in each flexible cord, of a character adapted for practical use in connection with the manipulation of metallic circuits.

My said invention consists, first, in substituting a ribbon of spring-steel, of hard copper, or other suitable metal or alloy, for the conductors heretofore used; in combining the same with a flexible and non-conducting protecting-covering; in a novel method of attaching the said ribbon to metal terminals—such as plugs or tags; and in combining together in one external protective covering two of the said ribbon-steel conductors, separating them by a non-conducting substance, which also divides the terminal plugs, so that each flexible conducting-cord from tip to tip consists of two entirely separate conductors, and can thus be used conveniently in the manipulation of loops or metallic circuits.

In the accompanying drawings, Figure 1 represents a flexible conductor constructed in accordance with my invention, and showing the

external form. Fig. 2 shows the method of connecting the conducting part to a tip when great flexibility is not desirable at the tip-connection. Fig. 3 shows the plan of connecting the tip, whereby a sudden strain at the point of connection is prevented. Fig. 4 is a cross-section of the complete conductor on the line xx of Fig. 1. Fig. 5 is a representation of the conducting-ribbon tipped, but unprotected by the insulating-covering; and Fig. 6 shows the uncovered conductors arranged in duplicate for use in metallic circuits. As shown in Fig. 5, the actual conducting part simply consists of a narrow and thin ribbon, of spring-steel or other elastic metal of any suitable length. I have obtained good results from a ribbon of steel three-sixteenths of an inch wide and one-hundredth of an inch thick.

In the drawings the metal band a is shown as being tipped with a switch-board plug, B , at one end, while the other end is provided with a screw-tip, C , adapted for attachment to any permanent binding-screw terminal. It is obvious that any other form of tip may be equally well fitted to the steel ribbon, but since I have used these forms I have for convenience adopted them in this specification.

As shown in Fig. 2, which is an enlarged view of the end C , the tip has an incision, a' , sawed into one end, and terminating in a round hole a little larger than the width of the incision. The said incision is made just wide enough to admit the end of the steel ribbon a , and a drop of solder is then applied to the junction, which is thus made homogeneous.

Fig. 3 shows in actual size the ribbon end as fitted with a switch-plug, B . This consists of a metal shank, b , of the size and shape corresponding to the hole in which it is to fit, attached to the metallic ribbon a in the manner described. The upper part, f , of the shank b surrounds the slit or incision in which the steel ribbon is fixed, and is externally threaded for the reception of a tubular thimble or guard-piece, c . This guard-piece is internally threaded at its lower end, but at its upper end expands into a flaring orifice, e . The utility of this is evident.

Although the band or ribbon a is in all ordinary cases extremely flexible, it is in telephone-switching operations subject to sudden and abrupt bends, which, taking place at the point

b' , would be very apt to break the steel ribbon short off. By the use of the hollow guard-piece or protector c , which screws onto the shank, this is prevented, and the depth and flare of the orifice e produces a gradual bend in all such cases.

Before attaching the tags or end pieces the insulating and protecting covering is placed round the conducting-ribbon. I prefer to use a simple tube of vulcanized rubber, A , which may be slipped over the conducting-ribbon a , and which is kept in place by the flanges g of the several tips. This fits loosely, as shown in the cross-section, Fig. 4, in which a represents the conducting-ribbon and A the inclosing-tube.

If desired, a woven covering may be adopted instead of the rubber tube, but for most purposes the tube is the best, because it is much cheaper and more easily supplied and replaced.

Fig. 1 shows the cord as it appears when completed, A being the external coating or non-conducting covering; B , the switch-plug or tag at one end thereof, consisting of shank b and guard-piece c , and C being another form of tip or terminal applied to the other end. A flange, g , at both ends is provided, which serves to hold the flexible covering in place.

In Fig. 6 I show a cord provided with a double conductor and adapted for use in connection with metallic circuits. The two ribbon-like steel conductors a^1 and a^2 are separated and insulated from one another by the non-conducting layer i , which extends from end to end of the cord, irrespective of the length thereof. The tips or metal terminals of such a cord are also completely divided by the insulating medium, which is made to correspond in shape to the conformation of the tip terminal or plug, as shown in section in the drawings, in which, at one end, the plug B is shown, having its two sides, b^1 and b^2 , electrically divided by the non-conductor i , yet forming mechanically a homogeneous whole. The tubular guard-piece c is made in one metallic piece, as in other forms. The plug B and opposite terminal, C , may be both separately manufactured, with a hard-rubber partition between

the two semicircular metallic plates, and in this case the slit or incision between the plates, wherein the double conductor is to be inserted, must be necessarily wider than when adapted for a single conductor.

Having now described my invention, I claim—

1. A flexible electrical conducting-cord composed of an elastic metallic ribbon, metal terminals or tips therefor, whereby the said ribbon may be connected with electrical circuits or apparatus, and a non-conducting covering for the said metallic ribbon, consisting of a vulcanized rubber tube loosely surrounding the same, substantially as hereinbefore described.

2. The hereinbefore-described stem or tip for flexible electric cords, consisting of a conducting-shank, slitted for the connection of a flat flexible conductor, and provided with a tubular guard-piece at its inner end, substantially as and for the purpose described.

3. The combination, in a flexible electrical conducting-cord, of a steel-ribbon conductor, a metal plug forming a terminal therefor, and a tubular guard-piece screwed or otherwise attached to the inner end of the said plug, and provided with a flaring orifice, whereby the steel conductor is protected from injury, due to sudden bending at the point of attachment to the plug, substantially as specified.

4. The hereinbefore-described method of forming the connection between a ribbon-like metal flexible conductor and a metallic tip therefor, which consists in cutting an incision or slit in the end of the said tip, in inserting the end of the ribbon in the said slit, in making the joint homogeneous by soldering, and, finally, by encircling the junction by a tubular guard-piece which laps, by means of a flaring extension, over a portion of the ribbon-like conductor, for the purposes described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 4th day of May, 1883.

HENRY B. LYTTLE.

Witnesses:

J. H. CHEEVER,
GEO. WILLIS PIERCE.