

Dec. 25, 1951

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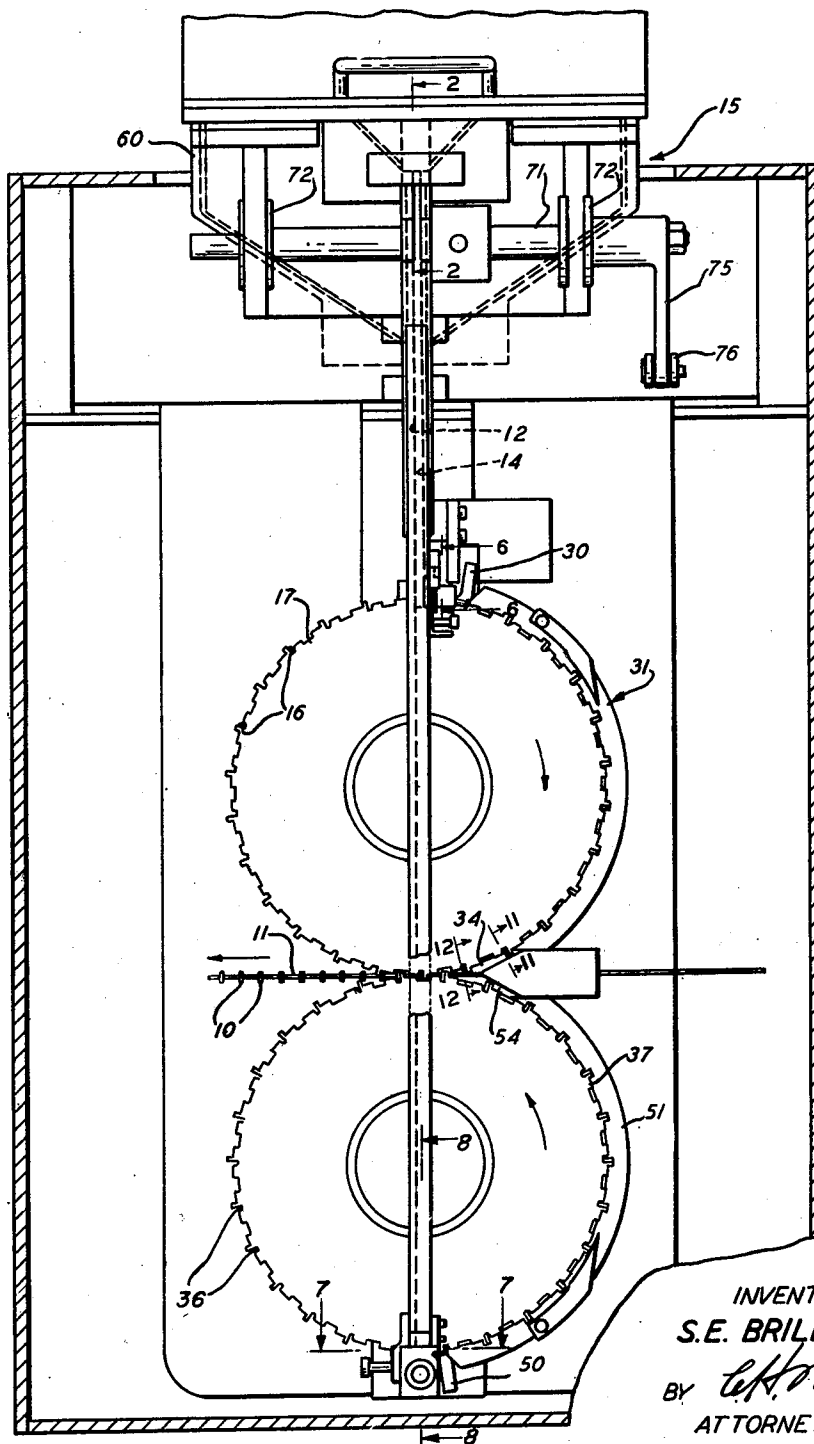
2,579,468

APPARATUS FOR MAKING COAXIAL CABLE UNITS

Filed Oct. 10, 1946

4 Sheets-Sheet 1

FIG. 1



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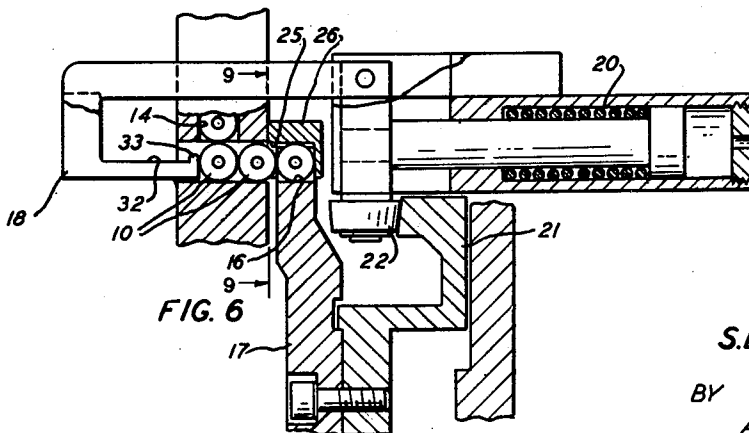
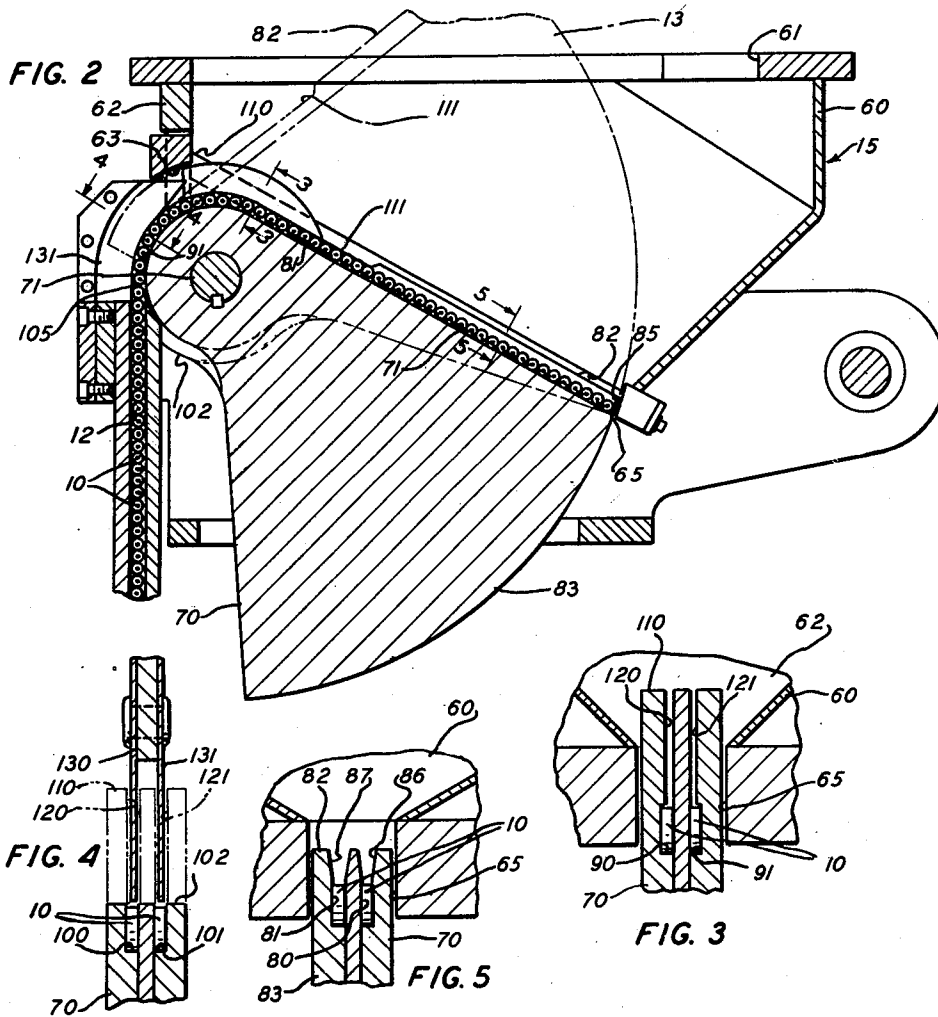
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APPARATUS FOR MAKING COAXIAL CABLE UNITS

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4 Sheets-Sheet 2



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APPARATUS FOR MAKING COAXIAL CABLE UNITS

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4 Sheets-Sheet 3

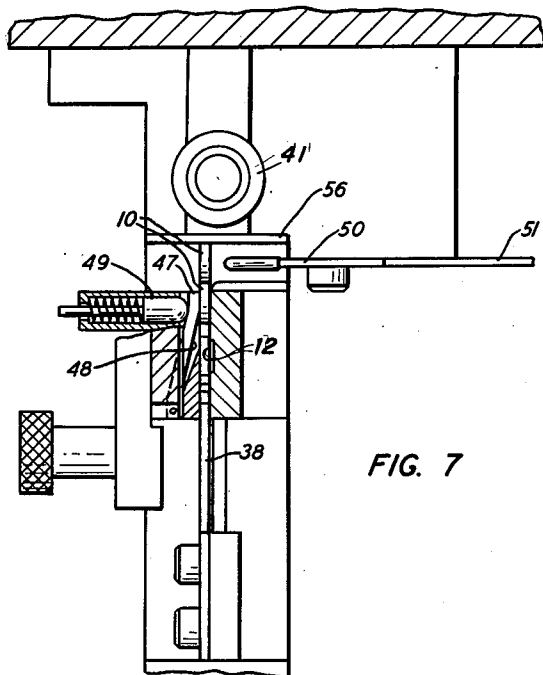


FIG. 7

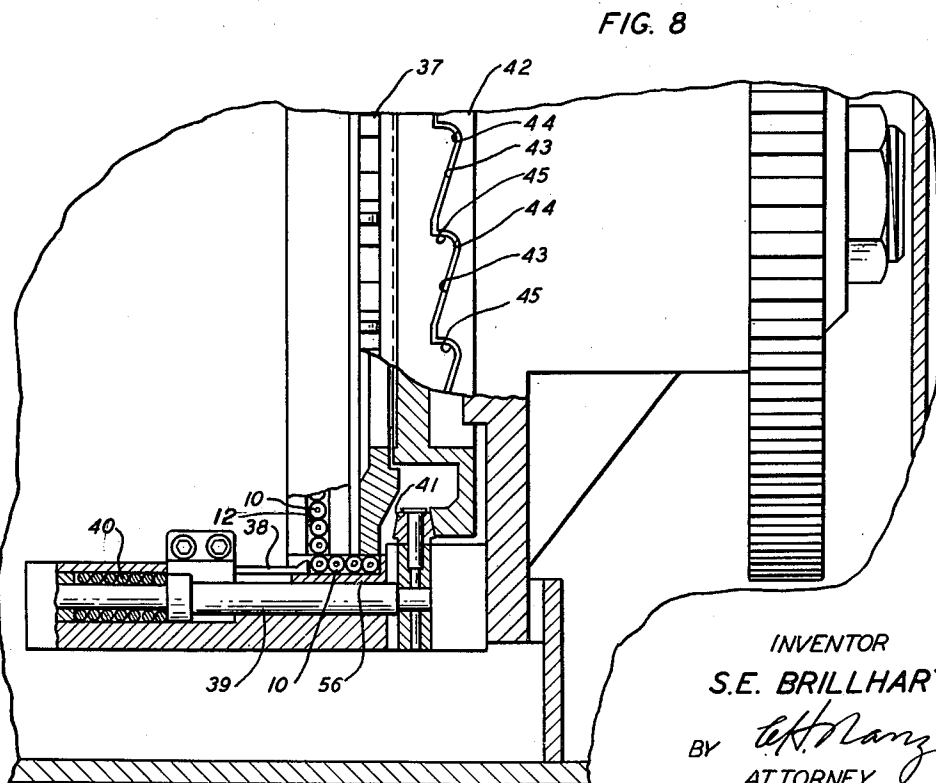


FIG. 8

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APPARATUS FOR MAKING COAXIAL CABLE UNITS

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4 Sheets-Sheet 4

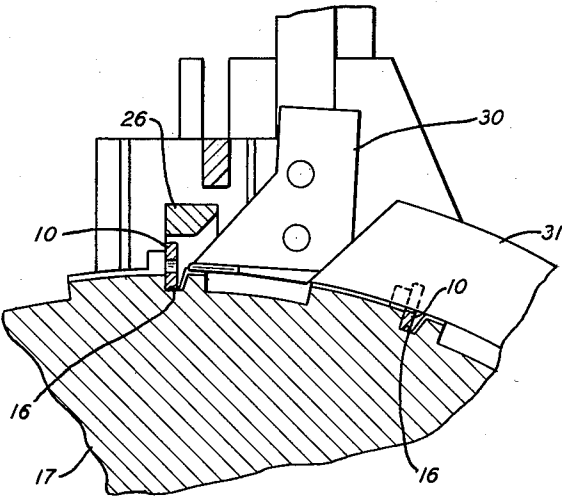
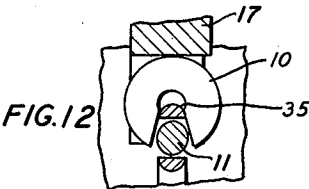
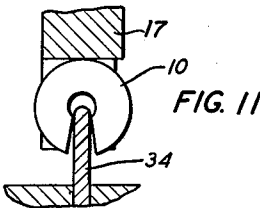
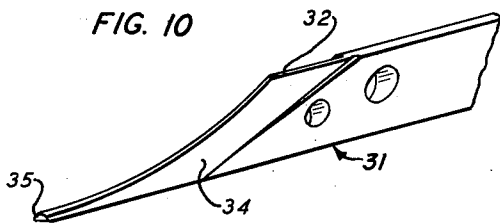


FIG. 9

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UNITED STATES PATENT OFFICE

2,579,468

APPARATUS FOR MAKING COAXIAL CABLE
UNITS

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Application October 10, 1946, Serial No. 702,491

3 Claims. (Cl. 29—203)

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This invention relates to apparatus for making coaxial cable units.

In some types of apparatus for forming coaxial cable units, soft, plastic washer-like insulating discs are positioned upon a central conductor. The soft, plastic insulating discs are fed through guide chutes from hoppers to transfer devices, after which the transfer devices move the discs into oriented positions in notches formed in applicator wheels. The applicator wheels advance the discs over knives, which slit the discs radially, and then over guides which enter the slits in the discs and keep them open. The wheels move the discs from the guides onto the central conductors with a wiping action.

With apparatus heretofore known, it has been difficult to handle the soft, plastic discs without jamming the discs, which jamming requires stopping the whole apparatus for forming coaxial cable units with which the disc feeding, slitting and applying devices are associated. Furthermore, the discs sometimes become displaced from their oriented positions in the notches in the applicator wheels so that, as the displaced discs are moved over the knives, the knives form non-radial slits therein. This prevents proper application of the discs onto the central conductors. In addition, the discs sometimes were agitated so much that they acquired static charges, which prevented the discs from feeding freely through the guide chutes.

An object of the invention is to provide new and improved apparatus for making coaxial cable units.

A further object of the invention is to provide new and improved apparatus for feeding insulating discs from hoppers to oriented positions in notches in applicator wheels without jamming and without the discs developing static charges, and for maintaining the oriented positions of the discs as the applicator wheels move the discs over slitting knives so that the knives slit the discs properly.

An apparatus illustrative of the invention includes a straight guide chute disposed vertically for feeding by gravity insulating discs from a hopper feed including a slow-moving, non-static forming vane to a transfer device. The transfer device feeds the discs into notches in a rotating applicator wheel, and a guide maintains the discs in such positions as the applicator wheel moves them over a slitting knife that the knife slits the discs radially.

A complete understanding of the invention may be obtained from the following detailed de-

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scription of an apparatus forming a specific embodiment thereof, when read in conjunction with the appended drawings, in which:

Fig. 1 is a fragmentary, vertical section of an apparatus forming one embodiment of the invention;

Fig. 2 is an enlarged, fragmentary, vertical section taken along line 2—2 of Fig. 1;

Fig. 3 is an enlarged, substantially vertical section taken along line 3—3 of Fig. 2;

Fig. 4 is an enlarged, fragmentary section taken along line 4—4 of Fig. 2;

Fig. 5 is an enlarged, fragmentary section taken along line 5—5 of Fig. 2;

Fig. 6 is an enlarged, fragmentary, vertical section taken along line 6—6 of Fig. 1;

Fig. 7 is an enlarged, fragmentary, horizontal section taken along line 7—7 of Fig. 1;

Fig. 8 is an enlarged, fragmentary, vertical section taken along line 8—8 of Fig. 1;

Fig. 9 is a fragmentary, vertical section taken along line 9—9 of Fig. 6;

Fig. 10 is an enlarged perspective view of a portion of the apparatus;

Fig. 11 is an enlarged, substantially vertical section taken along line 11—11 of Fig. 1, and

Fig. 12 is an enlarged, substantially vertical section taken along line 12—12 of Fig. 1.

Referring now in detail to the drawings, there is shown in Fig. 1 an apparatus for feeding applying soft, plastic, washer-like, insulating discs 10—10, which may be composed of polymerized ethylene, for example, to a conductor 11 to form a core unit of a coaxial cable. The discs 10—10 are fed in edge-to-edge positions to straight, vertical guide chutes 12 and 14 by a hopper feed 15, certain features of which are disclosed and claimed in copending application Serial No. 702,493, filed October 10, 1946 by A. C. Frankwich now Patent No. 2,579,486 issued December 25, 1951. The discs 10—10 are propelled by gravity down the vertically disposed guide chutes 12 and 14, and the discs in the guide chute 14 are fed into notches 16—16 formed in an applicator wheel 17 by a plunger 18, the height of which is less than the diameter of the discs 10—10. The chute 14 extends to the level of the top of the applicator wheel 17, and is almost centered with respect to the applicator wheel 17 but is slightly to the right of the center, as viewed in Fig. 1. The chute 12 is just slightly to the left of the center of the applicator wheel 17.

The plunger 18 is urged to the right, as viewed in Fig. 6, by a compression spring 20, but is prevented by a cam 21 carried by the applicator wheel

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17 from moving to the right except when one of the notches 16—16 is in a position to receive one of the discs, and the cam engages a cam follower 22 carried by the plunger. The discs 10—10 fed to the applicator wheel 17 pass through a notch 25 5 formed in a U-shaped guide 26, which holds the discs centered in the notches 16—16 while the applicator wheel 17 moves the discs over a knife 30 (Fig. 1), which forms line-like, radial slits in the discs. A thin arcuate guide 31 extends from the knife 30 to an end 32 of a wedge-shaped ex- 10 pander 34 (Figs. 10, 11 and 12) and forms a continuation of the arcuate guide 31 (Fig. 1). The expander 34 extends to the point at which the guide 31 wipes the discs onto the conductor 11. 15 The thin arcuate guide 31 enters the radial slits formed in the discs and holds the discs in oriented positions as the applicator wheel 17 rotates in a clockwise direction, as viewed in Fig. 1, and also holds the slits in the discs slightly open. The ex- 20 pander 34 tapers gradually from an end 32 of the guide 31 abutting the end to a thicker end 35, which is near the point of application of the discs.

As the discs are carried along the expander, the expander gradually opens the slits in the discs sufficiently that only the inner ends of the walls of the slits contact the conductor 11 as the discs are wiped onto the conductor. The gradual expansion of the slits in the discs by the expander 34 prevents crushing of the soft, plastic discs, which might occur if the discs were wiped onto the conductor with the slits not previously ex- 25 panded sufficiently. The fact that the walls of the slits are held by the expander out of contact with the conductor 11 except for the innermost portions of these walls prevents contamination of and formation of conductive paths along the walls of the slits from contact with the conductor.

On each movement of the plunger 18 to the right, as viewed in Fig. 6, the plunger 18 moves one of the discs 10—10 into one of the notches 16—16 which is in a disc-receiving position, and in so doing moves the lowermost one of the discs 10—10 in the guide chute 14 out from under the remainder of the discs in the guide chute 14. The remainder of the discs then drop upon a relieved portion 32 of the plunger 18 while the plunger is at its farthestmost position to the right. As the plunger is moved back to the left from this position by the cam 21, a jiggling finger 33 projecting above the relieved portion 32 of the plunger moves the column of discs 10—10 in the guide chute 14 upwardly to dislodge any of the discs which might possibly stick in the guide chute 14.

The movement of the plunger 18 to the left continues until the finger 33 moves out completely from under the column of discs in the guide chute 14, and the column of discs then drops to the bottom of the guide chute 14. The total height of the plunger 18 and the finger 33 is slightly over half of the diameter of one of the discs 10—10 so that the plunger engages the discs 10—10 at the centerline of the discs and does not slide under the discs as it is moved toward the right, as viewed in Fig. 6. However, in the operation of the plunger 18, the discs in the guide chute 14 drop somewhat over half the diameter of one of the discs as the plunger 18 is moved to its farthestmost right position, and as the plunger 18 is moved to the farthestmost left position, the finger 33 of the plunger 18 moves the column of discs upward enough to dislodge any stuck discs. The plunger then permits the discs to drop the combined height of the finger 33 and the plunger 18, which

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height is substantially less than the diameter of one of the discs.

The dropping of the discs in the guide chute 14 through the distance of the diameter of one of the discs in two almost equal steps during each reciprocation of the plunger insures that there is sufficient time for the lowermost one of these discs to reach the bottom of the guide chute 14 before the movement of the plunger 18 to the right be- 5 gins, even at very high operating speeds of the plunger 18. The jiggling finger 33 agitates the column of discs in the guide chute 14 at each stroke to prevent sticking of the discs in the guide chute and thereby insures continuous feed of the discs down the guide chute. 10

The discs 10—10 are fed down the guide chute 12 and are fed into notches 36—36 in an applicator wheel 37 positioned directly below the applicator wheel 17 by means of elements similar to the plunger 18, the cam 21 and their associated elements. These elements include a plunger 38 (Figs. 7 and 8), which is mounted on a guide pin 39 urged to the right, as viewed in Fig. 8, by a compression spring 40 to hold a cam follower 41 15 against a cam 42 carried by the applicator wheel 37. The cam 42 is identical with the cam 21 except that the contour of one of these cams is right hand while that of the other is left hand. The cam 42 is provided with a series of gently sloping plunger-retracting portions 43—43 ex- 20 tending from dwell portions 44—44 to sharply relieved vertical drop plunger-feeding portions 45—45. The plunger-retracting portions 43—43 push the plunger 38 slowly back to the left after each feeding stroke, and the plunger-feeding portions permit the compression spring 40 to make almost instantaneous the feed of the plunger 38 25 to the right to feed a disc into one of the notches 36—36 in the rotating applicator wheel.

A pivotally mounted brake shoe 47 (Fig. 7) having a deflecting portion 48 is urged by a spring-pressed plunger 49 against the disc which is the disc to be fed next into one of the notches 36—36 in the applicator wheel 37. The brake shoe prevents that disc from movement 30 until the feed stroke of the plunger, at which time one of the notches 36—36 is in a position to receive the disc. Hence, jamming of the disc with the applicator wheel from premature movement of the disc is prevented. 35

A knife 50 (Fig. 1) slits the discs 10—10 radially, and a thin arcuate guide 51 extends to an expander 54, which extends substantially to the point of application of the discs to the central conductor 11, and is identical in construction and operation with the expander 34. The expanders 34 and 54 and the elements associated therewith are disclosed and claimed in copending application Serial No. 702,494, filed October 10, 1946 by A. C. Frankwich. 40

The wheel 37 rotates in a counterclockwise direction, as viewed in Fig. 1, to wipe the discs 10—10 upon the conductor 11 alternately with respect to the discs applied by the applicator wheel 17 to the conductor. A U-shaped guide 56 holds the discs in the notches 36—36 centered in the notches as each disc is moved over the knife 50 so that the knife forms radial slits in the discs. The combined length of the guide 31 and the expander 34 is substantially the same as that of the guide 51 and the expander 54 so that the discs receive the same treatment as they are moved along the guides and the ex- 45 panders. That is, each of the discs is rubbed to the same extent and for the same length of time 50

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by the guides 31 and 51 and is expanded to the same extent and for the same length of time by the expanders 34 and 54. Hence, all the discs have identical mechanical and electrical properties. Thus, except for the greater travel of the discs in the guide chute 12 as compared to the discs in the guide chute 14, the discs applied by the applicator wheel 17 are subjected to the same conditions, from entrance into the hopper to application to the conductor, as the discs applied by the applicator wheel 37. In the guide chutes 12 and 14, the discs are freely floating, and the chutes protect the discs against contamination. Hence, the difference in the length of the guide chutes has no effect on the uniformity of treatment of the discs, and does not affect the properties of the discs.

The hopper feed 15 includes a sloping-wall hopper 60 having an opening 61 (Fig. 2) for placing the insulating discs 10—10 haphazardly into the hopper, and also includes a side wall 62 provided with a vertical slot 63 therein. The hopper is also provided with a bottom slot 65. A vane 70 is keyed to a shaft 71 whose axis is located slightly to the right of and below the side wall 62 of the hopper 60, as viewed in Fig. 2. The shaft 71 is rotatably mounted in bearings 72—72 (Fig. 1), and is oscillated slowly by an arm 75 connected by a link 76 to a suitable crank (not shown). The shaft 71 slowly oscillates the vane 70 between a position in which the vane is shown in full lines in Fig. 2, which position is its lowermost position, and a position in which the vane is shown in broken lines, which position is its uppermost position.

When the vane is in its lowermost position, the discs 10—10 in the hopper 60 fall edgewise into grooves 80 and 81 extending along an upper edge 82 of an arcuate blade portion 83 thereof. The grooves 80 and 81 are provided with flared entrance portions 86 and 87 (Fig. 5) to facilitate entrance of the discs therein. When the vane 70 is in its lowermost position, the grooves 80 and 81 tilt downwardly to the right, as viewed in Fig. 2, but the discs in these grooves are prevented from sliding out of the grooves by stops, of which a stop 85 is shown, positioned at the right ends of the grooves. The grooves 80 and 81 are sufficiently long that the hopper feed 15 maintains the chutes filled with the discs even though its speed is slow.

Discs made of a plastic, such as polyethylene or the like, tend to acquire static charges when agitated or rubbed against other objects, particularly when certain atmospheric conditions prevail. The slow speed of the vane, plus the absence of any mechanical agitator for the hopper feed, keeps at a minimum the agitation of the discs in the hopper so that electrostatic charging of the discs, which results from agitation, is held to a minimum.

As the vane 70 is swung to its uppermost position, the discs 10—10 slide downwardly to the left in the grooves 80 and 81, and pass through passages 90 and 91 formed in the vane 70. The entrance portions of the passages 90 and 91 are straight and are aligned with their respective grooves 80 and 81, and the remainder of the passages 90 and 91 are arcuate with the axis of the shaft 71 at the center thereof. The passages 90 and 91 are aligned with and run into arcuate grooves 100 and 101 (Fig. 4), which have the axis of the shaft 71 as their centers.

A portion 102 of the periphery of the vane 70 is coextensive with the grooves 100 and 101 and

is concentric with these grooves. The depth of the grooves 100 and 101 is substantially equal to but slightly larger than the diameter of the discs 10—10. Tangential deflecting portions, of which a tangential deflecting portion 105 of the guide chute 14 is shown, rest upon the bottoms of the grooves 100 and 101, and deflect the discs 10—10 out of the grooves 100 and 101 into the guide chutes 12 and 14. The right hand edge, as viewed in Fig. 2, of the guide chute 12 is substantially tangential to the bottom of the groove 100.

A raised guard portion 110 of the vane 70 extends arcuately from the upper edge 82 of the blade portion 83 of the vane concentrically with the passages 90 and 91 and terminates at the right ends of the grooves 100 and 101. The periphery of the guard portion 110 is spaced substantially outwardly from the outer periphery of the passages 90 and 91, and also fits closely in the slot 63 in the side wall 62 so that the guard portion serves to close the slot. The length of the guard portion 110 is such that the guard portion blocks the slot 63 throughout the path of movement of the vane 70 in its oscillation, thereby preventing escape of the discs from the hopper 60, but is short enough that the guard portion does not strike the chutes 12 or 14 when the vane 70 is oscillated to its broken line position, as shown in Fig. 2.

The height of the guard portion 110 is such that when the vane 70 is in its uppermost position, the blade portion 83 of the vane is spaced a substantial distance from the side wall 62 of the hopper 60, which distance is sufficient to prevent jamming of the discs between the wall 62 and the edge 82 of the blade portion. Also, the blade portion 83 is provided with a relieved portion 111 at the end thereof adjacent to the guard 110, which increases the clearance between the side wall 62 and the outer edge 82 of the blade portion when the vane is in its uppermost position. However, the depth of the grooves 80 and 81 coextensive with the relieved portion 111 is equal to the diameter of the discs 10—10, and the flared entrance portions 86 and 87 are not present in these portions of the grooves so that the discs in the hopper do tend to enter these portions of the grooves directly from the hopper.

The guard 110 is provided with slots 120 and 121 extending from the periphery thereof to the passages 90 and 91. The width of each of the slots 120 and 121 is not enough to permit the discs to enter the slots 120 and 121. Arcuate guides 130 and 131 are designed to project into the slots 120 and 121, respectively, and to prevent the discs from leaving the grooves 100 and 101 in the vane 70 when the vane is in its lowermost position, thereby preventing jamming of the discs. The guides 130 and 131 serve to guide the discs into the guide chutes 12 and 14, respectively.

The discs are fed by gravity down the straight, vertical guide chutes 12 and 14 (Fig. 1). Since the guide chutes have no curves therein and the interior surfaces are smooth, there is no possibility of the discs becoming stuck in the chutes. Also, the plungers 18 and 38 intermittently jiggle the columns of the discs to prevent sticking of the discs in the chutes. Since the chutes are straight and vertical, compressed air or mechanical disc-advancers for the chutes are eliminated in feeding the discs, so that dirt and moisture concomitant with compressed air and abrasion and jamming of the discs by mechanical

advancers are avoided. Also, the slow moving pick-up arrangement in the hopper avoids the formation of static charges on the discs fed to the chutes, and the discs have no tendency to cling to the walls of the chutes as they sometimes do when carrying static charges.

In the operation of the apparatus described hereinabove, the discs 10-10 are fed by the hopper feed 15 into the straight, vertical guide chutes 12 and 14. The discs in the guide chute 14 are fed by gravity to the bottom thereof, which is offset from the applicator wheel 17. Each of the discs in the guide chute 14 is pushed seriatim from the guide chute 14 by the plunger 18 (Fig. 6) into the U-shaped guide 26 and one of the notches 16-16 in the applicator wheel 17. The wheel moves the discs facewise past the knife 30 (Fig. 1) to slit the discs and the guide 26 centers the discs with respect to the knife 30 so that the slits are formed radially therein. The applicator wheel 17 moves the discs along the arcuate guide 31, over the wedge-shaped expander 34, and wipes them onto the conductor 11 at uniformly spaced points thereon as it is advanced tangentially between the applicator wheels 17 and 37. The wedge-shaped expander 34 gradually expands the slits to prevent damage to the soft discs from abrupt expansion thereof and protects the walls of the slits in the discs from contamination.

The discs in the chute 14 are fed by gravity therethrough down across the faces of the applicator wheels 17 and 37 to a point offset from the notched periphery of the applicator wheel 37. The discs are pushed by the plunger 38 one at a time from the bottom of the chute 14 toward the applicator wheel 37 and into the notches 36-36 in the applicator wheel 37. The plunger 38 jiggles the discs in the column to prevent sticking thereof, and the brake shoe 47 prevents the discs from moving into contact with the applicator wheel 37 prior to the time when one of the notches 36-36 is in a disc-receiving position, when the plunger 38 pushes the foremost disc past the brake shoe into that notch.

The U-shaped guide 56 holds the discs 10-10 centered with respect to the knife 50 as the applicator wheel 37 moves them past the knife. As this occurs, the knife forms radial slits in the discs to permit the discs to be wiped onto the conductor 11. The discs then are moved over the thin guide 51 (Fig. 1), which enters the slits therein, holds the discs slightly open and in properly oriented positions for application to the conductor 11. The wedge-shaped expander 54 expands the slits in the discs to facilitate applying the discs to the conductor 11 and to prevent damaging and contaminating the discs. The applicator wheel 37 wipes the discs carried thereby onto the conductor at points thereon spaced equally between the discs applied by the applicator wheel 17.

The above-described apparatus orients, feeds, slits and applies the insulating discs 10-10 to the conductor 11 without jamming, abrading, contaminating, wetting or electrostatically charging the discs so that the apparatus is not stopped from jamming and neither the physical nor electrical properties of the discs are impaired by such operations. The above-described apparatus has a minimum of movable parts so that it is simple in its construction and operation, while it is highly effective in continuously feeding, slitting and applying discs.

The elements of the above-described apparatus

are simple in construction so that they may be made with mass production techniques, which effects substantial economies in the manufacture and maintenance of the apparatus. The slow movement of the vane 70 keeps the chutes 12 and 14 filled, but keeps static charges on the discs 10-10 at a minimum. Furthermore, the treatment of the discs applied by the applicator wheel 17 is substantially identical with that of the discs applied by the applicator wheel 37 from entrance in the hopper to application to the conductors so that the discs have uniform mechanical and electrical properties.

What is claimed is:

1. An apparatus for feeding insulating discs from an elevated hopper feed to a pair of rotating applicator wheels from which the discs may be alternately applied to an advancing horizontal conductor of a coaxial cable, which comprises an applicator wheel having a plurality of disc-receiving notches extending radially inwardly from the periphery thereof mounted in a vertical plane for rotation in a predetermined direction for applying insulating discs to a horizontal conductor advanced tangentially along the lower periphery of the wheel, a second wheel having a plurality of disc-receiving notches extending radially inwardly from the periphery thereof mounted in said vertical plane directly below the first applicator wheel for rotation in a direction opposite to that of the first applicator wheel for applying insulating discs to the conductor, a straight guide chute extending vertically from an elevated hopper feed to a point at the same level as but offset from the top of the first applicator wheel and in a plane perpendicular to that wheel for feeding discs edgewise and by gravity in a straight column from the hopper feed to said point, a plunger reciprocable parallel to the axis of the first applicator wheel for pushing the discs edgewise from the guide chute into the notches in the first applicator wheel, a second straight guide chute extending vertically from the hopper feed to a point at the same level as but offset from the bottom of the second applicator wheel and in a plane perpendicular to that wheel for feeding discs edgewise and by gravity in a straight column from the hopper feed to the last-mentioned point, a second plunger reciprocable parallel to the axis of the second applicator wheel for pushing discs edgewise from the second guide chute into the notches in the second applicator wheel, and means for alternately and intermittently reciprocating the plungers to feed discs into the notches on the rotating applicator wheels, each of said plungers having an upwardly protruding finger on the tip end thereof so that the columns of discs will be jiggled during each reciprocation of the plungers to prevent jamming of the discs in the guide chutes.

2. In an apparatus for feeding insulating discs from an elevated hopper into spaced radial notches on the periphery of a vertical rotating applicator wheel from which the discs may be applied to an advancing horizontal conductor of a coaxial cable, the improvement which comprises an entirely straight guide chute extending vertically from the hopper to a point horizontally offset from the periphery of the vertical applicator wheel in a plane substantially perpendicular to the axis of the wheel for feeding discs edgewise and by gravity in a straight column from the hopper to said point, a horizontal guideway extending from the bottom of the chute

to the periphery of the wheel for guiding discs from the chute into the notches on that periphery, a plunger reciprocable along the guideway for pushing a disc edgewise from the guide chute into a notch on the periphery of the wheel, said plunger having on the tip end thereof a finger protruding upwardly a distance above the guideway of slightly more than half the diameter of a disc to be pushed so that the disc will be positively engaged and so that the column of discs will be jiggled during each reciprocation of the plunger to prevent jamming of the discs in the guide chute, and means for intermittently reciprocating the plunger in timed relation to the spacing of the notches on the rotating applicator wheel.

3. In an apparatus for feeding insulating discs from an elevated hopper into spaced radial notches on the periphery of a vertical rotating applicator wheel from which the discs may be applied to an advancing horizontal conductor of a coaxial cable, the improvement which comprises an entirely straight guide chute extending vertically from the hopper to a point horizontally offset from the periphery of the vertical applicator wheel in a plane substantially perpendicular to the axis of the wheel for feeding discs edgewise and by gravity in a straight column from the hopper to said point, a horizontal guideway extending from the bottom of the chute to the periphery of the wheel for guiding discs from the chute into the notches on that periphery, a plunger reciprocable along the guideway for pushing a disc edgewise from the guide chute

into a notch on the periphery of the wheel, said plunger having on the tip end thereof a finger protruding upwardly a distance above the guideway of slightly more than half the diameter of a disc to be pushed so that the disc will be positively engaged and having a relieved portion so that this portion of the plunger protrudes upwardly a distance above the guideway of slightly less than half the diameter of a disc, whereby the column of discs will be jiggled twice during each reciprocation of the plunger and the column will fall a distance equal to the diameter of a disc in two nearly equal steps to prevent jamming of the discs in the guide chute, and means for intermittently reciprocating the plunger in timed relation to the spacing of the notches on the rotating applicator wheel.

SAMUEL E. BRILLHART.

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