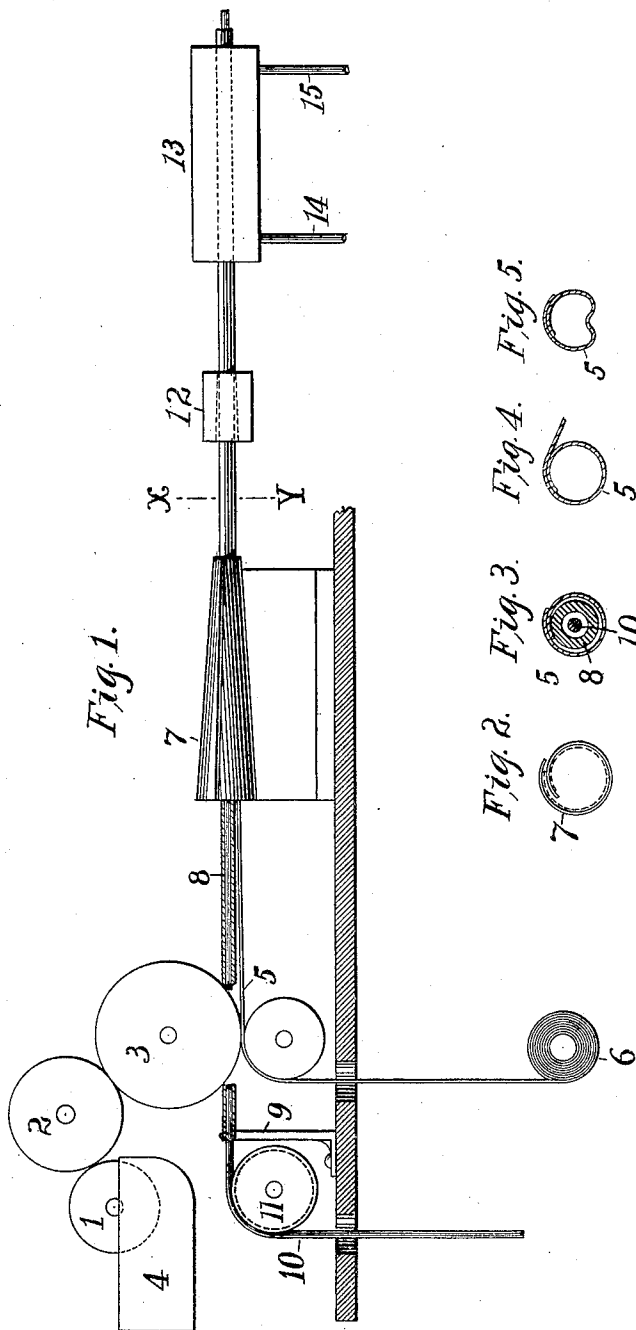


(No Model.)

J. D. BISHOP.  
INSULATED ELECTRIC CONDUCTOR AND APPARATUS FOR MAKING SAME.

No. 591,997.

Patented Oct. 19, 1897.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

JAMES D. BISHOP, OF NEW YORK, N. Y.

INSULATED ELECTRIC CONDUCTOR AND APPARATUS FOR MAKING SAME.

SPECIFICATION forming part of Letters Patent No. 591,997, dated October 19, 1897.

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*To all whom it may concern:*

Be it known that I, JAMES D. BISHOP, a subject of the Queen of Great Britain, residing in the city of New York, county of New York, and State of New York, have invented certain new and useful Improvements in Insulated Electric Conductors and Apparatus for Making the Same, of which the following is a specification.

10 This invention relates to insulated electric conductors and apparatus for making the same, the object being to produce an insulated conductor of low electrostatic capacity, especially suited for telephony, transmission  
15 of power, or other applications in which a high frequency of alternation necessitates for the insulation of such conductors a material having a low specific inductive capacity in order to avoid retardation or lagging currents, which interfere with successful transmission,  
20 and which in telephony tend to mutilate or blot out speech. The material chiefly used heretofore for securing this low capacity is paper, commonly applied in the form of a continuous strip wound spirally or pressed  
25 around the conductor longitudinally. In either case an effort is made to occupy a maximum amount of space diametrically, with a minimum amount of strip, thus reducing the electrostatic capacity to the lowest degree. The spiral treatment of the paper involves complicated and slow-acting machinery, and necessitates also a preliminary treatment of the paper, such as punching slits or holes in  
35 the strip to allow it to bend easily, in order to avoid continuous increase of diameter of the spiral. By reason of the overlapping edges the slits or holes allow the strip to crimp or wrinkle, thus obviating the increase of diameter. When a paper strip is applied to the conductor longitudinally, two strips are ordinarily employed, one outside of the other, so as to "break joint," the edges of the two overlapping, and the whole bound down by a  
45 string wound spirally about the conductor. This process is also a slow and expensive one.

The chief object in the class of insulations above noted is to mechanically separate from one another two or more adjacent conductors—as, for example, where several are combined to form a cable to be carried through a conduit—and also avoid what is technically

known as a "ground" by preventing contact between the inclosed conductor and some neighboring conductor or with the earth, and  
55 also to have the insulating material employed of the lowest practicable specific inductive capacity. As air has the lowest specific inductive capacity known, it is desirable to have as much air-space in the immediate  
60 neighborhood as possible. I accomplish these desiderata in a cheap, speedy, and economical manner as follows: I lead a strip of paper under a revolving disk whose periphery is supplied with an adhesive mixture—such as dextrine, gum, or other suitable material of this character—by which one edge of the strip is  
65 continuously coated. The strip then passes with the conductor to be covered through a former, similar in construction to the hemmer  
70 used in a sewing-machine, by which the edges of the paper are curled with a gradually-increasing proximity until on emerging from the former the edges overlap and completely  
75 inclose the conductor. The conductor and inclosing tube are then led through a die perforated with a conical hole, the walls of which press the edges of the tube together and cause them to firmly adhere. The inclosed conductor  
80 is then led through blocks heated by steam in order to rapidly dry the adhesive, and the covered conductor may then be wound upon a reel in the ordinary manner.

In order to prevent the breaking or wrinkling of the paper tube when the apparatus is  
85 working at a high speed, I insert in the apparatus, in a line with and passing through the former, a tube, the wire being carried through the inside of the tube and the paper being curled around the outside of the same. The  
90 tube is about the diameter of the completed paper covering and prevents the latter from buckling and also facilitates joining the edges firmly under the pressure of the die.

In the accompanying drawings, which illustrate my invention, Figure 1 is a diagrammatic view of an apparatus embodying my improvements. Fig. 2 is a detail view showing an end view of the hemmer-shaped former. Fig. 3 is an enlarged sectional view on the  
100 plane X Y of Fig. 1, showing a completed paper tube, the enlarged conductor, and the auxiliary tube used in the apparatus for preventing buckling. Fig. 4 is a modified form

of paper tube in which the adhesive is applied inside the edge, leaving a free margin. Fig. 5 is a sectional view showing the tendency to buckle or wrinkle when no means are employed to prevent it.

1 2 3 represent a train of paste-wheels delivering any suitable adhesive material from a trough 4 to a strip of paper 5, carried over a suitable guide-roll from a reel 6.

7 is a cone-shaped former similar in construction to the hemmer of a sewing-machine, preferably of metal, and gradually curling toward the delivery end to a cross-sectional shape. (Indicated in Fig. 2.) The paper in being led through this former is gradually curled as it approaches the delivery end to the shape indicated in dotted lines in Fig. 2. Through the center of the former passes a tube 8, which may be conveniently made of metal, supported at one end on a standard 9. Through this tube passes the wire 10, guided over a grooved roller 11. The paper after emerging from the former is led through a die 12, the orifice of which converges toward the delivery end, so that on reaching the latter sufficient pressure is applied to squeeze down into contact the overlapping edges of the paper tube, thus bringing the two contact-surfaces into intimate union. The wire-covered tube then passes through a drying-box 13, the walls of which are heated by steam led to and from it by pipes 14 and 15.

With an apparatus thus organized the speed is limited only by the drying capabilities of the adhesive employed and the tensile strength of the paper.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. Apparatus for covering a conductor with a continuous tube of flexible insulating material, comprising feed devices for feeding the conductor and a web of insulating material simultaneously to a flaring former to curl the material about the wire with overlapping edges, means for applying adhesive material to an edge of the flexible material to unite

the overlapping edges, and a pressure device to force the overlapping edges to adhere to one another.

2. Apparatus for covering conductors with a continuous tube of insulating material, comprising feed devices for leading the wire and a web of material simultaneously to a flaring former to curl the material about the wire with overlapping edges, means for applying adhesive material to an edge of the flexible material to unite the overlapping edges, a pressure device to force the edges to adhere, and drying-chamber through which the covered wire may pass.

3. Apparatus for inclosing conductors within a continuous, loosely-fitting paper tube, comprising a hollow former through which the conductor passes, said former having converging walls to curl the paper into tubular form greater in diameter than the conductor and with overlapping edges, means for applying adhesive to the paper to fasten together the overlapping edges, a pressure device to squeeze the surfaces into contact, and a pipe or tube supported between the wire and paper tube extending through the hollow former for the purpose specified.

4. An insulated conductor inclosed within a paper tube of greater inside diameter than the conductor having overlapping, longitudinal, sealed edges.

5. An insulated conductor inclosed within a sealed paper tube sealed along a longitudinal seam and having a free air-space between the conductor and the tube.

6. An insulated conductor inclosed within a paper tube of greater diameter than the conductor, said tube having overlapping, longitudinal edges connected by adhesive material.

In testimony whereof I have hereunto subscribed my name this 3d day of June, A. D. 1897.

J. D. BISHOP.

Witnesses:

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