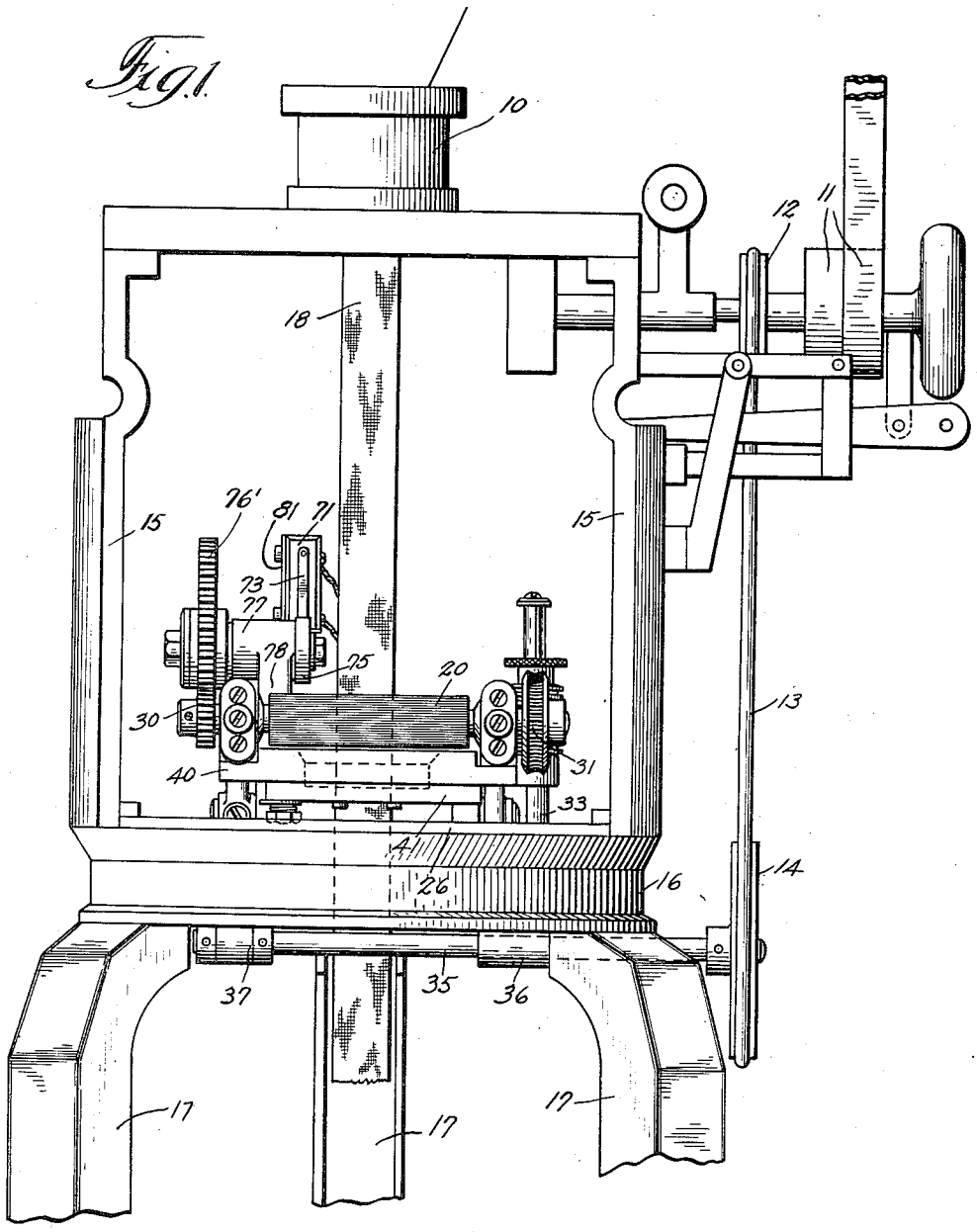
Aug. 17, 1948. T. A. SUSEN 2,447,103

KNITTING MACHINE

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Fig. 1.



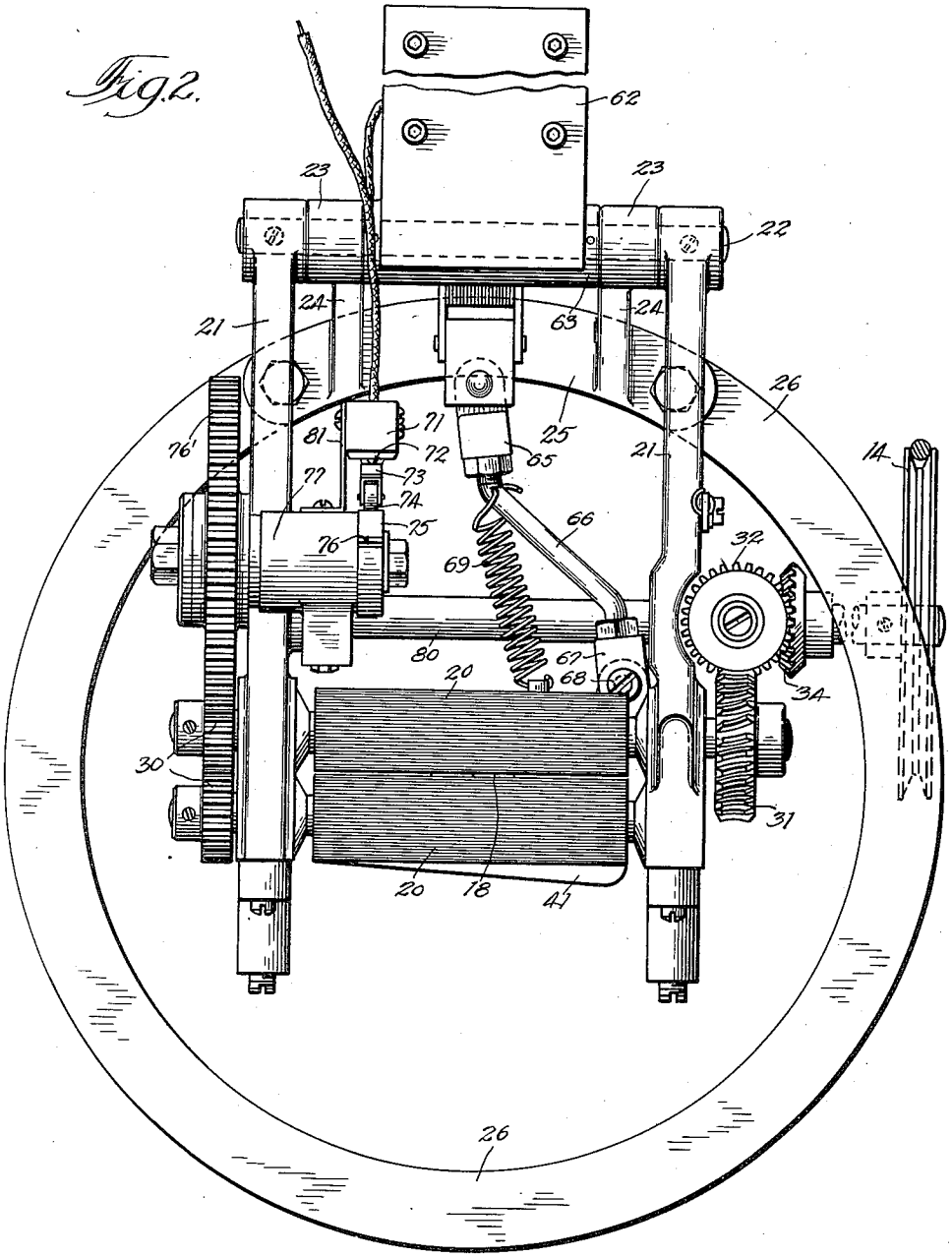
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KNITTING MACHINE

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Fig. 2.



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KNITTING MACHINE

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Fig. 3.

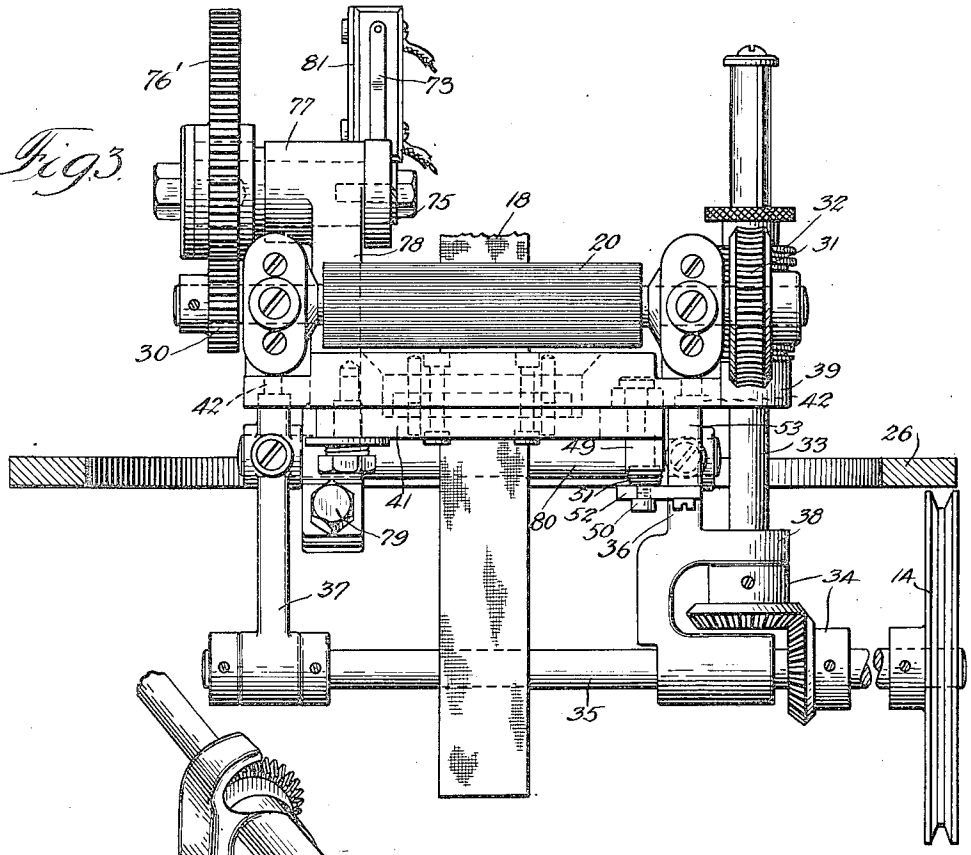
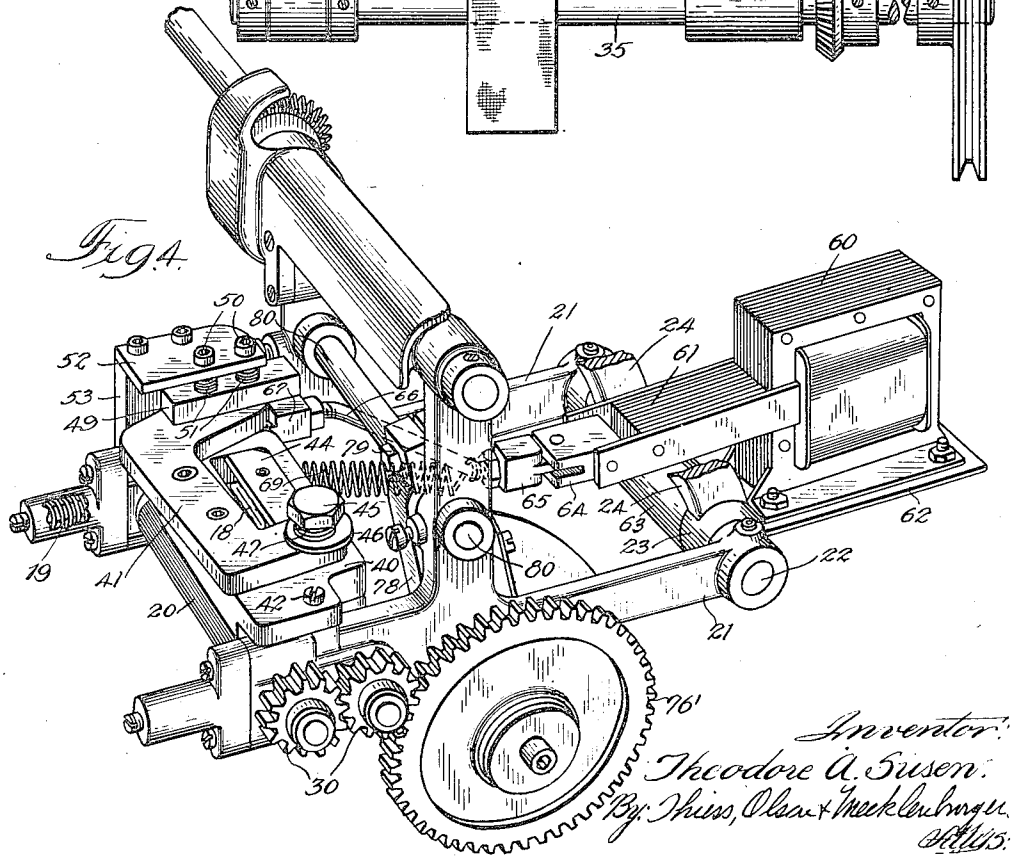


Fig. 4.



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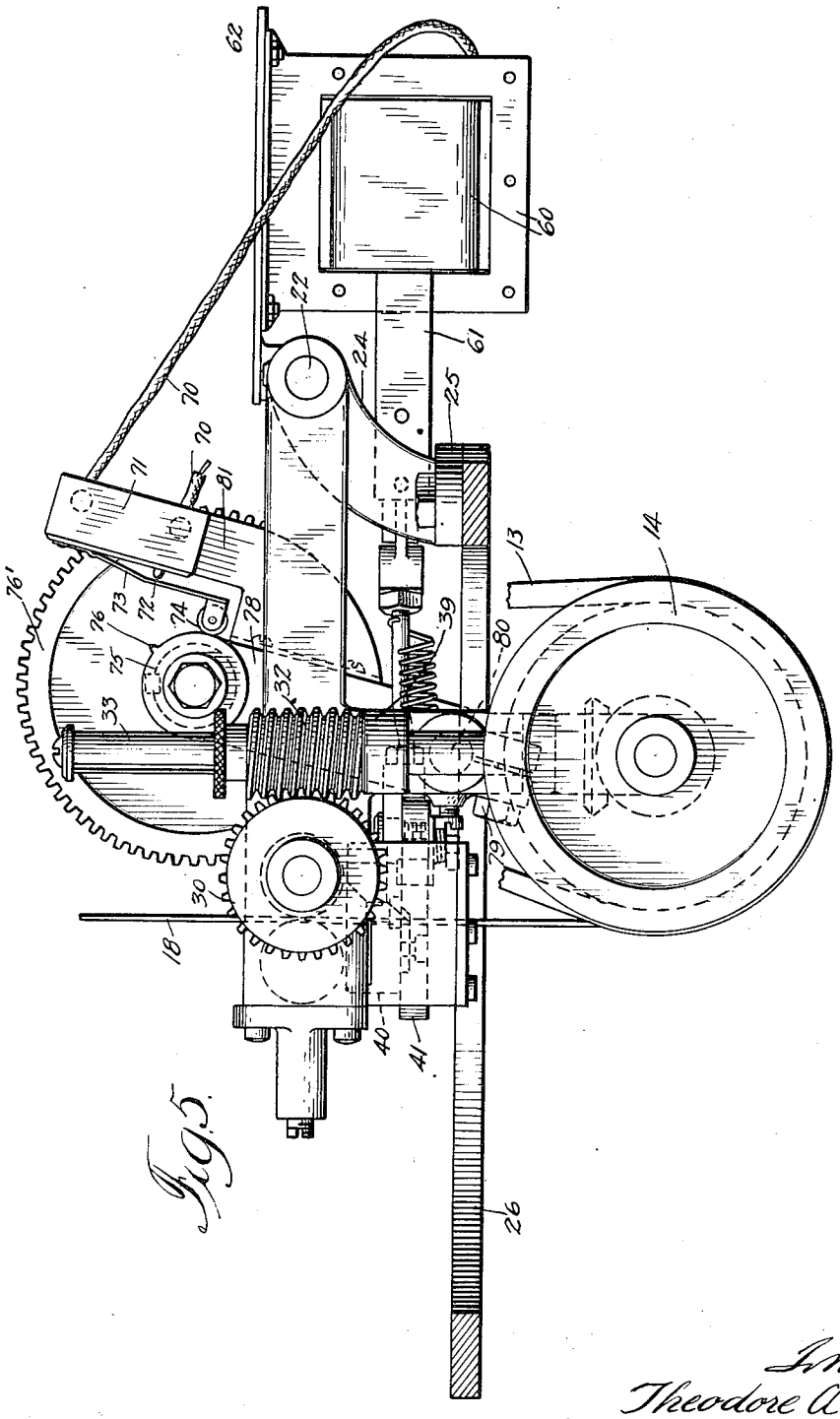


Fig. 5.

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Fig. 6.

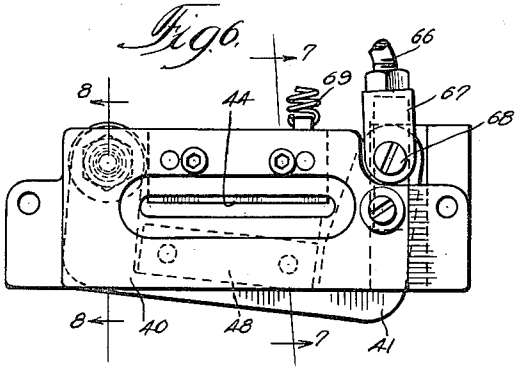


Fig. 7.

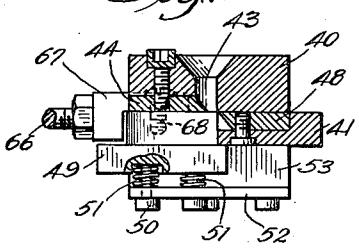


Fig. 9.

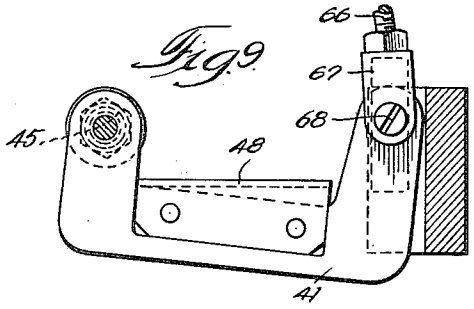


Fig. 8.

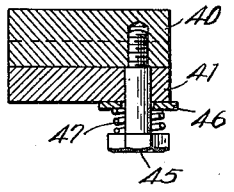


Fig. 10.

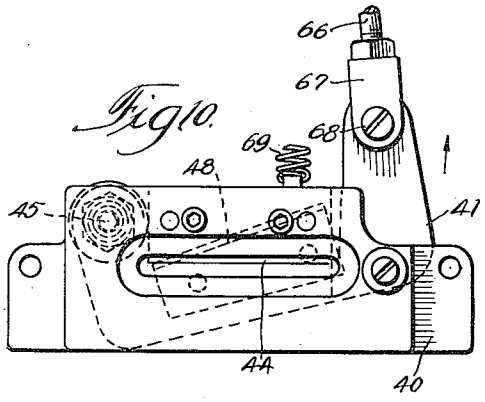
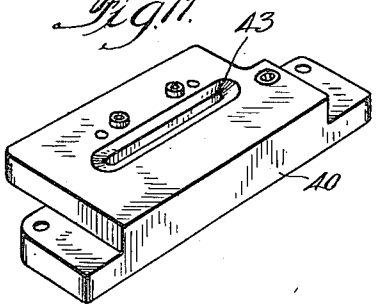


Fig. 11.



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Patented Aug. 17, 1948

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UNITED STATES PATENT OFFICE

2,447,103

KNITTING MACHINE

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Application March 15, 1945, Serial No. 582,926

14 Claims. (Cl. 164—42)

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This invention relates to improvements in knitting or other machines wherein the product produced thereby is received by take-up rolls or devices associated with the machines and issues therefrom in continuous tubular or other form.

In some machines, knitting machines particularly, the product is drawn from the needles or forming mechanism by tension applied thereto by the take-up rolls or other device which grips the product and pulls it with the desired degree of tension.

In such machines the rate of issuance of the product from the knitting mechanism is apt to vary slightly, and the desired uniform tension on the product necessary for the proper knitting of the product is secured in some machines by suitably controlled friction clutches in the power line of the take-up rolls. In other machines the rolls are mounted on a vertically floating frame of appropriate constant weight effect and are driven at a suitable varying rate so that the rolls and their associated parts are kept suspended as a weight on the issuing product, which is thereby placed under uniform tension regardless of variations in the rate of issuance of the product from the knitting mechanism.

In some knitting machines the bank of needles rotates and the issuing product does not; in others, the needles are stationary, that is, do not rotate, and the issuing product does. The take-up device in the former is non-rotative also, but in the latter it rotates with the product.

In all these machines the product issues from the machine as a continuous strip or tube, and for certain uses in manufactured articles must later be cut into short lengths. This involves extra labor, rehandling, inaccuracies, delays and the like, and is objectionable.

It is an object of this invention so to improve such machines that the product may be delivered therefrom in proper lengths for their intended uses.

A further object is the improvement in such machines that the continuous product is severed into the desired predetermined lengths as it comes from the machine.

It is also an object to provide such a continuous-product machine having means for severing the product into the desired predetermined lengths without interference or stoppage of the continuous production by the machine.

A further object is the improvement of such continuous machines that the issuing product is substantially instantaneously severed into pre-

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determined lengths without stoppage of the continuous production by the machine.

An additional object is the provision of severing means for the continuous product adjacent the take-up device or rolls to sever the issuing product into the desired lengths.

A further object is the provision in such continuous-product machines of severing means mounted on the take-up device to sever the product into desired lengths.

It is also an object of the invention to provide severing means controlled by the tension or take-up rolls to sever the issuing continuous product into predetermined lengths.

An object of the invention is the improvement in such continuous-product machines whereby the take-up device includes a severing means for the issuing product mounted on the device and controlled thereby to deliver predetermined lengths of the product from the machine without interference with the continuous production by the machine.

An object of the invention is also the improvement in such continuous machines having the floating type of take-up or tension device that the product is issued therefrom in predetermined lengths.

A further object is the provision in such take-up floating tension device machines of severing means for the product mounted on said device and controlled thereby to sever the product into uniform predetermined lengths without interference with the continuous production by the knitting mechanism of the machine.

Still further objects and advantages will appear from the description and claims to follow, in connection with the accompanying drawing illustrating one form of knitting machine embodying the invention, and in which

Fig. 1 is a side view, mainly in outline, of a knitting machine embodying the invention;

Fig. 2 is a plan view of the take-up device of the machine, including the severing means for the product;

Fig. 3 is an end elevation of the same, looking at the vertically movable end of the pivoted or floating take-up device;

Fig. 4 is a perspective view of the same, showing it turned over to expose the bottom face where the severing mechanism is mounted and may be more clearly seen;

Fig. 5 is a side view of the take-up device and associated parts, looking at it from the right hand of Fig. 2;

Fig. 6 is a plan view of the shearing blades, showing them in open position;

Fig. 7 is a cross section on the line 7—7 of Fig. 6 through the blades intermediate their ends;

Fig. 8 is a cross section on the line 8—8 of Fig. 6, taken through the pivot screw or bolt of the blades;

Fig. 9 is a plan view of the movable blade of the shears;

Fig. 10 is a plan view of the blades similar to Fig. 6 but showing the blades closed or nearly so; and

Fig. 11 is a perspective top view of the fixed shearing blade.

Referring to these drawings and particularly to Fig. 1, the machine here indicated is of the continuous tube type in which the product does not rotate nor does the take-up device, and the latter is of the floating type whereby its weight, or a large part of it, is imposed on the product to place the proper pull on the product and the knitting mechanism. All this is well known and the parts are only generally indicated. Thus, the knitting mechanism 10, including the usual bed plate, cylinder, dial and the entering yarn or yarns, is shown at the top of the machine, and is operated by a suitable power driving mechanism which may be a belt and tight and loose pulley arrangement generally indicated by the numeral 11 which, among other things, operates a small drive pulley or sheave 12 connected by a suitable belt 13 to a large driven pulley or sheave 14 of the take-up device of the machine. These two pulleys or sheaves 12 and 14 and belt 13 constitute the friction drive for the variable speed take-up rolls of the said device.

The bed plate of the knitting mechanisms is mounted on standards 15 extending up from the base 16 of the machine which may be supported by three legs 17. The take-up device is located between the standards 15 adjacent the base 16 and receives between its rolls the continuous product 18 from the knitting mechanism. In this instance the product is tubular in form and is flattened as it passes through the rolls of the take-up device.

These take-up rolls 20 which have lightly fluted or roughened surfaces, the better to grip the product 18 between them, are journaled in the forward free end of a frame, Figs. 2, 4 and 5, comprising side members 21 and rear end member in the form of a short shaft 22 to which the side members are rigidly secured as by set screws as shown, or otherwise. This end shaft 22 is mounted for slight rotation in bearings 23 in the upper ends of rearwardly curved standards 24, which in turn are secured to and project upwardly from an arc-shaped base 25 (Fig. 2) fitting upon and bolted to the upper face of a supporting ring 26 secured to and carried by the base 16 (Fig. 1) of the machine. Thus, while the rear end of this frame is pivoted to the framework of the machine, the forward end carrying the rolls has freedom for a limited up-and-down movement and, as will be explained, is sustained normally by the product 18 through the gripping and travel of the rolls 20 thereon. The product is thus pulled downwardly to the desired extent during the operation of the machine by the weight of the take-up device thus riding thereon.

The take-up rolls 20, which are adjustably spring-pressed together, as by the adjusting screws and coil springs 19 (Fig. 4) bearing against the bearing blocks of the outer roll 20, or in any other well-known or desired manner, properly to grip the product, are driven by intermeshing gears or pinions 30 at one end of the rolls, and a worm wheel 31 on one roll at the other end which is driven by a worm 32 on a vertical shaft 33 which extends above the worm with the usual provisions for permitting the worm to slide upwardly thereon when for any reason it is desired to back up or reverse the rolls 20. This shaft 33 is journaled in suitable bearings carried by the adjacent side member 21 of the pivoted or floating take-up frame and at its lower end has secured thereto one of a pair of bevel gears 34 (Fig. 3), the other of which is secured to the horizontal shaft 35 journaled in bearings secured to said floating take-up frame by depending hangers 36 and 37 from the side members 21 thereof. The lateral bearings 38 and 39 support the vertical shaft 33 on hanger 36. The driven friction belt pulley 14 is mounted on one end of this horizontal shaft 35. In this way rolls 20 are driven by the friction drive consisting of pulleys 12 and 14 and belt 13. These parts are so adjusted, related and proportioned that when the floating frame is near its lowermost position the rolls 20 are driven by the friction drive at a surface speed slightly greater than that of the descending product 18 with the result that the take-up device will rise or crawl up the product, and when it so ascends the belt 13 will be loosened on its pulleys, the friction will be less, the rollers 20 will turn at less speed, and the take-up device will descend. The whole result is that the take-up device goes up and down more or less or floats on the product, applying the desired uniform tension or pull thereto due to its weight regardless of the varying speed of the product in issuing from the knitting mechanism or that of the rolls in creeping up or down on the product.

In order to sever the continuous product into the desired uniform lengths regardless of its varying speed of production and of the tension to which it is subject between the forming mechanism and the floating take-up device, there is placed on the said device, closely adjacent the take-up rolls 20, a severing means, preferably in the form of a shear, which cuts the continuous product as it issues from the rolls into the desired lengths, whereby the product is delivered from the machine in such individual lengths rather than in a continuous strip which must later be straightened out and cut up.

This shearing means comprises a fixed blade carrier plate 40 and a cooperating pivoted movable blade carrier or plate 41. The fixed blade-plate 40 of the form shown in Fig. 11 is secured at its ends by screw bolts 42 to the under side edge of side members 21 of the take-up frame. This plate is so located that its slot 43 with its upwardly flaring mouth is directly beneath and in line with the space between the rolls 20 to receive the product as it issues and comes down from the rolls. In a recess in the under side of this plate 40, along the rearward side of the slot, a removable blade 44 is secured, as by suitable screws. This is the fixed blade of the shears with its cutting edge at the inner side of the product as it comes from the take-up rolls. It is readily removable for sharpening or replacement.

The cooperating shear plate 41, preferably of the form indicated in Figs. 4, 9 and others, is pivoted at one of its inwardly extending ends to the fixed plate 40 above by the screw bolt 45, Figs. 4 and 8, between the head of which and the washer 46 on the plate 41 is a coil spring 47 strongly pressing the said pivoted plate up against the

fixed plate to hold the blades together in proper shearing contact. In the upper side of this pivoted blade plate 41 is a recess along the inner edge in which is secured by screws a detachable blade 48 forming the movable blade of the shears which cooperates with the said fixed blade to sever the product 18 which passes between the blades in their open position. This blade too may be readily removed and attached for sharpening or replacement.

It will be noted from Figs. 6, 9 and 10, which show the blades in substantially open and closed positions, that the fixed blade 44 is the same width throughout but that the movable blade 48 is wider at the outer end, so that when open the cutting edges of both blades stand substantially in line with the vertical walls of the slot 43 through the fixed block or plate 40. Accordingly, when the pivoted blade is drawn toward the product, the cut or shear across the product starts at once at that edge and travels quickly across the same with a shear-like cut. The free end of the blade plate 41 is spring-pressed into face contact with the fixed plate 40 by a short block or plate 49 (Figs. 4 and 7) in side contact with the movable end of plate 41. This block 49 is held in place by screw bolts or pins 50 with coil compression springs 51 socketed in the plate 44 and bearing against the top of bracket plate 52 extending laterally under the block 44 and secured by screws or bolts to the lower edge of bracket plate 53 which in turn is secured in any desired way at its upper edge or end to one of the side rails 21 of the take-up frame. The pins 50 are spaced from the bottoms of the sockets in plate 49 (Fig. 7). In this way the shear blades are held in proper working contact by the springs throughout their various positions.

The movable blade carrier 41 and blade 48 are operated for shearing purposes preferably by a solenoid 60 of any desired type having a retractile core 61 and suitably mounted on the under side of a plate 62 extending rearwardly from a sleeve 63 on shaft 22 of the take-up frame, said sleeve being pinned to said shaft or otherwise non-rotatably affixed thereto. The plate 62 is firmly secured to said sleeve 63 by spot welding or otherwise whereby to form a rigid extension of the take-up frame on the other side of the pivotal bearings 23 for said frame.

The core 61 of the solenoid 60 which operates substantially in the plane of the shear blades is operatively connected with the end of a movable shear blade by a linkage comprising the double-clevis 64—65 pinned to the core and to each other for universal movement, the member 65 receiving or screwing onto the threaded rear end of a rod or link 66 with a lock nut thereon, which rod extends diagonally forward to the shearing blades, where it is similarly connected by threaded end and lock nuts to a block or semi-clevis 67 pivotally attached to the free end of shearing blade carrier 41. This block 67 (see Figs. 6 and 7) has a thinner portion extending over the end of the blade plate and is secured thereto by a shouldered screw 68 which permits pivotal movement of the parts while positively securing them together.

A coiled tension spring 69 is attached at the rear end to the rod 66 and at its forward end to a lug on the rear edge of the fixed blade carrier plate 40.

Accordingly, when the solenoid is energized and its core drawn in, the pivoted shearing blade

is operated through the linkage described to thereby sever the product. When the solenoid is de-energized, the spring 62 withdraws the core and restores the pivoted shear blade to its open position for the passage of the continuous product therethrough. This is all done so quickly—practically instantaneously—that the progress of the product through the rolls and blades appears not to be interrupted and is not practically or functionally interrupted.

The electric circuit of the solenoid may be connected with the local power circuit or with any suitable source of current and may include the conductors 70 leading to a suitable switch 71 which is preferably of the type known as micro-switches. Such switches have their contacts enclosed in an insulating casing with an operating pin extending to the outside. A slight push on this pin serves to operate the contacts. In the switch 71 shown, the operating pin is seen at 72, and an operating spring lever 73 secured at one end to the casing and extending over the pin and carrying a cam roller 74, at the other end, serves, when depressed, to operate the switch pin to close the circuit of the solenoid to operate the same, and when released, the switch opens the circuit to deenergize the solenoid.

In order that the proper lengths of the product may be cut off from the continuous strip regardless of its varying rate of production, the operation of the shears, magnet, switch, etc., is synchronized with the issuing product or some part or parts of the mechanism or machine operating in correspondence therewith. In this instance, since comparatively short uniform lengths are desired and the take-up rolls 29 meter or grip and feed the product out without slippage, the said shearing devices are preferably controlled or operated in synchronism therewith, whereby, regardless of their floating action and rise and fall on the product as produced, the proper lengths of the product are severed from the continuous strip and are so delivered from the machine.

As shown, the cam roller 74 of the micro-switch operating spring 73, Figs. 2, 3 and 5, is in the path of a cam disc 75 having a cam lug 76 thereon. In the rotation of the disc this cam lug engages the cam roller 74 and depresses spring 73 to operate the pin 72 of the micro-switch 71. This, as explained, operates the solenoid 60, which in turn operates the shears to cut the product. This cam disc 75 is suitably mounted on one end of a short shaft, on the other end of which is secured the large gear wheel 76' meshing with and driven by one of the intermeshing pinion gears 30 on the ends of the roller shafts (Figs. 2 and 4). Consequently the said switch is operated in timed relation with the rolls.

The stub or short shaft for the cam and gear wheel is suitably mounted for rotation in a bearing 77 at the upper end of a supporting bar or post 78, shown slightly inclined toward the rear at the upper end (Fig. 5) and adjustably clamped at its split lower end by bolt 79 to the cross non-rotatable shaft or rod 80 which is fixedly mounted as by set-screws at its ends in the depending hangers 36 and 37 of the take-up roll frame and at about the level or plane of the supporting ring 26.

The micro-switch is secured by screws to the side of the upper end of upwardly curved sheet-metal or similar bracket 81, the lower laterally bent end of which is secured by screws to the inclined post 78.

The gear wheels 76 and 30 and the cam 75 are

so proportioned that the desired length of product is severed at each revolution of the cam. Adjustments of the length of cuttings may be made by changing the gears and cam or otherwise, the supporting post 78 being adjustable on the cross shaft 80 as explained, to permit variations of position of the bearing 77 for the purpose.

From the foregoing the operation will be clear. Briefly stated, the product 18 is pulled down from the forming mechanism by a constant pull or weight imposed thereon by the take-up device, the take-up rolls 20 of which are driven by the variable friction drive 12—13—14 at such a speed as to keep the take-up device suspended therefrom regardless of variations in the speed of production of the product. The severing means in the form of shears 40 and 41 to cut the continuous product as it issues from the take-up rolls is mounted adjacent the exit of the rollers 20 on the take-up device so as to move therewith, and its operation to sever the product is controlled by the said rolls 20 whereby, regardless of the floating movement of the rolls and the varying speed of the product therethrough either due to the varying rate of production of the product or the creeping action of the take-up device up and down the product, the continuous product is neatly cross-severed or clipped into uniform lengths, without interruption or affecting the normal operation of the machine. By locating the shears close to the rolls the product does not get wrinkled or folded and have to be straightened and stretched out again before severing, and the tension thereon is relieved so that a clean cut is made without tearing or irregularity. The cut is so quickly made that there is no appreciable interference with the continuous progress of the product. It is cut by a natural progressive shearing action, and owing to the short distance from the rolls there is sufficient stiffness in that short length to cause the product to continue to feed down through the slot of the shears and between the blades without interruption. While but a comparatively narrow product is shown, a wider product within the limits of the slot in the shears may be accommodated, and with a still wider product the shears themselves may be changed for those with a longer slot and blades.

While but one embodiment of the invention is shown in the drawings as an example of one type of machine of the class described to which the invention relates, it will be understood that the same may be embodied in various types and forms of machines and that various changes and alterations may be made therein, all without departing from the scope or principle of the invention as set forth or intended to be set forth in the following claims, to-wit:

1. A machine of the continuous product type including product forming mechanism, a take-up device suspended on and for applying tension to the product as it is formed, and a severing means mounted on and controlled in synchronism with said device for severing the product into predetermined lengths in the operation of the machine.

2. A knitting machine of the continuous product type including a floating take-up device suspended on the product to apply uniform tension to the product as it is formed, and a severing means located on said device and controlled in synchronism therewith to sever the product into predetermined lengths as it issues from the device and machine.

3. A knitting machine of the continuous product type comprising a floating take-up device therefor having gripping rolls to grasp the product and suspend the weight of the device on the product to apply tension thereto as it is formed, a severing means for the product mounted on the take-up device and movable therewith, and means for causing the operation of said severing device to sever the product into predetermined lengths.

4. A knitting machine of the continuous product type having a floating take-up device with power-operated gripping rolls for the product, severing means for the product mounted on said device adjacent the rolls, a camming means in the device operated in synchronism with the rolls, and operating means for the severing means controlled by said camming means to sever the product into predetermined lengths as measured by the rolls in the operation of the machine.

5. A knitting machine of the continuous product type having a floating take-up device with power-operated gripping rolls for the product to place the product under a uniform tension as it is formed, severing means for the product mounted on the device adjacent the rolls, a cam on the device operated in synchronism with the rolls, magnetic means on the take-up device for operating the severing means, and electric contacts operated by said cam in circuit-making and breaking relation with said magnetic device, whereby the product is cut into predetermined lengths in the operation of the machine.

6. A knitting machine of the continuous product type having a floating take-up device with power-operated gripping rolls for the product, severing means for the product mounted on the device adjacent the rolls, a cam on the device operated in synchronism with the rolls, a solenoid on the device, linkage connecting the solenoid with the severing device to operate the same, and electric contacts in circuit relation with the solenoid operated by said cam, whereby to sever the tube into predetermined lengths in the operation of the machine.

7. A severing means for a continuous product knitting machine or the like having a floating take-up device to place the product forming mechanism under uniform tension by the weight of the device on the product as it is formed, comprising shear blades on the device and movable therewith, and means for operating said blades to sever the product, the operation of said means being controlled by the said device to produce the desired lengths of product irrespective of the position of the device.

8. A severing means for a continuous product knitting machine or the like having a floating take-up device to place the product forming mechanism under uniform tension by the weight of the device on the product as it is formed, comprising shear blades on the device and movable therewith, and means for operating said blades to sever the product to produce the desired lengths of product irrespective of the position of the device.

9. A severing means for a continuous product knitting machine or the like having a floating take-up device to place the product forming mechanism under uniform tension by the weight of the device on the product as it is formed, comprising shear blades on the device and movable therewith, and means for operating said blades to sever the product, the operation of said means being controlled in unison with said device to produce the desired lengths of product irrespective of the position of the device.

10. A severing means for a continuous knitting

machine or the like having a vertically floating take-up device including a pair of rolls to grip the product between them and place the product forming mechanism under proper tension by the weight of the device on the product as it is formed, comprising shear blades adapted to be mounted on said device closely adjacent the said rolls and vertically movable therewith, and means for intermittently operating said blades to sever the product into the desired lengths as it issues from the rolls irrespective of the vertical position of the device and rolls.

11. A severing means for a continuous product knitting machine or the like, comprising shear blades in pivotal relation and normally open for the passage of the product therebetween, means for closing said blades upon the product to sever the same transversely by a shearing cut, the said blades being arranged to start the transverse cut on the edge of the product opposite the pivotal center of movement of the blades.

12. A severing means for a continuous knitting machine or the like having a vertically floating take-up device including a pair of rolls to grip the product between them and place the product forming mechanism under proper tension by the weight of the device on the product as it is formed, comprising shear blades adapted to be mounted on said device closely adjacent the said rolls and vertically movable therewith, and means for intermittently operating said blades to sever the product into the desired lengths as it issues from the rolls irrespective of the vertical position of the device and rolls, said blades being pivotally connected adjacent one side edge of the product and starting the severing cut at the opposite edge.

13. A severing means for a continuous knitting machine or the like having a vertically floating take-up device including a pair of rolls to grip the

product between them and place the product forming mechanism under proper tension by the weight of the device on the product as it is formed, comprising shear blades adapted to be mounted on said device closely adjacent the said rolls and vertically movable therewith, said device having a pivotal connection adjacent one end with the said machine, and an operating magnet for said blades carried by the said device on the opposite side of said pivotal connection.

14. A severing means for a continuous knitting machine or the like having a vertically floating take-up device including a pair of rolls to grip the product between them and place the product forming mechanism under proper tension by the weight of the device on the product as it is formed, comprising shear blades adapted to be mounted on said device closely adjacent the said rolls and vertically movable therewith, and an electromagnetic device connecting with said blades for operating same to sever the product as it issues from the rolls, said magnetic device being so operated to sever the product as desired irrespective of the vertical position of the take-up device on the product.

THEODORE A. SUSEN.

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