Nov. 18, 1930. P. DUNSHEATH 1,782,381

MEANS FOR THE APPLICATION OF INSULATING MATERIAL IN THE FORM OF STRIPS TO ELECTRIC CONDUCTORS

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Fig. 1.

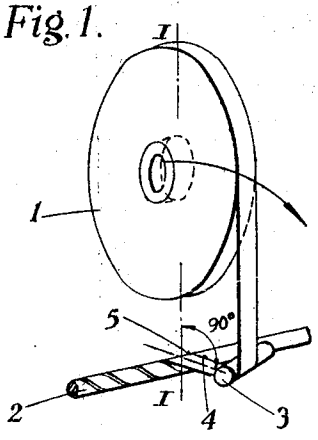


Fig. 2.

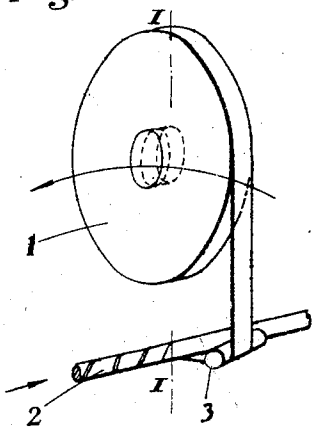


Fig. 3.

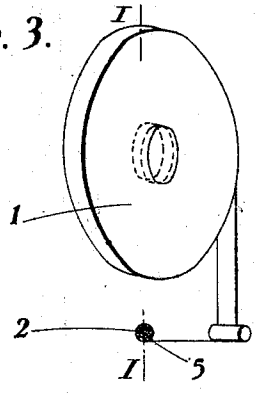


Fig. 4.

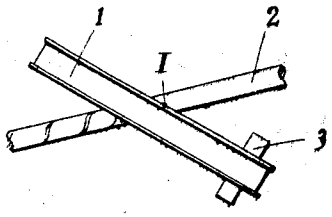


Fig. 6.

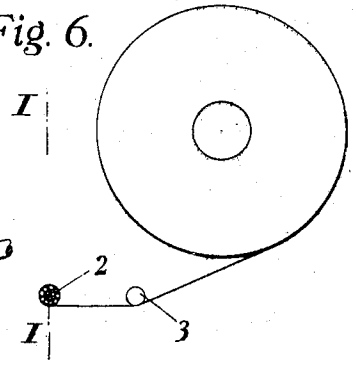
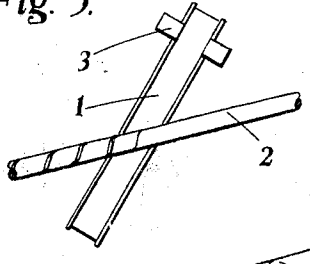


Fig. 5.



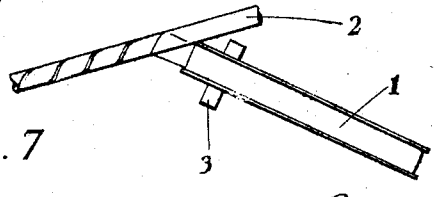


Fig. 7

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Fig. 9.

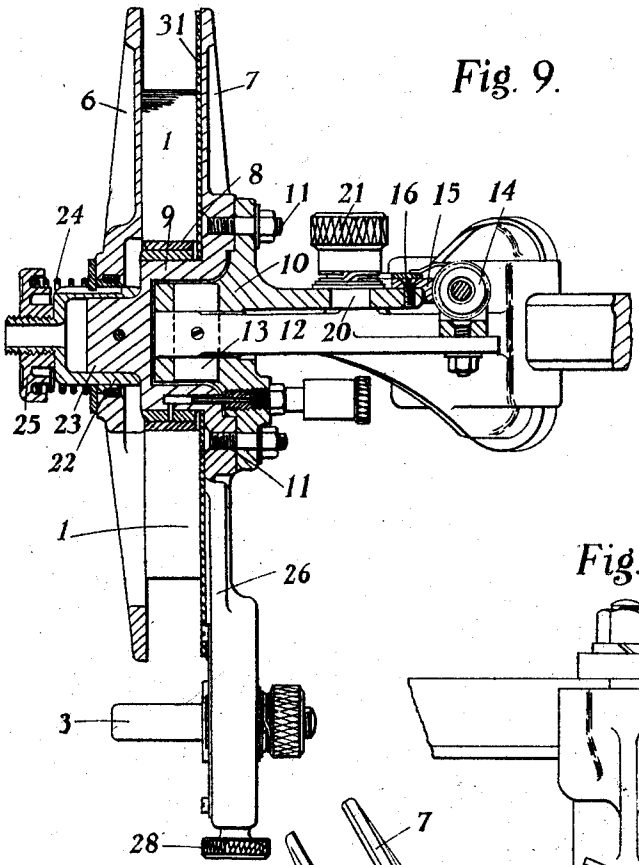
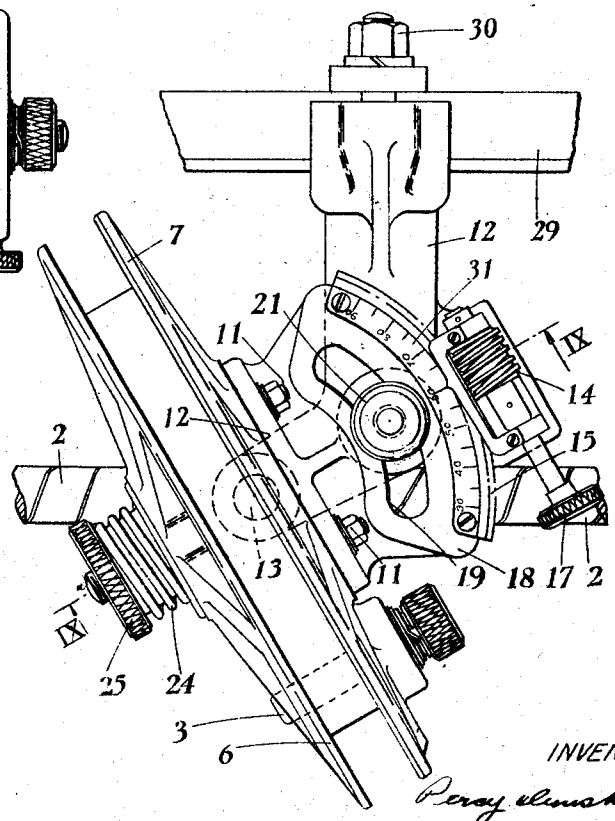


Fig. 8.



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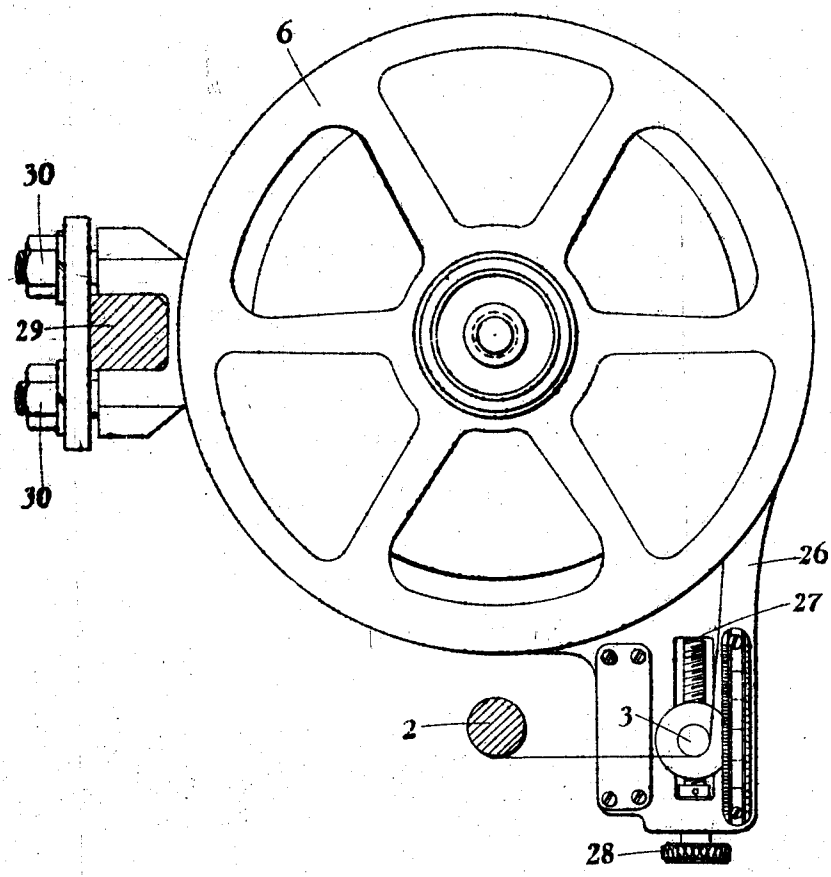
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Fig. 10.



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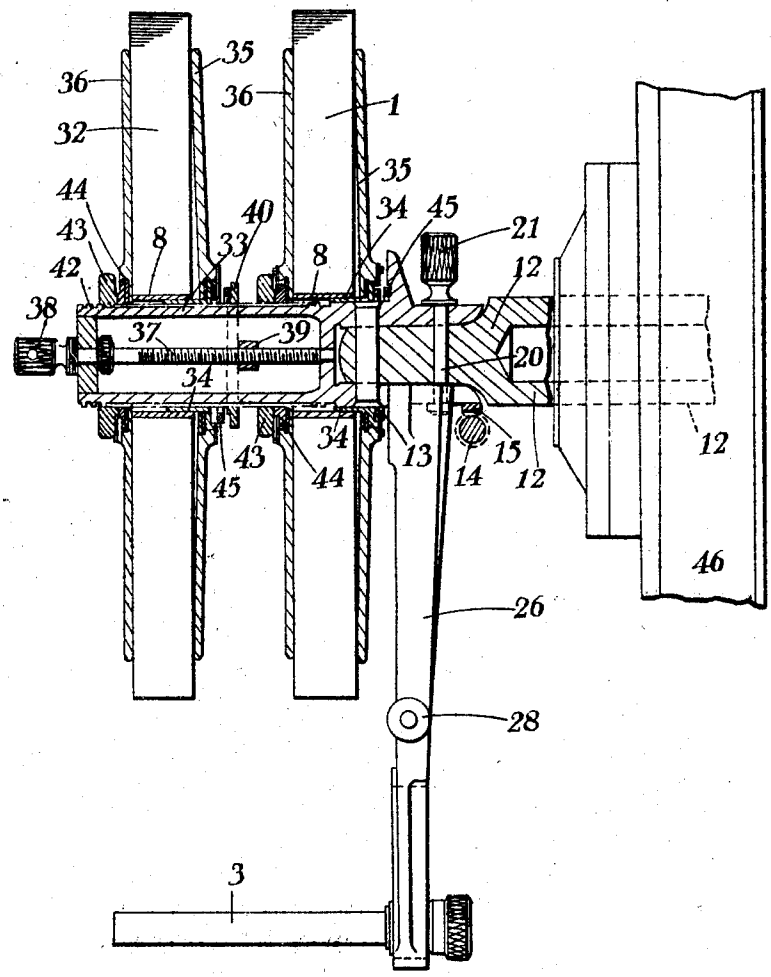
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Fig. 11.



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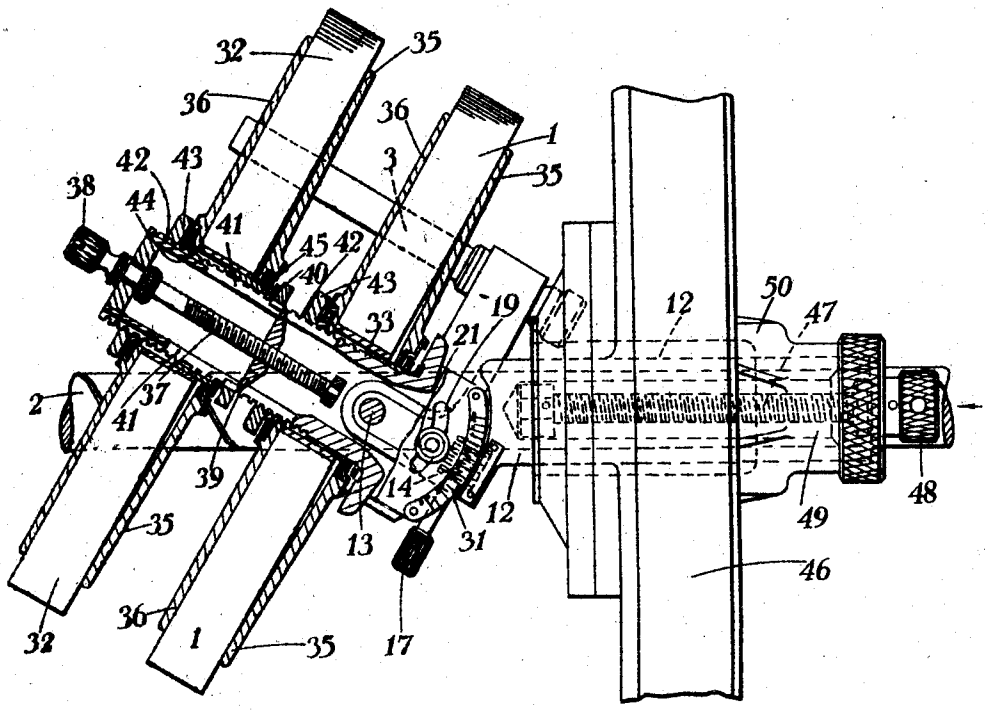
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MEANS FOR THE APPLICATION OF INSULATING MATERIAL IN THE FORM OF STRIPS TO ELECTRIC CONDUCTORS

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Fig. 12.



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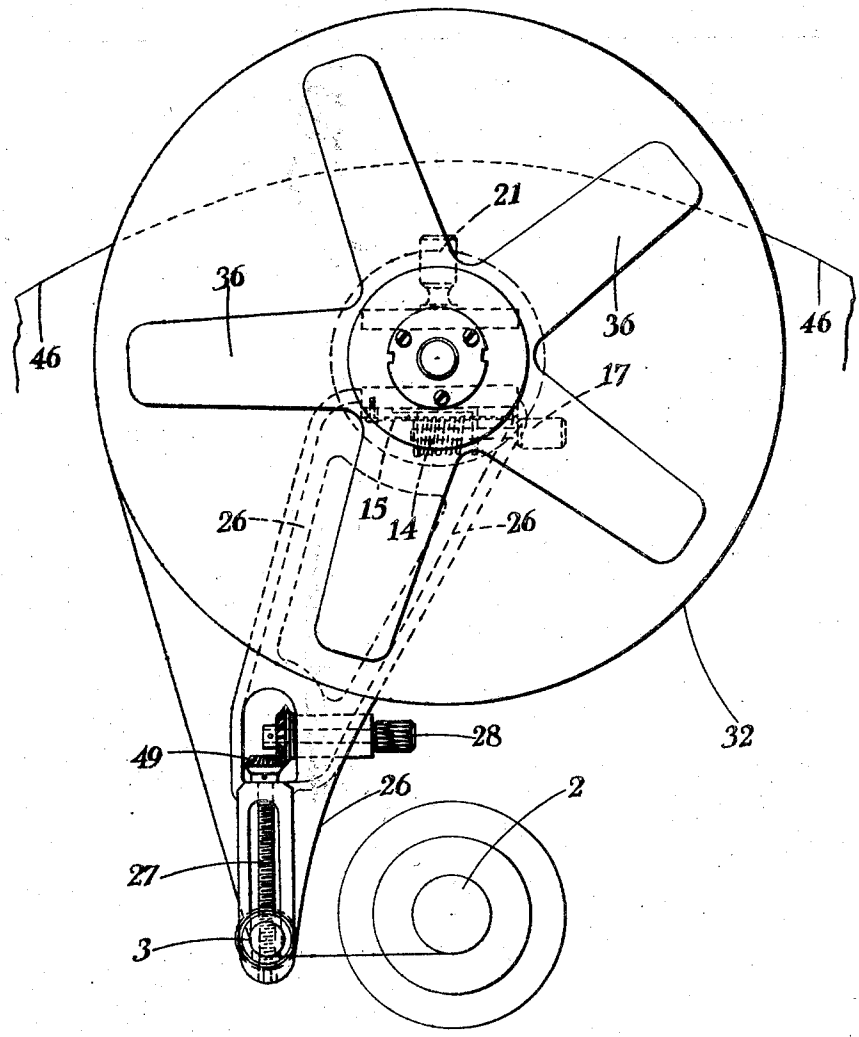
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MEANS FOR THE APPLICATION OF INSULATING MATERIAL IN THE FORM OF STRIPS TO ELECTRIC CONDUCTORS

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Fig. 13.



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UNITED STATES PATENT OFFICE

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MEANS FOR THE APPLICATION OF INSULATING MATERIAL IN THE FORM OF STRIPS TO ELECTRIC CONDUCTORS

Application filed April 22, 1930, Serial No. 446,368, and in Great Britain May 10, 1929.

This invention relates to apparatus for applying to electric conductors or cables insulating material (hereinafter for convenience referred to as paper) in the form of strips. In such apparatus the paper is led off from flat coils which are mounted on a rotary carrier which moves them in circles about the axis of the conductor or cable and thereby applies the paper strips as spiral wrappings on the conductor or cable (hereinafter for convenience referred to as conductor).

In order that the wrapping of the conductor may be carried out with precision and uniformity it is desirable that certain adjustments of the path of the paper as it comes on the conductor should be possible. The principal adjustments required are the setting of the angle at which the paper is led on to the conductor and the setting longitudinally of the conductor, of the place at which one edge of the paper commences to be wrapped round the conductor. The first of these adjustments is required to take care of variations in the diameter of the conductor and the width of the strip of paper. The second adjustment is required in order to get the correct overlap of successive layers of paper. The arrangement for leading the paper on to the conductor should preferably be such that these settings are not influenced by the size of the coil of paper, which of course, varies through a considerable range as the paper is removed from it. This last requirement has been met by the use of a guide round which the paper passes on the way from the coil to the conductor. This guide is so placed that the strip leaves it at the appropriate angle for wrapping on the conductor and passes from it to the conductor in a plane tangential to the surface of the latter. In addition to the requirements as set out above, it is also desirable that certain conditions should be met in apparatus of this character. In this connection it should be pointed out that it is desirable that the paper should be led from the coil on to the conductor without twist in order to avoid unequal stresses in the paper strip. Further, the position of the paper upon the conductor should be determined immediately the paper is passed from the coil round the guide on to the conductor, without the necessity for running the machine, as is the usual requirement in prior arrangements. The present apparatus provides for these results being obtained.

It will be understood that as the paper carrier is continually rotating round the axis of the conductor, angles and planes mentioned in this description must not be taken as fixed in space, but only as fixed in relation to each other and the axis of the conductor. If the paper carrier be considered as stationary and the conductor as rotating, the planes and angles would then be fixed in space.

In accordance with the present invention we provide an improved arrangement for carrying the paper coils and the guides, whereby, amongst other advantages, we obtain the result that the two principal adjustments above referred to can be made quite independently of each other, that is to say, the angular adjustment can be made without affecting the position at which the paper is led on to the conductor and the adjustment of this position can be made without disturbing the angular setting.

This result is attained by arranging that the coil of paper is made angularly adjustable on a pivot having an axis which is on a line radial to the conductor and passes through a point at which the strip of paper makes contact with the conductor as it comes from the guide. This point is preferably that at which one edge of the strip makes contact, as this provides a definite reference for use when making the setting. It follows from the description given above that the line of the axis of the pivot is located so as to be perpendicular to the plane in which the strip moves when passing from the guide on to the conductor. This guide is carried on the same mounting as the coil of paper so that it turns with it. The axis of the pivot lies in the plane of the edge of the coil or in a plane parallel with the edge. It need not be diametrical with relation to the coil or even intersect the coil, but it is usually most convenient to place it so as to be diametrical. The carriage for the pivot is mounted on a

support which is adjustable in a direction parallel with the axis of the conductor. This support may be carried on a bar parallel with the axis of the conductor and forming part of a rotary frame in which are a number of similarly placed bars carrying on them a group of coil supports. In an alternative construction the coil supports may be carried on a disc which rotates about the axis of the conductor and each support may be in the form of a short pillar engaging in a socket in the disc and lying parallel with the axis of the conductor so that the longitudinal adjustment can be obtained by varying the position of the pillar in the socket. The coil-holder is provided with an extension which carries the guide. This is generally in the form of a pin or roller, and the mounting provides for adjustment in a direction parallel with the pivot axis so as to provide for obtaining the lead of the paper on to the conductor in the appropriate plane by an adjustment of the guide to correspond with the diameter of the conductor.

Two forms of construction in accordance with the invention are illustrated as examples in the accompanying drawings, wherein:—

Fig. 1 is a diagrammatic view in perspective, illustrating the principle of the invention and in which the coil of paper is carried around the cable in a clockwise direction.

Fig. 2 is a similar view to that shown in Fig. 1, the coil, however, being carried round in an anticlockwise direction.

Fig. 3 is an end view of Fig. 2,

Fig. 4 is a plan view of Fig. 2,

Fig. 5 is a plan view of Fig. 2, the coil being viewed from below the cable.

Fig. 6 is a diagrammatic view in elevation showing a modified arrangement of the coil and,

Fig. 7 is a plan view of Fig. 6,

Fig. 8 is a plan view of an arrangement suitable for a single coil,

Fig. 9 is a section taken on the line IX—IX of Fig. 8.

Fig. 10 is a front view of Fig. 8,

Fig. 11 is a sectional elevation of a construction suitable for two coils, the latter however, being shown for convenience in a non-operative position,

Fig. 12 is a plan view in section of Fig. 11, the coils being shown in an operative position and

Fig. 13 is an end view of Fig. 12.

In Figs. 1–7, 1 represents a coil of paper to be lapped round an electric conductor 2. The coil is carried round the conductor 2, the paper being drawn off the coil and lapped round the conductor, a guide pin or roller 3 being used to guide the paper on to the conductor. The guide is carried in a bracket carrying the coil, so that the guide and coil are rigid with each other, the guide being disposed with its axis parallel to that of the coil. The coil 1 and guide 3 are mounted so as to be adjustable in order to vary the angle at which the paper passes on to the conductor from the guide 3. For this purpose, the coil is mounted upon a pivot, the axis of which is on a line passing through the axis of the conductor 2 and a point at which the paper makes contact with the conductor as it comes from the guide 3. The axis of the pivot can lie in the plane of either edge of the coil 1 or in a plane parallel with and lying between these edges. The pivot axis, however, need not intersect the coil, as will be explained hereafter in connection with Figs. 6 and 7. The guide 3 is adjustable so that the plane of the paper as it leaves the guide and passes on to the conductor may be maintained at right angles to the line of the axis of the pivot irrespective of the size of the conductor being used. This angle is indicated in Fig. 1 of the drawings. For practical reasons the most convenient positions of the coil and the axis of the pivot are such that the latter lies in the plane of one edge of the coil and is diametrically arranged in relation to this edge as shown in Fig. 4. In Fig. 1 the axis I—I of the pivot for the coil passes through the axis of the conductor 2 and also the point where the edge 4 of the paper meets the conductor. This point is shown more clearly at 5 in Fig. 3. The angular setting may be obtained without disturbing the position of the paper on the conductor, in a longitudinal direction. One advantage of adopting this particular arrangement is that the point 5 in the edge 4 of the paper remains in the same position so that the edge 4 serves as a convenient reference line when varying the angular setting of the coil with respect to the axis of the conductor. The arrangement also provides for the ready adjustment of a number of coils so that each strip of paper is led on to the conductor at the same angle. In Figs. 6 and 7 the coil itself is arranged to one side of the conductor but is still pivoted about an axis passing through the centre line of the conductor and a point 5 at which the paper coming from the guide 3 meets the conductor. The guide is adjustable in each case to permit the appropriate angle to be maintained between the plane of the paper and the line of the axis of the pivot and the paper passes without twist from the coil around the guide on to the conductor. The particular arrangement of the coil axis as described above also has the advantage of avoiding any tendency for the paper to wander on the conductor. Independent arrangements which will be described later are also provided to permit the coil to be moved axially of the conductor. The coil may be carried around the conductor in either a clockwise or anticlockwise direction as indicated by the arrows in Figs. 1 and 2.

It is often desirable to mount two coils side

by side upon a common hub or spindle. In an arrangement of this character, an approximation to the results obtained above may be effected by arranging the pivot in relation to one of the coils as described above and providing means for moving the other coil towards the first coil in order to compensate for the axial movement along the conductor of the second coil after an angular adjustment has been made. This arrangement is described in more detail below.

Referring now to Figs. 8–10, the coil 1 is mounted between a pair of plates 6, 7. The coil is secured to a centre 8 and is mounted upon a boss 9 forming part of the plate 7. The latter is secured to the support 10 by means of the bolts 11. A bracket 12 passes through the support 10 and has a pivot 13 about which the coil 1 can be adjusted, for this purpose the bracket 12 has a worm-wheel 14 which gears with a segment 15 secured to the support 10 by means of a screw 16. The worm-wheel 14 is operated by a handle 17. The support 10 has a plate 18 slotted at 19 to receive a stud 20 secured to the bracket 12. After the coil 1 has been given its proper angular setting the support 10 and bracket 12 may be secured together by a lock nut 21. The plate 6 is rotatably mounted upon a sleeve 22 which fits on to a boss 23 forming part of the fixed plate 7. The plate 6 is held in position by a spring 24, the pressure of which is adjustable by a nut 25. The plate 7 has a bracket 26 in which a guide pin 3 is adjustably mounted. The guide pin is mounted upon a screw 27 which can be rotated by a handle 28 in order to bring the guide pin into position such that the paper passes tangentially on to the conductor 2. The bracket 12 is carried upon a bar 29 and the position of the coil 1 can be adjusted axially of the conductor by moving the bracket 12 along the bar 29. The bracket 12 can be locked to the bar 29 by a nut 30. The plate 7 may be provided with a felt washer 31. In operation the whole device is carried round the conductor 2, the plate 6 rotating with the coil but the plate 7 remaining stationary to provide the necessary friction upon the coil as the latter is unwound. It will be seen from Fig. 9 that the axis of the pivot 13 passes through one edge of the coil and through a point at which the corresponding edge of the paper meets the conductor. The plate 18 may have a scale 31 for convenience in obtaining the required angular adjustment of the coil.

In Figs. 11–13 a coil of paper 1 and a second coil 32 are both carried on a hollow hub 33. Each coil is provided with a centre 8 and is free to rotate upon a bush 34. The coils are disposed between plates 35 and 36 which, in this case, are in the form of star shaped battens seen in Fig. 13. The bracket 12 has a pivot 13 about which the hub 33 is angularly adjustable by means of a worm 14 and segment 15. The hub 33 has secured to it a dependent bracket 26 provided with a guide pin 3, the latter serving to guide the two paper strips on to the conductor 2. It will be seen from Fig. 11 that the axis of the pivot pin is disposed substantially in the plane of one edge of the coil 1. In order to provide for the axial movement of the paper coming from the second coil relatively to the conductor 2, the screw 37 operated by a handle 38, is adapted to slide the coil 32 along the hub 33. The screw 37 passes through an adjustable stop 39 which bears against a ring 40. Slots 41 are formed in the hub 33 through which the stop 39 projects so that it can bear against the ring 40. The hub 33 is screw threaded at 42 to accommodate nuts 43 which bear against rings 44 keyed to the hub 33. The necessary frictional restraint against the rotation of the coils 1 and 32 is obtained by the nuts 43 and a spring 45, against which latter the ring 40 bears. When the nuts 43 are slackened off and the screw 37 rotated in the appropriate direction the coil 32 is moved outwardly on the hub 33. By rotating the screw 37 in the opposite direction the stop 39 comes out of contact with the ring 40 and the nut 43 can then be rotated to bring the coil 32 nearer to the coil 1. By this means the axial movement of the coil 32 relatively to the conductor can be compensated for.

To provide for the axial movement of the complete head the bracket 12 is carried back and is supported by a rotatably mounted disc 46. The rearwardly extending portion of the bracket 12 is provided with a screw 47 operated by a handle 48. The screw 47 passes through a screw-threaded portion 49 of a bracket 50 and rotation of the screw causes the bracket 12 to slide relatively to the disc 46 so as to move the two coils longitudinally of the conductor 2. As the disc 46 rotates the axis of the conductor, it carries round with it the coils 1 and 32. Adjustability of the guide pin 3 is provided for, as in the previous case, by a screw 27 upon which the guide pin 3 is mounted, gearing 49 and an operating handle 28.

What I claim as my invention and desire to secure by Letters Patent is:—

1. Apparatus for applying material in the form of strip to an electric conductor, comprising a carrier for a flat coil of the material, a guide round which the strip passes from the coil to the conductor, means for supporting said carrier and guide in fixed relation to each other and rotatable about the conductor, said supporting means comprising a pivotal mounting of the coil and guide providing adjustment of their positions by turning about an axis which is radial to the conductor and which passes through a point at which the strip makes contact with the conductor as it comes from the guide.

2. Apparatus for applying material in the form of strip to an electric conductor, comprising a carrier for a flat coil of the material, a guide round which the strip passes from the coil to the conductor, means for supporting said carrier and guide in fixed relation to each other and rotatable about the conductor, said supporting means comprising a pivotal mounting of the coil and guide providing adjustment of their positions by turning about an axis which passes through the axis of the conductor and through a point at which one edge of the strip coming from the guide makes contact with the conductor and lies in the plane of the corresponding edge of the coil and passes through the axis of the coil.

3. Apparatus for applying material in the form of strip to an electric conductor, comprising a carrier for a flat coil of the material, a guide round which the strip passes from the coil to the conductor, means for supporting said carrier and guide in fixed relation to each other and rotatable about the conductor, said supporting means comprising a pivotal mounting of the coil and guide providing adjustment of their positions by turning about an axis which is radial to the conductor and which passes through a point at which the strip makes contact with the conductor as it comes from the guide, said supporting means also comprising means for adjusting the position of the guide relative to the carrier so as to provide for the angle between the plane of the strip as it moves between the guide and the conductor and the axis of pivoting aforesaid being made a right angle for all sizes of the conductor.

4. Apparatus for applying material in the form of strip to an electric conductor, comprising two coaxial carriers for flat coils of strip material and a guide round which the strips pass from the coils to the conductor, means for supporting said carriers and guide in fixed relation to each other and rotatable about the conductor, said supporting means comprising means for pivotally mounting the carriers and guide for adjustment about an axis which is radial to the conductor and passes through a point at which one of the strips makes contact with the conductor as it comes from the guide, and means for moving the carrier, for that strip which is not intersected by the axis of the pivot, axially relative to the other carrier to compensate for the axial movement of its strip relative to the conductor when an angular adjustment of the carrier is made.

5. Apparatus for applying material in the form of strip to an electric conductor, comprising two carriers for flat coils of strip material, a hub supporting the two carriers, one of said carriers being fixed in axial position on said hub and means being provided within the hub for adjusting the other of said carriers, a guide round which the strips pass from the coil carriers to the conductor, means for supporting said hub and said guide in fixed relation to each other and rotatable about the conductor, said supporting means comprising means for angularly adjusting the carriers and guide about an axis which is radial to the conductor and passes through a point at which the strip coming from the fixed carrier makes contact with the conductor.

In testimony whereof I affix my signature.

PERCY DUNSHEATH.