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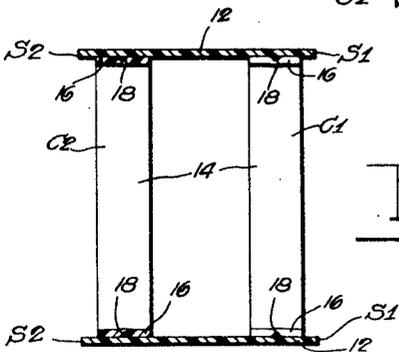
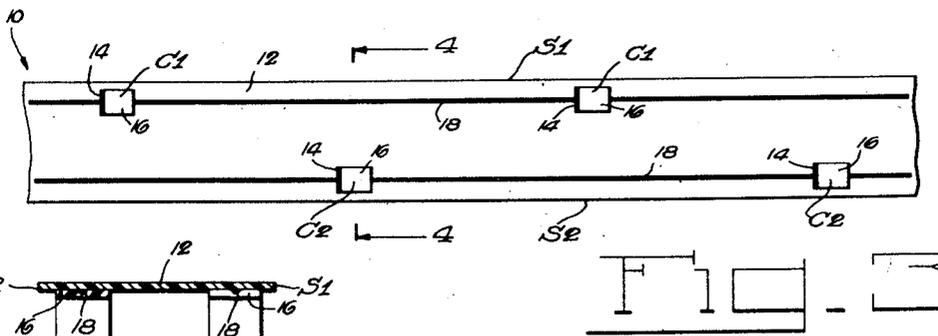
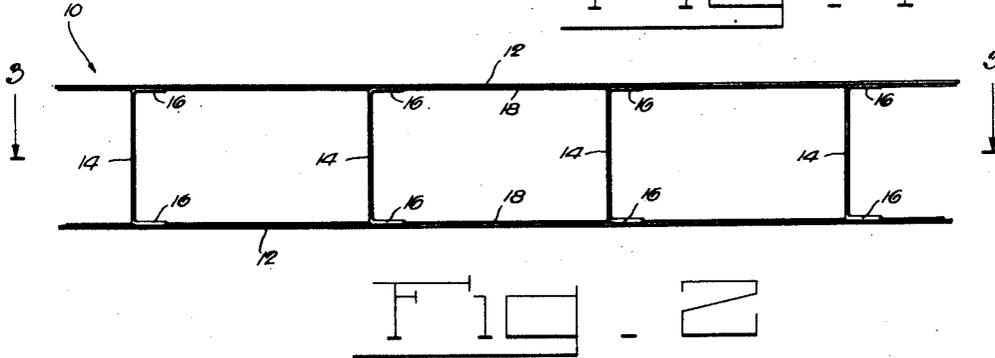
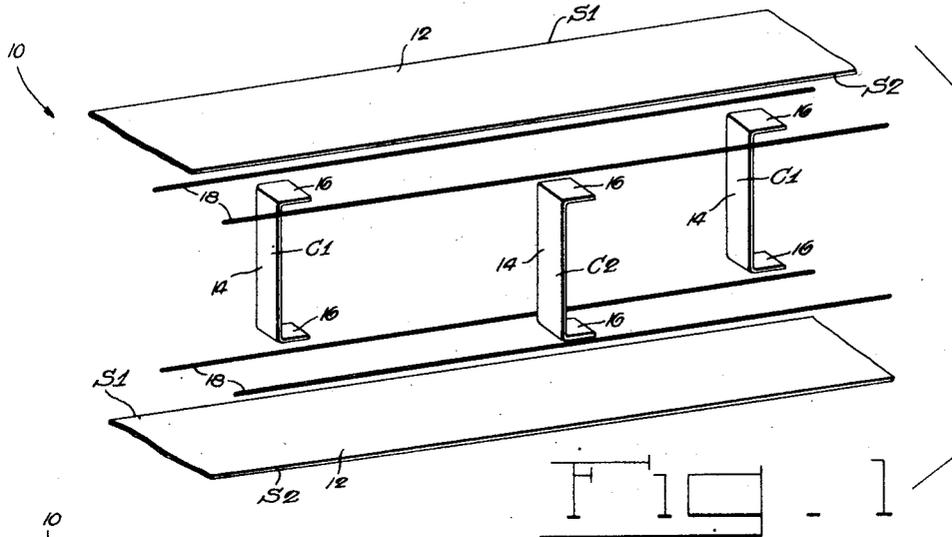
C. H. FRANKEL ET AL

2,527,627

APPARATUS FOR MAKING LADDERED TAPE FOR VENETIAN BLINDS

Filed Dec. 24, 1947

3 Sheets-Sheet 1



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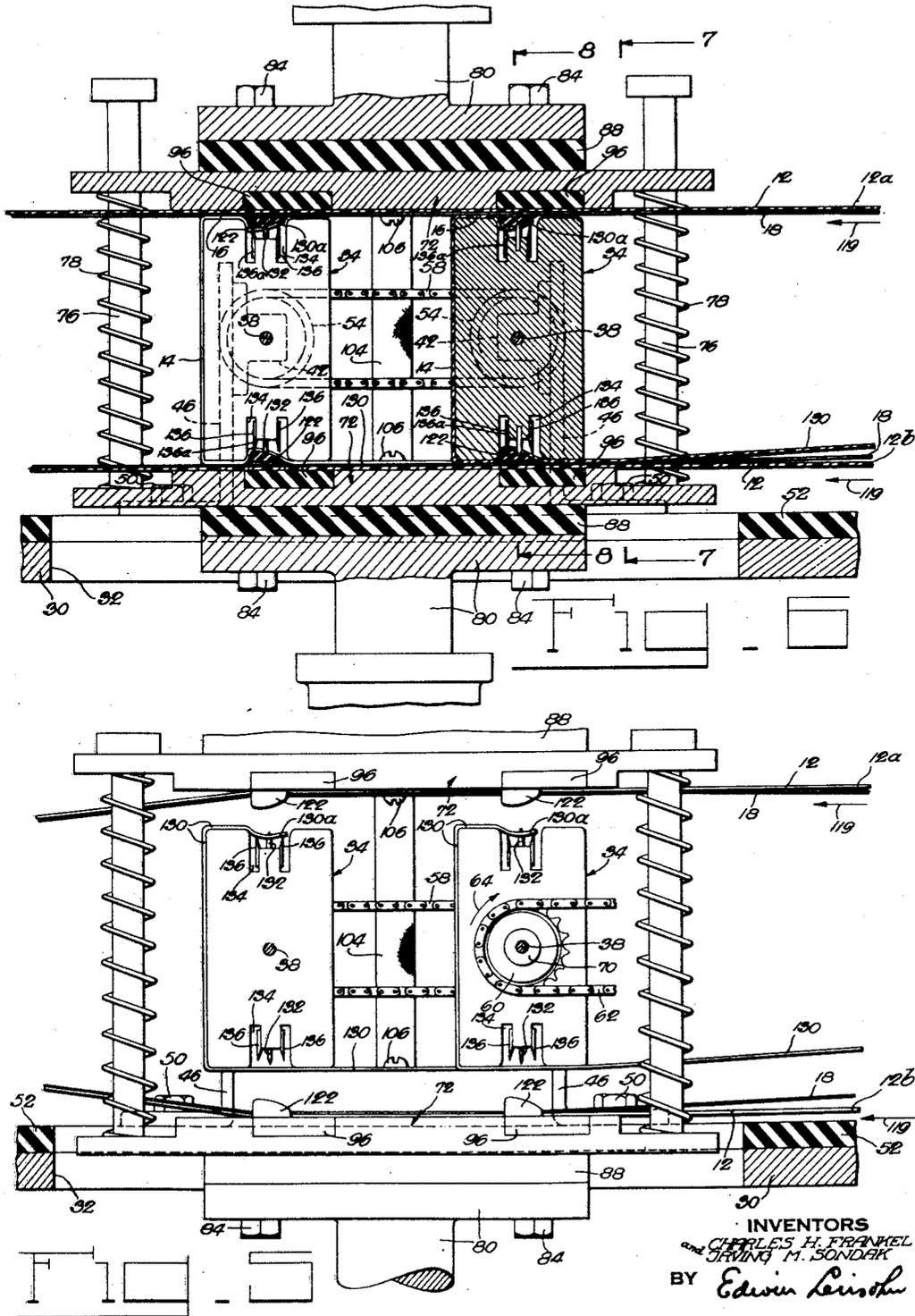
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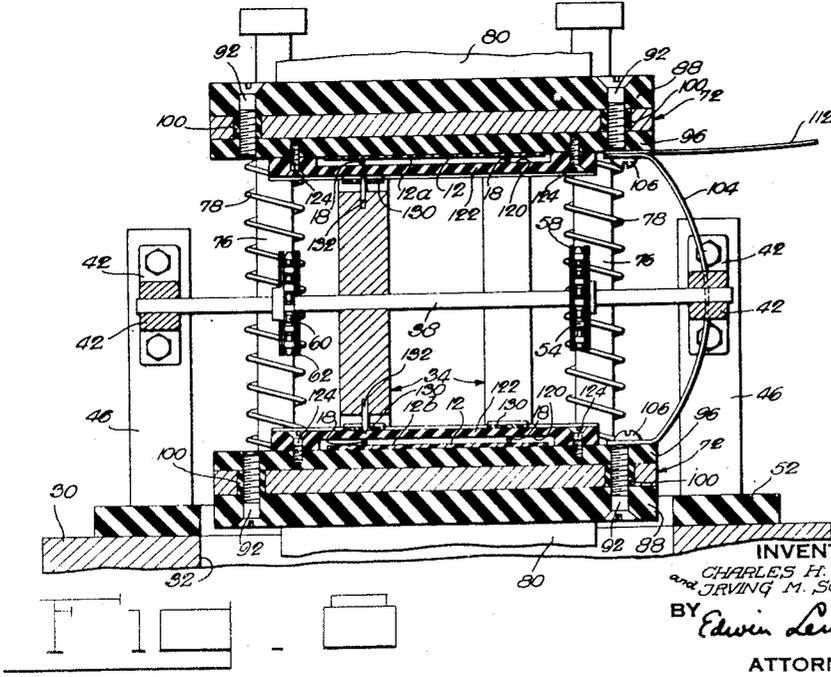
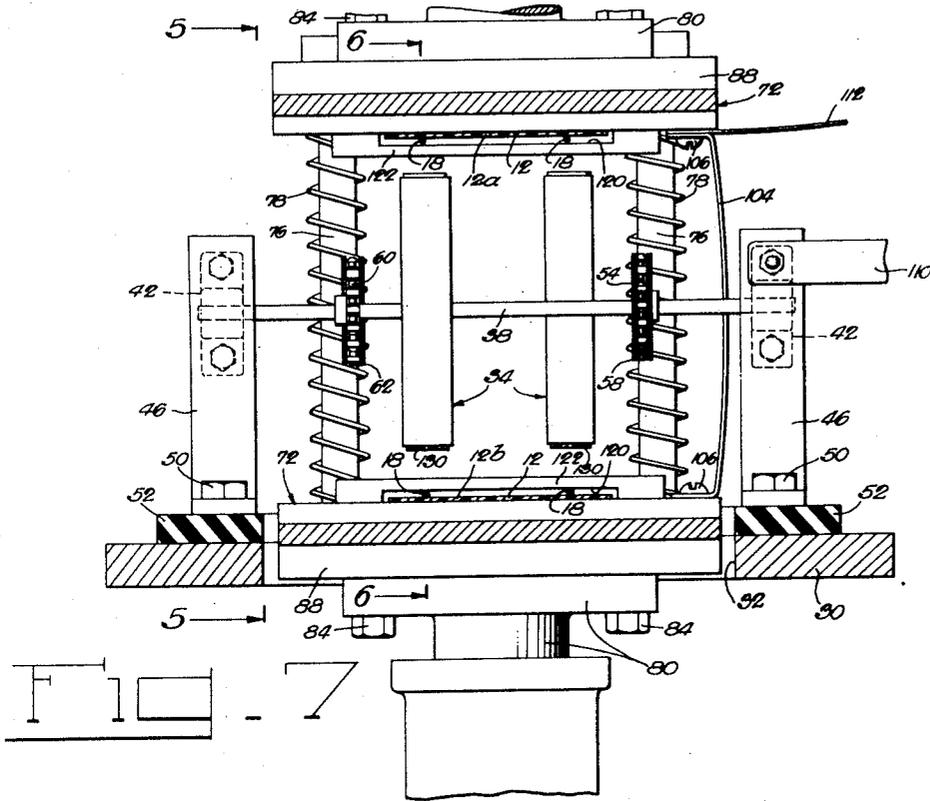
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APPARATUS FOR MAKING LADDERED TAPE FOR VENETIAN BLINDS

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11 Claims. (Cl. 154—1.6)

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This invention relates to a method and apparatus for making laddered slat-supporting tapes or straps for venetian blinds, and especially plastic tapes of the kind shown and described in our co-pending application, S. N. 785,750, filed Nov. 13, 1947.

It is the primary object of the present invention to provide apparatus of simple and rugged construction in which the separate parts of the referred tapes are rapidly assembled and joined.

It is a more specific object of the present invention to provide apparatus of this type into which are directly fed in continuous form the supply materials from which the separate parts of the tapes are made, and in which the fed supply materials are coordinated and joined in such fashion as to form a finished tape of indefinite length from which any desired lengths may be severed as needed for individual blinds.

It is another specific object of the present invention to design the apparatus with a view to render it suitable for full automatic operation, so as to require the services of an operator only for occasional supervision and servicing.

It is another important object of the present invention to devise a method of making the referred tape which lends itself to inexpensive, yet highly efficient, mass production of the tape in the present apparatus.

The above and other objects, features and advantages of the present invention will be fully understood from the following description considered in connection with the accompanying illustrative drawings.

In the drawings:

Fig. 1 perspective illustrates the several disassembled parts of a tape made in the present apparatus;

Fig. 2 is a side elevational view of the assembled tape;

Fig. 3 is a longitudinal section through the tape, as taken on the line 3—3 of Fig. 2;

Fig. 4 is an enlarged cross-section through the tape, as taken on the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary side elevation of apparatus which embodies the present invention and in which the present tape is produced, part of the apparatus being shown in section taken on the line 5—5 of Fig. 7;

Fig. 6 is a longitudinal section through the apparatus, as taken on the line 6—6 of Fig. 7; and

Figs. 7 and 8 are fragmentary cross-sections through the apparatus, taken substantially on the lines 7—7 and 8—8, respectively, of Fig. 6.

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Referring to the drawings, and particularly to Figs. 1 to 4 thereof, the reference numeral 10 designates a tape or strap of the laddered construction commonly used for the support of the slats in Venetian blinds. More particularly, the instant strap 10 is of the same construction as that shown and described in our referred co-pending application, and comprises spaced parallel plastic bands 12, and transverse plastic rungs 14 which at regularly recurrent intervals are fused with their lateral end tabs 16 to the adjacent bands 12, respectively. The bands 12 and rungs 14 are preferably made from any suitable plastic sheet material which is readily flexible and may be of any desired color or colorless. Since the plastic sheet materials used in the tape expand considerably when subjected to heat, and in order to prevent excessive and unequal expansion of the opposite bands 12 of the tape when subjected to different degrees of heat, as when one band nearest a window is exposed to the sun and the opposite band is not so exposed, or when one band nearest a cold window is less subjected to the heat from a room radiator than the opposite band, provisions are made in the instant tape to compel the bands 12 thereof to remain of the same length regardless of varying heat conditions to which they are so frequently subjected when used in Venetian blinds. To this end, the opposite bands 12 of the tape 10 are reinforced by substantially inexpandable threads 18 which are preferably of considerable tensile strength. Nylon threads, for instance, were found to be very satisfactory for this purpose.

As customary in tapes of this kind, the rungs 14 are staggered longitudinally of the bands 12 in the fashion best shown in Fig. 3, thus forming two parallel columns C—1 and C—2 of rungs along the opposite side edges S—1 and S—2, respectively, of the bands 12.

Preferably, there are provided in the tape 10 for maximum security four separate threads 18 which extend along the rung columns C—1 and C—2 and between the bands 12 and rung tabs 16 fused thereto, in the manner shown in Figs. 3 and 4.

Each thread 18 is thus conveniently anchored at regularly recurring intervals to its respective band 12 within the confines of each rung tab 16 which it traverses.

Referring now to Figs. 5 to 8, inclusive, there is shown apparatus in which the above-described tape 10 is produced. The instant apparatus comprises a suitably supported base or bed plate 30, having an aperture 32 in which certain parts to

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be described of the apparatus are vertically movable with clearance from the base plate 30. Carried by the base plate 30 are, in the present instance, two electrodes 34 each of which is mounted on a shaft 38, journaled in suitable bearing brackets 42 which are mounted on standards 46. The standards 46 are, in turn, suitably mounted at 50 on an insulating plate 52 on the base plate 30 so as to be out of electrical contact with the latter. The shafts 38 carry sprockets 54, respectively, over which passes a chain 58 for drivingly connecting said sprockets. One of the shafts 38 carries a second sprocket 60 over which passes a chain 62 that may be driven from any suitable hand or power-operated indexing mechanism (not shown) which during each intermittent operation turns sprocket 60 through one-half revolution in the direction of the arrow 64 in Fig. 5. Inasmuch as the other sprockets 54 are of the same size, the electrodes 34 will each be driven in the same direction through one-half revolution every time sprocket 60 is indexed through one-half revolution.

The standards 46, bearing brackets 42, shafts 38, electrodes 34, sprockets 54 and chain 58, are of any suitable conductive metal, so that these parts are electrically connected with one another, though insulated from the base plate 30 by the plate 52. The indexing sprocket 60 is preferably mounted on an insulating hub 70 so that the former and the chain 62 thereon are effectively insulated from the electrically connected parts above-mentioned.

Adapted to cooperate with the rotary electrodes 34 are top and bottom counter-electrodes 72 which are in the form of plates of any suitable conductive material. The plate electrodes 72 are guided to and from clamping engagement with the rotary electrodes 34 on pilot pins 76 which may be mounted in the lower plate and be slidably received in the upper plate. The plate electrodes 72 are normally urged apart into the open position shown in Figs. 5 and 7 by compression springs 78, and are moved into clamping engagement with the rotary electrodes 34 (Fig. 6) preferably by hydraulically operated rams 80, respectively, on which the plate electrodes may be mounted and suitably insulated therefrom. Preferably, screws 84 in the rams 80 are threadedly received in metallic inserts (not shown) in insulating plates 88, respectively, which are interposed between the rams 80 and adjacent plate electrodes 72, respectively. The insulating plates 88 themselves may, in turn, be secured to the adjacent plate electrodes 72, respectively, by means of screws 92 (Fig. 8) which are threadedly received by insulating inserts 96 in the plate electrodes 72, respectively. The screws 92 are preferably held out of contact with the plate electrodes 72 by passing through insulating bushings 100 in the latter (Fig. 8). Thus, the conductive plate electrodes 72, while being carried by the rams 80, are fully insulated from the latter, and are connected with each other by a conductive strap 104 which may be secured to the metal electrodes 72 as by screws 106.

The rotary electrodes 34 may be connected by means of a conductive strap 110 (Fig. 7) of an A. C. power source (not shown) which is suitable for fusing the contacting portions of the plastic parts of the tape 10 together. The counter-electrodes 72 are connected with the other side of the electric power source by means of a conductive strap 112 (Figs. 7 and 8).

As previously mentioned, the tape 10 may in the present apparatus be formed of indefinite

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length, and suitable lengths may subsequently be cut therefrom as they are needed for individual blinds. Thus, the instant apparatus is highly advantageous, in that it may produce laddered tape of indefinite length which, if not immediately cut into shorter lengths for Venetian blinds, may be wound into a supply roll for convenient storage or shipment in this form. Thus, plastic sheet stock of the cross-sectional dimensions of the bands 12 may be drawn, by suitable feeding mechanism (not shown), from supply rolls, respectively, and fed directly into the apparatus in the direction of the arrows 118 (Figs. 5 and 6) at an intermittent rate at which they are required in the formation of the tape 10. More particularly, the top and bottom supply bands 12a and 12b are passed through guide slots 120 in transverse insulating blocks 122, which are secured at 124 (Fig. 8) to the insulating inserts 96, respectively, in the plate electrodes 72.

The rungs 14 in the columns C—1 and C—2 of the tape 10 are formed from two plastic strips 130, respectively, which may be of indefinite lengths in the form of supply rolls (not shown) from which they may be unwound at the rate at which they are being used in the formation of the tape. As described more in detail hereinafter, the leading ends of the supply strips 130 are led to the rotary electrodes 34, respectively, and there fused to the adjacent supply bands 12, respectively, and also cut from the supply strips 130, to form the separate rungs 14 on the tape 10. The supply strips 130 are temporarily secured with their "anchor" ends 130a on the electrodes 34, respectively, by being impaled on needle elements 132 on the latter in the fashion shown in Fig. 5. More particularly, needle elements 132 are suitably carried in opposite grooves 134 in each of the electrodes 34. Also suitably mounted in each groove 134 of each electrode 34 are knives 136 which straddle the adjacent needle element 132, and cooperate with the adjacent block 122 on the adjacent closed plate electrode 72 in cutting the adjacent supply strip 130 (Fig. 6).

To prepare the instant apparatus for operation, the supply bands 12a and 12b are, as above-mentioned, threaded through the aligned guide slots 120 in the blocks 122 on the upper and lower plate electrodes 72, respectively, in the fashion shown in Figs. 5 and 7. Next, the inexpandable threads 18, of which there are four in the present instance, may be drawn from suitable supply spools (not shown) and passed through the guide slots 120 in the blocks 122 in the manner shown in Figs. 5 and 7, i. e., so that they lie substantially in the median plane of the rotary electrodes 34 (Fig. 7). The supply strips 130 may next be wound with their leading ends about portions of the circumferences of the electrodes 34, respectively, and impaled with their respective anchor ends 130a on the presently topmost needle elements 132 in the fashion shown in Fig. 5.

Assuming now that the electrodes 34 and 72 carry current and that the plate electrodes 72 are closed by the manually or automatically controlled hydraulic rams 80, respectively, those parts of the supply bands 12 and plastic strips 130 which then contact each other between the conductive surfaces of the electrodes 34 and 72 will be fused together, with the interposed portions of the reinforcement threads 18 firmly anchored therebetween at these points along the bands 12. Closure of the plate electrodes 72 also results in cutting performance of the presently foremost knives 136a in the electrodes 34, re-

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spectively, (Fig. 6) to the end that they sever the fused rungs 14 from the supply strips 130 adjacent the bottom electrode 72 and sever the anchor ends 130a from the rungs 14 adjacent the top electrode 72. Further, on closure of the plate electrodes 72, the presently lowermost needle elements 34 in the electrodes 34, respectively, enter the new anchor ends 130b of the supply strips 130 (Fig. 6), and thus anchor the new leading ends of the supply strips 130 to these electrodes. After two spaced rungs 14 are thus formed and fused to the opposite bands 12, as well as severed from the supply strips 130, the plate electrodes 72 are permitted to open, whereupon the previously mentioned indexing mechanism comes into operation and turns the electrodes 34 through one-half revolution, as described, whereby the presently leading, anchored ends of the supply strips 130 are automatically wound around portions of the circumferences of the electrodes 34 and finally assume the same dispositions as the previous leading strip ends in Fig. 5. The supply bands 12a and 12b, as well as the reinforcement threads 18, are also advanced appropriate amounts in the apparatus for the formation and attachment of the next two rungs 14 on the next closure of the plate electrodes 72.

It will thus be seen that the present apparatus is adapted for continuous operation, the supply materials being fed into the apparatus during intermittent openings of the plate electrodes 72, and the rungs 14 being formed and assembled with the bands 12 and reinforcement threads 18 during intermittent closures of the plate electrodes 72.

While we have shown and described the preferred embodiment of our invention, it will be understood that various changes may be made in the present invention without departing from the underlying idea or principles of the invention within the scope of the appended claims.

Having thus described our invention, what we claim and desire to secure by Letters Patent, is:

1. Apparatus for making ladder tape, comprising a first electrode with two opposite surfaces around part of which a plastic-faced flexible strip may be wrapped and extended over and in engagement with said surfaces, respectively, counter electrodes movable to and from pressing engagement with plastic-faced bands, respectively, superposed on the strip portions on said surfaces, respectively, of said first electrode, and pairs of cooperating elements carried by said first electrode and counter electrodes, respectively, and operative on movement of said counter electrodes into pressing engagement with their respective bands for severing said strip between its ends and the nearest portions thereof on said electrode surfaces, respectively, in close proximity to said strip portions.

2. Apparatus for making ladder tape, comprising a first electrode having two opposite surfaces, means on said electrode for releasably holding the leading end of a plastic-faced flexible supply strip in engagement with one of said surfaces so that a leading length of said strip may be wrapped partially around said electrode and extended over and in engagement with the opposite surface, counter electrodes movable to and from pressing engagement with plastic-faced bands, respectively, superposed on the strip portions on said surfaces, respectively, of said first electrode, and elements carried by said first electrode and the counter electrode adjacent said opposite surface of said first electrode, respec-

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tively, and cooperating on movement of the last mentioned counter electrode into pressing engagement with its respective band for severing said leading strip length from the supply strip.

3. Apparatus for making ladder tape, comprising a rotary electrode having two opposite surfaces on opposite sides, respectively, of its rotary axis, means on said electrode for releasably anchoring the leading end of a plastic-faced flexible supply strip to either one of said surfaces so that a leading length of said strip may be wrapped partially around said electrode and extended over and in engagement with the opposite surface on turning said electrode through a partial revolution, and counter electrodes movable to and from pressing engagement with plastic-faced bands, respectively, superposed on the strip portions on said electrode surfaces, respectively.

4. Apparatus for making ladder tape, comprising a rotary electrode having two opposite surfaces on opposite sides, respectively, of its rotary axis, means on said electrode for releasably anchoring the leading end of plastic-faced flexible supply strip to either one of said surfaces so that a leading length of said strip may be wrapped partially around said electrode and extended over and in engagement with the opposite surface on turning said electrode through a partial revolution, counter electrodes movable to and from pressing engagement with plastic-faced bands, respectively, superposed on the strip portions on said electrode surfaces, respectively, and elements carried by said first electrode and the counter electrode adjacent said opposite surface of said first electrode, respectively, and cooperating on movement of the last mentioned counter electrode into pressing engagement with its respective band for severing said leading strip length from the supply strip.

5. Apparatus for making ladder tape, comprising opposite counter electrodes, another electrode between said counter electrodes having at its opposite ends two spaced pairs of diagonally opposite contact surfaces and being turnable into either of two normal positions 180 degrees apart in which the opposite sets of contact surfaces adjacent the opposite sides, respectively, of said other electrode are in operative alignment with said counter electrodes, and means on said other electrode between the spaced contact surfaces at each end thereof for releasably anchoring thereto the leading end of a plastic-faced flexible supply strip, said counter electrodes being movable toward and away from the aligned contact surfaces, respectively, of either set on said other electrode.

6. Apparatus as set forth in claim 5, in which said other electrode is notched between the contact surfaces at each end thereof, and said anchoring means comprises a needle element in each of said notches on which said strip may be impaled.

7. Apparatus for making ladder tape, comprising opposite counter electrodes, another electrode between said counter electrodes having at its opposite ends two spaced pairs of diagonally opposite contact surfaces and being turnable into either of two normal positions 180 degrees apart in which the opposite sets of contact surfaces adjacent the opposite sides, respectively, of said other electrode are in operative alignment with said counter electrodes, the latter being movable toward and away from the aligned contact surfaces, respectively, of either set on said

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other electrode, and pairs of cooperating elements on said other electrode between the spaced contact surfaces at each end thereof and the adjacent counter electrodes, respectively, for releasably anchoring to the element on either end of said other electrode a plastic-faced flexible supply strip interposed between said element and the adjacent counter electrode, on movement of the latter electrode toward the aligned contact surface of said other electrode.

8. Apparatus as set forth in claim 7, in which said other electrode is notched between the contact surfaces at each end thereof, and each pair of cooperating elements comprises a needle element in one of said notches and an insulating bar on the adjacent counter electrode forcing an interposed strip into said one notch and impale it on the needle element therein on movement of said adjacent counter electrode toward the aligned contact surface of said other electrode.

9. Apparatus as set forth in claim 7, in which said other electrode is notches between the contact surfaces at each end thereof, and each pair of cooperating elements comprises a needle element in one of said notches and an insulating bar on the adjacent counter electrode forcing an interposed strip into said one notch and impale it on the needle element therein on movement of said adjacent counter electrode toward the aligned contact surface of said other electrode, and each insulating bar being recessed adjacent its respective counter electrode to form with the latter a guide passage for a plastic-faced band to lead it between said counter electrode and other electrode.

10. Apparatus for making laddered tape, comprising opposite counter electrodes, another electrode between said counter electrodes having at its opposite ends two spaced pairs of diagonally opposite contact surfaces and being turnable into either of two normal positions 180 degrees apart in which the opposite sets of contact surfaces adjacent the opposite sides, respectively, of said other electrode are in operative alignment with said counter electrodes, separate means on said other electrode between the spaced contact surfaces at each end thereof for releasably anchoring to either of said means the leading end of a plastic-faced flexible supply strip so as to wind

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a leading length of the anchored strip partly around said other electrode and extend it over the contact surfaces of one set thereof on turning said other electrode in a certain direction into one of said normal positions in which said one set of contact surfaces is in operative alignment with said counter electrodes, said counter electrodes being movable to and from pressing engagement with plastic-faced bands, respectively, superposed on the strip portions on the aligned contact surfaces, respectively, of said other electrode, and means operative on movement of said counter electrodes into pressing engagement with their respective bands for severing said leading strip end from said leading strip length and the latter from said supply strip.

11. Apparatus as set forth in claim 10, in which said other electrode is notched between the contact surfaces at each end thereof and said anchoring means are located in said notches, respectively, and said severing means comprises spaced knives in each notch straddling the anchoring means therein, and an insulating bar on each counter electrode entering the adjacent notch in said other electrode and forcing the interposed strip material against the knife therein nearest the adjacent counter electrode, when the latter is moved into pressing engagement with its respective band, and each insulating bar being recessed against its respective counter electrode to form with the latter a guide passage for the adjacent band to lead it between the latter electrode and said other electrode.

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