

**May 17, 1966**

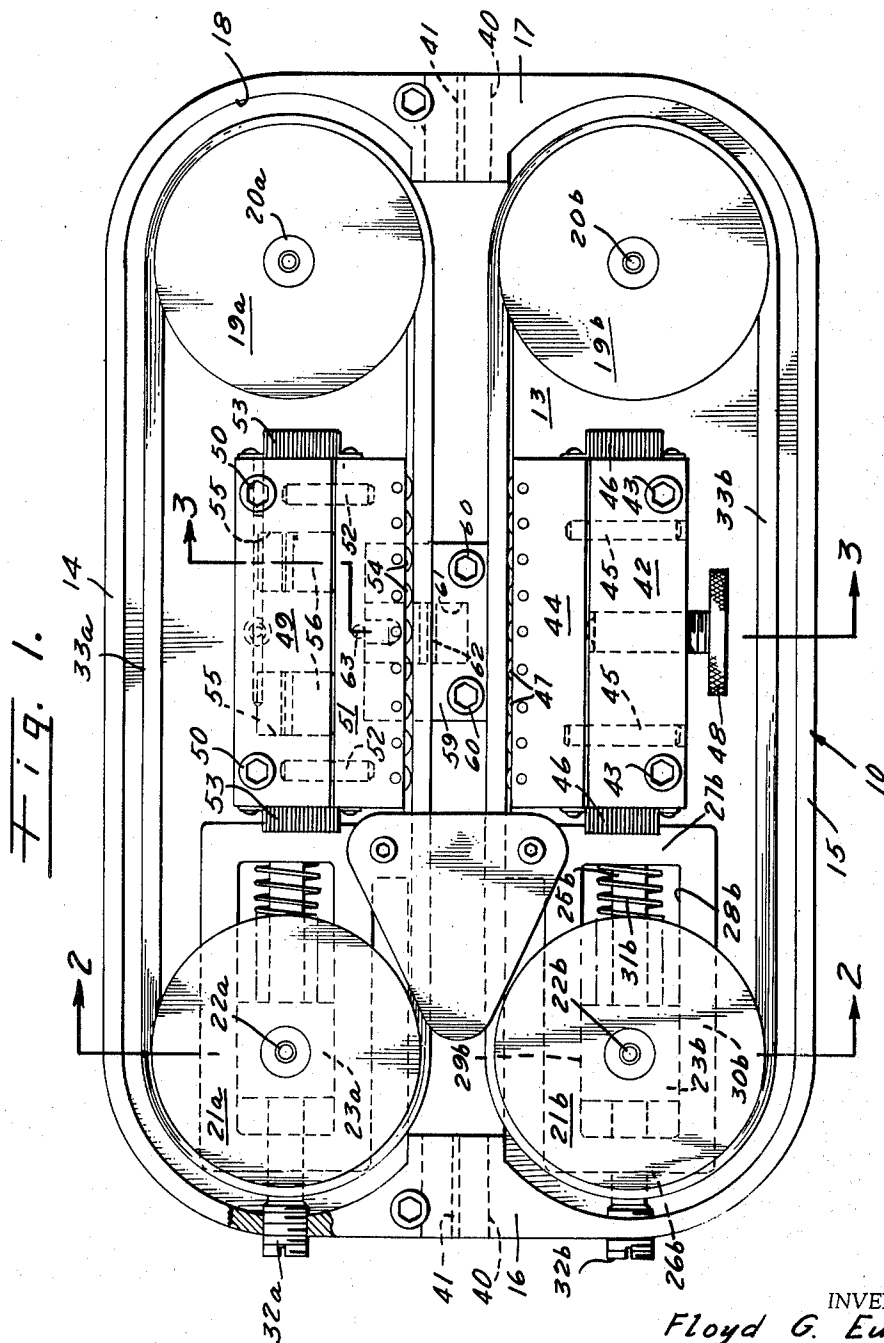
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**3,251,253**

# APPARATUS FOR WORKING FILAMENTARY MATERIALS

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

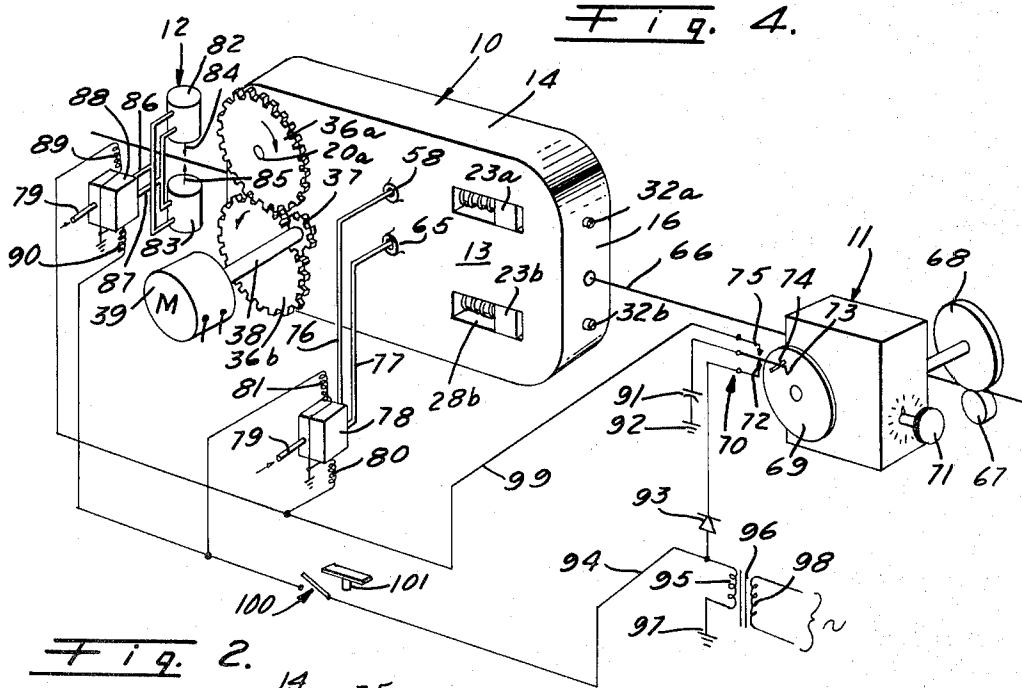


Fig. 2.

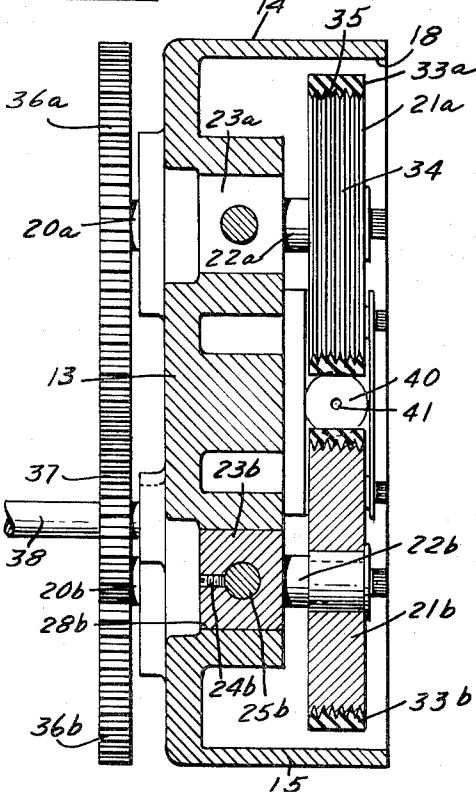
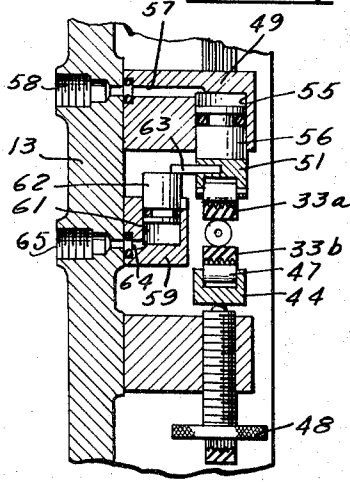


Fig. 3.



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## APPARATUS FOR WORKING FILAMENTARY MATERIALS

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The present invention relates generally to the art of working filamentary materials such as wire, cable and the like, and is more particularly concerned with improvements in apparatus for the cutting of such material into predetermined lengths, and in the case of insulated wire for stripping insulation from the ends of the cut lengths.

In its broad concept, the present invention seeks to provide apparatus for the herein described purpose having greater flexibility of operation, and in which the feeding and cutting operations will be accomplished with greater accuracy, and maintained during long periods of operation.

Heretofore, feed mechanisms in wire cutting and insulation stripping apparatus have in the main employed presser feed rollers to feed the wire to the cutting position. Such rollers had the inherent disadvantage of making substantially point contact with the wire insulation, and in some cases caused an undesirable flattening of the insulation. The substantially point contact of the rollers also tended to permit slippage, especially at high feeding speeds, so that length accuracies were difficult to obtain and maintain.

Having the foregoing in mind, the present invention proposes to engage finite lengths of the filamentary material on opposite sides by opposed portions or sections of moving belts arranged for movement towards and away from each other into feeding and non-feeding coaction. The belts provide non-slipping line contact so that a greater feed accuracy may be obtained and maintained. Moreover, in my improved arrangement, the feed is operable with different sized wire, and it is not necessary, as in the case of the rollers, to have interchangeable rollers accommodated to the different wire sizes.

A further object of the invention is to provide improved control for coordinating and synchronizing the various operations in filamentary wire working apparatus, such for example as the measuring, feeding and cutting operations.

Further objects of the invention will be brought out in the following part of the specification, wherein detailed description is for the purpose of fully disclosing the invention without placing limitations thereon.

Referring to the accompanying drawings, which are for illustrative purposes only:

FIG. 1 is a front elevational view of my improved feeding mechanism as embodied in the present invention;

FIG. 2 is a transverse section through the same, taken substantially on line 2-2 of FIG. 1;

FIG. 3 is a fragmentary transverse sectional view showing details of the fluid actuators for effecting feeding and non-feeding operations, taken substantially on line 3-3 of FIG. 1; and

FIG. 4 is a view diagrammatically showing the embodiment of the feeding mechanism into filamentary working apparatus according to the present invention, and schematically showing the electrical control circuitry therefor.

Referring more specifically to the drawings, the apparatus of the present invention includes a number of component assemblies which are usually supported in co-

operative relationship upon a main mounting panel so as to form a unitary apparatus of a character well known in the art. This coordination of assemblies will be subsequently explained, and for purposes of the present invention may be generally considered as embodying, as best shown in FIG. 4, a feeding mechanism 10, length measuring device 11 and cutter means 12. These components are coordinated and synchronized in their operation in a manner and for the purpose to be hereinafter explained.

As shown in detail in FIG. 1, the feeding mechanism 10 comprises a substantially rectangular dished frame structure formed with a back wall 13 which is integrally formed with peripherally extending top and bottom walls 14 and 15, and opposite end walls 16 and 17 which co-operatively form a peripheral closure defining a front opening 18.

Mounted within the above frame structure adjacent the end wall 17 are similar driving pulleys 19a and 19b, these pulleys being respectively supported upon associated shafts 20a and 20b which are rotatably supported in appropriate bearings (not shown) supported in the back wall 13.

At the opposite end wall 16, there is mounted within the frame structure similarly arranged idler pulleys 21a and 21b, these pulleys being respectively supported upon nonrotating shafts 22a and 22b. These idler shafts are carried by slide blocks 23a and 23b. Each of the slide blocks is similarly mounted, and for this reason it is believed that an explanation of the mounting for one of the blocks will suffice without describing the mounting for both blocks.

Briefly, for example, the slide block 23b is secured as by a set screw 24b (FIG. 2) to a rod member 25b which has its ends slidably supported for longitudinal movement in walls 26b and 27b respectively at the ends of a slot 28b within which the slide block is longitudinally slidable, being guided in this movement and retained by upper and lower slot walls 29b and 30b. The slide block 23b is urged towards the end wall 26b by means of a compression spring 31b which surrounds the right end of the rod 25b, one end of this spring bearing against the end wall 27b and the other end against the adjacent side of the slide block 23b. This spring urges the slide block and connected rod towards the left, the extent of this movement being variably adjusted by means of an adjusting screw 32b in the end wall 16 of the frame structure. The inner end of the screw 32b bears against the adjacent end of the rod 25b, and by adjusting the screw 32b, the limit of the leftward movement of the slide block 23b may be adjusted, while the block is free to move towards the right against the compression of the associated compression spring 31b. Adjustment of the slide block 23a is similarly accomplished by means of adjusting screw 32a.

The pulleys 19a and 21a form a pair of pulleys over which a looped belt 33a is trained, while pulleys 19b and 21b have a belt 33b similarly trained thereover, these belts being respectively maintained under tensioned condition by means of the spring loaded pulleys 21a and 21b, this tension being adjustable independently for each belt by means of the adjusting screws 32a and 32b. As shown in FIG. 2, the pulleys may be provided with circumferentially extending lands and grooves 34 which are adapted to mate with similar longitudinally extending lands and grooves 35 on the inner surface of the belts to maintain the belts and pulleys against lateral displacement and increase their surfaces of contact.

As shown in FIG. 2, driving power is supplied to the driving pulleys 19a and 19b through driving gears 36a and 36b which are respectively carried by the shafts 20a and 20b. The gears 36a and 36b are in meshed connec-

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tion and are driven from a spur gear 37 which meshes with the driving gear 36b, the spur gear being driven through a driving shaft 38 from a suitable power device such as an electric motor 39 (FIG. 4).

Referring again to FIG. 1, the end walls 16 and 17 are respectively provided with a central removable bushing 40 having a central bore 41 of a size to accommodate filamentary material of certain diameter. To accommodate different wire sizes, bushings having different sized bores would be used. These bushings guide the entrance and exit of the filamentary material so that it will pass axially between the confronting surfaces of the adjacent spaced apart inner legs of the belt loops 33a and 33b.

Means are provided for relatively positioning the inner legs of the belt loops so as to place them in proper operative relationship with respect to the filamentary material passing therebetween, and also for selectively relatively moving the inner legs of the belt loops into coacting feeding and non-feeding relationship, as will now be described. More specifically, as clearly shown in FIG. 1, an elongate block member 42 is fixedly secured to the back wall 13 by means of securing bolts 43—43. This fixed block provides a support for a movable presser member 44 which is supported on the block 42 for raising and lowering movements, the presser member being guided in these movements by means of guide pins 45—45 carried by the presser member and having sliding guiding movement in the block 42. The presser member is normally urged to its lowered position by means of tension springs 46—46 respectively interconnecting the ends of the block and presser members. The presser member is shown as carrying a plurality of individually supported rotatable rollers 47 having their axes of rotation extending across the associated belt leg which they are adapted to engage and thus provide antifriction bearing engagement between the presser member and the associated belt leg. The leg section of the belt which overlies the presser member 44 may be adjustably raised and lowered by means of a thumb screw 48 threadably mounted in the block member 42 with its end bearing against the presser member 44. The thumb screw is positioned between the guide pins 45—45, and by turning the thumb screw in the proper direction, the presser member may be raised so that the inner leg of the belt will be elevated until it is just barely spaced from the filamentary material passing between the belts.

Control of the feeding and non-feeding operations is accomplished by a fluid actuated similar presser arrangement positioned above and coacting with the inner leg of the belt 33a. Similarly a block member 49 is fixedly secured to the back wall 13 by bolts 50—50, a presser member 51 being guided by pins 52—52 and being urged upwardly by springs 53—53. The presser member similarly carries antifriction rollers 54 for engaging the adjacent leg of belt 33a.

Provision is made for positively selectively raising and lowering the presser member 51 by means of fluid actuators which will now be explained. As shown in FIG. 1, the block 49 is formed with spaced cylinder bores 55—55 having cooperatively associated pistons 56—56 which have their outermost ends bearing against the associated presser member 51. The cylinder bores communicate with a fluid conducting passage 57 which connects with connection port 58 in the back wall 13. It will be evident that when a fluid under pressure is supplied through the passage 57, the pistons 56 will be motivated in a direction to forcefully move the presser member 51 downwardly in such a way as to carry the inner leg of the looped belt 33a into engagement with the filamentary material and thus cooperate with the adjacent inner leg of belt 33b to effect a feeding operation of the filamentary material.

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Positive movement of the presser member in an opposite direction is secured by means of a releasing actuator. This actuator comprises an auxiliary block 59 which is secured to the back wall as by securing bolts 60—60. The auxiliary block is formed with an upwardly opening cylinder bore 61 and is cooperatively associated with a piston 62 which has its working end arranged to bear against a projecting pin 63 carried by the presser member 51. The cylinder bore 61 connects with a fluid conducting passage 64 which connects with a connection port 65 in the back wall 13. Energization of the actuator cylinder 61 with a pressurized fluid will move the piston 62 upwardly carrying the pin 63 with it and hence motivate the presser member in a release or upward direction so that the inner leg of the looped belt 33a will be tensioned by the associated loading spring for pulley 21a and the belt moved away from the filamentary material to a non-feeding position.

As will be explained by reference to FIG. 4, the feeding mechanism and its cooperative relationship and synchronization with the other components such as the length measuring device 11 and cutter means 12 will now be considered in detail. A filamentary material such as a wire 66 is threaded through the feeding mechanism 10.

As the wire is supplied to the feeding mechanism, it passes between an idler wheel 67 and driving wheel 68 which actuates the length measuring device 11 through a variable ratio driving mechanism which may be variably adjusted to control the speed of rotation of an output disc or wheel 69 which is arranged to control the contacts of an electric switch 70 in a preset ratio to the rotation of the driving wheel 68 or the feed speed and consequent length of the filamentary material to be cut or otherwise operated upon. The ratio or proportionate length of material per revolution of the disc 69 is determined by adjusting means under the control of a setting knob 71. Length measuring devices such as that indicated at 11 are readily available and need not be described further.

It will be noted that the switch 70 has a fixed contact 72 which is in normally closed relation with a movable contact 73. As the disc 69 rotates, a pin 74 is arranged to engage the movable contact 73 and move it to a position in engagement with a second contact 75.

Fluid pressure is supplied to the connection ports 58 and 65 through flow pipes 76 and 77 from a four-way valve 78 having a fluid supply connection 79. This valve is selectively operable by means of a coil 80 which is energized to connect the fluid pressure with flow pipe 77 to move the feed belts to non-feeding position, and a coil 81 which is energized to actuate the valve to connect the fluid pressure to flow pipe 76 to actuate the belts for a feeding operation.

At the discharge end of the feeding mechanism 10, the filamentary material is carried to the cutter means which are of conventional construction, being comprised of double acting cylinder-piston fluid actuators 82 and 83 for respectively motivating the cutters 84 and 85. The actuators are connected in parallel to flow pipes 86 and 87 under the control of a four-way valve 88. This valve is selectively controlled by a coil 89 which upon energization will operate the valve to connect the flow pipe 86 with the fluid supply connection 79 and actuate the cutters to closed position. A coil 90 upon energization operates the valve to connect the flow pipe 87 with the fluid supply connection so as to open the cutters.

The valves 78 and 88 are connected in parallel and are electrically controlled in their operation by means of the switch 70. The movable contact 73 of this switch is connected through a capacitor 91 to a ground point 92. The contact 73 is normally in engagement with contact 72, this latter contact being connected through a rectifier 93 to a conductor 94 having connection with

one terminal of a secondary winding 95 of transformer 96, the other terminal of the secondary winding being carried to a ground point 97. The primary winding 98 of this transformer connects with an alternating current supply source.

It will be observed that when the contact 73 engages contact 72, a circuit is completed from the transformer output through the capacitor 91, and that the capacitor will be charged through the rectifier 93. This will take place during a normal feeding operation of the filamentary material 66 by the feeding mechanism 10. However, when the desired length of filamentary material has been fed to bring the pin 74 against the contact 73, the contact 73 will be moved into engagement with contact 75 and the capacitor thus connected to a conductor 99 which completes energizing circuits through coils 80 and 89, thus operating the valve 78 to operate the feeding mechanism to non-feeding position, and operate the valve 88 to close the cutters 84 and 85 while the movement of the filamentary material is stopped.

The resumption of a feeding operation by means of the feeding mechanism 10 is accomplished by means of a recycling switch 100 which can be arranged as a normally opened switch which will be closed within a short time delay interval after the closing of the cutters, or in case of insulation stripping can be arranged to be closed by a pin such as indicated at 101 which will be moved in response to the stripping operation and close the contacts of switch 100 at the conclusion of the stripping operation. Whatever timing means are utilized to close the contacts of switch 100, it will be seen that when this switch closes it will connect the conductor 94 into parallel energizing circuits through the coils 81 and 90 so as to operate the valve 78 to start a feeding operation, and simultaneously operate the valve 88 to open the cutters 84 and 85. The feeding operation will now continue until the length measuring device 11 again operates for a sufficient interval to again bring the pin 73 into engagement with the movable contact 79 and thus repeat the operation previously described. It will be noted that energization of the coils 81 and 89 will be directly from the transformer secondary 95. A simplified control is thus provided from a single transformer for operating the feeding mechanism to feed and non-feed positions, and the cutter means to cutter closed and open positions, these operations being synchronized through a length measuring device in such a way that the desired length of filamentary material may be determined merely by adjusting the knob 71, and that by the use of the feeding mechanism utilizing the looped belt arrangement, accurate lengths of filamentary material may be cut and otherwise operated upon with a most high degree of accuracy, and that this accuracy may be maintained over long operating periods.

Various modifications may suggest themselves to those skilled in the art without departing from the spirit of my invention, and hence, I do not wish to be restricted to the specific forms shown or uses mentioned, except to the extent indicated in the appended claims.

I claim:

1. In apparatus for working filamentary materials, feed mechanism, comprising:

- (a) a pair of spring tensioned looped belts having spaced adjacent elongate sections movable in the same direction and adapted to receive an elongate filamentary material therebetween;
- (b) presser means respectively on the inner sides of said belt sections; and
- (c) means for moving the presser means for one of said belt sections towards and away from the presser means for the other of said belt sections to effect feeding and non-feeding of the filamentary material, said means including selectively energizable actuators.

2. In apparatus for working filamentary materials, feed mechanism, comprising:

- (a) a pair of looped belts having spaced adjacent elongate sections axially movable in the same direction and having outer linearly moving confronting surfaces adapted to receive an elongate filamentary material lengthwise therebetween;
- (b) means for adjustably transversely moving one of said sections to variably position its confronting surface spacing with respect to the confronting surface of the other section; and
- (c) power means selectively energizable to transversely move the other section to position its confronting surface into clamping and non-clamping cooperation with the confronting surface of said one of said sections to start and stop feeding of the filamentary material.

3. In apparatus for working a filamentary material, feed mechanism, comprising:

- (a) a pair of looped belts having spaced adjacent elongate sections axially movable in the same direction and having outer confronting surfaces adapted to receive an elongate filamentary material lengthwise therebetween;
- (b) movable presser members respectively engageable with the inner surfaces of said sections;
- (c) means for manually adjusting one of said presser members to vary its position with respect to said adjacent filamentary material; and
- (d) power means selectively energizable to move the other of said presser members towards and away from said one of said presser members to effect feeding and non-feeding of the filamentary material by said belts.

4. In apparatus for working a filamentary material, feed mechanism, comprising:

- (a) a pair of looped belts having spaced adjacent elongate sections axially movable in the same direction and having outer confronting surfaces adapted to receive an elongate filamentary material lengthwise therebetween;
- (b) movable presser members respectively engageable with the inner surfaces of said sections;
- (c) means for manually adjusting one of said presser members to vary its position with respect to said adjacent filamentary material; and
- (d) power means selectively energizable to move the other of said presser members towards and away from said one of said presser members to effect feeding and non-feeding of the filamentary material by said belts, said power means being energizable in response to a working operation on said filamentary material.

5. In apparatus for working a filamentary material:

- (a) feed mechanism including a pair of looped belts having spaced adjacent elongate sections movable in the same direction and adapted to receive an elongate filamentary material therebetween;
- (b) actuating means for said feed mechanism including first means electrically energizable to relatively move said belt sections towards each other to effect feeding of the filamentary material, and second means electrically energizable to relatively move said belt sections away from each other to effect non-feeding of the filamentary material;
- (c) cutter means receiving the filamentary material from said feed mechanism, said cutter means including third means electrically energizable to open said cutter means, and fourth means electrically energizable to close said cutter means and sever the filamentary material;
- (d) switching means cyclically operable to energize said first means and said third means, whereby filamentary material is fed to said open cutter means; and

- (e) filamentary material length measuring means including switch contacts operable upon feed of a predetermined length of filamentary material to energize said second means and said fourth means to terminate the feed and close the cutter means to sever the filamentary material. 5
6. In apparatus for working a filamentary material:
- (a) feed mechanism including a pair of looped belts having spaced adjacent elongate sections movable in the same direction and adapted to receive an elongate filamentary material therebetween; 10
- (b) first actuating means selectively electrically energizable to move said belt sections to feed and non-feed positions;
- (c) cutter means receiving filamentary material from the feed mechanism; 15
- (d) second actuating means selectively electrically energizable to move said cutters to cutting and non-cutting positions with respect to the filamentary material; 20
- (e) switching means cyclically operable to energize the first actuating means for moving the belt sections to feed position, and the second actuating means to move the cutter means to non-cutting position; and 25
- (f) switch means operable by feeding movement of the filamentary material, including contacts adjustable to close in response to feeding movement of a predetermined length of filamentary material, said closed contacts operating to energize said first actuating means to move the belt sections to non-feed position and the second actuating means to move the cutter means to cutting position. 30
7. In apparatus for working a filamentary material:
- (a) feeding mechanism including a pair of spaced movable belt sections selectively operable into feed and non-feed positions with respect to a filamentary material therebetween; 35
- (b) cutters operable to opened and closed positions with respect to filamentary material fed thereto from the feeding mechanism; 40
- (c) actuators respectively for said feeding mechanism and said cutters including a first circuit energizable to operate the feeding mechanism to feed position and the cutters to opened position, and a second circuit energizable to operate the feeding mechanism to non-feed position and the cutters to closed position; and 45
- (d) switching means for alternately energizing said first and second circuits in timed relation to the feed-

- ing movement of a predetermined length of filamentary material to said cutters.
8. In apparatus for working a filamentary material:
- (a) feeding mechanism including a pair of spaced movable belt sections selectively operable into feed and non-feed positions with respect to a filamentary material therebetween;
- (b) cutters operable to opened and closed positions with respect to filamentary material fed thereto from the feeding mechanism;
- (c) actuators respectively for said feeding mechanism and said cutters including a first circuit energizable to operate the feeding mechanism to feed position and the cutters to opened position, and a second circuit energizable to operate the feeding mechanism to non-feed position and the cutters to closed position;
- (d) an A.C. electrical source;
- (e) switch means cyclically operable to connect and disconnect said first circuit to said source;
- (f) a capacitor;
- (g) a rectifier;
- (h) other switch means selectively operable to one position to actuate a first set of contacts to normally connect said capacitor and rectifier into a changing circuit from said electrical source, and to another position to actuate a second set of contacts to connect said capacitor for energizing said second circuit; and
- (i) means operable by feeding movement of said filamentary material for actuating said other switch means in timed relation to the feeding movement of a predetermined length of said filamentary material.

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