Aug. 29, 1944. J. J. GREGORY 2,356,841

FILAMENT CUTTING APPARATUS

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Fig. 1.

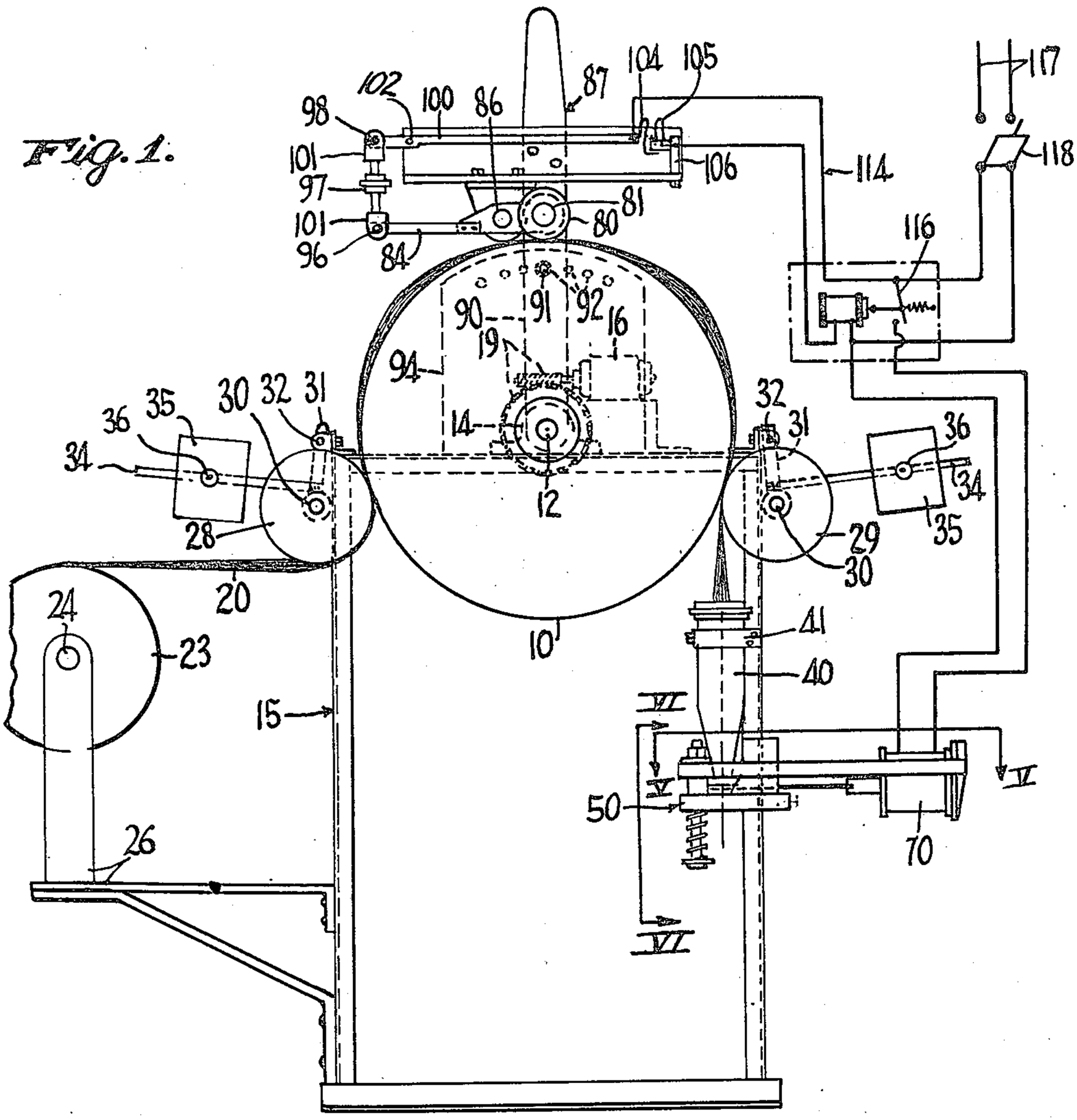

Fig. 2

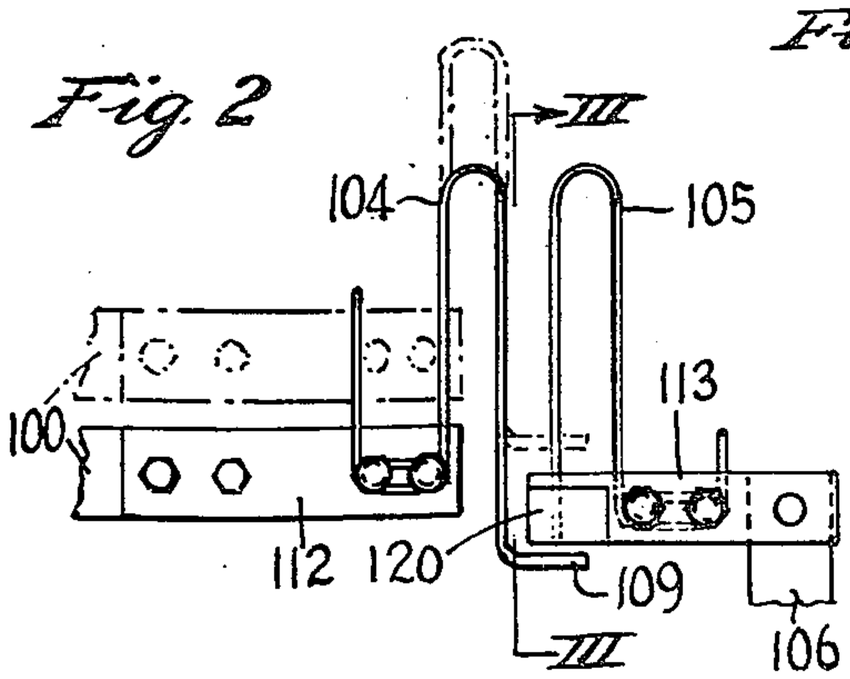

Fig. 3

Fig. 4

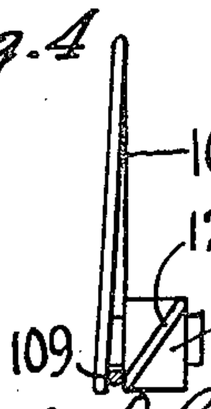

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Fig. 5.

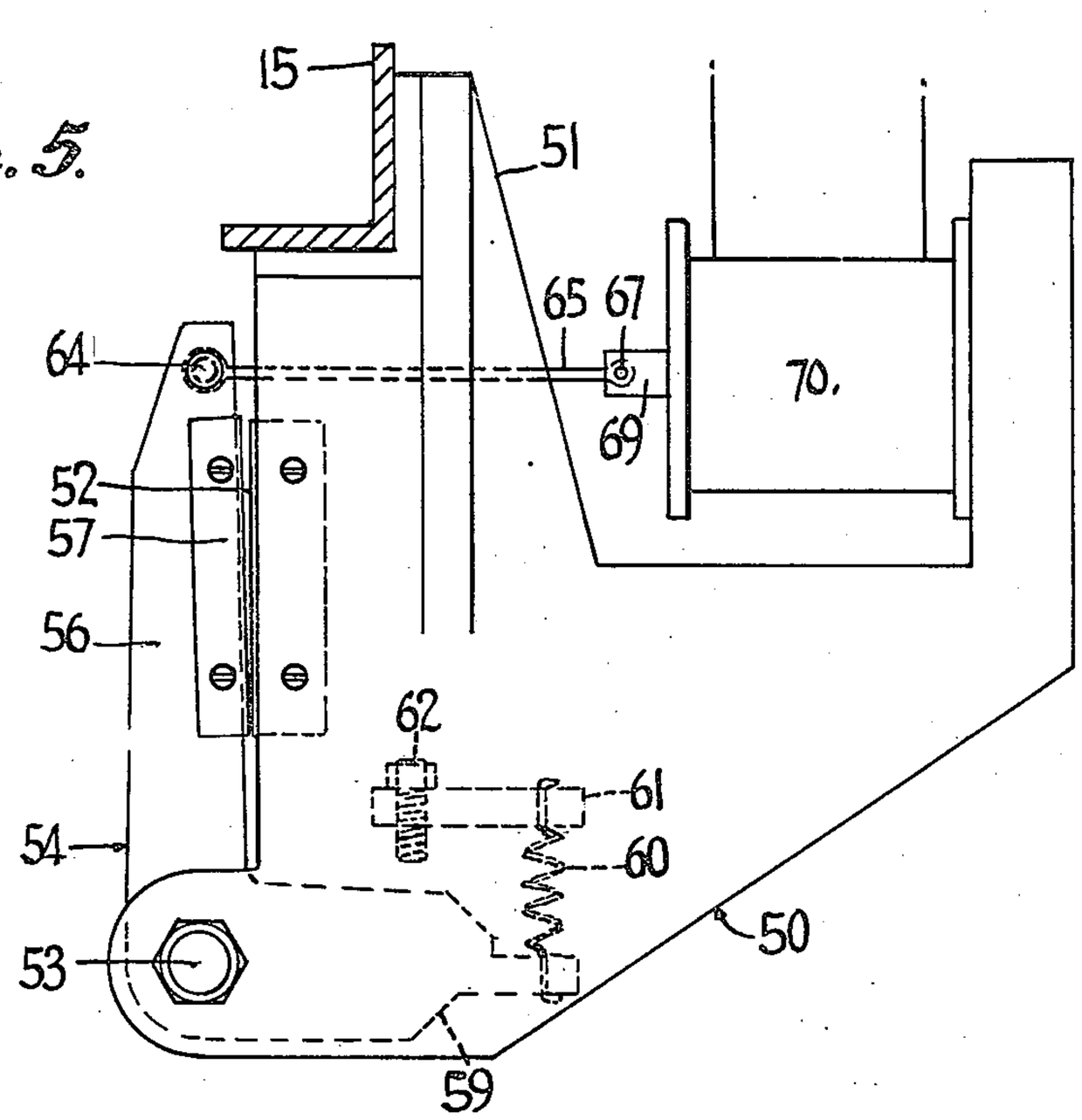


Fig. 6.

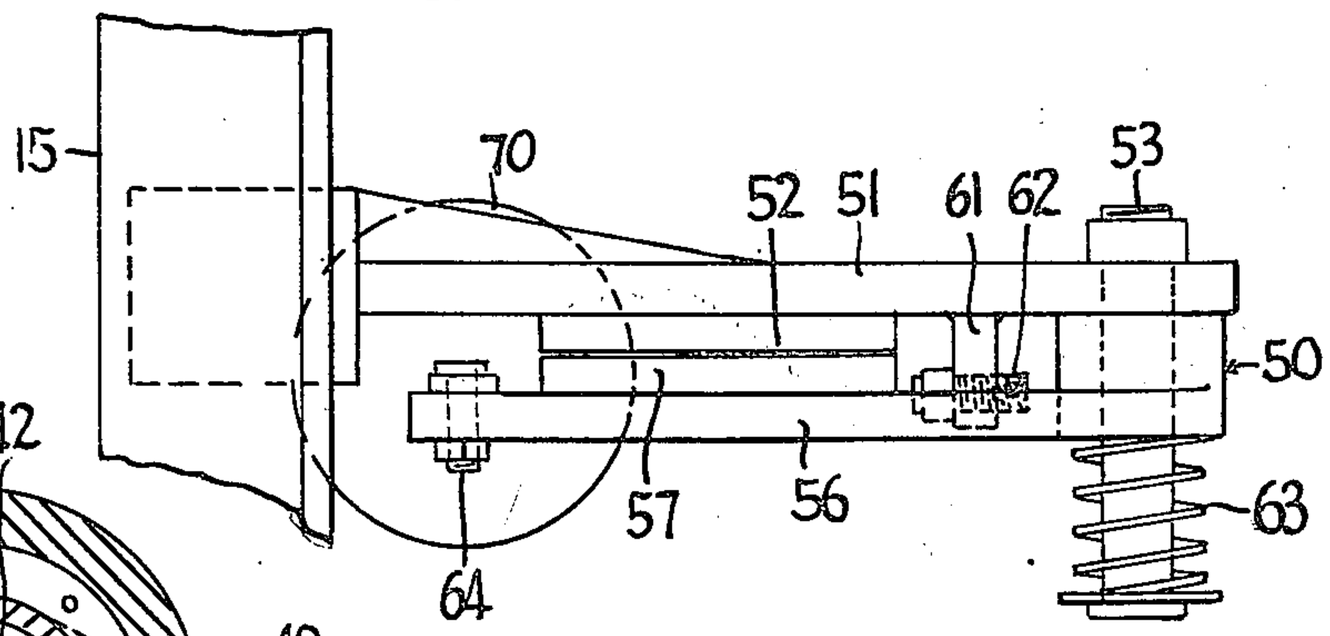
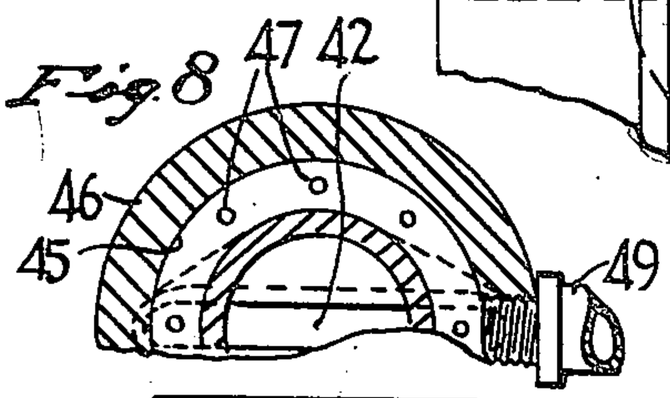


Fig. 8



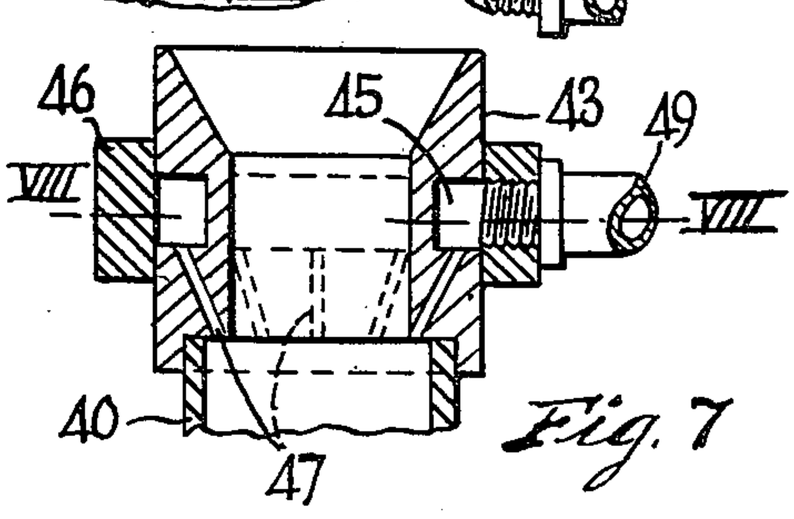


Fig. 7

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FILAMENT CUTTING APPARATUS

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Application August 19, 1943, Serial No. 499,264

4 Claims. (Cl. 164—42)

This invention relates to the manufacture of synthetic filaments and it has particular relation to the measurement and cutting to length of synthetic bristles adapted to be employed for manufacturing brushes, or for other purposes.

One object of the invention is to provide an improved apparatus for cutting filaments to predetermined lengths.

Another object of the invention is to provide an improved apparatus for receiving filaments that are tapered at intervals and automatically cutting the filaments to lengths according to the length of the tapered portions.

Another object of the invention is to provide an improved apparatus that is adapted to respond to the action of linearly travelling filaments which are recurrently tapered along their lengths, such action serving to initiate operation of cutting apparatus to sever the filaments at intervals corresponding to the intervals of tapering.

In one form of apparatus in which the invention is adapted to be incorporated synthetic filaments are received continuously from a filament forming machine, such as that shown and described in my copending application Serial No. 459,251, filed September 22, 1942. The filaments, which are tapered at intervals, are produced continuously at a constant rate from this machine and are received upon a suitable surface along which they can be guided. Since the filaments are tapered at intervals the varying thickness thereof can be utilized to make and break electric contacts when the thicker portions pass a predetermined point. These contacts are connected to an electric cutting device which is operable to sever the filaments when it is electrically energized. The relative positions of the cutting device and the guiding surface and the distance between thicker portions of the tapered filaments can be co-ordinated to control the cutter so as to sever the filaments regularly either at the location where they are thicker or at the location where they are thinner.

In the drawings:

Fig. 1 is a diagrammatic elevation of a filament cutting apparatus; Fig. 2 is a fragmentary elevation, on a larger scale, of electric make and break contacts with supports therefor; Fig. 3 is a vertical section taken substantially along the line III—III of Fig. 2 and with parts shown in elevation; Fig. 4 is a view similar to Fig. 3 with parts shown in different positions; Fig. 5 is a horizontal section taken substantially along the line V—V of Fig. 1 and with cutter structure shown in plan; Fig. 6 is a side elevation of the structure shown in Fig. 5 looking in the direction of the arrows on line VI—VI of Fig. 1; Fig. 7 is a fragmentary vertical section, on a larger scale, of a tubular guide including air directing parts; and Fig. 8 is a fragmentary horizontal section taken substantially along the line VIII—VIII of Fig. 7.

In practicing the invention a drum 10 is rotatably mounted upon a horizontally disposed driven shaft 12 which is mounted in suitable bearings 14 on a supporting frame 15. A motor 16 having suitable reduction gearing 19 connecting it to the shaft provides power for rotating the drum.

Filament stock 20, which can be in the form of one or a group of filaments, is received from a source of supply, such as a filament producing machine described in my copending application above referred to, and is guided over an idler roll 23 carried upon a pin 24 in a bracket 26 on the frame 15. From the idler roll 23 the filaments are directed between the drum 10 and weighted rolls 28 and 29 which are rotatable upon horizontal bearings 30 forming the lower portion of hangers 31 that have pivotal connections 32 suspending them upon the upper portion of the frame 15. An arm 34 rigidly connected to the lower portion of each hanger extends laterally therefrom and is provided with a weight 35 adjustably mounted thereon by means of a set screw 36 passing therethrough into contact with the arm. The rolls thus mounted tend to swing toward the drum to confine and guide the filaments yieldably under pressure against the surface of the drum. These rolls 28 and 29 are disposed substantially on opposite sides of the drum slightly below the horizontal center line thereof, and the filaments 20 pass from the roll 28 over the upper peripheral surface of the drum. They then pass downwardly between the roll 29 and drum through a tube 40 that is rigidly mounted on the frame 15 by means of a bracket 41 rigidly carried thereby.

The tube 40 is disposed substantially vertically and is partially flattened at its lower end to form a slot-like exit opening 42 (Fig. 7). The upper end portion of the tube has formed thereon a hollow head 43 provided with a circumferential channel 45 which is surrounded by a collar 46 mounted by sweating it upon the head so as to provide an air-tight fit thereon in covering relation to the channel. Air directing ducts 47 lead from the channel 45 in a downward direction and open through the inner walls of the tube. A nipple 49 connected to the collar and communi-

cating with the channel 45 is adapted to be connected to a suitable air pressure source (not shown) for the purpose of streaming air downwardly through the ducts 47 and downwardly through the tube.

Immediately below the lower end of the tube 40 a cutting device 50 is mounted by welding or otherwise securing a plate portion 51 thereof upon the frame 15. This plate also includes a stationary horizontal blade 52 rigidly carried thereby and has a pivot pin 53 mounted thereon to support a bell-crank 54. One arm 56 of the latter includes a knife 57 arranged to cooperate in shearing relation with the blade 52. The other arm 59 of the bell-crank is connected by means of a tension spring 60 to a lug 61 that is welded to the lower side of the plate 51. This spring normally holds the knife in open position. A set screw 62 threaded through the lug 61 limits the pivotal movement of the bell-crank to prevent execessive opening of the knife. If desired, a compression spring 63 can be mounted on the pin 53 to maintain the bell-crank pressed against the plate 51 and in proper position to insure close contact between the blade 52 and knife 57 when they are moved in cutting relation. The outer end of the lever arm 56 is pivotally connected, as indicated at 64, to one end of a link 65, the other end of which is pivotally connected, as indicated at 67, to the outer end of a core 69 that forms a part of a solenoid 70. The latter is rigidly connected to the plate 51 by means of welding, or the like.

As the filaments 20 are directed upwardly over the periphery of the drum 10 they pass underneath a feeler roll 80 rotatably mounted, as indicated at 81, on one end of a lever 84 that has an intermediate pivotal connection 86 securing it on an upright adjustable frame 87. The lower portion of the frame 87, which includes an upright bar 90, is pivoted upon one of the bearing members 14 with its axis of pivoting coincidental with the axis of the driven shaft 12. An adjusting bolt 91 passes through the bar and through one of series of openings 92 in an upright plate 94 that is rigidly mounted upon the apparatus frame 15. This arrangement provides for adjusting the frame 87 to the right or left, as viewed in Fig. 1, about the axis of rotation of the drum 10.

The end of the lever 84 opposite the mounting of the roll 80 has a pivotal connection 96 securing it to one end of an adjustable link 97, the other end of which is connected, as indicated at 98, to the outer end of an electric contact lever 100. The adjustable link includes opposite end heads 101 into which the shank of the link is screw-threaded in opposite directions so as to move the heads toward or away from each other, depending upon the direction of turning of the shank of the link. An intermediate portion of the contact lever 100 has a pivotal connection 102 securing it to the adjustable frame 87.

The lever arrangement described above constitutes an actuating mechanism for making and breaking resilient contacts 104 and 105 of inverted U-shape which are mounted on the outer end of the lever 100 and on a bracket 106, respectively. The latter bracket 106 is rigidly mounted upon the frame 87. The free end of the contact 104 is in the form of a horizontal finger 109 which is adapted to engage the other contact 105. Insulating blocks 112 and 113 forming end portions of the lever 100 and bracket 106 support the contacts 104 and 105, respectively, which are connected by conventional wiring 114 to a magnetic switch 116 through which electrical connection is established to the solenoid 70 (included in the wiring 114) and to electric mains 117. Connection to the mains is controlled by a switch 118.

It will be observed that the levers 84 and 100 are so mounted that the degree of movement of the contact 104 on the outer end of the lever is greatly increased with respect to the movement of the roll 80 in response to movement of the larger portions of the tapered filaments 20 thereunder. When the larger portions of the filaments pass underneath the roll 80, the finger 109 is raised and in traveling upwardly it strikes a sloping under surface of a cam 120 that is formed upon the outer end portion of the insulating member 113. The finger 109 continues this movement until it is sprung outwardly and snaps over the upper edge of the cam to the position indicated in broken lines of Fig. 3. As the larger portions of the filaments pass from beneath the roll 80 the finger 109 drops against the contact 105 to the position shown in Fig. 4 and completes the electric circuit to energize the solenoid 70 and to operate the knife 57, thereby severing the filaments 20. This action is rapidly consummated and the knife 57 is immediately reopened to such position that the next length of filaments to be cut continues past the knife until the thicker filaments again actuate the roll 80 to initiate a repetition of the operation described. In order that the filaments may not recoil or otherwise disarrange themselves before or after the cutting operation, air under pressure is streamed downwardly through the tube 40 from the ducts 47. The action of the air continuously draws the filaments toward the area of cutting.

The frame 87 can be adjusted to vary the distance from the point of contact of the roll 80 with the filament stock to the cutter. Such adjustment provides for cutting the filaments at the proper location and to provide for proper cutting of filaments which have different lengths of tapered sections from those shown in the drawings.

It should be understood that the group of filaments are supplied and fed to the drum 10 in such manner that a thicker portion of any filament lies together with thicker portions of adjacent filaments. Thus the filaments as a group have successive thicker and thinner areas.

Although only one form of the invention has been shown and described in detail, it will be apparent to those skilled in the art that the invention is not so limited, but that various changes can be made therein without departing from the spirit of the invention or from the scope of the appended claims.

I claim:

1. A cutting apparatus comprising a solenoid, a cutter connected to said solenoid for operation thereby, guiding means for passing a filament of varying denier to the cutter, an actuator movable adjacent the guiding means for receiving the filament between it and said guiding means, means for supporting said actuator in its movable relation, electric wiring connected to the solenoid and including make and break contacts engageable by said actuator, said guiding means including a tubular member adjacent the cutter for passing the filament directly to the cutter, and air conduits directed substantially in the direction of movement of the filaments longitudinally through said tubular member to supply a stream of air lengthwise along the filaments.

2. An apparatus for cutting into sections a filament of recurrently varying thickness, a drum for receiving the filament about the peripheral surface thereof, means for rotating the drum with the filament passing thereover, a member movable toward and away from the surface of the drum with the filament disposed between said member and surface whereby the filament in its varying thickness varies the position of said member, an electric circuit including a solenoid, a cutter connected to the solenoid for operation thereby, said member and circuit including make and break contacts through which the electric circuit is completed in response to movement of said member, and means for carrying the filament away from the surface of the drum toward the cutter as the drum rotates.

3. An apparatus for cutting a filament of recurrently varying thickness, a drum for receiving the filament about the peripheral surface thereof, means for rotating the drum with the filament passing thereover, an actuator movable toward and away from the surface of the drum with the filament between said actuator and surface whereby the filament in its varying thickness varies the position of said actuator, an electric circuit including a solenoid, a cutter connected to the solenoid for operation thereby, a support carrying said actuator relatively movable thereon, means for bodily adjusting the support to vary the distance between said actuator and cutter, said actuator and circuit including make and break contacts through which the circuit is completed in response to movement of said actuator, and means for carrying the filament away from the surface of the drum as the latter rotates.

4. An apparatus for cutting into sections filament stock having successive sections of varying thickness, a drum for receiving the filament upon the peripheral surface thereof, means for rotating the drum with the filament passing thereover, a pivotal support having its axis of pivoting coincidental with the axis of rotation of said drum, a control member movable on said support toward and away from the drum surface with the filament disposed between said member and surface whereby the filament in its varying thickness varies the position of said member, an electric circuit including a solenoid, a cutter connected to the solenoid for operation thereby, said control member and circuit including make and break contacts through which the electric circuit is completed in response to movement of said control member by the filament, means for carrying the filament away from the surface of the drum toward the cutter as he drum rotates, and means for adjusting the pivotal support about its axis of pivoting toward and away from the cutter.

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