Nov. 23, 1954 F. A. J. DOUCHET 2,694,849

MACHINE FOR THE MANUFACTURING OF COAXIAL PAIRS FOR TELECOMMUNICATION CABLES

Filed Feb. 20, 1952

3 Sheets-Sheet 1

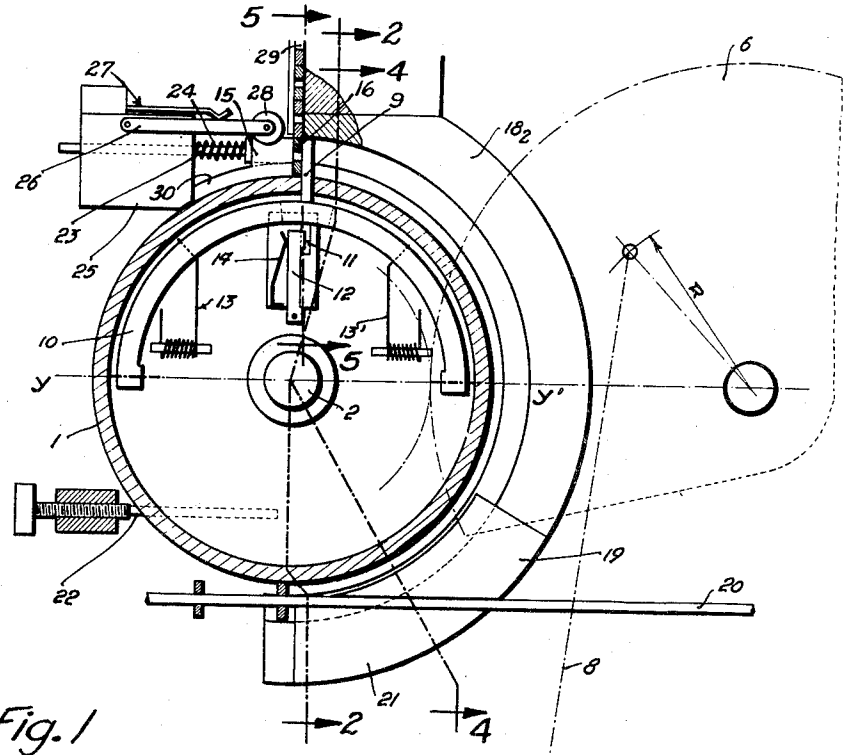


Fig. 1

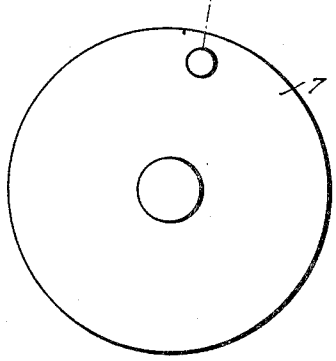
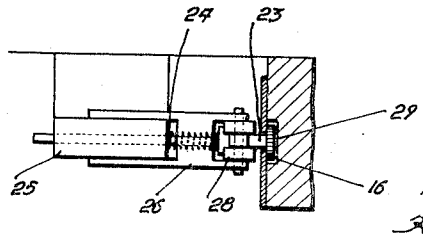


Fig. 3



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Fig. 2

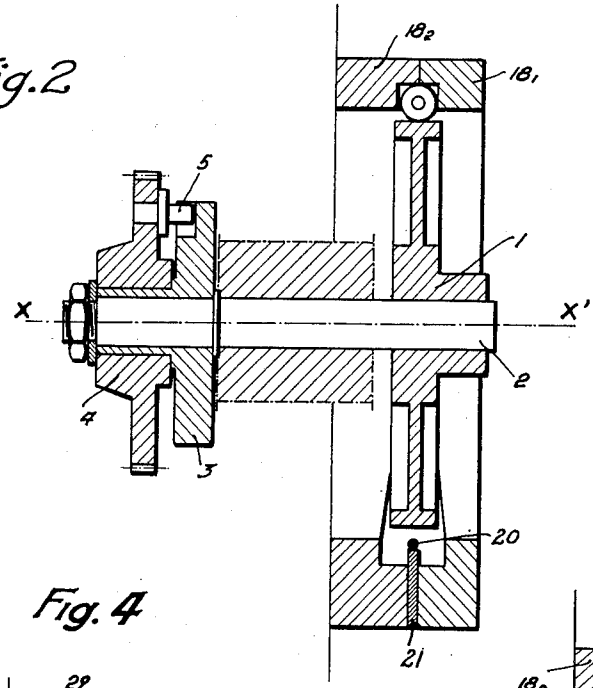


Fig. 4

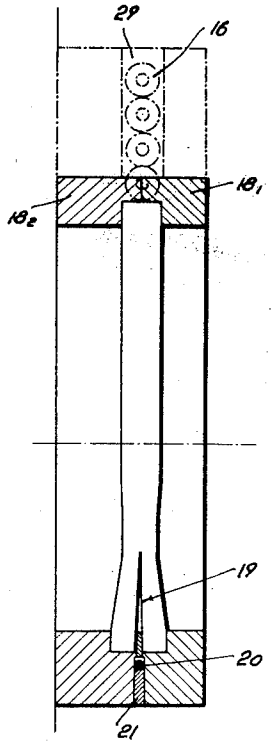
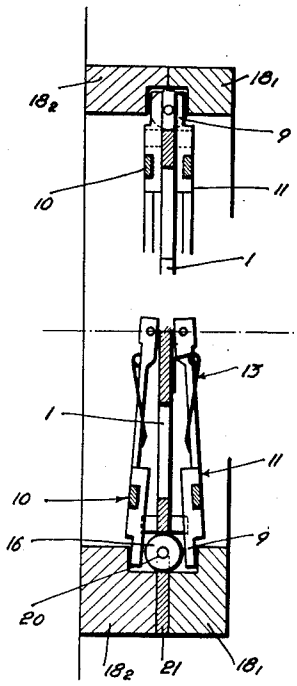


Fig. 5



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Fig. 6

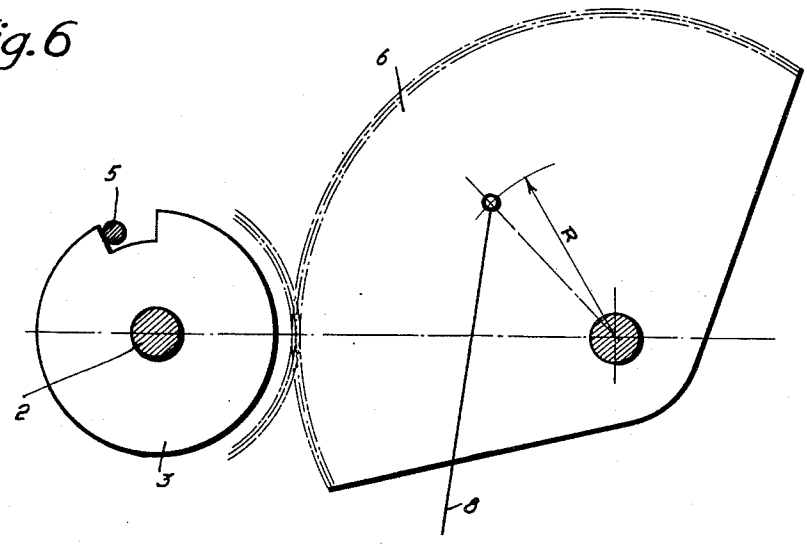
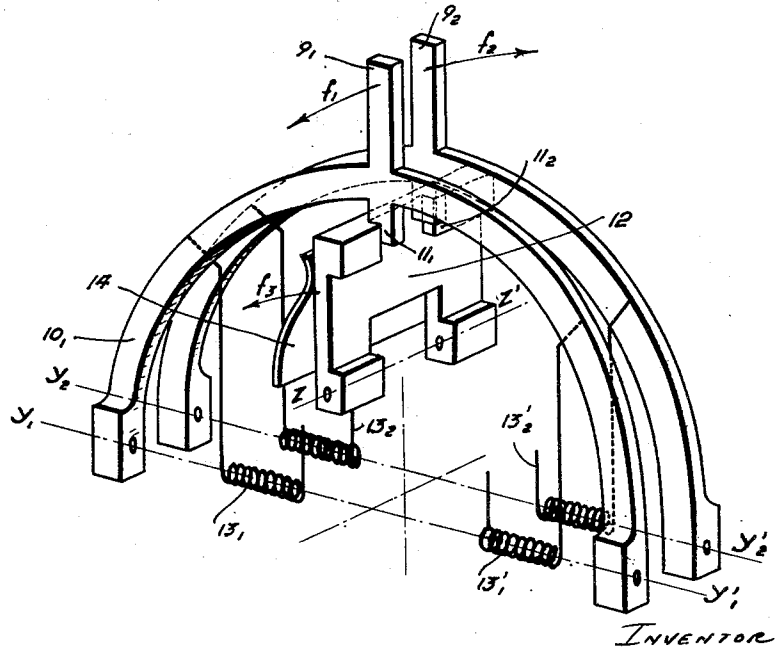


Fig. 7



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MACHINE FOR THE MANUFACTURING OF COAXIAL PAIRS FOR TELECOMMUNICATION CABLES

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Application February 20, 1952, Serial No. 272,683

Claims priority, application France March 5, 1951

5 Claims. (Cl. 29—33)

In the technique of telecommunications, cables are used, comprising so-called discontinuous insulation coaxial pairs, in which a first conductor hereinafter called "central conductor" is perfectly centered inside a second conductor of tubular shape, this centering being obtained by means of insulating discs of plastic material of circular shape placed at regular intervals.

The manufacturing of coaxial pairs in effected, in the present state of the art, in three phases, each one of which requires the use of a well defined device forming a part of an automatic machine.

The first phase consists in arranging regularly, on the central conductor, insulating discs, previously cut and perforated to suitable dimensions, out of a strip of insulating material.

During the second phase the tubular conductor surrounding the insulating discs is formed from a metal tape previously cut.

During the third phase, finally, the assembly previously constituted is provided with metal and insulating tapes ensuring the outside protection of the coaxial pair.

In the practical carrying out of the first phase, difficulties arise, particularly in case the central conductor has a large diameter. The insulating discs are subjected to considerable stresses when, after being slit radially, they are made to straddle the central conductor by moving apart the edges of the slot. They therefore are in danger of taking an incorrect position if they are not firmly held during this operation.

The present invention, has, as a main object, a device for placing insulating discs regularly on a central conductor, chiefly in case this conductor has a large diameter, while avoiding the above mentioned drawbacks. To this effect, the device which is the object of the invention encloses each disc, supplied separately from a vertical feed channel, between elements associated with a wheel to which is imparted a motion of alternate rotation; each disc, after being slit during travel with the elements along the path of the latter, is then released by the elements only when the slot thus made has closed around the central conductor and the disc is firmly held by its natural resilience in a position perpendicular to the axis of the conductor.

This device comprises fundamentally, a block having a substantially semi-circular channel the plane of symmetry of which coincides with the general plane of the machine containing the central conductor of the coaxial pair, a wheel carrying on its periphery a projecting piece pushing the insulating discs and capable of sliding inside said channel, means for imparting to said wheel a motion of alternate rotation over half a turn so as to drive said projecting piece, at each run, over the whole length of said semi-circular channel, and means cooperating with said wheel and said projecting piece for enclosing the insulating discs driven along a semi-circular path corresponding to that of said projecting piece and for holding said insulating discs in a radial position until they are placed in position on said central conductor, and perpendicularly thereto. The said central conductor moves along a rectilinear path near the outlet of said channel.

Other features of the device according to the present invention will appear later in the more detailed description given hereinafter with reference to the appended drawings which illustrate schematically an example of

embodiment of the device according to the invention and in which:

Figure 1 is a diagrammatic view, from the front, of a machine for placing insulating discs in accordance with the invention;

Figure 2 is a sectional view along the line 2—2 of Figure 1;

Figure 3 is a view, in plan, of a device limiting the movement of the wheel shown in Figure 1.

Figure 4 is the projection, on a vertical plane containing the axis of rotation of the wheel illustrated on Figure 1, of a section of the machine taken along the line 4—4 of Figure 1 and showing the shape of the semi-circular channel flared at its lower portion, as well as the vertical channel used for the supplying of insulating discs.

Figure 5 is another view of the projection, on a vertical plane containing the axis of rotation of the wheel illustrated in Figure 1, of a section of the machine, taken along the line 5—5 of Fig. 1, and showing laterally movable fingers included in the machine in their closed position on the upper portion of this figure and in their open position on its lower portion.

Figure 6 is a view of the driving device for the wheel illustrated in Figure 1, illustrating the stopping of said wheel at the end of each run.

Figure 7 is a view in perspective illustrating the operation of the laterally movable or retractile fingers.

On Figure 1, **1** designates a main wheel driven in a motion of alternate rotation. This wheel is secured on a shaft **2**, associated with a notched plate **3**. A gear **4**, carrying a driving stud **5** is mounted free on the same shaft; **6** is a toothed sector, **7** a driving wheel the uniform rotation motion of which is transmitted to the sector **6** through a small connecting rod **8**.

Considering Figures 1 and 2, it will be seen that the amplitude of the angular motion of the wheel **1**, and the positions of the dead points of this motion are determined by the distance R of the articulation point of the connecting rod **8** from the axis of the toothed sector and by the length of said connecting rod.

At the end of each run of the wheel **1**, stopping of the motion of this wheel is controlled by a device illustrated in Figure 6 which consists of a notch provided in the plate **3**, and in which the driving stud **5** has some lost motion at each reversal of its direction of movement; the continuous motion of the gear **4** is thus transmitted in a discontinuous manner to the plate **3** and to the wheel **1**.

Two laterally movable or retractile fingers 9_1 and 9_2 are carried by two semi-circular supports 10_1 and 10_2 placed on each vertical face of the wheel **1**. These two assemblies are similar and operate in an identical manner. Figure 7 shows the support 10_1 articulated about an horizontal axis $y_1y'_1$ parallel with the face of the wheel. Two springs with pincers 13_1 and $13'_1$ tend to make the support **10** pivot about the axis $y_1y'_1$ so that these springs tend to move the fingers 9_1 and 9_2 away from each other in the directions indicated by the arrows f_1 and f_2.

Lugs 11_1 and 11_2 are extensions of the fingers 9_1 and 9_2 and are engageable by a part **12** capable of rocking about an axis ZZ' perpendicular to the plane of the wheel **1** so as to oppose separation of the fingers 9_1 and 9_2. A spring **14** normally holds the rocking part **12** in the position for engagement with the lugs or extensions.

If the rocking part **12** is subjected to the action of a force in the direction indicated by the arrow F_3, said lugs 11_1 and 11_2 are released and the fingers 9_1 and 9_2 can move apart under the actions of the springs 13_1, $13'_1$, and 13_2, $13'_2$.

The operation of the device according to the present invention will now be described with reference, first, to Figure 1.

In this figure, the wheel **1** is shown at the upper end of its run. A projecting piece or pushing member **15**, associated with the wheel **1**, is aligned with a vertical feed channel **29** for supplying the insulating discs and for pushing them.

The position of the fingers 9_1 and 9_2 is such that their distance to the projecting piece **15** is sufficient for constituting the housing of an insulating disc **16**.

The feed channel **29** opens into a semi-circular chan-

nel, concentric with the wheel 1, comprised of two elements 18_1 and 18_2 (Figures 1 and 2), the lower portion of which is flared as may be seen in Figure 4.

The projecting piece 15 pushes the insulating disc 16 which participates in the rotation of the wheel 1 and is thus driven in the channel constituted by the elements 18_1 and 18_2.

During the whole duration of this rotation, each insulating disc 16 is constantly immobilized in a radial position by the projecting piece 15 on the one hand and by the fingers 9_1 and 9_2 on the other hand.

On its path, each insulating disc 16 meets an arcuate edge knife 19, shown on Figures 1 and 4, and held in the plane of symmetry of the semi-circular channel by suitable notches arranged in the elements 18_1 and 18_2. The pushing member 15 is provided with a radially opening central groove (not shown) to accommodate the knife 19 as the pushing member moves through the related portion of the semi-circular channel.

Each insulating disc being thus slit radially, the edges of the slot are moved apart and are made to straddle the central conductor 20 of the coaxial pair, said conductor 20 being also introduced inside the channel (Figures 1, 4, 5). A shim 21 extends the knife 19 but leaves a sufficient space for the passage of the conductor 20, while preventing it from evading the thrust of the insulating disc 16 at the time of straddling.

At the end of the angular run of the wheel 1, the insulating disc 16 held by the projecting piece 15 and the fingers 9_1 and 9_2 has remained in a radial position with respect to said wheel 1 and, consequently, is placed on the central conductor 20, in a vertical position, i. e. perpendicular to said conductor 20.

When the wheel 1 reaches the end of its run, the rocking part 12 is pushed by an adjustable abutment 22, the lugs 11_1 and 11_2 are released and the fingers 9_1 and 9_2 move apart under the actions of the springs 13_1, 13_2 and $13'_1$, $13'_2$.

The lower portion of Figure 5 shows the position, at this stage, of the retractile fingers. The disc 16 can now be carried along by the central conductor 20.

During the whole downward run of the projecting piece 15, the feed channel 29 is stopped by a latch 23 controlled by a spring 24.

The above described half-rotation is followed by a half rotation in the opposite direction, during which the fingers 9_1 and 9_2 bear against the walls of the semi-circular channel constituted by the two elements 18_1 and 18_2.

The flared shape of the semi-circular channel formed by the elements 18_1 and 18_2, is shown in Figs. 2 and 4 and allows the fingers 9_1 and 9_2 to be laterally urged apart after release by the rocking member 12 at the lower end of the run of the pushing member 15. Conversely, when the wheel is rotated in the opposite direction to return the pushing member 15 to its original position, the flaring channel, in which the fingers 9_1 and 9_2 engage, urges such fingers laterally together so that the rocking member 12, after release from the abutment 22, can again be urged by the spring 14 into locking engagement with the lugs 11_1 and 11_2. Thus, upon return of the pushing member 15 to its original or starting position (Fig. 1) the fingers 9_1 and 9_2 are held laterally together, as shown in the upper portion of Fig. 5, so that such fingers, together with the leading face of pushing member 15 and the side walls of the semi-circular channel, form the limits of a space adapted to receive an insulating disc from the guide channel 29.

When the wheel 1 has been returned to its initial or original position, an extension 30 of the pushing member 15 bears against a fixed abutment 25 (Fig. 1) to limit the return movement of the wheel, and the pushing member 15 engages the spring urged latch 23 to push the latter back from the lower end of the guide channel 29 thereby to permit an insulating disc to fall from the latter.

Preferably, the wheel 1 is yieldably held in its initial or original position, wherein the space between the laterally moveable fingers and the pushing member 15 is aligned with the lower end of guide channel 29, by a detent arrangement which includes a roller 28 mounted on the free end of a lever 26 which is pivoted on the abutment 25, with the roller 28 being urged into a suitable notch on the upper surface of the pushing member 15 by a spring 27 acting upon lever 26.

During the time the wheel 1 stops in this position, a new insulating disc can fall in the housing included between the projecting piece 15 and the end of the feed channel 29. The device is then back to its initial position, and the movement of rotation motion continues, the above described cycle being repeated identically.

What I claim is:

1. In a machine for manufacturing a coaxial pair of a telecommunication cable including a central conductor of relatively large diameter and insulating discs on the central conductor; a device for placing the insulating discs on the central conductor comprising means defining a feed channel for guiding the insulating discs to a delivery position, a wheel rotatable about a fixed axis and having a pushing member projecting from its periphery, means defining a semi-circular channel along the periphery of said wheel and concentric with the latter so that said pushing member can move along said semi-circular channel in response to rotational movement of said wheel, one end of said semi-circular channel being disposed adjacent said feed channel so that said pushing member can propel the discs, one at a time, from the delivery position, into said semi-circular channel, means for guiding the central conductor into said semi-circular channel adjacent the other end of the latter, said semi-circular channel flaring laterally from said one end to said other end thereof, means for rotationally oscillating said wheel so that said pushing member moves along the entire length of said semi-circular channel during each oscillation of the wheel, holding means for firmly holding the successive insulating discs against said pushing member while the discs are pushed, one at a time, through said semi-circular channel by said pushing member, and said holding means including two laterally movable fingers rotating with said wheel and disposed in said semi-circular channel in advance of said pushing member, means yieldably urging said fingers laterally apart to provide a space therebetween which is sufficiently wide to permit the passage of an insulating disc therethrough, locking means operative to hold said fingers laterally close together, a knife having an arcuate cutting edge disposed in said semi-circular channel to radially slit the successive insulating discs as the latter are propelled by said pushing member so that, as a propelled disc reaches the other end of the semi-circular channel, the central conductor enters the radial slit of the disc, releasing means rendering said locking means inoperative when said fingers and pushing member reach said other end of the semi-circular channel thereby to release said fingers and permit spreading apart of the latter within the relatively wide other end of said semi-circular channel so that the insulating disc can then move away from the pushing member, said flaring semi-circular channel moving said fingers laterally together during backward movement of the fingers to said one end of the semi-circular channel and means rendering said locking means operative again when said fingers reach said one end of the semi-circular channel.

2. In a machine for manufacturing a coaxial pair of telecommunication cable including a central conductor of relatively large diameter and insulating discs on the central conductor; a device according to claim 1, wherein said fingers have extensions thereon, and wherein said locking means includes a rockable member engageable in a first position with said extensions to hold said fingers laterally together and releasing said extensions when rocked to a second position, said means rendering the locking means operative includes a spring acting on said rockable member to urge the latter to said first position thereof, said releasing means includes an abutment engaging said rockable member when said fingers reach said other end of the semi-circular channel and rocking said rockable member to said second position of the latter.

3. In a machine for manufacturing a coaxial pair of telecommunication cable including a central conductor of relatively large diameter and insulating discs on the central conductor; a device according to claim 1, wherein said means for rotationally oscillating said wheel includes a shaft concentric with said wheel and fixed to the latter, a gear on said shaft and angularly movable relative to the latter, a plate fixed on said shaft and having a notch therein of limited circumferential extent, a drive pin extending from said gear and engaging in said notch to provide a lost motion connection between said gear and shaft, a toothed sector meshing with said gear, a continuously rotated driving wheel, and a connecting rod from said sector to said driving wheel to convert the con-

tinuous rotation of the latter into oscillation of said sector.

4. In a machine for manufacturing a coaxial pair of telecommunication cable including a central conductor of relatively large diameter and insulating discs on the central conductor; a device according to claim 1, further comprising a latch operative to close said feed channel during the movement of said pushing member through said semi-circular channel, and means on said pushing member engaging said latch and displacing the latter away from said feed channel to an inoperative position when said pushing member returns to its original position adjacent said one end of the semi-circular channel.

5. In a machine for manufacturing a coaxial pair of telecommunication cable including a central conductor of relatively large diameter and insulating discs on the central conductor; a device according to claim 4, further comprising a fixed abutment engageable by said pushing

member upon return of the latter to said original position to limit rotational movement of the wheel in the return direction, and engageable detent means on said abutment and pushing member with the wheel from said original position.

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