May 8, 1962 R. K. HORNE ET AL 3,033,140

APPARATUS FOR AUTOMATICALLY WINDING AND/OR UNWINDING WEB MATERIAL UNDER UNIFORM TENSION

Filed Feb. 24, 1959 5 Sheets-Sheet 1

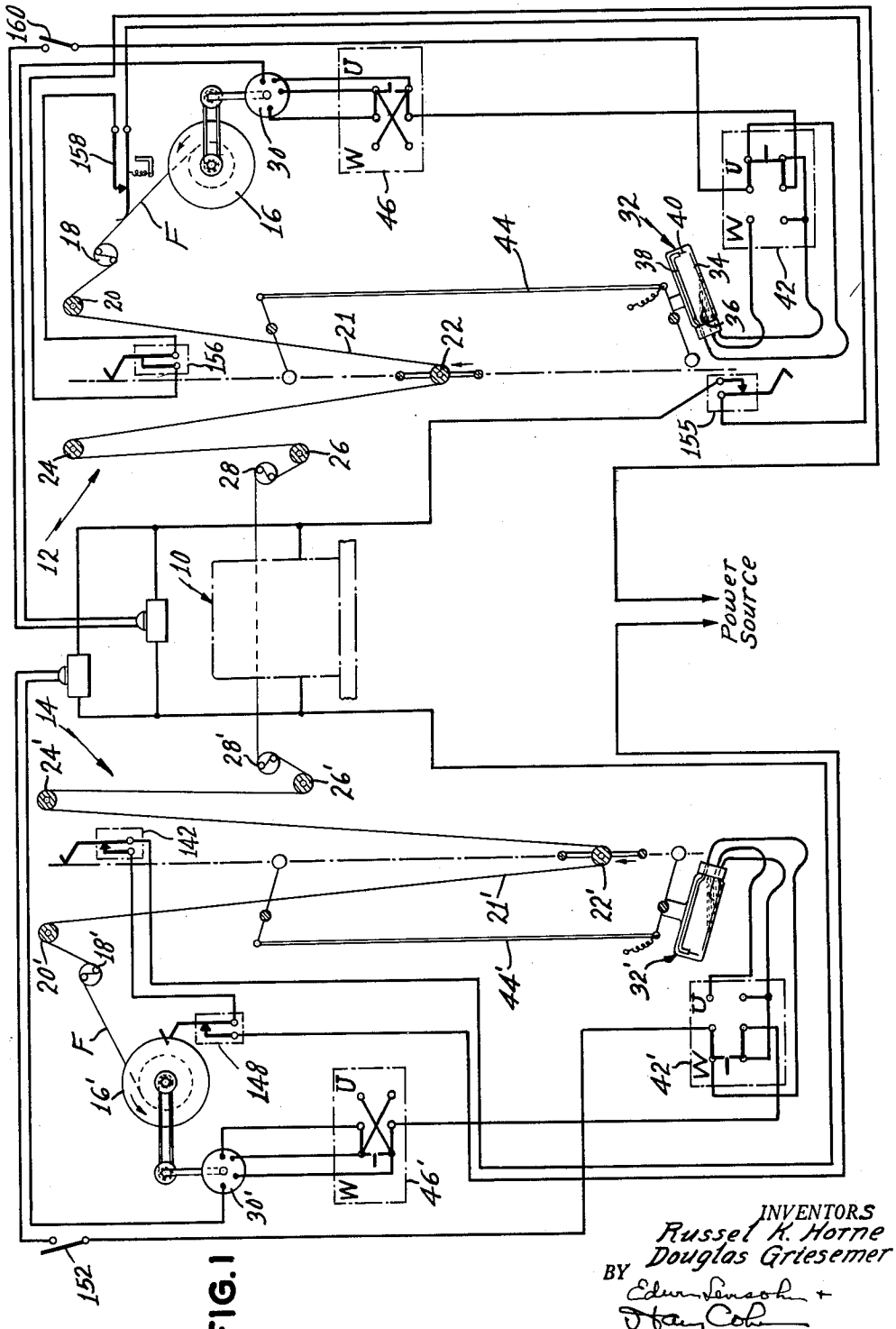



FIG. 1

INVENTORS
Russel K. Horne
Douglas Griesemer
BY
Edwin Jenson & Cobb
ATTORNEYS

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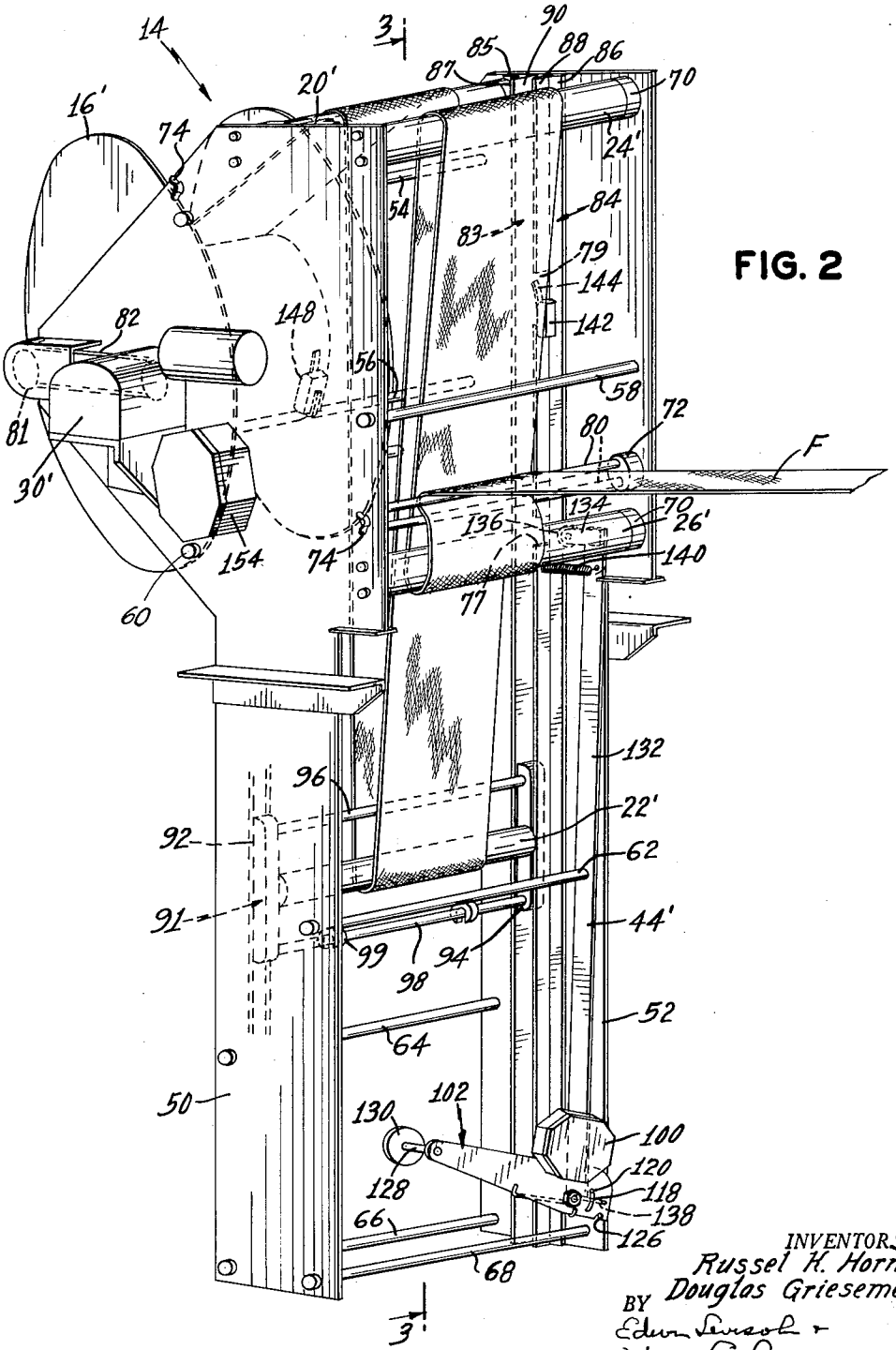



FIG. 2

INVENTORS
Russel K. Horne
Douglas Griesemer
BY Edwin Lewsohn
Otto Cole
ATTORNEYS

May 8, 1962 R. K. HORNE ET AL 3,033,140

APPARATUS FOR AUTOMATICALLY WINDING AND/OR UNWINDING WEB MATERIAL UNDER UNIFORM TENSION

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FIG. 3

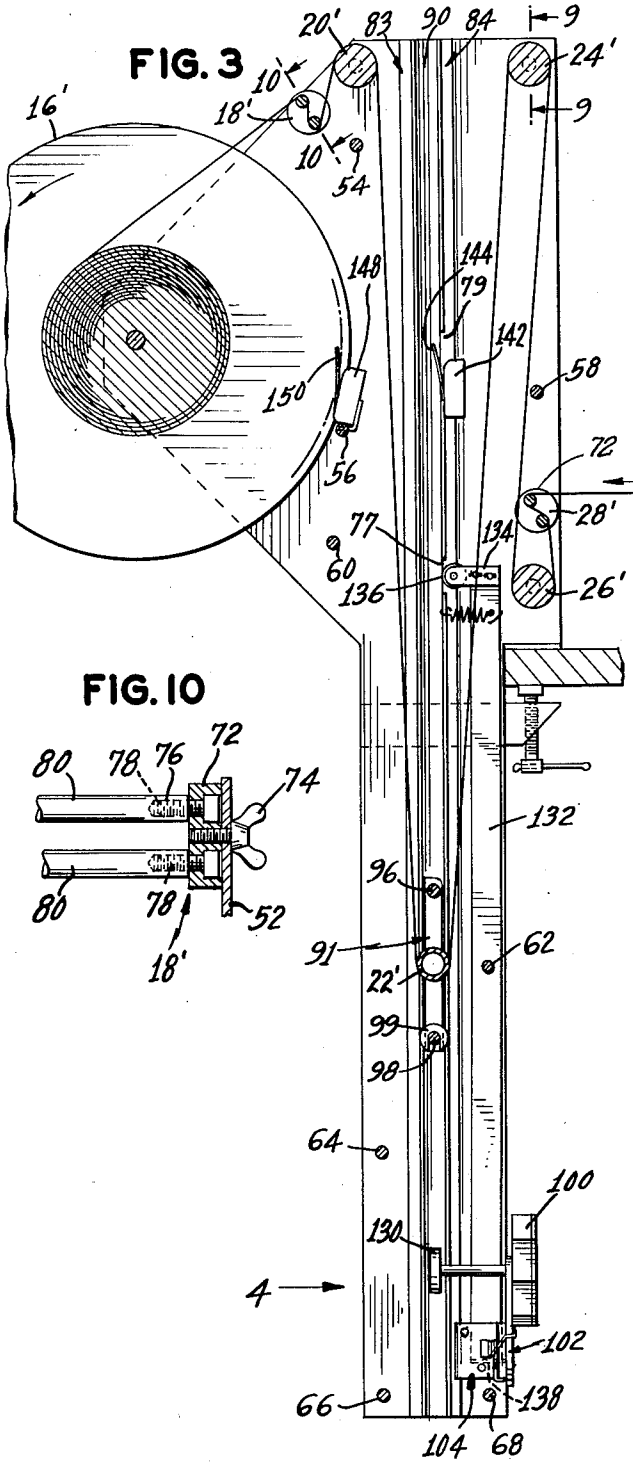



FIG. 9

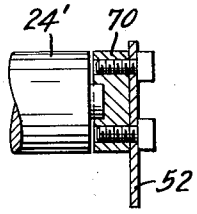



FIG. 5

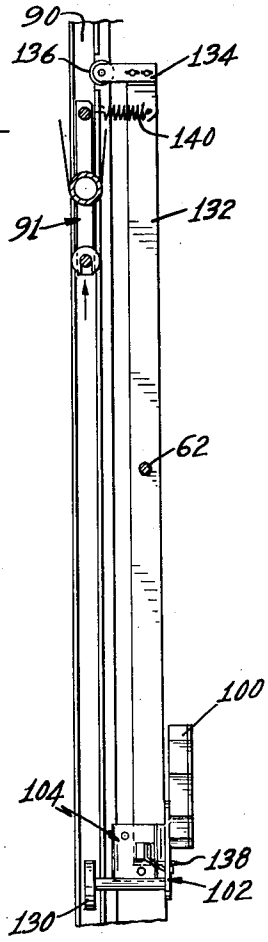



FIG. 10




INVENTORS
Russel K. Horne
BY Douglas Griesemer
Edwin Lemon & Hoag Cobb
ATTORNEYS

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FIG. 4

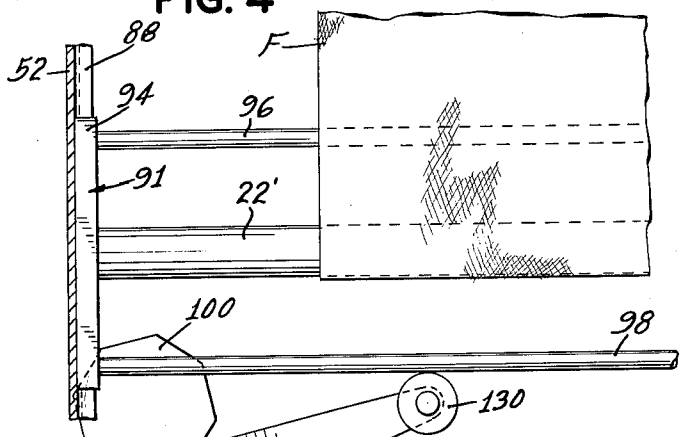



FIG. 8

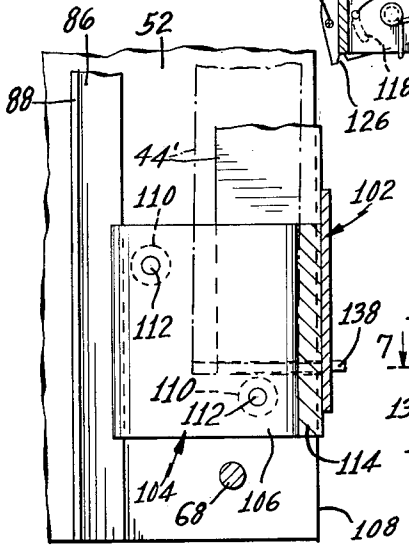
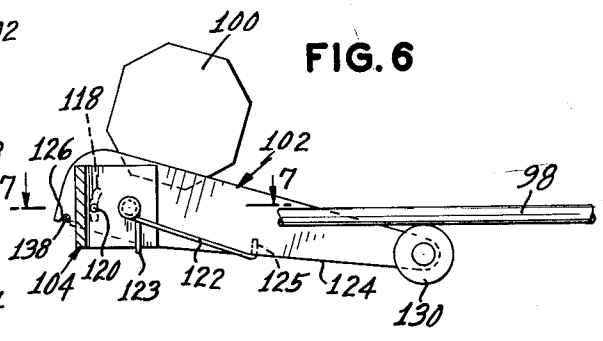



FIG. 6



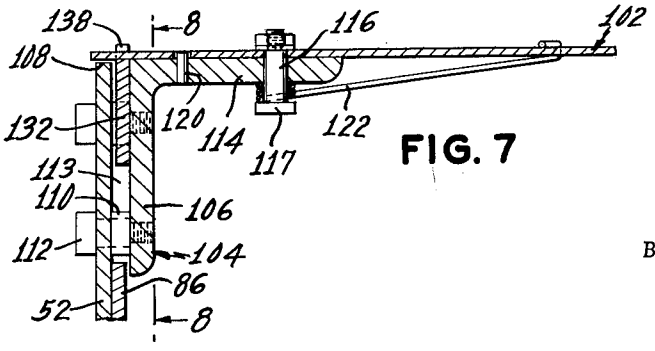




FIG. 7

INVENTORS
Russel K. Horne
Douglas Griesemer
BY Edwin Lincoln
Harry Cole
ATTORNEYS

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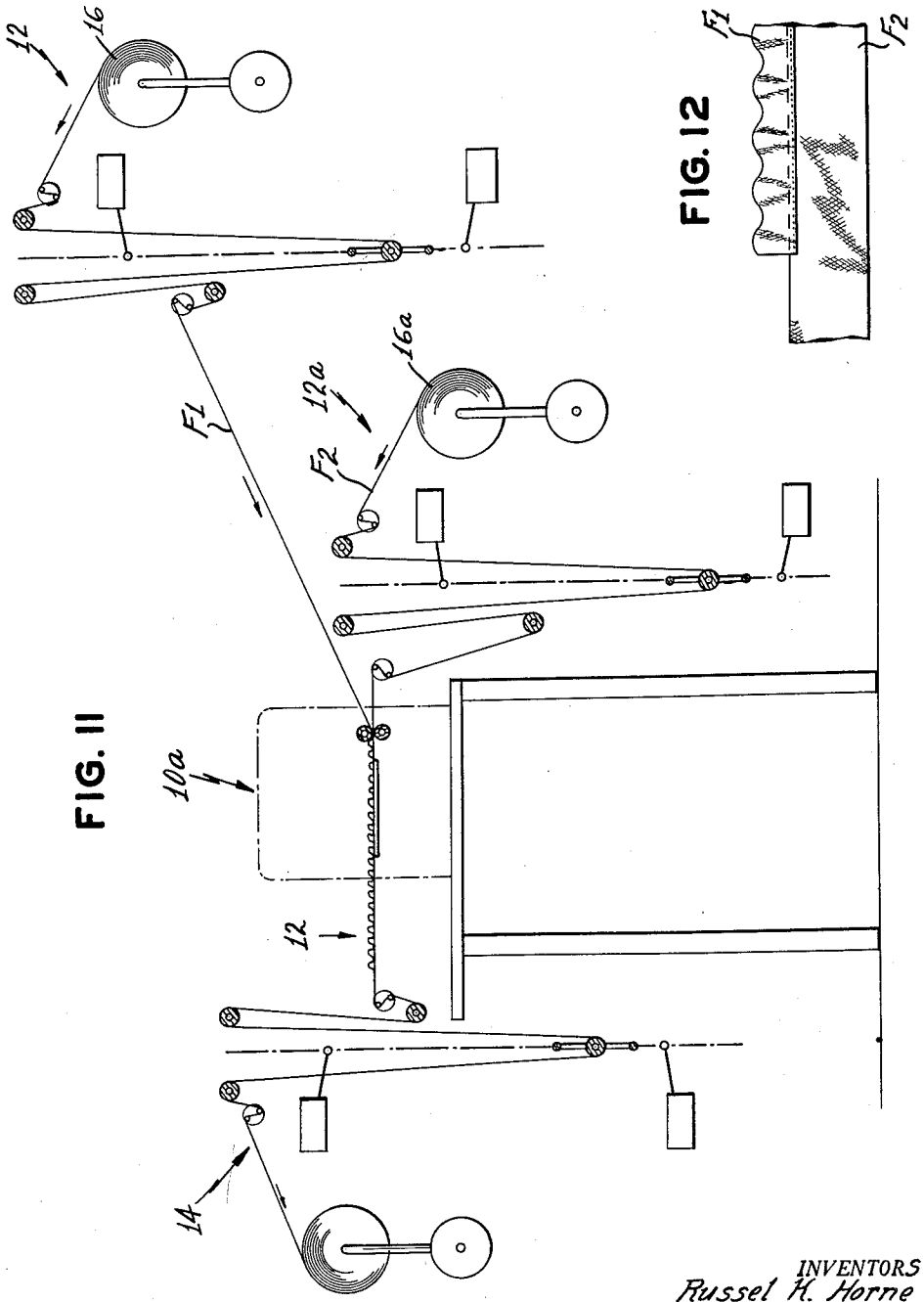



FIG. 11




FIG. 12

INVENTORS
Russel K. Horne
BY Douglas Griesemer
Edwin Jensen
Harry Cole
ATTORNEYS

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3,033,140

# APPARATUS FOR AUTOMATICALLY WINDING AND/OR UNWINDING WEB MATERIAL UNDER UNIFORM TENSION

Russel K. Horne, 369 N. Broad St., Lititz, Pa., and Douglas Griesemer, Lancaster, Pa.; said Griesemer assignor to said Horne

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7 Claims. (Cl. 112—203)

The present invention relates, in general, to automatic devices for supplying web fabric and to automatic devices for taking up web fabric. More specifically, the present invention relates to an automatic device for feeding a web of fabric to a sewing machine and for taking up the sewn fabric from said sewing machine after the sewing operation has been performed on the fabric.

It has heretofore been necessary for an operator to manually control the feed of the fabric to a sewing machine, and the operator accomplished this by unwinding material from the supply roll by hand so that there would be an even tension on the goods or on the needles of the sewing machine as it was fed therethrough. It has also heretofore not been possible or feasible to automatically take up or wind the fabric onto a take-up roll due to the fact that as the diameter of the roll of wound material increased, the linear speed of the material as it moved from the sewing machine to the take-up roll increased and this made it impossible to automatically take up the material from the sewing machine and wind it automatically onto a take-up roll because the increase in linear speed resulted in the application of excess tension on the sewn material. This would, in turn, damage the goods or the needles and, in fact, pull the material through the machine and past the needles at a linear speed greater than that at which the sewing machine was normally discharging the sewn fabric, with the obvious resultant damage to the material and to the machine.

The present invention eliminates these difficulties and not only enables the fabric to be fed at a constant rate to the sewing machine without requiring the services of an operator, but also enables the sewn material to be wound automatically on the take-up roll while it is being sewn on the sewing machine, with uniform tension applied to the fabric throughout the unwinding and winding operation.

In accordance with this invention, and in the case of the wind-up apparatus, the material discharged from the sewing machine is run over a plurality of guide rollers and under a tension control roller which is movable vertically up and down, and the fabric is then directed to a motor driven wind-up roller. Switching means are provided for making and breaking the motor circuit, and top and bottom actuators are provided in the path of the vertically movable control roller so that the motor is stopped when the control roller moves upwardly to a predetermined point as the material is wound onto the wind-up roller. When the roller reaches the upper predetermined point, the switch which controls the motor circuit is actuated to interrupt that circuit and the motor stops. As soon as the motor stops and the winding of the material on the take-up roller is discontinued by reason of the stoppage of the motor, the control roller descends and in descending draws the sewn material away from the sewing machine at a uniform linear speed and tension, which is the same speed and tension at which the sewn material was withdrawn from the sewing machine during the operation of the wind-up roller. When the control roller descends to a predetermined lower point, the switch is actuated in response to the descending control roller to start the motor, and the wind-up roller is immediately set into operation for continuing the winding of the sewn material from the sewing machine at the same uniform linear speed which previously prevailed during the operation of the apparatus, without any regard to the particular linear speed at which the wind-up roller is winding the fabric thereon.



Further, in accordance with the invention, in the case of the automatic supply apparatus, the same apparatus as the winding apparatus is used, except that in this case the supply roll is driven in a direction to unwind the material for movement to the sewing machine, and the actuation and deactuation operation of the motor is reversed so that when the control roller moves upwardly in its vertical movement to a predetermined upper limit point, it is operative to energize the motor, and when the control roller moves downwardly and reaches the lower predetermined limit point, it is operative to de-energize the motor and interrupt the unwinding operation of the supply roller.

It is therefore an object of the present invention to provide tension control means for a length of material in motion through a machine which performs an operation thereon.

Another object of the invention is to provide a device for automatically supplying to a machine web material under uniform tension, said device being of generally improved and simplified construction.

Another object is the provision of a device for automatically taking up web material from a machine under uniform tension, said device being of generally improved and simplified construction.

Another object is the provision in an automatic supply or take-up device for web fabric, of tension control means gravity biased into supporting engagement with a loop of said fabric, and movable in unison with said loop for actuating switch means whereby to intermittently rotate the supply or take-up rolls, respectively, for maintaining the traveling fabric under uniform tension.

Another object is the provision of a method for automatically supplying web fabric to a machine and automatically taking up said fabric from said machine without requiring any manual handling of said fabric, the latter continuously traveling under uniform tension.

A further object is the provision for automatically supplying to a machine a plurality of web fabrics under uniform tension, said fabrics being supplied to said machine at different linear speeds.

The above and other objects, features and advantages of the present invention will be fully understood from the following description considered in connection with the accompanying drawings which are illustrative of the presently preferred mode of practicing this invention.

In the drawings:

FIG. 1 is a schematic representation of an automatic winding and unwinding device according to the invention, together with the associated electrical circuitry therefor;

FIG. 2 is a perspective view of a winding device in accordance with the invention;

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 2, and showing one position of the switch actuating mechanism;

FIG. 4 is a partial view thereof, with parts broken away, looking in the direction of arrow 4 in FIG. 3, and showing one position of the switch mounting bracket;

FIG. 5 is a fragmentary view, similar to FIG. 3, showing another position of the switch actuating mechanism;

FIG. 6 is a view similar to FIG. 4, but showing another position of the switch mounting bracket;

FIG. 7 is a vertical sectional view taken on the line 7—7 of FIG. 6;

FIG. 8 is a partial sectional view taken on the line 8—8 of FIG. 7;

FIG. 9 is a sectional view taken on the line 9—9 of FIG. 3;

FIG. 10 is a sectional view taken on the line 10—10 of FIG. 3;

FIG. 11 is a schematic representation illustrating the utilization of the invention for supplying two web fabrics at different speeds to a sewing machine for making shirred fabric; and

FIG. 12 is a fragmentary view, looking in the direction of arrow 12 of FIG. 11, showing the shirred fabric made by the system of FIG. 11.

Referring now to the drawings, and particularly to FIG. 1, there is shown a schematic representation of a sewing machine 10 which is provided with an automatic fabric unwinding or supply device 12 and an automatic fabric winding or take-up device 14 according to the invention. The fabric F is unwound from fabric supply roll 16 and passes through a snubber 18, over a stationary guide roller 20, then forms a loop 21 about movable control roller 22 which it supports. Fabric F then passes to stationary guide rollers 24 and 26, and through snubber 28 into sewing machine 10 which draws the fabric therethrough at a substantially uniform linear speed for the desired sewing operation. Fabric supply roll 16 is driven by motor 30 which is intermittently operated under the control of a mercury switch 32. Mercury switch 32 comprises three electrodes 34, 36 and 38. Electrode 38 is insulated from the other electrodes except for a bare reflexed end portion 40 adapted to be contacted by the mercury or other conducting fluid when the switch is tilted in a clockwise direction, viewing FIG. 1, for electrical connection with electrode 34. On the other hand, when switch 32 is tilted in a counter-clockwise direction, as shown in FIG. 1, the mercury moves away from the adjacent ends of electrodes 34 and 38, thereby to break the electrical connection therebetween, and makes an electrical connection between electrodes 34 and 36, electrode 36 being relatively short so that when the switch is tilted in a clockwise direction the circuit is broken between electrodes 34 and 36. The three electrodes are connected to a double-pole double-throw switch 42 so that in one position thereof (U) electrodes 34 and 38 are in circuit with the motor 30 and in the other position thereof (W) electrodes 34 and 36 are in said motor circuit. It is thus seen that when switch 42 is in the U position, the counter-clockwise tilting of mercury switch 32 will break contact between electrodes 34 and 38 to interrupt the energization of motor 30, and the clockwise tilting of mercury switch 32 will make electrical connection between said electrodes to energize said motor. On the other hand, when switch 42 is in the W position, it will be apparent that counter-clockwise tilting of mercury switch 32 establishes electrical connection between electrodes 34 and 36 to energize motor 30 while clockwise tilting of switch 32 breaks said electrical connection to interrupt the motor energization. A double-pole double-throw switch 46 is provided for motor 30 and is operative in the U position thereof to rotate roller 16 in a direction in which it unwinds the fabric thereon, and in the W position thereof to rotate said roller in the opposite direction.

Viewing FIG. 1, switches 42 and 46 are in the U position, and mercury switch 32 is in its counter-clockwise disposition whereby motor 30 is de-energized as explained above. With the sewing machine in operation, the fabric F will be drawn therethrough. This will cause loop 21 to decrease in size, and control roller 22, which is mounted for vertical movement in unison with loop 21, will ascend. When it reaches a predetermined upper limit point due to the decrease in size of loop 21, control roller 22 is operative to actuate switch control lever 44 so as to cause the clockwise tilting of mercury switch 32 and thereby energize motor 30 so as to unwind fabric from supply roll 16 at a greater linear speed than that of the fabric through the sewing machine. As soon as fabric F is unwound from supply roll 16, the size of the loop 21 increases in size and the control roller 22 descends due to its own gravity and, in descending, draws the unwound fabric away from the supply roll 16 until control roller 22 reaches a predetermined lower limit point at which time said control roller 22 is operative to actuate switch control lever 44 to cause the counter-clockwise tilting of mercury switch 32 and thereby discontinue the operation of motor 30. When this occurs, the size of loop 21 will now decrease in size and control roller 22 will reverse its direction and begin to ascend again, due to the continued feeding of fabric F through the sewing machine, until it again reaches its predetermined upper limit point at which time the previously described operation is repeated as above described. The unwinding device 12 enables the sewing machine 10 to draw the fabric F therethrough at a constant and uniform tension which is governed by snubber 28 and the weight of control roller 22, both of which are adjustable to provide a desired even and uniform tension to the drawn fabric through the sewing machine, throughout the operation of the device.



When the fabric F leaves the sewing machine after the intended sewing operation, such as stitching or hemming, has been performed thereon, it is fed to automatic take-up device 14 and passes through snubber 28', under stationary guide roller 26', over stationary guide roller 24', and forms a loop 21' about control roller 22' which it supports. Fabric F then passes over stationary guide roller 20', through snubber 18', and from the latter to take-up roll 16'. Take-up roll 16' is driven by motor 30' which is intermittently operated under the control of mercury switch 32'. The respective rollers 20', 22', 24' and 26' and snubbers 18', 28' of winding device 14 are in all respects identical to their counterparts in the unwinding device 12, previously described. Likewise, roll 16', driving motor 30', mercury switch 32' and toggle switches 42' and 46' are identical to their previously described counterparts in the unwinding device 12, except that the switches 42' and 46' are each in the W position thereof, as shown in FIG. 1.

With mercury switch 32' in its clockwise position, the motor 30' is energized and is operative to cause fabric take-up roll 16' to rotate in a direction so as to wind the fabric F thereon. Such winding of fabric F will cause a decrease in size of loop 21' and control roller 22' will rise until it reaches a predetermined upper limit point at which time control roller 22' is operative to actuate switch control lever 44' to cause counterclockwise pivotal movement of switch 32' to interrupt the energization of motor 30'. As soon as motor 30' stops and the winding of the fabric on roll 16' is discontinued by reason of the stoppage of the motor, the size of loop 21' will increase and the control roller 22' descends, and in descending draws the fabric away from the sewing machine at a uniform linear speed and tension, which is the same speed and tension at which the sewn material was withdrawn from the sewing machine during the operation of the take-up roll 16'. When the control roller 22' descends to a predetermined lower limit point, control roller 22' is operative to actuate switch control lever 44' so as to cause clockwise pivotal movement of mercury switch 32' to thereby start motor 30' and immediately setting into operation the take-up roll 16' for continuing the taking up of the fabric from the sewing machine at the same uniform linear speed which previously prevailed during the operation of the sewing machine and the take-up apparatus. Thus it is seen that fabric F is withdrawn from the sewing machine at a uniform linear speed and tension, regardless of the diameter of the roll 16' or the linear speed at which the fabric is wound onto the roll.

It is thus seen that the only difference between the unwinding device 12 and the winding device 14 is that, in the case of the unwinding device, the control roller 22 is operative to activate the motor at its upper limit point and deactivate the motor at its lower limit point, while in the winding device 14, the control roller 22' is opera-

tive to deactivate the motor at its upper limit point and actuate the motor at its lower limit point. Thus it is seen, that the devices 12 and/or 14 are identical in construction and are readily interchangeable so that they may be used either as an automatic winding device or an automatic take-up device, the only difference being in the setting of the switches 42, 42' and 46, 46', respectively.

The constructional details and manner of operation of winding device 14 will now be described with reference to FIGS. 2 to 10, but it will be understood that, except as otherwise stated or described, the unwinding device 12 is in all respects indentical to the winding device 14.

As best shown in FIG. 2, winding device 14 comprises a pair of vertically extending side frames 50, 52 maintained in parallel spaced relation by means of tie rods 54, 56, 58, 60, 62, 64, 66 and 68. Mounted on the side frames are a plurality of pairs of confronting roller mounts 70 (FIGS. 3 and 9) which provide bearings for the freely rotatable stationary guide rollers 20', 24' and 26'. Also mounted on the side frames are pairs of confronting snubber rod ends 72 (FIGS. 3 and 10). Each snubber rod end 72 is provided with a central threaded aperture which threadedly receives wing nut 74 for securing said snubber rod ends onto the associated side frame. The snubber rod ends 72 are also each provided with a pair of spaced threaded apertures 76 for receiving screws 78 which are threadedly insertable in the adjacent ends of snubber rods 80 for fixedly securing thereto two snubber rods 80 between each pair of confronting snubber rod ends. Snubber rod ends 72 and snubber rods 80 form the previously described snubber 18'. It is apparent that by loosening wing nuts 74 the snubber 18' can be rotated to move the snubber rods 80 to their desired disposition, and wing nuts 74 may then be tightened to fix said snubber rods in said desired position. As seen in FIGS. 1 and 2, fabric F passes between the two snubber rods 80 as it goes through the device 14, and the tensioning of the fabric can be regulated by adjusting the position of said rods 80 in the manner described.

Mounted between the side frames 50, 52 at the upper rear part thereof, is the take-up roll 16', the latter being adapted to be rotated by pulley 81 which is driven by belt 82, the latter being driven by motor 30'. It will be understood that a plurality of pulleys may be provided for adjusting the speed of rotation of winding roll 16'.

The confronting inner surfaces of side frames 50, 52 are each provided with a pair of parallel spaced angle irons 83, 84 suitably secured to each side frame as for example, by welding sides 85, 86 of angle irons 83, 84, respectively, to the inner surface of the associated side frame, sides 87, 88 of said angle irons at each side frame being in confronting relation and defining therebetween a guideway 90 extending for the entire vertical extent of their respective side frames 50, 52. Side 88 of angle iron 84 on side frame 52 is interrupted along the vertical extent thereof to define slots 77 and 79.

Slide assembly 91 comprises slides 92 and 94 which are adapted to slide freely in guideways 90 and which are interconnected in spaced parallel relation by an upper tie rod 96 and a lower tie rod 98. Control roller 22' is rotatably mounted between slides 92 and 94, intermediate rods 96 and 98. Slide 94 is rounded off at its upper and lower ends for reasons which will be evident hereafter. The slide assembly 91 is of generally light weight so as not to apply too much tension to the fabric. However, weights 99 can be provided on rod 98, as desired, to adjust the fabric tension.

Mercury switch 32' is mounted in a housing 100 which is fixedly secured, as by welding, to mercury switch bracket 102, the latter being mounted on device 14 for pivotal movement from a maximum clockwise position thereof to a maximum counter-clockwise position thereof. An angle-shaped mounting bracket 104 (FIGS. 3, 5, 7 and 8) has one leg 106 thereof secured to the inner surface of side frame 52, in spaced relation therewith, and said leg 106 extends approximately from the welded leg 86 of angle iron 84 to a little beyond the outer edge 108 of said side frame member 52. Bracket 104 is secured in said spaced relation by means of spacer elements 110 and shoulder screws 112. It will thus be observed that there is a substantial clearance 113 between bracket 104 and side frame 52. It will also be noted that the spacers and screws 110, 112, respectively, are disposed at opposite corners of leg 106 of bracket 104. The other leg 114 of bracket 104 extends inwardly of the device 14, and it is on said leg 114 that the mercury switch bracket 102 is pivotally mounted as by shoulder pin 116. Mercury switch bracket 102 is provided with an elongated slot 118 and leg 114 of angle bracket 104 is provided with a dowel pin 120 which projects into slot 118 and thereby limits the maximum clockwise and counter-clockwise pivotal movement of mercury switch bracket 102, and thus of switch 32'. A torsion spring 122 is wound about pin 116 between leg 114 of bracket 104 and shoulder 117 of said pin, and has end 123 thereof hooked over bracket 104 and the other end 125 thereof is hooked over the lower edge 124 of mercury switch bracket 102 to bias the latter in a clockwise direction viewing FIG. 2, or in a counterclockwise direction viewing FIG. 4. Accordingly, spring 122 is operative to normally bias bracket 102 to the position thereof shown in FIG. 4, in which pin 120 is at the upper end of slot 118. Mercury switch bracket 102 is also provided with a recess 126 along lower edge 124, for reasons which will be fully explained hereafter. At the other end of mercury switch bracket 102, there is provided an arm 128 extending transversely of the mercury switch bracket and terminating in a roller disc 130 which is disposed in the vertical path of rod 98 on the slide assembly 91 which carries control roller 22'. Accordingly, downward movement of control roller 22' will be operative to cause rod 98 to engage disc 130 and move the latter downwardly to thereby cause rotation or pivotal movement of the mercury switch bracket 102 against the action of spring 122.

Switch actuating lever 44' is Z-shaped and comprises a generally vertically extending member 132 provided at the upper end thereof with a transversely extending arm 134 which pivotally mounts, at the free end thereof, a roller 136 in alignment with slot 77. As shown in FIG. 5, arm 134 is adjustably secured to member 132. At its lower end, member 132 is provided with a pin 138 extending transversely thereof. Switch actuating lever 44' is pivotably mounted to side frame 52 by means of tie rod 62. The lower part of member 132, as best shown in FIG. 7, extends between leg 106 of angle 104 and the side frame 52 in the clearance 113 provided therebetween by spacers 110 as previously described. A tension spring 140 having one end thereof secured to switch actuating lever 44' at the upper end thereof and having its other end secured to angle 84, biases the lever 44' in a counterclockwise direction viewing FIG. 3. Spring 140 is thus operative to bias pin 138 into engagement with the inner surface of mercury switch bracket 102, as shown in FIGS. 2, 3 and 4. When pin 138 is in said engagement with bracket 102, roller 136, at the upper part of switch actuating lever 44', does not project into slot 77.

With the respective parts positioned as shown in FIG. 3, the mercury switch bracket 102 is biased in its counterclockwise position, as viewed in FIG. 4, by means of torsion spring 122, motor 30' is de-energized and slide assembly 91 moves down as the fabric F is withdrawn from the sewing machine. Continued downward movement of slide assembly 91 will cause lower rod 98 to engage roller 130 of the mercury switch bracket. FIG. 4 illustrates the position of bracket 102 just as rod 98 engages roller 130. In such position it is noted that pin 138 is in abutment with the inner side of mercury switch bracket 102. As slide 91 continues to descend it will cause pivotal movement (clockwise viewing FIG. 4) of the mercury switch bracket 102, against the biasing action of spring 122, and

pivot the bracket from its position shown in FIG. 4 to that shown in FIG. 6. When said mercury switch bracket 102 is moved to its position shown in FIG. 6, recess 126 on said bracket moves into alignment with pin 138 of switch actuating lever 44', and said pin 138 now enters said recess under the biasing action of spring 140 (FIG. 8). At the same time, mercury switch 32', having been likewise tilted, will energize the motor circuit 30' whereby take-up roll 16' will wind the fabric, thus immediately causing control roller 22', and slide assembly 91, to rise. Bracket 104, however, remains locked in the position shown in FIG. 6 by virtue of the engagement of pin 138 in recess 126, which prevents bracket 104 from returning to its counter-clockwise position shown in FIG. 4, under the action of torsion spring 122. The penetration of pin 138 in recess 126 enables additional pivotal movement of switch actuating lever 44' under the action of tension spring 140, to cause roller 136 to project into slot 77 and thus be disposed in guideway 90, in the path of silde 94.

Upon continued upward movement of slide 91 due to the fabric winding action of roller 16', slide 94 reaches slot 77 and its rounded edge engages roller 136 which is disposed in its path, resulting in a camming action which moves the roller out of slot 77 against the action of spring 140 (FIG. 5). Such movement of roller 136 imparts pivotal movement to actuating lever 44' against the action of spring 140, and is operative to release pin 138 from its locking engagement in recess 126. The mercury switch bracket 102 is now tilted by the action of torsion spring 122 so as to cause the return of the bracket to its counter-clockwise position shown in FIG. 4, in which position switch 32' is operative to de-energize the motor. When the motor is de-energized under the action of switch 32', slide 91 continues to rise a small amount due to inertia and will then reverse direction and descend until it is once again operative to actuate bracket 102 at its lower limit point to re-energize motor 30'. This cycle is then repeated continuously throughout the operation of the winding device 14.

A normally closed switch 142 is provided on device 14 and has a flexible arm 144 normally disposed in slot 79 so as to project therethrough into guideway 90. As seen in FIG. 1, switch 142 is in the line circuit so that when it is opened, it will interrupt the circuits to both the sewing machine and the winding device. Accordingly, if for any reason whatsoever motor 30' does not become de-energized when slide 94 engages roller 136, the fabric F would continue to be wound into roller 16' thus pulling the entire slide assembly 91 out of device 14. Switch 142 prevents such occurrence, since before slide assembly 91 would reach the uppermost part of device 14, slide 94 would engage flexible arm 144 to open switch 142 and thus de-energize, positively, both the sewing machine motor and the winding motor 30'.

Another normally closed switch 148 is provided on device 14 and may be mounted on tie rod 56 as best shown in FIG. 3. Switch 148 is operative to limit the amount of fabric wound on to wind-up roll 16'. As shown, when wind-up roll 16' reaches a predetermined diameter, flexible arm 150 of switch 148 will be engaged by the wound fabric to open said switch and interrupt the line circuit thereby stopping both the sewing machine and winding motor 30'.

As seen in FIG. 1, switches 142 and 148 are in series with each other and are connected directly in series with the power source so that when either of said switches is opened, the sewing machine as well as motor 30' will be stopped. On the other hand, the energizing circuit for motor 30', as well as switches 46' and 42', are all in a series circuit which is across the power supply so that interruption of the motor circuit 30' does not, in any way, effect either the operation of the sewing machine or that of the winding device 12.

An on-off switch 152 is also provided for manually controlling the operation of motor 30'. Switches 42', 46' and 152 are disposed in a switch housing 154 mounted on side frame 50, as shown in FIG. 2, for easy access thereto.

Thus it is seen that the automatic winding device 14 is constructed so as to perform its intended function previously described. Automatic device 14 will automatically take up the fabric as it is withdrawn from the sewing machine 10 at a uniform linear speed as well as under uniform tension. The tension at which the fabric is withdrawn is governed by the adjustment of snubber 28' and by the weight of slide assembly 91. Snubber 18' has no effect on the tension of the fabric as it is pulled out of the sewing machine but does effect the tension of the fabric as it is wound on winding roll 16'.

Unwinding device 12 is in all respects similar in the details of construction to winding device 14 described in connection with FIGS. 2 through 10. The operation of winding device 12 will, however, be somewhat different, and such difference is obtained by placing switches 42 and 46 in the U position. Under such conditions, actuation of roller 136 when slide assembly 91 is ascending will result in the energization of motor 30 in order to unwind or pay off the fabric F from roller 16, and actuation of bracket 102 in the downward movement of slide assembly 91 will result in de-energization of motor 30 to stop the unwinding or paying off of the fabric F from roll 16. A normally closed switch 155, similar in construction to switch 142, is provided in unwinding device 12 to act as a safety switch should motor 30 not become energized after bracket 104 has been tilted during the descending movement of slide assembly 91. Likewise, normally closed switch 156, which is similar in construction to switch 142, is provided in device 12 as a safety switch to prevent slide 91 from being completely pulled out of the device due to defective operation thereof.

A normally closed switch 158 is provided, as shown in FIG. 1, and is operative to interrupt all the circuits when the roll 16 is completely unwound. Switch 160 is an on-off switch for motor 30 similar to switch 152.

In the operation of the unwinding device 12, the sewing machine is enabled to draw the fabric therethrough at any desired tension which is maintained uniform throughout the operation thereof. The amount of tension can be controlled by adjustment of snubber 28, and/or by the weight of slide assembly 91, in the manner previously described.

It will be apparent from the above description that by utilizing an unwinding device 12 and a winding device 14 in conjunction with sewing machine 10, the entire sewing operation for a given roll of fabric can be automatically performed without requiring any manual handling or attention, other than those that are normally supervisory. After the entire roll has been worked upon and is wound upon roll 16' of device 14, the latter can be immediately converted into an automatic supply device by merely reversing switches 42' and 46', without it even being necessary to remove the wound fabric roll from roll 16'.

Referring to FIG. 11, there is shown another method of utilization of the devices according to the invention. Sewing machine 10*a* is of the type that can draw therethrough two separate webs of fabric at two different linear speeds in order to produce a shirred or ruffled product such as is shown in FIG. 12. Since one material F1 is drawn through the machine at a much faster rate than fabric F2 in order to produce the shirred fabric, two automatic supply devices 12 and 12*a*, respectively, are provided, each feeding one of the webs of fabric to the sewing machine at the desired speed. For example, fabric F1 which is to be ruffled will be supplied at a higher linear speed to the sewing machine than fabric F2. The only difference between units 12 and 12*a* is that the speed of rotation of the supply roll 16 is greater in unit 12 than in unit 12*a*, such being easily accomplished by selecting the proper pulley arrangement to give the proper unwind-

ing speed. The winding machine 14 would be, in all respects, similar to the one previously described.

Thus it is seen that the automatic supply and take-up devices hereabove described are eminently well suited to accomplish the intended objects of the invention.

While the present invention has been described in connection with the feeding to and taking up of a fabric from a sewing machine, it will be understood that the invention would be equally applicable for the feeding and taking up of any material to and from a machine other than a sewing machine.

While we have shown and described the preferred embodiments of our invention, it will be understood that various changes may be made in the idea or principles of the invention within the scope of the appended claims.

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

1. In apparatus which includes a machine for performing an operation on a web of material which is moving continuously through the machine at a uniform linear speed; means for continuously transmitting said web of material to said machine at a uniform linear speed and constant tension, said means comprising a motor operated supply reel having said web of material wound thereon and being operable to unwind said material to permit movement of the material in the direction of its length toward said machine, means for forming a downwardly extending loop of a part of said material which is unwound from said reel, a weighted tension control member carried by said loop and movable concomitantly with the changes in the size of said loop for maintaining a constant tension on the material transmitted to said machine, means operable in response to the movement of said control member for interrupting the operation of said reel when said control member is in one position to stop the unwinding of said material and for restoring the operation of said reel when said control member is in another position to start the unwinding of said material, and means for continuously withdrawing said material from said machine at a uniform linear speed and constant tension concurrently with the transmission of the material to said machine.

2. In apparatus which includes a machine for performing an operation on a web of material which is moving continuously through the machine at a uniform linear speed; means for continuously transmitting said web of material to said machine at a uniform linear speed and constant tension, and means for continuously withdrawing said material from said machine at a uniform linear speed and constant tension concurrently with the trasmission of the material to said machine, said withdrawing means comprising a motor operated winding reel for winding the web of material from said machine onto said reel, means for forming a downwardly extending loop of part of the material from said machine, a weighted tension control member carried by said loop and movable concomitantly with the changes in the size of said loop for maintaining a constant tension on the material withdrawn from said machine, means operable in response to the movement of said member for interrupting the operation of said winding reel when said control member is in one position to stop the winding of said material and for restoring the operation of said winding reel when said control member is in another position to start the winding of said material.

3. In apparatus which includes a machine for performing an operation on a web of material which is moving continuously through the machine at a uniform linear speed; means for continuously transmitting said web of material to said machine at a uniform linear speed and constant tension, said means comprising a motor operated supply reel having said web of material wound thereon and being operable to unwind said material to permit movement of the material in the direction of its length toward said machine, means for forming a downwardly extending loop of a part of said material which is unwound from said reel, a weighted tension control member carried by said loop and movable concomitantly with the changes in the size of said loop for maintaining a constant tension on the material transmitted to said machine, means operable in response to the movement of said control member for interrupting the operation of said reel when said control member is in one position to stop the unwinding of said material and for restoring the operation of said reel when said control member is in another position to start the unwinding of said material, means for continuously withdrawing said material from said machine at a uniform linear speed and constant tension concurrently with the transmission of the material to said machine, said withdrawing means comprising a motor operated winding reel for winding the web of material from said machine onto said reel, means for forming a downwardly extending loop of part of the material from said machine, a weighted tension control member carried by said loop and movable concomitantly with the changes in the size of said loop for maintaining a constant tension on the material withdrawn from said machine, means operable in response to the movement of said member for interrupting the operation of said winding reel when said control member is in one position to stop the winding of said material and for restoring the operation of said winding reel when said control member is in another position to start the winding of said material.

4. In apparatus which includes a machine for performing an operation on a web of material which is moving continuously through the machine at a uniform linear speed; means for continuously transmitting said web of material to said machine at a uniform linear speed and constant tension, said means comprising a motor operated supply reel having said web of material wound thereon and being operable to unwind said material to permit movement of the material in the direction of its length toward said machine, means for forming a downwardly extending loop of a part of said material which is unwound from said reel, a weighted tension control member carried by said loop and movable vertically concomitantly with the changes in the size of said loop for maintaining a constant tension on the material transmitted to said machine, means operable in response to the movement of said control member for interrupting the operation of said reel when said control member is at one level to stop the unwinding of said material and for restoring the operation of said reel when said control member is at a higher level than said one level to start the unwinding of said material, and means for continuously withdrawing said material from said machine at a uniform linear speed and constant tension concurrently with the transmission of the material to said machine.

5. In apparatus which includes a machine for performing an operation on a web of material which is moving continuously through the machine at a uniform linear speed; means for continuously transmitting said web of material to said machine at a uniform linear speed and constant tension, and means for continuously withdrawing said material from said machine at a uniform linear speed and constant tension concurrently with the transmission of the material to said machine, said withdrawing means comprising a motor operated winding reel for winding the web of material from said machine onto said reel, means for forming a downwardly extending loop of part of the material from said machine, a weighted tension control member carried by said loop and movable vertically concomitantly with the changes in the size of said loop for maintaining a constant tension on the material withdrawn from said machine, means operable in response to the movement of said member for interrupting the operation of said winding reel when said control member is at one level to stop the winding of said material and for restoring the operation of said winding

reel when said control member is at a lower level than said one level to start the winding of said material.

6. In apparatus which includes a sewing machine for performing a sewing operation on a pair of webs of material which are moving together continuously through the sewing machine at different uniform linear speeds, respectively, for sewing said materials together to make a shirred fabric; means for continuously transmitting said webs of material together to said machine at different uniform linear speeds, respectively, and at constant tensions, said means comprising a first motor operated supply reel having one of said webs of material wound thereon and being operable to unwind said one material at one linear speed to permit movement of said one material in the direction of its length toward said machine, means for forming a downwardly extending loop of part of said one material which is unwound from said first reel, a weighted tension control member carried by said loop and movable concomitantly with the changes in the size of said loop for maintaining a constant tension on said one material, means operable in response to the movement of said control member for interrupting the operation of said first reel when said control member is in one position to stop the unwinding of said one material and for restoring the operation of said first reel when said control member is in another position to start the unwinding of said one material, a second motor operated supply reel having the other of said webs of material wound thereon and being operable to unwind said other material at a linear speed which is different than said one linear speed to permit movement of said other material in the direction of its length toward said machine concomitantly with the movement of said one material, other means of forming another downwardly extending loop of part of said other material which is unwound from said second reel, another weighted tension control member carried by said other loop and movable concomitantly with the changes in the size of said other loop for maintaining a constant tension on said other material, and means operable in response to the movement of said other control member for interrupting the operation of said second reel when said other control member is in one position to stop the unwinding of said other material and for restoring the operation of said second reel when said other control member is in another position to start the unwinding of said other material.

7. In apparatus which includes a sewing machine for performing a sewing operation on a pair of webs of material which are moving together continuously through the sewing machine at different uniform linear speeds, respectively, for sewing said materials together to make a shirred fabric; means for continuously transmitting said webs of material together to said machine at different uniform linear speeds, respectively, and at constant tensions, said means comprising a first motor operated supply reel having one of said webs of material wound thereon and being operable to unwind said one material at one linear speed to permit movement of said one material in the direction of its length toward said machine, means for forming a downwardly extending loop of part of said one material which is unwound from said first reel, a weighted tension control member carried by said loop and movable concomitantly with the changes in the size of said loop for maintaining a constant tension on said one material, means operable in response to the movement of said control member for interrupting the operation of said first reel when said control member is in one position to stop the unwinding of said one material and for restoring the operation of said first reel when said control member is in another position to start the unwinding of said one material, a second motor operated supply reel having the other of said webs of material wound thereon and being operable to unwind said other material at a linear speed which is different than said one linear speed to permit movement of said other material in the direction of its length toward said machine concomitantly with the movement of said one material, other means for forming another downwardly extending loop of part of said other material which is unwound from said second reel, another weighted tension control member carried by said other loop and movable concomitantly with the changes in the size of said other loop for maintaining a constant tension on said other material, means operable in response to the movement of said other control member for interrupting the operation of said second reel when said other control member is in one position to stop the unwinding of said other material and for restoring the operation of said second reel when said other control member is in another position to start the unwinding of said other material, and means for continuously withdrawing the resulting web of shirred fabric from said sewing machine at a uniform linear speed and constant tension concurrently with the transmission of the webs of material to said sewing machine.

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