

May 18, 1948.

H. C. BOSTWICK

2,441,791

STRIP FEEDING MECHANISM

Filed July 7, 1944

5 Sheets-Sheet 1

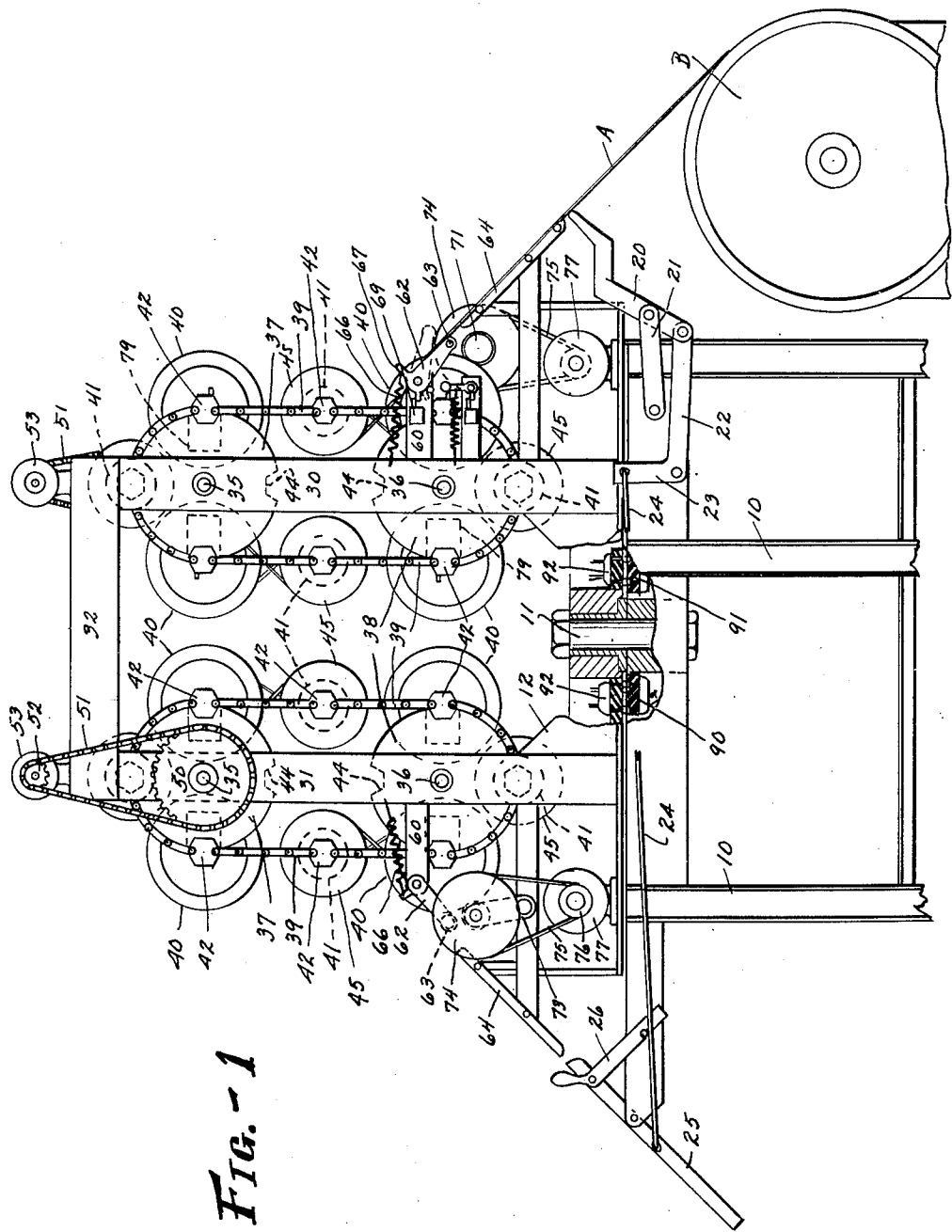


Fig. - 1

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5 Sheets-Sheet 2

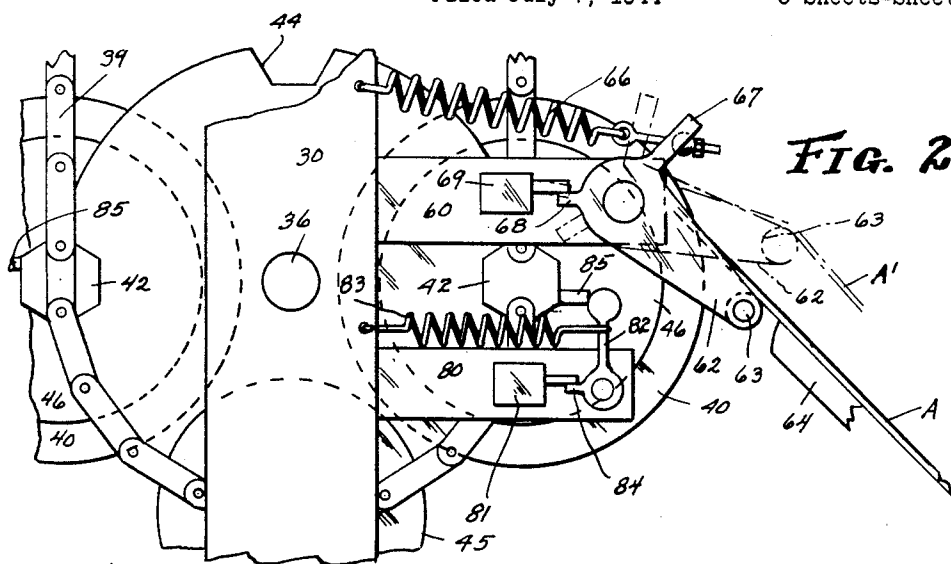


FIG. 2

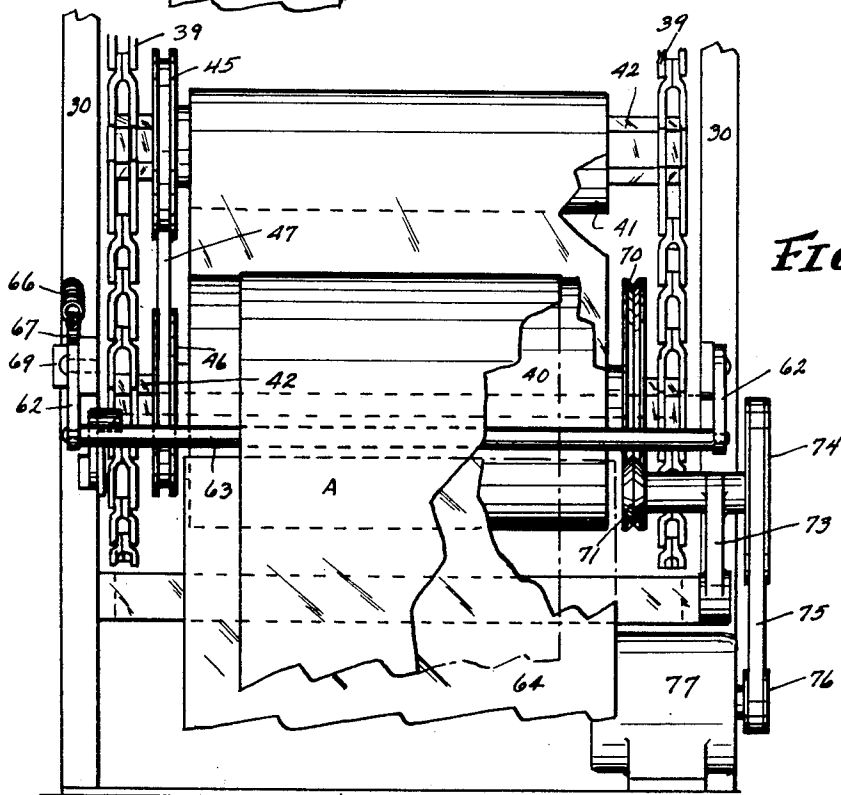


FIG. 3

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5 Sheets-Sheet 3

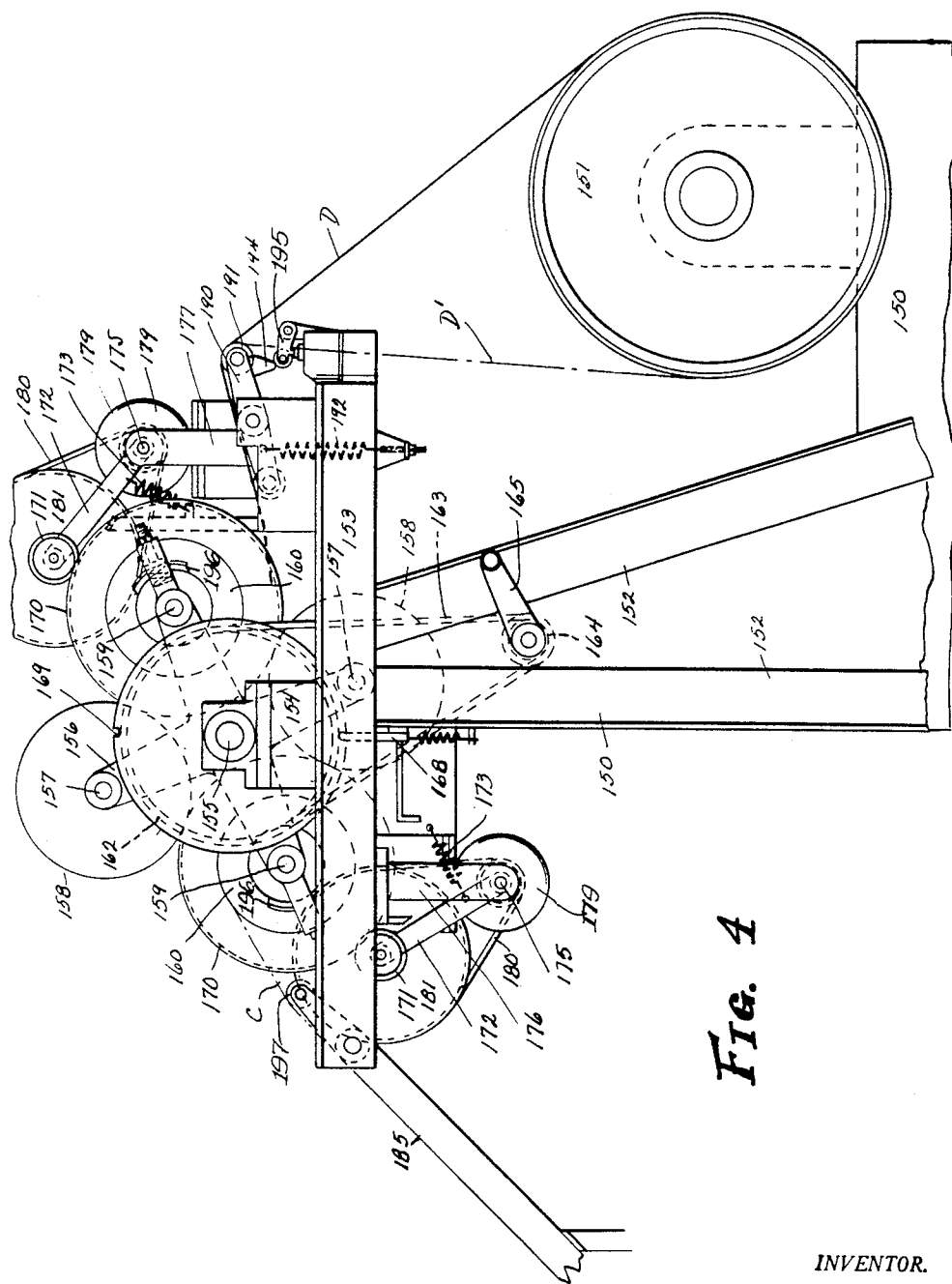


FIG. 4

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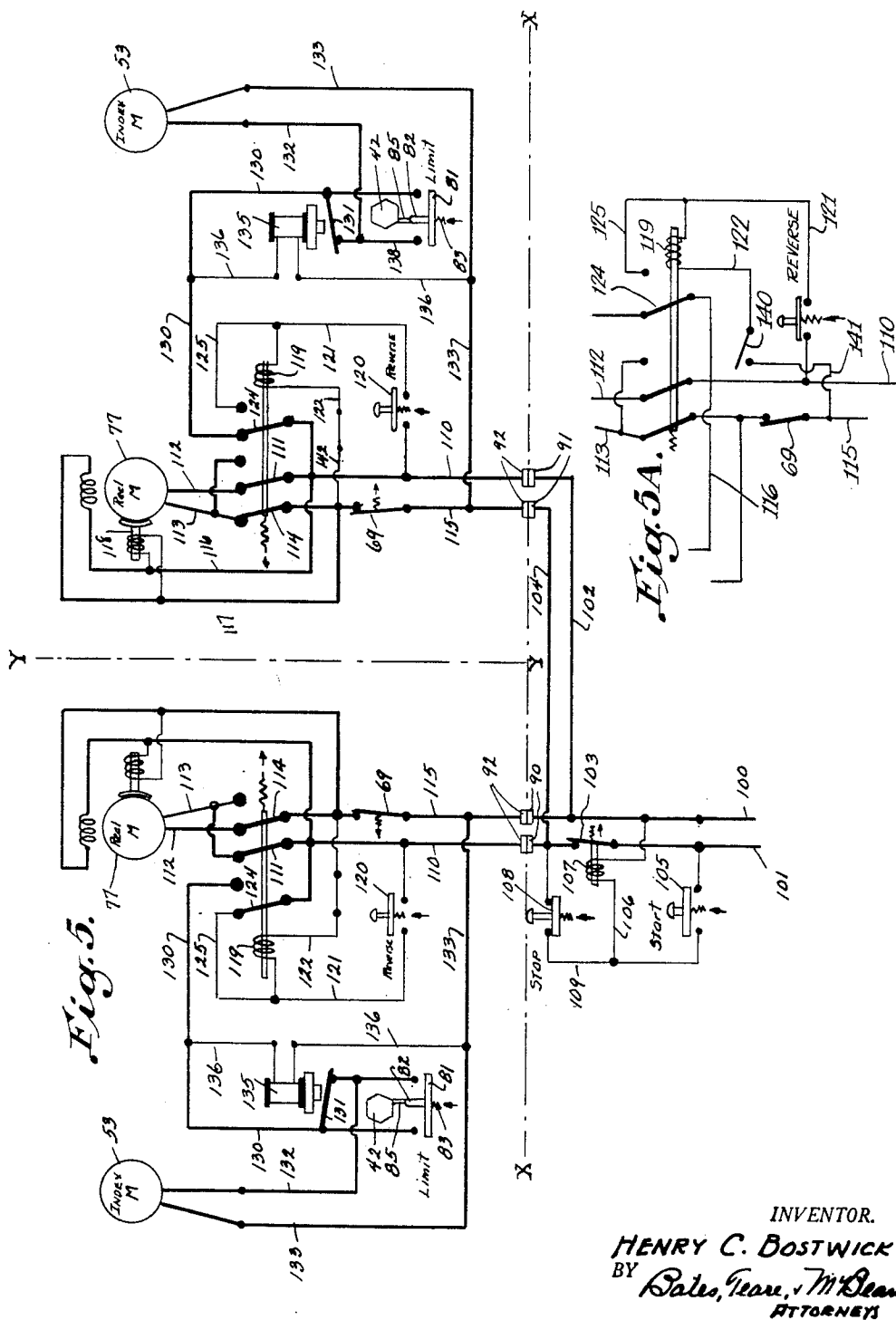
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STRIP FEEDING MECHANISM

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5 Sheets-Sheet 4



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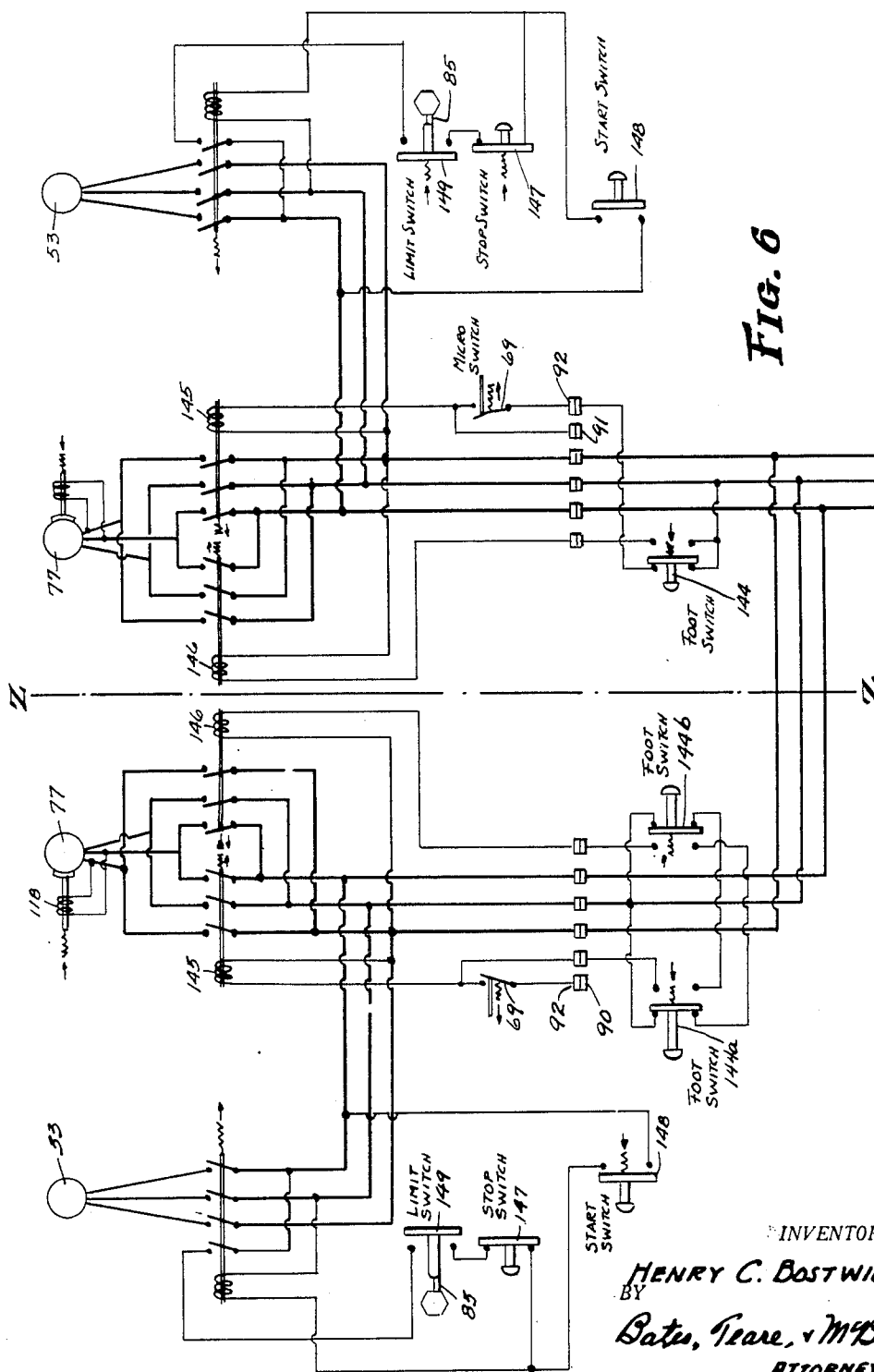
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2,441,791

STRIP FEEDING MECHANISM

Filed July 7, 1944

5 Sheets-Sheet 5



UNITED STATES PATENT OFFICE

2,441,791

STRIP FEEDING MECHANISM

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Application July 7, 1944, Serial No. 543,798

23 Claims. (Cl. 154—10.2)

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This invention relates to an apparatus for supplying strips to a band building drum to build up an annular band either for subsequent transference for a tire building machine or for formation into a tire on the same drum. An object of the invention is to forward the strip automatically from a supply reel while maintaining it under proper tension. A further object is to furnish a supply reel with a driving motor which may rotate the reel in the unwinding direction to feed the stock positively, and to provide a controlling switch and suitable circuits for the motor controlled by the tension of the strip passing from the reel to the drum.

Still another object of the invention is to provide a motor-operated indexing means for automatically bringing a fresh loaded reel into position for discharging the wound-up strip or to bring an empty reel into position for reloading.

The present invention provides means for accomplishing all of these objects as will become clearer from the following description of embodiments shown in the drawings.

In the drawings, Fig. 1 is a side elevation, partially broken away and in section, of one embodiment of an apparatus having all the features of my invention; Fig. 2 is an enlarged view of the reel-controlling mechanism in the same plane as Fig. 1; Fig. 3 is a fragmentary end view of the apparatus; Fig. 4 is a side elevation of a simpler embodiment of my invention having the automatic unwinding and rewinding features of my invention but positioning the loaded and empty reels manually; Fig. 5 is a diagram of electric circuits which may be employed with the embodiment of Figs. 1 to 3, particularly when it is desired to index the stock carrier automatically to bring a fresh reel into action; Fig. 5a is a fragmentary diagram illustrating a modification of a portion of the circuits shown in Fig. 5; Fig. 6 is a diagram of a simpler arrangement of circuits which may be employed with either embodiment shown, when the indexing is to be effected manually.

Referring first to Figs. 1 to 3, 10 indicates a suitable base frame and 12 a turret above the frame and swiveled thereto by a king pin 11 about which the turret may be revolved. The turret carries two sets of stock storage devices, and it is intended that an attendant at the left of Fig. 1 may be loading the set of devices which stand adjacent to him at the same time that stock is being withdrawn from the other set, which at that time will be in the right hand position in Fig. 1.

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I provide a suitable latch mechanism for holding the turret in either of two diametrically opposite positions. This latch mechanism may be of any suitable form and may be manually or automatically operated. The latch mechanism shown in Fig. 1 includes a hand lever 20 which is pivoted intermediately to a link 21, the other end of which is pivoted to the arm 22 of a bell crank pivoted to the base frame. The other arm 23 of this bell crank coacts with the turret to lock it. It may enter a notch in the turret, or its pivot may be a rock shaft carrying a similar arm at the other end and the two arms may swing up as a unit across opposite faces of the turret.

To place the latch under the joint control of the loading attendant and the attendant at the discharge location, I prefer to connect the latching bell crank arm 23 by a link 24 to a swinging inclined table 25 pivoted to the base frame and normally locked by a latch lever 26 pivoted to the table and engaging a pin on the base frame. When this latch lever 26 is engaged, the latch 23 cannot be operated to unlock the turret. After the latch lever 26 has been raised, the attendant in the discharge location may operate the lever 20 to unlatch the turret. Such movement swings the table 25 into idle position so that there is no danger of the loading attendant feeding stock to the machine while the turret is rotating.

Rising from the turret are two pairs of upright standards 30 and 31, all four of which are braced at the top by a rectangular frame 32. Each pair of standards carries a number of sets of stock carrying devices, movable to and from active position as about to be explained, the mechanisms on the two standards being identical.

As shown in Fig. 1, each pair of standards carries two horizontal shafts 35 and 36 on each of which are a pair of wheels 37 and 38 over which extend a pair of endless chains 39 which carry the reels.

As shown in Figs. 1, 2 and 3, each stock carrying unit comprises a reel drum 40 and an associated web-carrying drum 41. A fabric web anchored to the drum 41 is unwound therefrom and wound up, interleaved with the rubberized stock, on the reel drum 40. The reel drum has axially positioned hexagonal heads 42 at its ends. The endless chain is made in sections and each section secured at its ends to the heads of adjacent drums. The wheels over which the chains travel have trapezoidal notches 44 receiving a portion of the successive heads. The drums carry grooved pulleys 45 and 46 (Fig. 3) and a tape 47 anchored to the pulleys passes from the right

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hand side of one to the left hand side of the other. Thus the rotation of the reel 40 in one direction serves to rotate the associated web drum 41 in the opposite direction, to take up the slack of the fabric web as the stop passes therefrom.

On the upper shaft 35 is secured a sprocket wheel 50 connected by a sprocket chain 51 with a pinion 52, on a shaft operated by a motor 53. Accordingly, the energization of such motor may operate the endless chain 39 to change the position of the reels and the web drums. As the desired movement is short and the loaded reels and drums have considerable weight, it will be understood that a suitable reduction gearing (not shown) exists between the motor 53 and the driving pinion 52.

So much of the embodiment of Figs. 1 to 3, as has been described, is to be understood as merely illustrative of any suitable mechanism for carrying wound up stock and webs and shifting them by motor action from one position to another. The mechanism shown is not, of itself, claimed herein but is claimed in my prior Patent No. 2,242,810, issued May 20, 1941.

I come now to the particular portion of the embodiment of Figs. 1 to 3, with which the present invention is concerned. This mechanism is associated with the reel which is in active position to be loaded or discharged, namely, the lower one of the outermost course of reels of either set.

As is best shown in Fig. 2, the standards 30 carry laterally extending brackets 60 which lie at opposite ends of the reel which is in the active position for loading or unloading. Pivoted to the brackets 60 are a pair of levers 62 which carry a cross roller 63 which underlies the rubberized strip being fed to or from the reel.

In Figs. 1 and 2, the rubberized strip A is being withdrawn from the reel downwardly along a fixed inclined table 64 from which position the strip may pass to the band building drum B. A tension spring 66 anchored at one end to the standard 30 and at the other end to an upstanding arm 67 of the lever 62 tends to swing the roller 63 upwardly and thus lift the strip into the position indicated at A' in dotted lines in Fig. 2. The lever 62 has a lug 68 which actuates a micro-switch 69 which controls an electric motor which may rotate the reel in question and as herein-after described.

The arrangement is such that when there is proper tension on the web A to hold the lever in the position shown in full lines in Fig. 2, the motor is active to rotate the reel, but when the web is slack and the spring is able to swing the lever 62 into the position shown in broken lines, the switch is operated to stop the motor. The result is that in feeding the material to the band building drum, the motor will operate to unwind the positioned reel 40 as fast as the band building drum winds it on but if the reel is unwound with a peripheral speed faster than that of the band building drum the web between them is slackened and the motor ceases to operate the unwinding reel.

The motor which effects the unwinding at the delivery side, as above outlined, also operates in the reverse direction to wind in the reel at the loading side, but in that case the micro-switch is idle. At each side the switch which starts the motor may be actuated by a suitably positioned foot pedal not shown in the mechanism drawings, but indicated in the diagrams.

Each reel is provided with a driving pulley 70 having a peripheral groove, V-shaped in cross

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section. When any reel comes into the loading or discharging position, such grooved pulley makes a frictional contact with a complementarily formed driving wheel 71 on a shaft mounted in a bearing on a bracket 73 (Fig. 3), carried by the turret. On the other end of this shaft is a belt pulley 74 about which extends a belt 75 running over a driving pulley 76 operated by a motor 77. Accordingly, the energization of this motor may rotate the particular reel at the active position in either direction according to the direction of the rotation of the motor.

It will be seen that the same mechanism may actuate any reel which is in its active position. In the right hand portion of Fig. 1, the reel is rotated in the unwinding direction to unwind it to feed the rubberized strip positively to the band building drum, and in the winding direction to re-wind the overhanging portion of the strip when it has been severed from the part on the band building drum. When those same parts are in the left hand position, due to turning of the turret 180°, the same motor mechanism may operate the active reel in either direction to enable the winding on of a strip for loading that reel, or winding it off, should it be desired to remove in this location some of the wound-up stock.

I prefer to employ suitable friction brakes constantly acting on the reels to enable proper tension to be applied to the strips. These brakes are not shown in detail, but are indicated by the dotted lines 79 in Fig. 1. They may have the form shown and described in my prior patent mentioned.

The motors 53 which operate the endless chains 39 to shift the position of the reels, to bring an empty reel to the loading position and a loaded reel to the discharging position, may be energized manually by the closing of a suitable switch whenever the operator desires to shift the position of the reels, or may, if desired, be operated automatically consequent upon an active reel on the loading side becoming full, or an active reel on the delivery side becoming empty. In either case, I provide an automatic limit switch to stop the rotation of such motor automatically when the reel arrives in active position.

For automatic indexing, I provide a bracket 80 carried by the standard 30 on which is mounted a switch 81 and a control lever 82. A spring 83 anchored to the standard and the lever tends to pull the lever toward the left in Fig. 2, in which position the lug 84 on the lever leaves the switch closed. On one of the heads 42 of each reel is a projecting pin 85, and when that reel comes into the desired position this pin engages the lever 82 and forces it against the action of its spring 83 to swing the lever into position to operate the switch 81 to open the circuit at that point. Thereupon the corresponding motor 53 stops and the reel remains in this new position until the manual switch is again operated to energize the motor.

It should be understood that the circuits are such that this motor may be manually energized even though the limit switch is open, the limit switch being available, however, to stop the next positioning operation after having been released by the reel which was holding it in open position moving away from the vicinity of the switch-operating lever 82. Such operation will be clear when I come to describe the circuits illustrated in the diagram of Fig. 5.

Before describing that diagram it should be noted from Fig. 1 that such circuits as are car-

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ried by the base frame 10 terminate in two sets of terminals 90 and 91 and that these terminals have contact with two sets of terminals 92 in the turret, each terminal 92 making an electric connection with the terminals 90 or 91 according to the position of the turret.

Referring now to the diagram Fig. 5, that portion of the diagram which is below the line X—X refers to the circuits, and switches mounted on the base frame. The rest of the diagram indicates the circuits and switches which are mounted on the turret, the portion at the right of vertical line Y—Y corresponding to one of the sets of reels and its wheel-driving and indexing motors as, for instance, the right hand set, and the portion of the diagram at the left of the vertical line Y—Y corresponding to the other set.

In the diagram (Fig. 5) 100 and 101 indicate two conductors adapted to be coupled to any source of electric supply. The line 100 leads to one of the base terminals 90 and by a line 102 to the other base terminal 91. The line 101 leads through a switch 103 to the other one of the base terminals 90 and by a line 104 to the other one of the base terminals 91. The switch 103 is normally open but may be closed by the closing of a manual starting switch 105 which is on a shunt circuit 106 across the two main terminals and including a solenoid 107 which may close the switch 103 whenever the switch 105 is closed. The switch 105 is normally open but is adapted to be momentarily closed whenever desired to start the machine.

Also in the base circuits is a normally closed stopping switch 108 in a shunt line 109 through the solenoid 107. To stop the machine the momentary opening of the switch 108 breaks the circuit to the solenoid 107 and the spring opens the switch 103.

On the turret from one of the terminals 92, a line 110 leads through a solenoid-operated switch 111 to the line 112 and thence to the armature of the reeling motor 77. From this armature a line 113 leads to the switch 114 operated by the same solenoid and thence through the micro-switch 69 to a line 115 which leads to the other turret terminal 92. At the same time current passes from the line 110 via the line 116 to the field of the motor and returns via the line 117 to and through the micro-switch. Simultaneously with this actuation of the motor a solenoid brake 118 on a shunt across the lines 116, 117 is released from the motor.

In the action described, the solenoid 119 operating the switches 111 and 114 is idle. When the strip A leading from the reel to the band building drum B is sufficiently mounted on the drum, the operator severs it adjacent the drum. To rewind the portion of the strip then projecting from the reel, the motor 77 should be reversed. To effect this I provide a push button switch 120 which is normally open but is adapted to close a shunt 121, 122 through the solenoid 119. Upon the momentary actuation of this switch the solenoid 119 is energized and the switches 111 and 114 are moved to bring 114 into contact with line 112, and 111 into contact with line 122 leading to line 113. This reverses the armature with reference to the field and the motor operates in the reverse direction to wind in the projecting strip, provided the operator manually maintains proper tension thereon, to hold the micro-switch 69 closed.

As soon as the closing of the reversing switch 120 energizes the solenoid 119, such solenoid also shifts another switch 124 (which leads from the

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main line 110) into engagement with a terminal of another shunt line 125 and 122 through the solenoid. This operates to maintain the current in the solenoid notwithstanding the opening of the reversing switch.

I have described the operation largely with reference to the right hand portion of the diagram and the operation of the supply reel from which the strip is withdrawn to the band building drum. The operation of the left hand end of the diagram on the reel receiving the supply is similar but with the motor reversed. That is to say, with the reel normally driven in the winding-in direction instead of the unwinding direction. The switches 111, 114 and 124 are accordingly in the reverse position from that shown in the right hand portion of the diagram.

The automatic indexing movement of the endless chains to bring an empty reel to the loading position or a full reel to the unloading position is accomplished by an arrangement of circuits and switches indicated at the extreme right or the extreme left of the diagram, Fig. 5.

As to the indexing circuit, it should be noted that when the tension on the strip ceases, on the reverse movement of the motor to wind-in the projection portion of the strip, the micro-switch 69 opens. It results from this that the shunt circuit 122, 125 and through the switch 124 in the reverse position is without current. This de-energizes the solenoid 119 and the spring returns the triple switch (including the arm 124) to the position shown in the right hand half of the diagram. This brings into action the line 130 which leads from the switch 124 through a switch 131 to a line 132 to the indexing motor 53 (which rotates in but one direction) and thence to the line 133 and back to the main line 115. This automatically starts the operation of the indexing motor notwithstanding that the limit switch 81 is open.

The operation of the indexing motor to shift a reel from active position is dependent not only on the reverse connections being established for the reel motor by the solenoid 119, but also on the micro-switch being opened by the slacking of the tension on the strip projecting from the reel. In case the reel is rotated in the winding-in direction, either for original loading or for rewinding the attached portion of the cut-off strip after the strip has been severed at the band building drum, the motor circuits are in the reverse condition and in such case the drag of the fabric on the face of the table 64, assisted if necessary by manual holding by the operator, supplies proper tension to the projecting portion of the strip to maintain the micro-switch closed. Accordingly, as soon as such stock clears the upper end of the table 64, the tension actuated member is released, the micro-switch opens and the indexing motor starts.

It results, therefore, that as soon as the reel which was in active position is no longer needed, the shifting of a fresh reel to that position immediately takes place. Thus the operation of the machine is very rapid and the desired reel is immediately and automatically brought into active position whenever such reel is needed either an empty reel on the loading side or a reel filled with fabric, which may have its cords lying in different directions, on the band building side.

135 indicates a delayed-action relay on a shunt circuit 136 across the lines 130 and 133. This relay is energized simultaneously with the energization of the motor 53, but by reason of its delaying

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character it does not become effective until the motor has had time to start moving the reel chain. As soon as the chain has moved a very slight distance, the pin 85 on the active reel is disengaged from the lever 82 and the limit switch 81, by reason of its spring 83, goes to closed position. In such closed position this switch closes a circuit between the line 130 and a line 138 connected to the line 132, thus maintaining the circuit to the motor 53 irrespective of the relay switch 131.

At sometime after the above circuit has been established, the delayed action relay 135 becomes effective and opens the switch 131 and this leaves the limit switch closed and available to open the switch to the indexing motor as soon as the next reel arrives in the active position and its pin 85 opens the switch 81.

If it be desired to enable the reel-operating motor 77 to be actuated independently of the micro-switch 69, I can accomplish this by inserting an additional switch in the line 122 to control a circuit from the main line through the solenoid 119 independently of the micro-switch 69. Such additional switch is indicated in Fig. 5a at 140 in line 122 and leads to a line 141 leading to the line 115 below the micro-switch 69. When such switch 140 and circuit 141 is used, the connection from the point 142 in the diagram of Fig. 5 to the line 114 is omitted.

The manual operation of indexing may be availed of, for instance, whenever it is desired to use only a portion of a reel supply on one band building operation and thereafter continue with the remainder of the supply on that reel for a subsequent operation or operations.

If it is preferred to save the expense of equipping the machine with mechanism to effect the automatic indexing operation, one may then conveniently employ such an arrangement of circuits as is shown for instance in the diagram, Fig. 6. In this diagram the different motors and other features common to the construction already described bear the same reference numerals and the description will not be repeated. It may be noted, however, that the diagram of Fig. 6 is drawn for alternating current motors supplied by three wire circuits, whereas in Fig. 5, I have indicated direct current motors reversible by changing the relation of their fields to their armatures.

In Fig. 6, the part at the left hand side of the center line Z—Z, which indicates the axis of rotation of the turret, refers to the circuits for the loading side and part of the diagram at the right to the unloading side. Considering first the unloading side of the diagram, a foot switch 144 is normally in closed contact, supplying current through the micro-switch 69 to start the motor whenever the fed strip is taut enough to swing the control arm downwardly. At such time the current flows through coil 145 to energize the relays to release the brake 118 and start the motor 77, to unwind the stock from the reel.

If too much stock should be unwound, then the operator steps on the pedal controlling the switch 144 to open the previous circuit and close a reversing circuit. The reversing circuit operates the coil 146 to actuate the relays and to release the brake and actuate the motor in the reversing direction, to run the stock back onto the roll.

Taking up the indexing motor 53, the circuit of Fig. 6 includes switches to stop, start, and limit the operation, indicated by 147, 148 and 149 respectively. The circuit is closed by manually actuating the start switch 148. This energizes the relays to start the motor and also energizes a

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holding relay to by-pass the current around the start switch whereby the start switch can be released from manual holding; in other words, it is a momentarily operated switch. The motor 53 continues to operate until the limit switch 149 is automatically actuated by the reel-projection 85 to break the circuit, or until the manually operated stop switch 147 is actuated.

On the feeding side of the machine provision is made for two foot pedal controlled switches 144a and 144b. Both switches are normally closed. When switch 144a is depressed it causes the current to energize the coil 145 to actuate the feed motor in one direction so as to wind the stock onto the roll. That situation remains the same so long as that foot pedal is depressed. Upon releasing the pressure the motor stops. If the operator desires to turn the roll backwardly to wind stock off of it, he steps on the foot switch 144b, which energizes the coil 146 and reverses the motor.

To actuate the indexing motor, the procedure is the same as before described for actuating the indexing motor by the operator stationed at the band building form side of the machine.

Fig. 4 indicates a simpler embodiment of that portion of my invention which is concerned only with the rotation of the reels in active position either for loading or unloading. As appears in this view, 150 indicates a suitable base having standards carrying the shaft of a band building drum 151. Rising from this is an upright frame 152 carrying a horizontal table 153. From this table rise brackets 154 carrying a shaft 155 on which are mounted a pair of spiders 156, each having four arms. In diametrically opposed arms of the two spiders are mounted shafts 157 carrying reels 158, while the other two arms support shafts 159 carrying web-drums 160. The web-drums and reels of this embodiment are reversely interconnected in the same manner as heretofore described with reference to Fig. 1.

On the spider shaft 155 is a wheel 162 connected by a belt 163 to a driving pulley 164 on the shaft carrying a hand crank 165. The rotation of the crank therefore may turn the two spiders to present the reels to different active position. A suitable manual latch 168, by engaging either of a pair of diametrically opposed notches 169, holds the reels either in the position as shown in Fig. 4, or with the loading and unloading reels reversed in position.

The shaft of each of the reels carries a wheel 170 having a peripheral V-shaped groove mating with a driving pulley 171 on a pivoted arm 172 swung toward the reel by a spring 173. The pivot is on a shaft 175 mounted in a bracket carried by the table 153. The bracket for one of these reel-driving mechanisms extends downwardly from the table, as shown at 176 and the other upwardly, as at 177. Concentric of each shaft 175 is a motor 178 or 179, which by a belt 180 drives a wheel 181 rigid on a shaft carrying one of the reel-driving pulleys 171. Thus each reel in the active position is operated by a motor adapted to drive it in the direction desired.

The reel when positioned at the left hand side in Fig. 4 may be rotated to receive the web C lying along the inclined table 185, and motor at the right hand side operated to unwind the corresponding reel to deliver the web indicated at D.

I have indicated in Fig. 4 a pair of levers 190 carrying a transverse roller 191 underlying the delivered strip D, a spring 192 tending to elevate this roller against the strip. One of the levers

190 carries a downward projection 194 operating a switch 195. When the outer end of the lever is pulled downwardly by the tension on the strip against the action of the spring 192, the switch operates the motor 178 to unwind the corresponding reel to feed out the web so long as the tension is maintained. However, when the web becomes slack, the spring is able to operate the lever to open the switch of the motor. As indicated in Fig. 4, spring pressed brake shoes 196 are carried by the spider arms and act on the two reels to maintain suitable friction thereon.

The motor 179 which operates the reel in loading position is similarly under the control of a spring actuated cross roller 197 over which the web C being wound onto that reel passes. If the proper tension is not maintained on this web, the winding motor stops. The circuits to the two motors 178 and 179 in the embodiment of Fig. 4, may be substantially like those of the corresponding portions of Figs. 5 or 6.

It will be seen that my system of maintaining proper tension on the fabric strip, whether it is being fed to a band building drum or is being loaded on the supply reel, is applicable to widely different arrangements of reel-carrying structures. The endless-chain and the rotating-spider embodiments described are therefore to be taken as illustrative of any mechanism for carrying the reels, and likewise various mechanisms may be used for transferring the reels from loading to unloading position and vice versa. The rubberized strips used in band building frequently embody cords extending diagonally, or on the bias, and it is desirable to have one layer with such cords extending in one diagonal direction and the surmounting layer with the cords in a direction substantially at right angles to the first layer. In the embodiment of Fig. 1, I prefer to effect this by winding the strips on successive reels with the cords in one direction on one reel and in such other direction on the next reel, and when this is done the strips from one reel may be used for the first layer and then another reel positioned for laying the next layer. The motor-driven indexing means for positioning the reels in Fig. 1, enables this shifting to be very quickly accomplished. If desired, a similar indexing control could be used with the structure of Fig. 4, substituting a motor for the hand crank.

In such an embodiment as is illustrated in Fig. 4, it may be desirable not to interchange the position of the reels to obtain the different diagonal layers, but to draw the material from one reel for successive layers and reverse the direction of the rotation of the band building drum successively for successive layers. Fig. 4 indicates by the broken line D—1 the course of the strip to the band building drum, if it is desired to employ this reverse rotation of such drum.

The difficulty heretofore experienced in attempting to apply the material drawn into a band-building drum from a stock supply has been to obtain a winding in a way that would not stretch the fabric. The difficulty principally has been that once the fabric is started in motion, it either is pulled too tightly by the drum and thereby stretched, or it is not pulled tightly enough and there is insufficient tension, which causes wrinkles. My system of positively driving the reels while controlling the rotation of such reels by the tension on the fabric avoids these difficulties.

I claim:

1. The combination of a plurality of reels, 75

mechanism for positioning the same successively in active position, mechanism for rotating the reel which is in active position, mechanism controlling the rotation of such reel by the tension on a strip extending therefrom, and mechanism whereby cessation of the action of such reel automatically causes the shifting of the reels to remove the reel which was being rotated from the active position to substitute a fresh reel in such position.

2. The combination of a plurality of reels shiftably carried, indexing mechanism for shifting the reels to place them successively in active position, a motor, mechanism driven thereby for rotating the reel when in active position, and mechanism for automatically operating the indexing mechanism when the strip which was projecting has been substantially wound up and loses its external tension.

3. The combination of a plurality of reels shiftably carried, a motor, indexing mechanism actuated thereby for shifting the reels to place them successively in active position, a reversible motor, mechanism driven thereby for rotating the active reel in the unwinding direction, and means for automatically starting the indexing motor when the strip which was projecting from the reel has been substantially unwound from the reel, said means including switch mechanism controlled jointly by the reversal of the motor which operates the reel and by the lack of tension on the projecting strip.

4. The combination of a set of reels, endless chains carrying the same, a motor for operating the chains to bring reels successively into active position, a reversible motor for rotating the reel which is in active position, a movable member engaging the fabric extending from the reel, a controlling switch for the reel-driving motor, means whereby movement of said member may control the switch according to the tension on the strip extending from the reel, a reversing switch and circuits for reversing the reel-driving motor, and means under the joint control of the reversing switch and said member for actuating the chain driving motor.

5. The combination of a frame, a rotatable support thereon carrying a plurality of reels each rotatable on its own axis, a guide for stock to be fed to one reel, a band building drum to receive stock at the same time from another reel, a pair of reversible motors, mechanism driven thereby for operating said reels respectively, said motors being adapted respectively to operate in either direction the reel associated with the said guide and the reel associated with the band building drum, a movable member engaging stock projecting from a reel in the discharging position and having a position dependent on tension of such stock, and an electric switch and circuits to the motor for that reel controlled by the position of said movable member, whereby the operation of the discharging reel in the unwinding direction is dependent on the tension on the stock.

6. The combination of a stock storage mechanism having a plurality of reels, a table along which stock may be fed to load a reel in one active position, a rotatable band building drum to receive stock from a reel in another active position, means for interchanging the position of said reels, a motor for winding up the reel to which stock is to be fed across said table, a motor for unwinding the reel from which the stock is fed to the drum, mechanisms controlled

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by the tension on the strip between such reel and the table and between such reel and the drum respectively to control the winding and unwinding operations of the reels.

7. The combination of a reel adapted to carry a strip of fabric, and mechanism including a motor to rotate the reel in either direction to wind the fabric out or in, a movable member adjacent the reel and responsive to the tension on the strip, and a switch and circuits therefrom to the mechanism controlled by the position of said member to prevent operation of the mechanism in the direction to unwind the reel unless proper tension is maintained on the projecting portion of the strip while permitting the mechanism to operate in the winding direction.

8. The combination of a set of reels, endless chains carrying the same, a motor for rotating a positioned reel in the unwinding direction, mechanism for operating the chains to bring reels successively into active position and into engagement with said motor, a movable member engaging the fabric extending from the reel, a controlling switch and circuits for the reel-driving motor, means whereby movement of said member may control the switch according to the tension on the strip extending from the reel.

9. The combination of a stock storage mechanism having a plurality of reels, a motor, means for changing the position of said reels to bring them selectively into active position and into engagement with said motor, a rotatable band building drum to receive stock from a reel in an active position, said motor being connected for unwinding the reel from which the stock is fed to the drum, and mechanism acting against the strip between such reel and the drum to control the unwinding operation of the reel.

10. The combination of a frame, a support rotatably mounted therein carrying a plurality of reels, each rotatable about its own axis, the rotation of the support shifting a reel from the loading to the unloading position, a motor for unwinding any of the reels when in unloading position, means controlled by the tension on the strip extending from said reel to control the reel-operating motor.

11. The combination of a frame, a support rotatably mounted thereon on a vertical axis and carrying a plurality of reels each on a horizontal axis and each independently rotatable, means for driving one reel in the winding direction and another in the unwinding direction, and means controlled by the tension on the strip extending from the last-mentioned reel to control the reel-operating motor therefor.

12. The combination of a frame, a support rotatably mounted thereon on a horizontal axis and carrying a plurality of reels each on a horizontal axis parallel with the support axis and each independently rotatable, means for driving one reel in the winding direction and another in the unwinding direction, and means controlled by the tension on the strip extending from the last-mentioned reel to control the reel operating motor therefor.

13. The combination of a frame, a support rotatably mounted thereon and carrying a plurality of reels each on a horizontal axis and each independently rotatable, means on the support for driving one reel in the winding direction and another in the unwinding direction, and means controlled by the tension on the strip extending from the last mentioned reel to control the reel operating motor therefor.

14. The combination of a frame, a support

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rotatably mounted thereon and carrying a plurality of reels each on a horizontal axis and each independently rotatable, a motor on the frame for driving one reel in the winding direction, another motor on the frame for driving another reel in the unwinding direction, and means controlled by the tension on the strip extending from the last mentioned reel to control the reel operating motor therefor.

15. The combination of a feed table along which sheet stock may be fed, a band building drum adapted to utilize such stock, a rotary support, two reels carried by the support for the storage of said stock, each reel being rotatable on its own axis and the rotation of the support interchanging the position of said two reels with reference to the feed table and band building drum, a pair of motors and means connecting one motor with one reel for rotating it in the winding direction and means connecting the other motor to the other reel for rotating it in the unwinding direction.

16. The combination of a feed table along which sheet stock may be fed, a band building drum adapted to utilize such stock, a rotary support, two reels carried by the support for the storage of said stock, each reel being rotatable on its own axis and the rotation of the support interchanging the position of said two reels with reference to the feed table and band building drum, a pair of motors and means connecting one motor with one reel for rotating it in the winding direction and means connecting the other motor to the other reel for rotating it in the unwinding direction, said motors being carried by the support and being reversible so that either may rotate its reel in the winding direction or the unwinding direction.

17. The combination of a feed table along which sheet stock may be fed, a band building drum adapted to utilize such stock, a rotary support, two reels carried by the support for the storage of said stock, each reel being rotatable on its own axis and the rotation of the support interchanging the position of said two reels with reference to the feed table and band building drum, a pair of motors and means connecting one motor with one reel for rotating it in the winding direction and means connecting the other motor to the other reel for rotating it in the unwinding direction, said motors being mounted on a stationary support, and means for automatically connecting said motors to the respective reels as the reels are brought to position.

18. The combination of a stationary frame, a horizontal shaft journaled in said frame, mechanism for rotating said shaft, a pair of spaced spiders secured to the shaft, a pair of reels carried by and between opposed arms of said spiders, each reel being rotatable on its own axis, a feed table for feeding stock to one of the reels and a band building drum adapted to receive stock from the other reel, said two reels being interchangeable in position by the rotation of said shaft, and reel-driving means automatically connected to the respective reels as such reels are brought to position by the rotation of the shaft first mentioned.

19. The combination of a stationary frame, a shaft journaled on a horizontal axis, mechanism for rotating said shaft, a pair of spaced spiders secured to the shaft, a pair of reels carried by and between opposed arms of said spiders, each reel being rotatable on its own axis, said two reels being interchangeable in position by the rotation

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of said shaft, a pair of motors, a pair of friction wheels driven by the respective motors, said wheels being adapted to engage driving wheels associated with the respective reels as such reels are brought to position by the rotation of the shaft first mentioned.

20. The combination with a motor and mechanism driven thereby of a plurality of reels each adapted to carry a wound-up strip, and means for moving the reels successively into automatic engagement with the motor-driven mechanism adapted to unwind such positioned reel, and a switch controlling the motor and itself controlled by the tension on the strip fed from the reel.

21. The combination of a frame, a support rotatably mounted therein carrying a plurality of reels, each rotatable about its own axis, a motor and mechanism driven thereby for unwinding a reel when in active position, mechanism for rotating the support to shift the reels successively into engagement with said motor-driven mechanism, and means controlled by the tension on the strip extending from the active reel to control the unwinding mechanism.

22. The combination of a plurality of stock storage reels, a band building drum adapted to receive stock from any of said reels when it is in active position, power means independent of the stock for driving any reel in the unwinding direction to feed the stock under tension while said drum is rotating in its winding direction, means for causing automatic engagement of the

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successive reels one after another with said power means, and means acting against the face of the stock between the reel and drum for controlling said power means.

23. The combination of a stock storage mechanism having a plurality of reels, means for changing the position of said reels to render different ones active successively, a table along which stock may be fed to load a reel in an active position, a motor and mechanism driven thereby for winding up the reel to which stock is to be fed across said table, means for causing automatic engagement of the successive reels as they come to active position with said motor-driven mechanism, and mechanism acting on the strip between the table and reel and controlled by the tension on the strip to control the winding up operation.

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