March 7, 1944. E. L. MALHIOT 2,343,466

ARTICLE FORMING APPARATUS

Filed May 1, 1942 4 Sheets-Sheet 1

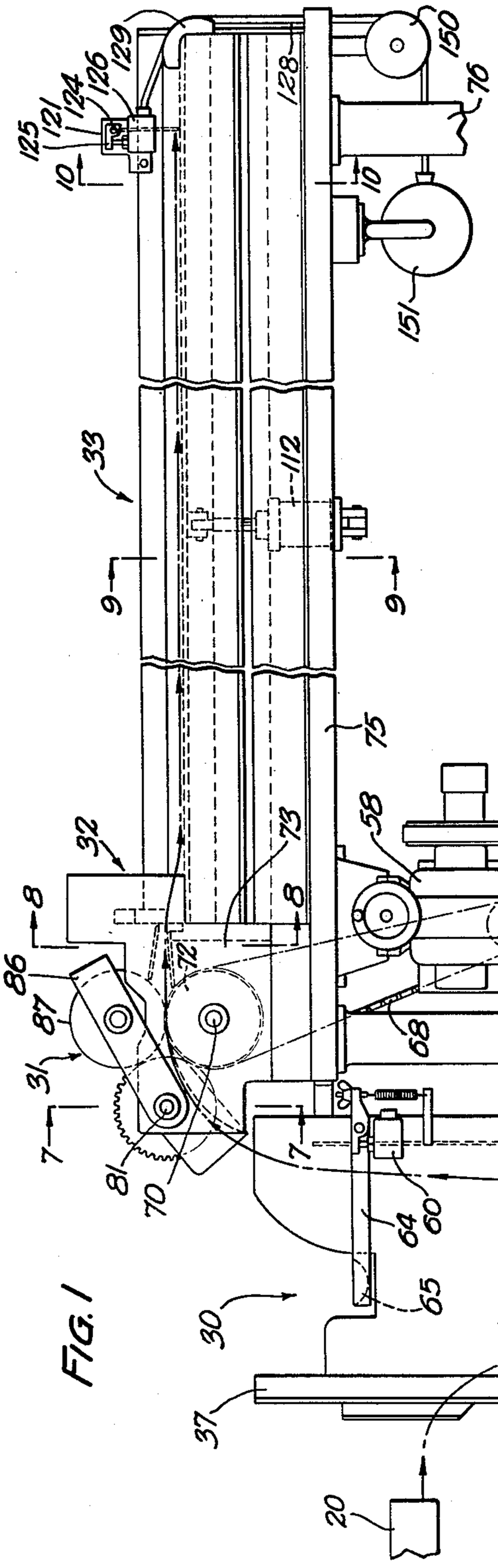

FIG. 1

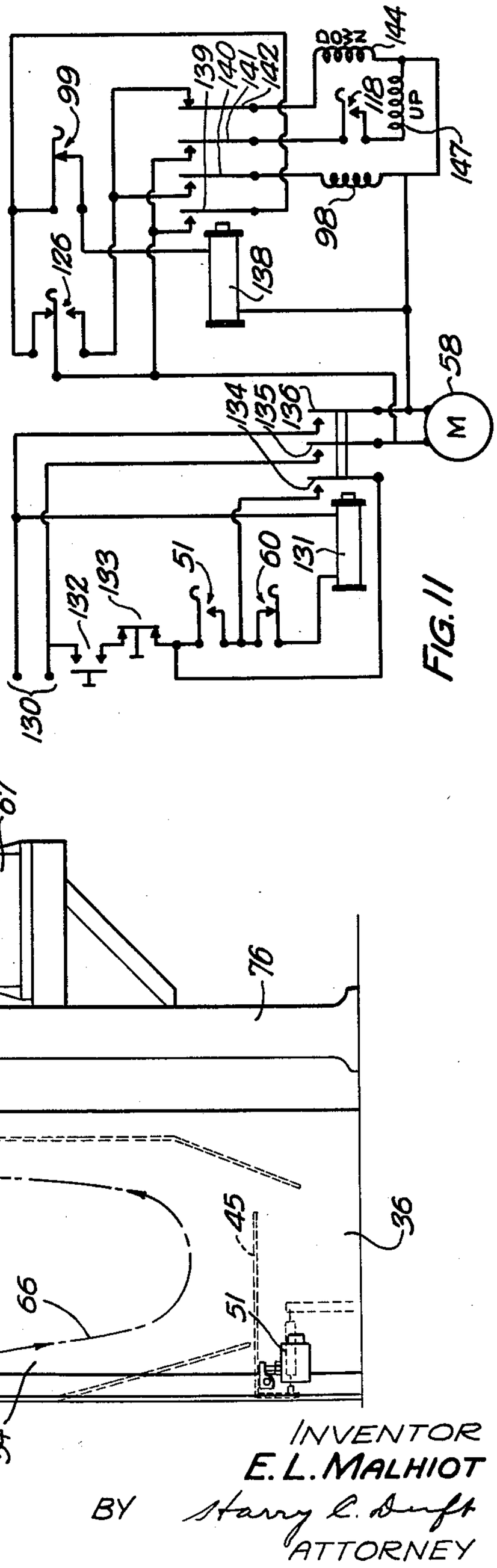

FIG. 11

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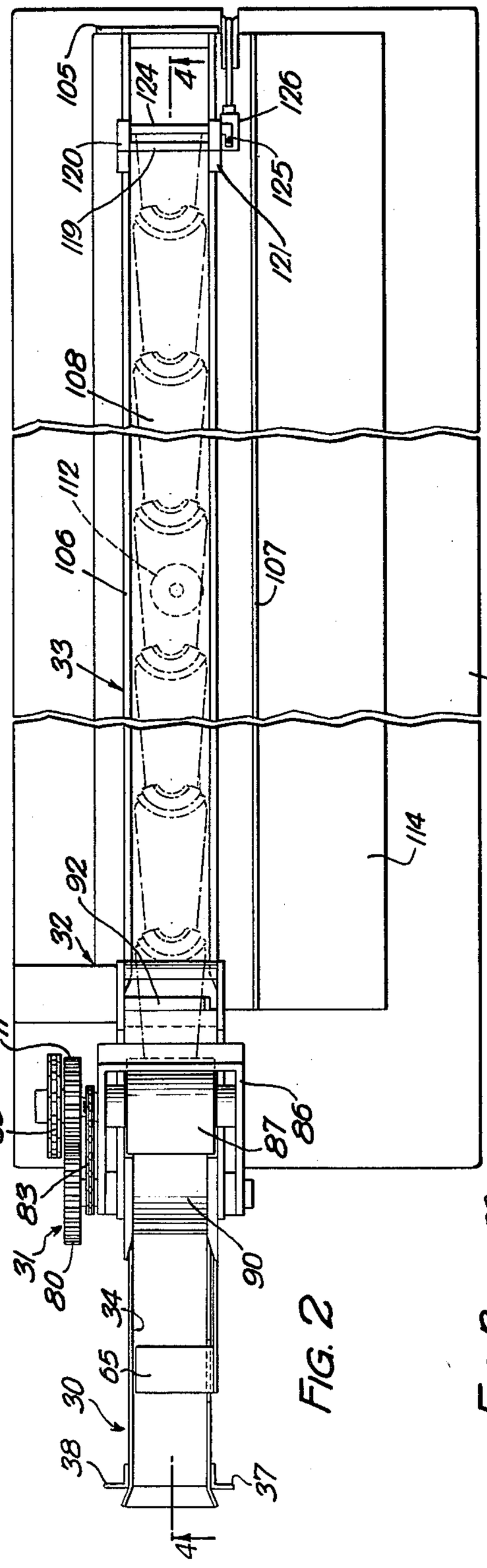

FIG. 2

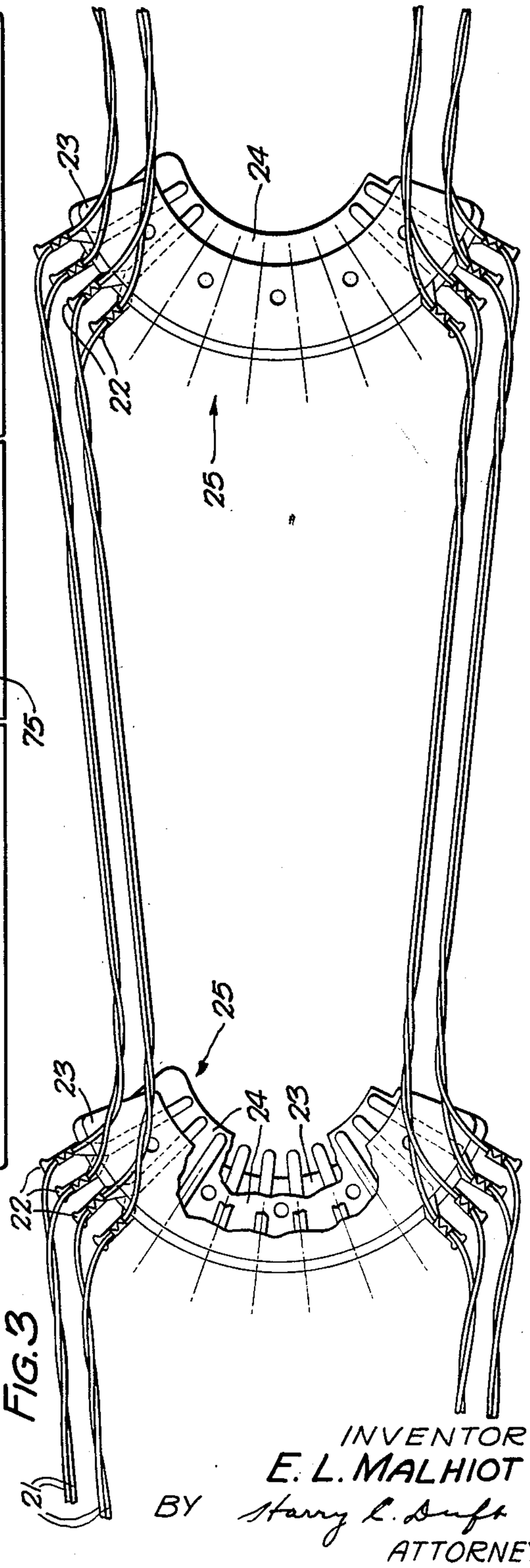

FIG. 3

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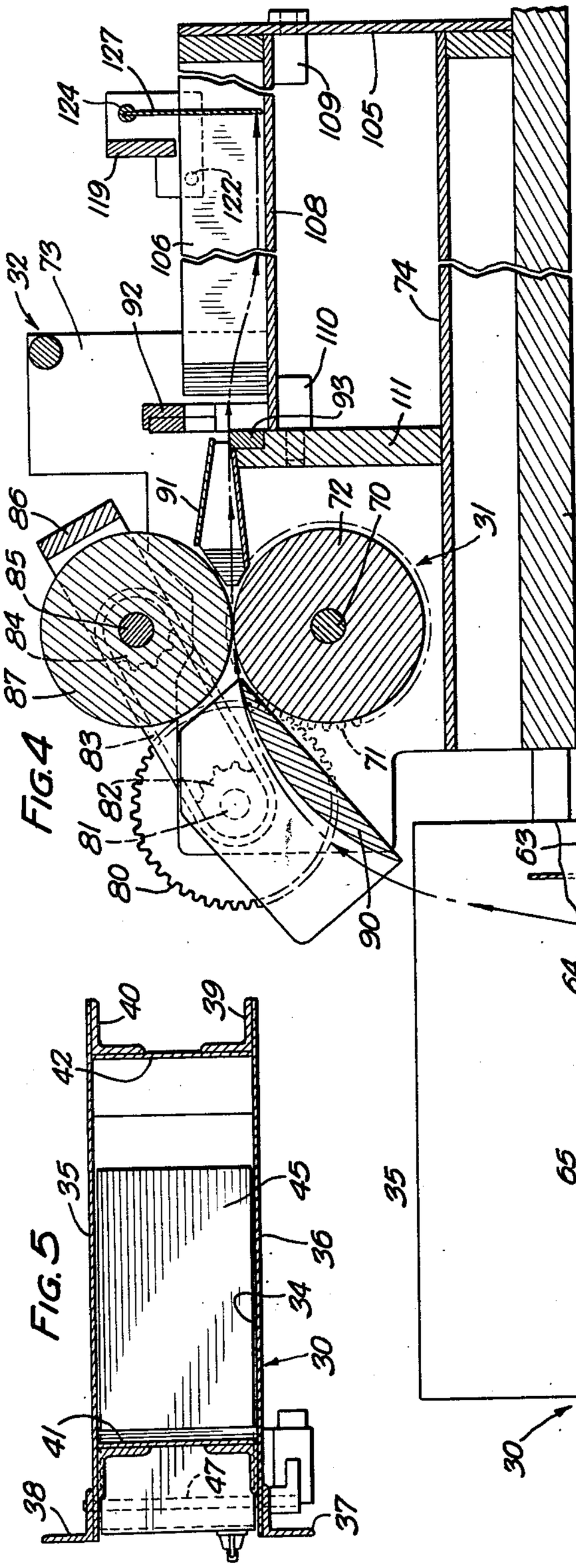

FIG. 4

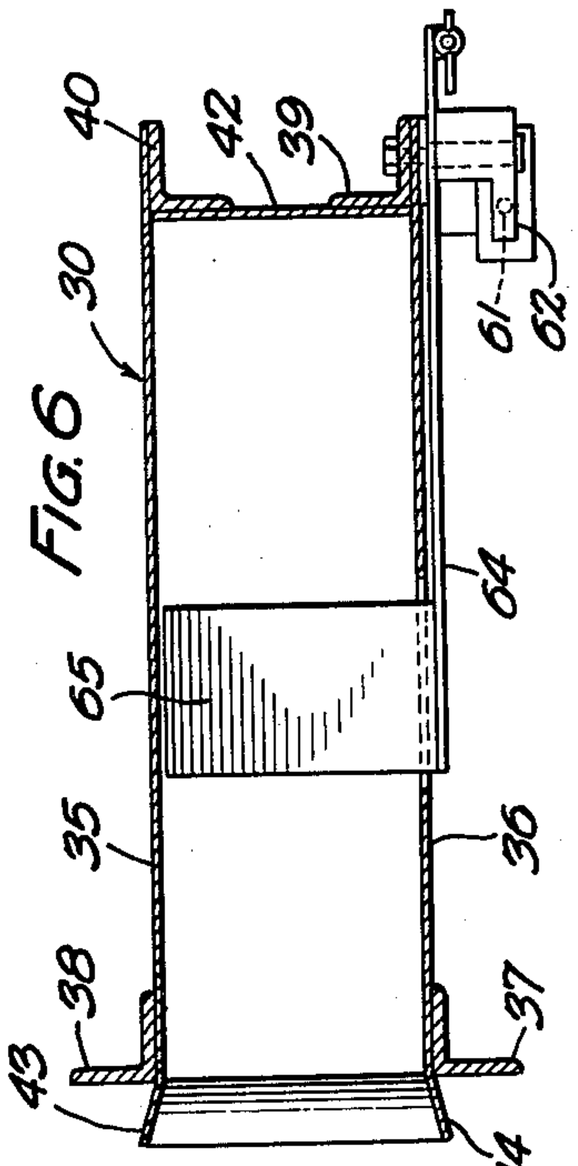

FIG. 6

FIG. 5

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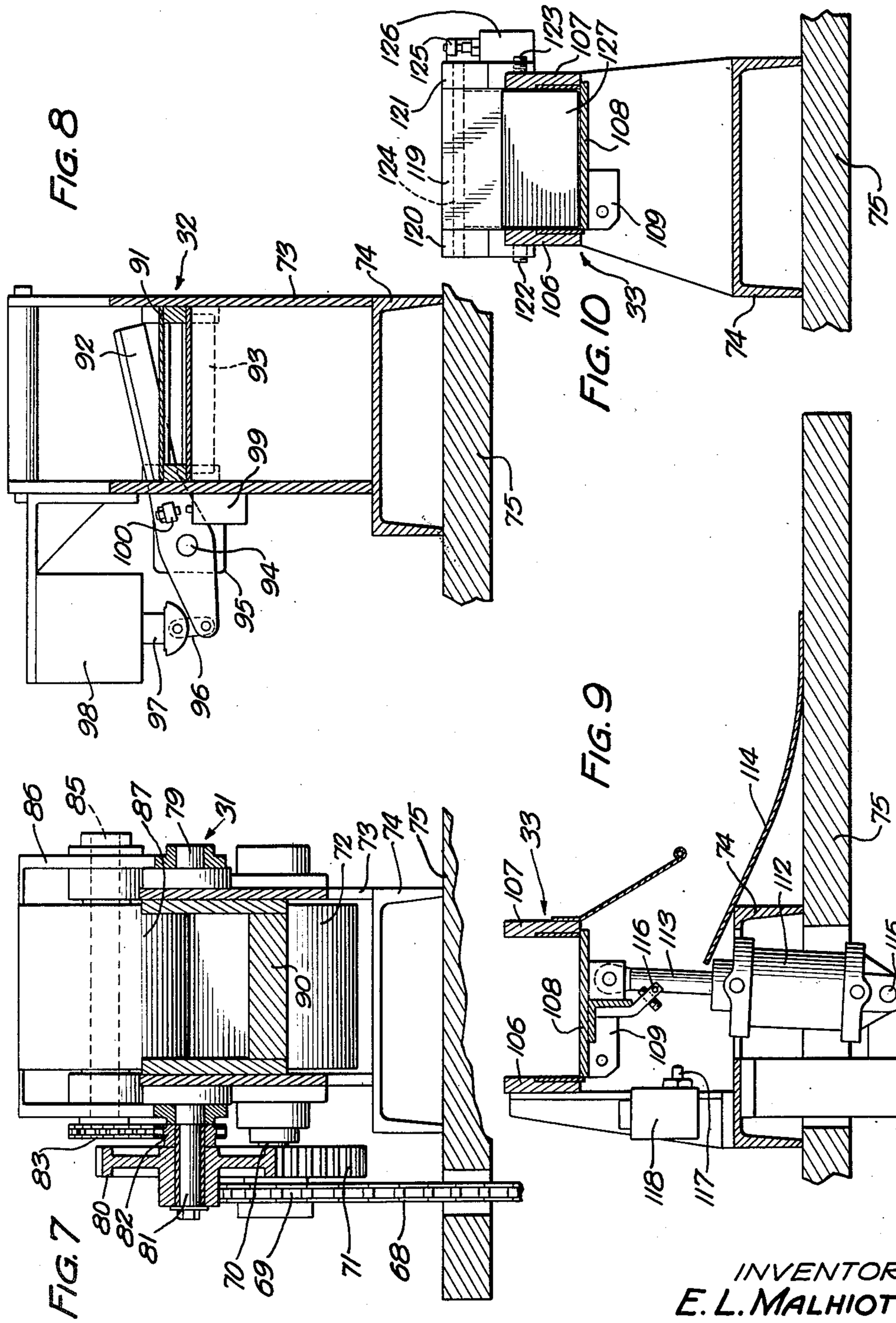

FIG. 7

FIG. 8

FIG. 10

FIG. 9

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UNITED STATES PATENT OFFICE

2,343,466

ARTICLE FORMING APPARATUS

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Application May 1, 1942, Serial No. 441,409

8 Claims. (Cl. 140—141)

This invention relates to an article forming apparatus and more particularly to an apparatus for receiving a series of interconnected articles from a machine which interconnects them continuously and cutting the interconnecting means to provide a selected length of interconnected articles.

In the manufacture of some types of telephone apparatus, it is the practice to connect a number of terminals of pieces of apparatus in multiple, that is, similar terminals, on adjacent switches, may all be wired together throughout a line of said switches. In the telephone equipment known as "step by step automatic exchange" equipment, banks of switching devices are mounted adjacent one to another and the switches are each provided with a series of selectable contacts which, in the operation of the switch, may be connected to other pieces of apparatus in the telephone exchange. The practice heretofore has been to mount all of these switches on their framework and then to wire the terminal ends of the switch connectors to other apparatus or in multiple, where the switches are designed for such use. This operation was performed by stripping the insulation from wires at predetermined spaced intervals and manually soldering the stripped portion of the wire to the terminals of the switches. It has been proposed to form these connections in a suitable manner prior to assembling the contacts in their respective banks and, in effecting such method, the contacts mounted on insulators are fed to a machine which has a constant supply of strands of wire fed to it and the machine connects the continuous lengths of wires to the terminals of the contacts. These continuous lengths of wires with the terminals connected to them must then be cut to provide a group of interconnected switch assemblies.

It is an object of the present invention to provide a simple and efficient, automatic apparatus for forming articles from a continuous length of material.

In accordance with one embodiment of the invention, an apparatus is provided for use in connection wth a machine for continuously attaching the terminals fixed on insulators in spaced relation along continuously fed wires, which apparatus will cut the wires having the terminals attached thereto in predetermined lengths, thereby to provide a selected number of interconnected banks of terminals. The apparatus includes a motor driven feeding device, which is controlled by the string of interconnected articles being fed to it by the article attaching means and which automatically feeds the interconnected articles on to a tiltable table. The apparatus is so connected that the feeding means for the interconnected articles is started in operation upon the receipt, by the apparatus, of a predetermined length of the strands or wires having the articles connected to them and the operation of the feeding portion of the apparatus is interrupted when the feeding portion of the apparatus tends to draw the strands from the associated machine faster than the machine can supply them. The tiltable table is automatically tilted and returned to its normal position under control of the length of interconnected articles being fed, reaching a predetermined length, due to the engagement, by the forward end of a group of interconnected articles, with a switch controlling mechanism. The switch operable under control of the controlling mechanism initiates the tilting operation by first energizing a cut-off knife which cuts a predetermined length of articles from the supply thereof and, when the cut-off mechanism operates to completely sever the length of interconnected articles from the supply, it closes a switch which controls the tilting table so that the cut-off length of interconnected articles will be tilted out onto a receiving table. The tilting table, upon reaching its tilted position, closes a switch, which restores the control circuits to normal position and initiates the return of the tilting table to normal position.

A better understanding of the invention may be had by reference to the following detailed description when considered in conjunction with the accompanying drawings, wherein

Fig. 1 is a side elevational view on a relatively small scale of apparatus embodying the present invention;

Fig. 2 is a plan view, on the same scale as Fig. 1, showing the apparatus shown in Fig. 1;

Fig. 3 is a view of a short length of the string of interconnected articles which are fed to the apparatus and sheared to predetermined lengths therein;

Fig. 4 is an enlarged longitudinal sectional view taken substantially along the line 4—4 of Fig. 2 in the direction of the arrows, parts being broken away to more clearly illustrate the various features of the invention;

Fig. 5 is a plan sectional view taken along the line 5—5 of Fig. 4 in the direction of the arrows showing one of the control devices for controlling the feeding of the interconnected articles to the cut-off device and tilting table;

Fig. 6 is a plan sectional view taken substantially along the line 6—6 of Fig. 4 in the direction of the arrows showing a second one of the control devices for controlling the feeding of the interconnected articles to the cut-off mechanism and tiltable table;

Figs. 7, 8, 9 and 10 are transverse vertical sectional views on a relatively large scale, taken along the lines 7—7, 8—8, 9—9 and 10—10 of Fig. 1 in the direction of the arrows showing the feed roll drive mechanism, the knife which cuts the wires, the table tilting mechanism, and the switch controlled by the fed material; and

Fig. 11 is a circuit diagram showing the various switches which control operation of the apparatus.

Referring to the drawings, wherein like reference characters designate the same parts throughout the several views, particular reference being had at this time to Fig. 1, a processing machine is shown, designated generally by the numeral 20, and represented only diagrammatically, for feeding continuous lengths of wire having terminal assemblies attached to them to the apparatus comprising the preferred embodiment of the present invention. The strands of wire with the terminal assemblies attached to them are illustrated in Fig. 3, wherein wires 21—21 are shown attached to terminals 22—22. The terminals 22 are interconnected with the wires by solderless connections, a prong or prongs (not shown) being formed on each terminal and being forced through the insulation on the wires to engage the conductor covered by the insulation. In other apparatus (not shown herein and not pertinent to the present invention), the terminals 22—22 are suitably fixed to insulators 23—23 and two of the insulators 23 are placed, one on each side of a spacing insulator 24. The machine 20 receives the insulators 23 with the terminals 22 attached to them and with the spacing insulator 24 between them, and fixes the wires 21 to the terminals at predetermined spaced points along the wires, as clearly shown in Fig. 3. The wires are fed in a continuous length to the machine 20 by mechanism (not shown) and the machine 20 delivers the lengths of conductor with the terminal assemblies designated generally by the numeral 25 and comprising the hereinbefore described terminals 22 and insulators 23 and 24 to a machine embodying the present invention.

The machine of the present invention comprises a receiving portion, designated generally by the numeral 30, a feeding portion, designated generally by the numeral 31, a cut-off mechanism, designated generally by the numeral 32, and a table section, designated generally by the numeral 33. The receiving portion of the apparatus comprises, as most clearly shown in Figs. 1, 2, 4, 5 and 6, a receiving compartment 34, comprised of side walls 35 and 36 having supporting angle members 37, 38, 39 and 40 at their front and rear ends for suitably supporting them. In addition, the receiving compartment 34 has front and rear walls 41 and 42 which are interposed between the side walls 35 and 36 and serve to space them one from the other and also serve to guide the lengths of wires 21 with the terminal assemblies 25 fixed to them in their passage through the receiving compartment. Portions of the side walls 35 and 36 are flared, as shown at 43 and 44 (Fig. 6) for guiding the material as it is fed from the machine 20 into the receiving portion 30 of the present apparatus. Positioned adjacent the bottom of the compartment 34 is a plate 45 fixed to a pivot bracket 46, which is, in turn, attached to a shaft 47 extending between and journaled in the angle members 37 and 38.

Mounted on the front face of the side wall 36 (Fig. 4) is a "Microswitch" 51, having an actuating plunger 52 extending in the path of an actuating lever 53, which is, in turn, fixed to the shaft 47. The pivot bracket 46 has a lever 54 fixed to it for receiving a threaded pin 55, on which a thumb nut 56 is threaded. The pin 55 is attached to a spring 57 and normally tends to rock the pivot bracket 46 in a counter-clockwise direction to hold the actuating lever 53 out of engagement with the plunger 52. However, when a series of interconnected terminal members 25, connected by the wires 21, are fed into the receiving compartment 34, a loop will be formed in the interconnected string of terminal assemblies and will bear against the plate 45, thereby to rock the shaft 47 clockwise (Fig. 4) against the action of the spring 57. As the shaft 47 rocks clockwise, it will carry the actuating lever 53 with it and depress the switch actuating plunger 52. The switch 51 initiates a cycle of operation of a motor 58 and, when the switch 51 is closed upon depression of the plate 45, current will be supplied to the motor 58 to drive it.

A second switch 60 is also mounted on the face of the side wall 36 and carries its switch actuating plunger 61 in the path of a lever 62. The lever 62 is rotatable about a stud shaft 63 and is balanced by a spring 59 so that the weight of lever 62, a lever 64, to which lever 62 is connected, and a control arm 65, carried by the lever 64, will just maintain the plunger 61 in position to hold the switch 60 closed without exerting undue pressure on the plunger 61. This arrangement is provided so that the string of interconnected articles, as indicated by the dot and dash lines 66, when drawn upwardly, will, upon applying a light pressure to the control arm 65, effect the opening of the switch 60. The switch 60, together with the switch 51, serves to control the motor circuit for feeding the articles and, when the switch 60 is operated momentarily, the driving motor's actuating circuit will be interrupted and will not be closed until the switch 51 is again actuated, all as will be described more in detail in connection with the description of the operation of the apparatus and its associated control circuit.

The motor 58 is interconnected, by means of a suitable gear reducer 67, to drive a chain 68 (Figs. 1 and 7), which drives a sprocket wheel 69 mounted upon a shaft 70. The shaft 70 has fixed thereto, in addition to the sprocket 69, a gear 71 and a drive roller 72 (Figs. 1, 4 and 7) made of relatively soft rubber or other suitably resilient material. The shaft 70 is mounted in a framework 73 extending upwardly from a channel member 74, which extends the length of a main base plate 75, underneath which the motor 58 and gear reducer 67 are mounted, the main base member 75 being supported on suitable standards 76—76 (Fig. 1). Gear 71 meshes with and drives a gear 80, which is rotatable on a stud shaft 81. The gear 80 has fixed to it a sprocket 82 for driving a chain 83, which extends upwardly and around a sprocket 84 fixed to a shaft 85. The shaft 85 is journalled in a U-shaped rocker assembly 86 and carries a feed roller 87, which cooperates with the drive roller 72, both of the rollers being driven. The rocker

assembly 86 is pivoted on the shaft 81 and a stud shaft 79 so that the rocker assembly may be rocked about the shafts 81 and 79 to facilitate loading the string of interconnected articles into the feeding mechanism for feeding thereby.

Extending between side walls of the framework 73 is a guide member 90, which serves to guide articles to the rollers 72 and 87. At the right side of the rollers 72 and 87 (Fig. 4), there is provided a guiding tube 91 for guiding the string of interconnected articles from the rollers to the cut-off mechanism 32. The cut-off mechanism 32, as most clearly shown in Figs. 4 and 8, comprises a movable knife blade 92 and a fixed blade 93. The movable knife blade 92 is pivotally mounted on a stud shaft 94, which is mounted in a bracket 95 connected to the rear of framework 73. The left end (Fig. 8) of the movable knife blade 92 is interconnected, by means of a link 96, to the movable member 97 of a solenoid 98, which is also mounted on the framework 73. When the solenoid 98 is energized, the movable member 97 will be moved upwardly (Fig. 8) and will cause the movable knife blade, in cooperation with the fixed blade 93, to cut a length of interconnected articles from the string thereof being fed to the apparatus by the rollers 72 and 87. Mounted adjacent the movable knife blade 92, on the framework 73, is a switch 99 adapted to be actuated by a switch actuating member 100 fixed on the movable knife blade 92, after the knife blade has sheared a section of connected articles from the string thereof being fed to the apparatus.

As the string of interconnected articles, as indicated by the dotted line 56, is fed in the direction of the arrows (Figs. 1 and 4) by the rollers 72 and 87, the string of interconnected articles will pass the cut-off mechanism 32 and will be directed to the table section 33, which is most clearly shown in Figs. 1, 2 4, 9 and 10. The table section of the apparatus comprises an end member 105 fixed to the channel member 74 and extending upwardly from the main base member 75. Extending between the end member 105 and the framework 73 are a pair of table side walls 106 and 107, which are supported by the framework 73 and end member 105. Cooperating with the side walls 106 and 107, to form a channel for receiving a series or string of interconnected members, is a tiltable table 108. The table 108 is provided with hinge brackets 109 and 110 (Fig. 9) that are pivoted on the end member 105 and a blade supporting plate 111, respectively, to hinge the tiltable table for movement from the position shown in Fig. 9 under control of a cylinder 112. When a fluid under pressure is admitted to the upper end of the cylinder 112, a piston 113 will be moved downwardly into the cylinder and will tilt the tiltable table 108 from the position shown to a position where anything supported by the table will be slid from the table on to an apron 114, the cylinder 112 being pivotally mounted at 115. Connected to the underside of the tiltable table 108 is a switch controlling bracket 116, which, when the table is tilted, will engage the plunger 117 of switch 118. The apron 114 is inclined so that a string of articles which have been disconnected from the supply thereof will slide off of the apron onto the main base member 75.

Adjustably mounted on the side walls 106 and 107 is a knife controlling switch mechanism comprised of bridge member 119, which extends across the top of the two side walls 106 and 107, and a pair of brackets 120 and 121 fixed to the opposite sides of the bridge member. The brackets 120 and 121 are equipped with set screws 122 and 123, respectively, which may be engaged with the side walls 106 and 107 to position the assembly at any desired place along the length of the side walls. Pivoted in the brackets 120 and 121 is a shaft 124, which carries a lever 125 for closing a switch 126. The shaft 124 has set into it a vane 127, which may be actuated by the extending end of a string of interconnected articles and when so actuated, will rock the shaft 124 to close the switch 126. As most clearly shown in Fig. 1, switch 126 is interconnected with other parts of the control circuit by a flexible cable 128, which extends over a guide 129 and roller 150 to a take-up drum 151 so that the cable will remain taut when the vane 127 is placed anywhere along the table 108.

A better understanding of the invention may be had from the following brief description of the circuit connections between the various switches and other portions of the electrical apparatus to be described in connection with the mode of operation of the apparatus.

The apparatus is supplied with power from a current source 130 (Fig. 11), upon energization of a relay 131. Suitably located on the frame of the apparatus are a start switch 132 and a stop switch 133. The stop switch 133 is normally closed and the start switch 132 is normally opened. Upon closure of the start switch 132, the apparatus will be conditioned for operation and as the string of connected articles, as indicated by the dot and dash lines 66, is fed from the processing machine 20, a loop of interconnected articles will be formed in the receiving compartment 34 and will extend downwardly until the loop contacts the plate 45, thereby to close switch 51 momentarily. It should be noted at this time that the motor 58 for driving the apparatus disclosed herein is arranged to feed the string of interconnected articles at a slightly faster rate of speed than they will be fed through and out of the processing machine 20 so that when the switch 51 is closed momentarily, it will initiate operation of the motor 58 and the motor 58 will continue to run until it has taken up the slack in the string of interconnected articles and brought them into engagement with the control arm 65.

Again referring to Fig. 11, closure of the switch 51 will extend the circuit through start switch 132 and stop switch 133 to normally closed switch 60 operable under control of control arm 65. Since switch 60 is at this time closed, the circuit will extend through it to one side of the winding of the relay 131, the other side of which is connected to the opposite line extending to the current source 130. Thus, relay 131 will be momentarily energized upon the momentary closure of switch 51. Relay 131 is provided with three contact closing armatures 134, 135 and 136. The armature 134 is connected to a point between the switch 51 and stop switch 133 so that, upon energization of the relay 131, it will lock energized through armature 134 and switch 60 to continue to supply operating current to the motor 58 through armatures 135 and 136 until switch 60 is opened. The lines leading from the armatures 135 and 136 to the motor are connected to the table tilting and knife operating portions of the circuit so that all the time that current is being supplied to the motor 58, this portion of the circuit will have power connected to it.

After the brackets 120 and 121, which support

the vane 127 and switch 126, have been set in the proper position to determine the length of interconnected articles to be severed from the string thereof fed from the machine 20 and the starting switch 132 of the apparatus has been closed, the motor 56, through the rollers 72 and 87, will feed the string of interconnected articles onto the tiltable table 108 until the right end (Figs. 1, 2 and 4) of the string of interconnected articles engages the vane 127, thereby to shift the switch 126 from the position shown in Fig. 11 to open its normally closed contact and close its normally open contact. In the condition shown in Fig. 11, a relay 138, having contact closing armatures 139, 140, 141 and 142, is held energized in the circuit from armature 135, through normally closed contact of switch 126, normally closed switch 99, the winding of the relay, and back to armature 136. When switch 126 shifts from the position shown, relay 138 will be held energized over the circuit from the armature 135, through its holding armature 139, and switch 99. Also, when switch 126 shifts from the position shown due to the actuation of vane 127, current, through armature 135, will be supplied through switch 126, normally open contact and armature 140 to the solenoid 98, thereby to actuate the movable knife blade 92. As the knife blade 92 completes its cutting operation, the switch actuating member 100 thereon will open switch 99 to break the holding path to the relay 138. As the relay 138 is de-energized, its normally closed contact will engage armature 142 and current will be supplied through closed armature 135, operated switch 126, armature 142, to a solenoid 144 connected to a suitable valve system (not shown) for furnishing fluid under pressure to the upper end of the cylinder 112. The cylinder 112 will thus draw the piston 113 downwardly to cause the table 108 to tilt, thereby discharging the cutoff length of interconnected articles from the table onto the apron 114. As soon as the table 108 has tilted all the way down, it will, through its switch controlling bracket 116, close switch 118. Switch 118 will remain closed for a very short interval and, since the cutoff length of string of interconnected articles has been discharged from the table 108, switch 126 will return to normal and re-energize relay 138 through normally closed contacts of switches 126 and 99. As soon as relay 138 is re-energized, a circuit will be completed from closed armature 135, through armature 141, closed switch 118, to a solenoid 145 for supplying fluid under pressure to the lower end of the cylinder 112, thereby to return the tilting table to its normal position, thus restoring the apparatus to normal. As soon as a new length of interconnected articles has been fed out on to the tilting table 108, the switch 126 will again be closed and re-initiate the cutting operation and table tilting operation to automatically feed predetermined lengths of interconnected articles out onto the main base member 75 as fast as the processing machine completes its operations.

What is claimed is:

1. An apparatus for receiving a continuous length of interconnected articles fed thereto at a predetermined constant rate of speed and cutting it to predetermined lengths comprising means for feeding the continuous length, control means operable by said continuous length for controlling said feeding means, a table for receiving said continuous length from the feeding means, means intermediate the table and feeding means for severing a length of said interconnected articles from said continuous length, and means for tilting the table to discharge said severed length therefrom, said control means including a switch operable by the length of interconnected articles when a surplus length of interconnected articles has been fed to the apparatus to interrupt operation of the feeding means, and a switch operable by the length of interconnected articles when the amount of material fed to the feeding means has been decreased by the feeding means taking up the material faster than it is supplied to the feeding means to initiate operation of the feeding means.

2. An apparatus for forming assemblies of wired together articles comprising means for receiving continuous lengths of wires having articles attached at intervals therealong and means for cutting predetermined lengths from said continuous lengths comprising a table for receiving said predetermined length, a switch adjustably positioned with respect to said table and engageable by the end of a length of said wires fed onto the table and means controlled by said switch for cutting said wires, means controlled by said cutting means for tilting said table to discharge the predetermined lengths of wires from the table, and means controlled by said tilting means for restoring said table to untilted position.

3. An apparatus for receiving a continuous length of wired assemblies and cutting it to predetermined lengths comprising feeding means, a table for receiving said continuous length from the feeding means, a switch positioned for actuation by said length on the table, a cut-off mechanism controlled by said switch for cutting the length on the table from the continuous length, and means controlled by said cut-off mechanism for tilting said table to discharge the cut-off length from the table and automatically restore the table to untilted position.

4. The combination with a processing machine for delivering a length of material of a cut-off mechanism including feed means driven to feed said length of material at a speed faster than it is received from the processing machine, a switch operable under control of the material for initiating operation of the feeding means, means for maintaining said feeding means in operation, a second switch operable by said material for interrupting operation of said feeding means, and means for cutting said material to predetermined lengths maintained operable by said means for maintaining the feeding mechanism operable.

5. In a cut to length apparatus, means for feeding a continuous length of material to said apparatus, a switch actuatable by said length of material, a table for receiving said length of material, means for tilting said table to discharge a length of said material therefrom, a cut-off mechanism operable under control of said switch for cutting the length of material from said continuous length and for controlling the tilting means, and means operable by the table when it is tilted for restoring the table to untilted position.

6. In an apparatus for cutting predetermined lengths of material from a continuous length thereof comprising feeding means for feeding said continuous length of material, a tiltable table for receiving a predetermined length of said material, a cut-off mechanism operable upon the receipt by the table of a predetermined length of said

material to cut said predetermined length from the continuous length, means operable when said cut-off mechanism completes its cutting-off operation to tilt said table, and means controlled by the table for restoring the table to untilted position.

7. In a cut-off mechanism for cutting predetermined lengths of material from a continuous length thereof, a table for receiving a predetermined length of material, a cut-off mechanism for cutting said predetermined length of material from a continuous length thereof, means for tilting said table to discharge said predetermined length of material therefrom, and a control circuit for the cut-off mechanism and table tilting mechanism comprising a switch actuated upon receipt by the table of a predetermined length of material for initiating operation of said cut-off mechanism, a switch controlled by said cut-off mechanism for initiating the tilting of the table, and a switch controlled by the table for initiating restoration of the table to untilted position.

8. In a cut-off mechanism for cutting predetermined lengths of material from a continuous length thereof, a table for receiving a predetermined length of material, cooperating knife blades for cutting said predetermined length of material from a continuous length thereof, means for tilting said table to discharge said predetermined length of material therefrom, and a control circuit for the knife blades and table tilting mechanism comprising a switch actuated upon receipt by the table of a predetermined length of material for initiating operation of said knife blades, a switch controlled by one of said knife blades for initiating the tilting of the table, and a switch controlled by the table for initiating restoration of the table to untilted position.

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