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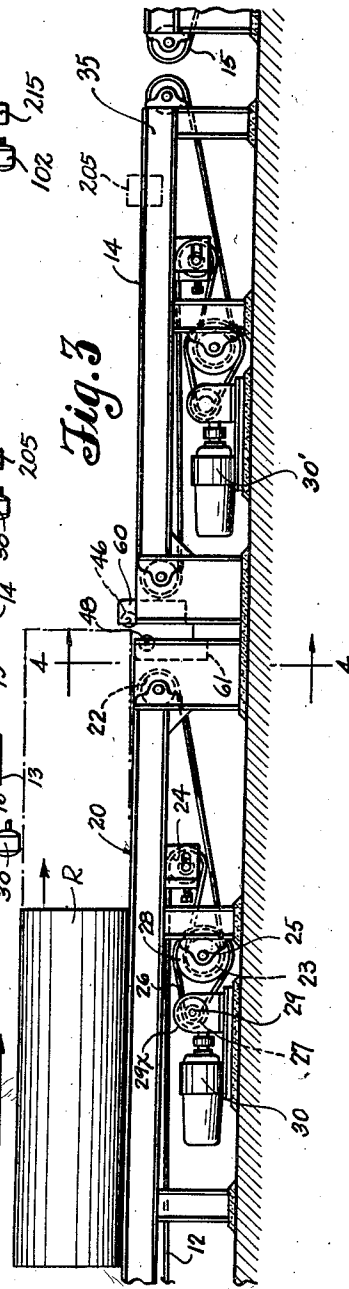
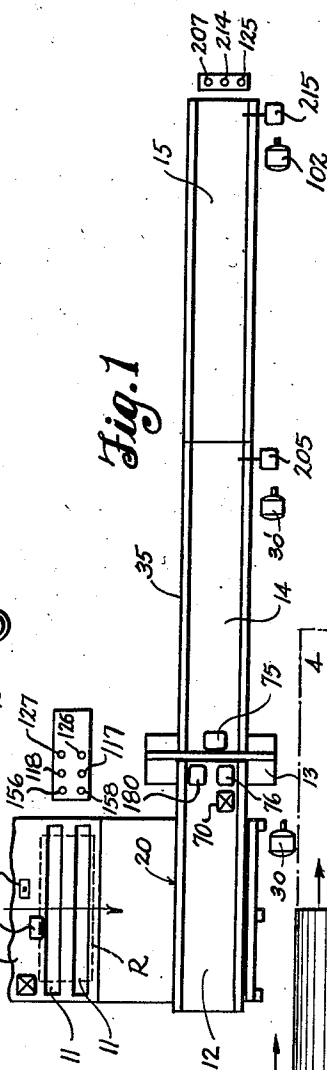
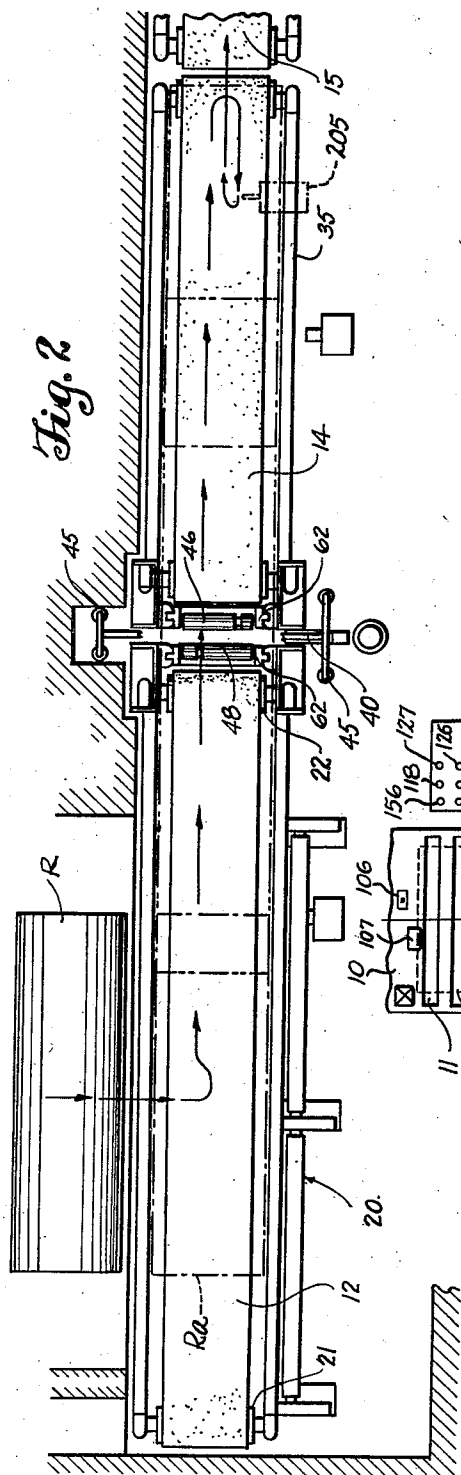
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2,818,795

ROLL CONVEYING AND BANDING MECHANISM

Filed Aug. 24, 1956

3 Sheets-Sheet 1



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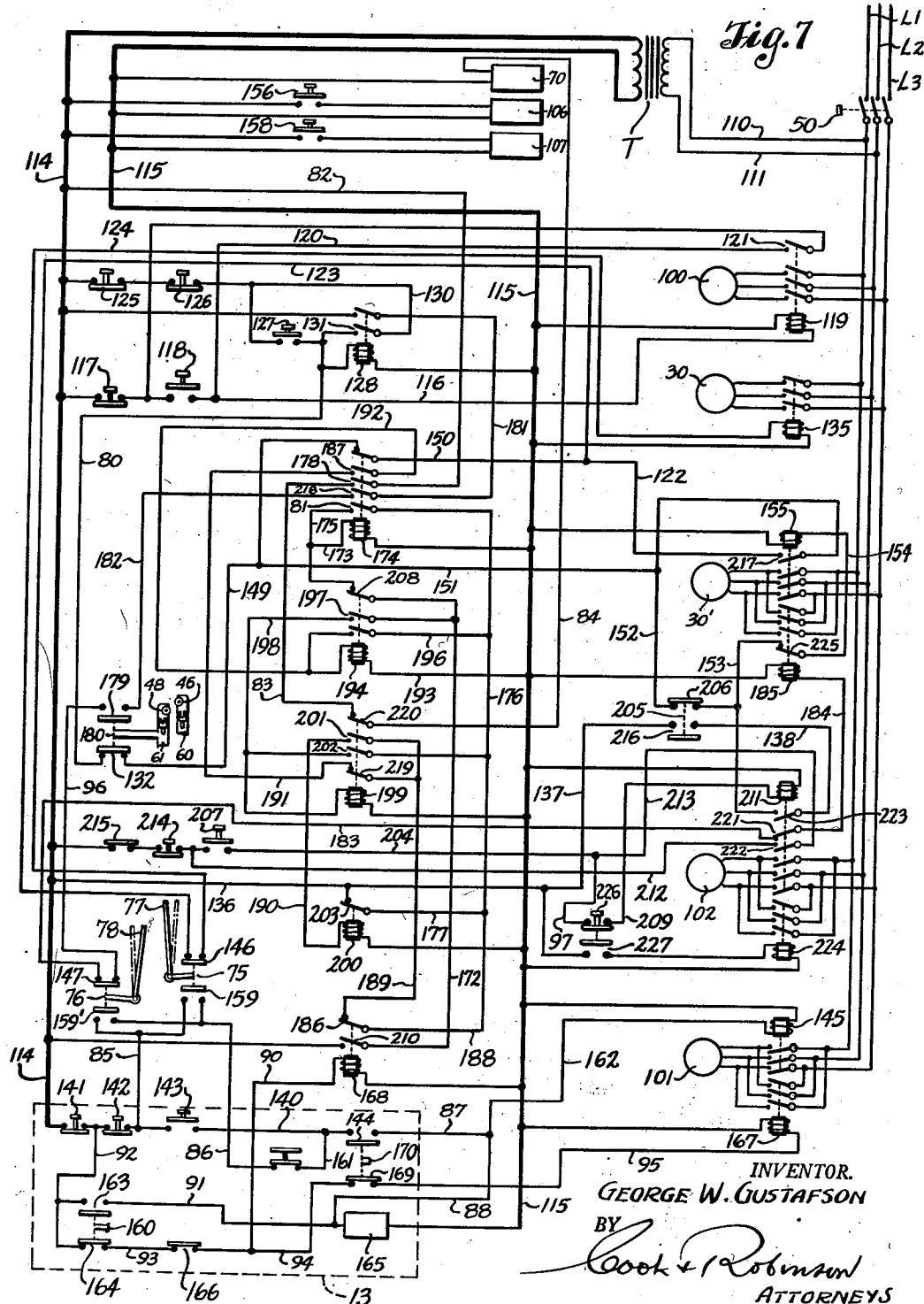
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ROLL CONVEYING AND BANDING MECHANISM

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10 Claims. (Cl. 100—4)

This invention relates to roll conveying and banding operations and it has reference more particularly to a mechanism whereby large, heavy rolls of paper, pulp or the like, may be conveyed to and through a band applying machine which operates for the application, tightening and securing of metal strap bands about the ends of the rolls to better prepare them for transportation, handling or storage.

It is the principal object of the present invention to provide a novel, practical and serviceable conveyor mechanism whereon such rolls of paper, pulp, or the like, may be conveyed to and from the banding machine, first to be moved endwise thereinto and brought to a position of rest against a stop for the mechanical application by said machine of a metal strap, or band about its forward end portion; then to advance the roll through the machine, and bring it back against a positioning stop in a position of rest for the application of a like strap or band about its trailing end portion; the roll then being conveyed away from the banding machine.

It is a further object of the invention to provide a mechanism of the character above recited wherein functional operations of the conveyors and banding machine may be quickly and expeditiously effected and automatically controlled by the roll in passing.

Further objects of the invention and its advantages reside in the details of construction and combination of its elements, and in the mode and sequence of operation of the roll conveyors and banding machine as a combination, as will hereinafter be fully described.

In accomplishing the above mentioned and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a diagrammatic layout of the present roll wrapping, conveying and banding mechanism as seen in plan view.

Fig. 2 is a plan view, somewhat enlarged, of the roll conveying and banding machine, indicating by arrows on the conveyor belts, the direction of travel of a roll in its conveyance to and away from the banding machine.

Fig. 3 is a front elevation of those parts of the conveyor mechanism as shown in Fig. 2; the banding machine per se not being shown.

Fig. 4 is an enlarged cross-sectional view, taken on the line 4—4 in Fig. 3, showing in particular, the relationship of the roll stops and the band applying machine.

Fig. 5 is a vertical section, taken on the line 5—5 in Fig. 4, showing the extendable and retractable stops, which coast with the belt conveyors for the proper positioning of the paper rolls to receive the bands about their opposite ends.

Fig. 6 is a diagrammatic layout of the control system for the stops shown in Fig. 5.

Fig. 7 is a wiring diagram for the electrical devices of the present mechanism.

Referring more in detail to the drawings:

In Fig. 1, a diagrammatic layout, including the present

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wrapping, banding and conveyor mechanisms, has been shown in plan view for explanatory purposes. While such mechanisms are not confined strictly to the handling and banding of rolls of any specific material, or rolls of any specific size, the mechanisms herein illustrated have been designed for the handling of paper or pulp rolls up to approximately eight feet in length and from three to five feet in diameter. Paper or pulp rolls that are to be banded, preferably are first wrapped with a suitable wrapping material, such as heavy paper. In the present instance, I have provided that the rolls which are to be banded be rolled one at a time along a slightly downwardly inclined platform, or floor, designated in Fig. 1 by numeral 10, onto a pair of parallel wrapping rollers 11—11 where they receive the wrapper. The wrapping operation and specific means for accomplishing it, however, are not involved in the present invention and will not be described herein.

After receiving its wrapper, while resting on the rollers 11—11, the wrapped roll is then rolled from the wrapping station along the platform 10 and delivered therefrom onto a conveyor belt 12 which operates to convey it endwise and horizontally thereon, directly to the banding machine which is designated in its entirety in Fig. 1, by reference numeral 13. It is well shown in Fig. 1 that this machine is disposed transversely of the conveyor belt 12 and across the discharge end thereof.

The banding machine 13, per se, is not claimed as a part of the present invention but is to be considered only as an element of the combination of devices herein shown. However, it will be here explained that it is like, or is a modification of, the banding machine which is the subject of United States Patent No. 2,707,430. It comprises an annular strap guide disposed transversely of the path of travel of the roll R as conveyed, and forms an opening into which the forward end of the paper roll is advanced, as carried on the belt 12, to engage a stop, there to receive a band thereabout, and into which annular guide a length of the banding strap material, as fed endwise thereinto, will be caused to be guided to form a closed loop about the end portion of the roll; the banding machine then being operable to cause the loop to be drawn taut about the roll, its ends joined and the strap then cut to free the roll from the supply of banding material.

With the banding of the forward end of the roll completed, the roll is then advanced by the conveyor belt 12 through the annular band guide of the banding machine and onto a second conveyor belt 14 which is aligned with belt 12 and synchronized in travel therewith. Together the belts 12 and 14 carry the roll completely through the annular guide of the banding machine. The belt 14 then is stopped and reversed in direction, thus to move the trailing end portion of the roll back and against a positioning stop into position within the plane of the annular band guide for banding that end. The banding machine then operates, as previously mentioned, to apply and secure a metal band about that end. With this operation completed, the conveyor belt 14 is energized to advance the banded roll onto a third conveyor belt 15 that carries it to a point of disposal, and belt 12 may operate to bring in another roll for banding.

It will be observed by reference to Fig. 1, that the conveyor belts 12, 14 and 15 are in alignment, and in Fig. 3 it is shown that their top runs, on which the paper rolls R are received for conveyance, are in the same horizontal plane.

The present invention is concerned primarily with the combination comprising the conveyor belts 12 and 14 with each other and with the roll stops, later described, and the banding machine 13 as arranged in Fig. 2, together with the controls of Figs. 6 and 7 whereby the belts are

caused to be driven in such manner and direction as to first bring the forward end of each conveyed roll against a stop whereby the roll is properly positioned for receiving a band about its forward end, then to retract the stop and advance the roll through the banding machine, then to reverse it to the extent required to bring its trailing end against another stop to properly position the roll for banding that end; all functional operations of conveyors, stops and banding machine being automatically controlled, as will presently be explained.

It will be explained in connection with Fig. 1, that the discharge of the paper roll R from a position upon the wrapping rolls 11—11 for delivery onto conveyor 12 is electrically controlled. The wrapped roll is received from platform 10 by the top run of conveyor belt 12 in a position thereon as indicated in dotted lines at Ra in Fig. 2. The belt 12 is shown to be mounted in a frame structure 20 and to operate about rollers 21 and 22 that are rotatably mounted in opposite end portions of the structure. The lower run of the belt, as extended from roller 22 which is at the discharge end of the belt, passes about a belt driving roller 23, and from this it passes in a reverse loop about a tensioning roller 24, as noted in Fig. 3, from which it extends to and about roller 21 as illustrated in Fig. 2.

The driving roller 23 is supported in the frame structure 20 by a cross-shaft 25 which is driven through the mediacy of a belt 26 operating about belt pulleys 28 and 27 mounted on the cross-shaft 25 and the driven shaft 29 of a gear reduction mechanism 29x, respectively; the latter mechanism being driven by an electric motor 30, as in Fig. 3, or other suitable manner. Intermediate the belt carrying rollers 21 and 22, the top run of belt 12 may be supported at required intervals therealong by angularly crossed rollers or other suitable means that will cause longitudinal troughing of the belt for better retaining of a roll R properly thereon.

The belt 14 onto which the rolls R are delivered from belt 12, is mounted in a frame structure 35 which, in construction, is substantially like frame structure 20. Also, belt 14 is supported and driven by means which may be and is here shown to be like the means provided for operation of belt 12, and in Fig. 3 of the drawings, such parts which are shown at the right hand end of the view, have been given the same, but primed, reference characters. The belt 15 may be driven by any suitable means such as motor 102 in Fig. 1.

It is to be observed by reference to Figs. 2 and 3, that the frame structure 35 which carries the belt 14 is spaced slightly from the end of frame 20 and it is at this location, between the adjacent ends of the frames that the banding machine 13 is disposed.

The banding machine, as seen in Fig. 4, may be described briefly as being one of automatic type, equipped with a reversible motor and having a reel mounted for holding a coil of flexible metallic strap. The motor is adapted to be driven in opposite directions for drawing strap from the reel to form a banding loop, or to draw it in to tighten the loop about a roll. When the motor is driven in one direction, i. e. backward, the strap is fed out into the strap guide and is so directed by the guide as to form a closed loop designed to receive an end portion of the paper roll therein. When the motor is driven forward in direction, the band will be drawn taut about the roll and then a holding clip is mechanically applied around the overlapped end portions of the band and the strap is cut as required to free the closed band from the strap supply.

It is further to be explained that the motor, roll, clip applying, and band cutting mechanism embodied in the banding machine is in the nature of a unitary mechanism that is pivotally mounted to swing toward and away from the roll that is to be bound; the normal or rest position of this mechanism, which is designated by reference char-

acter M, is as shown in dotted lines in Fig. 4, and its position against a roll is that shown in full lines. When the machine is started, the banding mechanism swings from the dotted line position toward and against the roll. The motor then operates to draw the band, which has previously been advanced into a band guide 42 to form a loop, taut about the roll. Then devices operate to join its ends and cut the band. With the cutting of the band, the machine M returns to its rest position and the banding material is again advanced from the supply reel into the guideway 42 to provide the open loop ready for the next operation.

In Fig. 4 of the drawings, the banding machine is shown to comprise a flat annular frame member 40 that is disposed vertically and transversely of the line of the belts 12 and 14 and which member is formed with a circular opening 41 through which the paper roll R passes as advanced endwise upon belts 12 and 14. The perimeter of the circular opening 41 is defined by the inwardly facing channel member or band guide 42 which constitutes the guide for the metal banding strap 43 to cause it to be formed in a closed loop as the band is fed out from a source of supply by the machine. A segmental portion of the band guide or chute 42 is hinged, as at 44 in Fig. 4, to swing with the Mechanism M. The frame member 40 is shown in Fig. 2 to extend to opposite sides of the belt carrying frame structures and to be rigidly supported by vertical posts designated by numerals 45.

Banding machines of the kind illustrated are well known in the industry and therefore the present machine will not be further described except as may be found necessary in connection with description of the control system. The machine of United States Patent No. 2,707,430, previously mentioned, is typical of banding machines of the type here employed and it can be modified as may be required to suit the size of rolls being handled.

Assuming that a paper roll R has been delivered from platform 10 onto the conveyor belt 12, as at Ra in Fig. 2, and the belt is being driven as required to carry the roll thereon to the banding machine 13, the advancing roll will be stopped in position for banding by reason of its forward end being brought against a transverse stop roller 46 which, as shown in Fig. 3, is located adjacent the receiving end of belt 14. When stopped by its engagement with this stop roller, the paper roll R will be held at rest with its forward end projecting slightly through an opening of the annular member 40 for application of a band about that end portion.

It is to be noted by reference to Fig. 3, and this will later be further explained, that in the advancing of the paper roll to its stopped position against the transversely disposed stop roller 46, the forward end of the paper roll has passed over a lowered or retracted transversely disposed stop roller 48, the purpose of which is presently explained.

After the banding machine has operated to apply and secure a band about the forward end of the stopped paper roll, the stop 46 is retracted or lowered, the freed paper roll R is then advanced by belt 12 onto the belt 14 which carries it on through the banding machine and slightly beyond the stop 46. As the roll R passes from contact with the lowered stop roller 48, the latter is released to jump upwardly to a position above the level of belt 14 and at that instant the driving motor 30 for belt 14 is stopped and reversed, thus to cause the trailing end of roll R to be brought back over roller 46 and against the stop roller 48. In doing this the trailing end portion of the roll is caused to again pass through the opening 41 in the annular frame member 40 and be placed in proper position for the application of a band about that end portion. The banding machine is then set in operation and the loop which had previously been formed in the guideway 42, is then drawn taut about the roll end in the same manner as previously explained. The band is then joined and cut to release the roll which is then advanced by belt

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14 onto belt 15 and carried thereby to a point of disposal.

In the operation above described, the raising and lowering of the stop rollers 46 and 48 is automatically accomplished by the moving paper roll through the means now to be described; reference being directed particularly to Figs. 4, 5 and 6.

It is shown in Figs. 4 and 5 that the stop rollers 46 and 48 are mounted horizontally and rotatably on the upper end of transverse frames 60—61 respectively, that are mounted for up and down shifting in guideways 62 formed in the frame structures 35 and 20 whereby the conveying belts are mounted. The frames 60 and 61 are individually raised and lowered by air cylinders 65—66 fixed in the base frame structures and having piston rods 65' and 66' extended upwardly therefrom and connected to the corresponding roller mounting frames.

Each cylinder is supplied with operating air under pressure, as seen in Fig. 6, through pipe lines 67 and 68 leading thereto from a control valve 70. This valve is solenoid operated and has an air supply line 72 leading thereto from a source of supply designated at 73. The pipe 67 has a connection with the upper end of cylinder 65 and lower end of cylinder 66. The pipe 68 has connection with the lower end of cylinder 65 and upper end of cylinder 66. Valve 70 can be operated to apply air through either pipe and permit exhaust through the other.

The stopping and starting of the conveyor belts 12 and 14 is controlled in part by the up and down movements of the stop rollers 46 and 48, and in this connection I provide a pair of conveyor stop switches 75 and 76, which are mounted on the vertically movable frames 60 and 61, and are actuated between two different positions by bars 77 and 78 which are pivotally mounted upon and move vertically with the roller mounting frames 60 and 61, respectively. When the paper roll, moving forward, moves into contact with stop roller 46, it simultaneously engages and actuates switch lever 77. When the roll, later reversed in direction, is engaged against stop roll 48, it simultaneously engages and actuates lever 78, as will be further explained later in this specification.

The aforementioned up and down movements of the stop-roller frames 60 and 61 are in turn employed to actuate a switch 180 which is actuated between two different positions by the vertical movement of the frame 61 as shown schematically in Fig. 7.

Another automatic switch 205 is mounted near the discharge end of the conveyor belt 14 to be actuated between two different positions by the absence or presence of the forward end of a roll R reaching the forward end of the conveyor belt 14. A plain cut-off switch 215 is located near the discharge end of the conveyor belt 15 to automatically stop this belt 15.

Although the banding machine mechanism itself is merely an element in the combination of devices disclosed herein, a pair of two-position switches 160 and 170, which are a part of the banding machine, will be shown herein to be in cooperation with certain other switches such as, for example, the aforementioned stop-roller switches 75 and 76, to produce results necessary to the proper functioning of the present invention. Similarly, a switch 166, which is automatically opened or closed by the extension or retraction of the banding machine 13, cooperates with the aforementioned banding machine switches 160 and 170 to cause the actuation of relays and other mechanisms outside the confines of the banding machine itself as will be explained in detail hereinafter. The above mentioned switch 160 which is associated with the banding machine is actuated by the sealer crank thereof and is moved to the position shown in Fig. 7 at the completion of the sealing operation. The switch 170, also mentioned above, is actuated by the absence or presence of banding material in the band chute 42, and the switch assumes the position shown in Fig. 7 when the band chute is empty. The third automatic switch associated with the banding machine,

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i. e., switch 166, is automatically closed when the banding machine moves to its retracted position shown by the phantom lines in Fig. 4.

In Fig. 1, certain of the principal controls have been indicated in their relationship to the path of travel of a paper roll R as conveyed by the belts 12, 14 and 15 through the machine. In Fig. 7, these controls have been included in the wiring diagram, which discloses that electrical current is brought to the system through power supply lines L1, L2 and L3 upon closing of the master switch 50. The electrical motor for driving the wrapping rollers 11 is designated in this diagram by the reference numeral 100; the motors for driving the conveyor belts 12 and 14, respectively, are designated by numerals 30 and 30'; the banding machine motor by 101 and the driving motor for belt 15 by 102. These motors, as shown at the right hand side of Fig. 7, are connected to the power lines L1, L2 and L3 by a series of gang switches, each of which is electrically actuated by means of relay coils or solenoids such as 119, 135, 155, 211, 145, 185, 224, and 167; the latter three being used to reverse the motors with which they are associated.

Electrical current from lines L1 and L2 is fed into a transformer T by the lines 110 and 111 where it is stepped down in voltage to supply the main lines 114 and 115 leading to the various control elements embodied in this machine. The lines 114 and 115 supply current directly to a plurality of solenoid-controlled air valves such as the stop-roller control valve 70, the deck stop valve 106, the wrapper roller discharge valve 107 and the banding machine valve 165; all having suitable control buttons or automatic switches to control the operation thereof. While the wrapper roller motor 100 is initially started by the pressing of button 118 to energize the coil 119, it is automatically held by line 120 and the closed contacts 121. Pressing button 117 stops the wrapper roller motor 100.

Interposed between the lines 114 and 115 is a conveyor control relay having a relay coil 128 which may be initially energized by the starter button 127 but which is self-holding through the line 130 and the contacts 131. Two normally closed manual stop buttons 125 and 126 are provided in the line 130 to de-energize the conveyor control relay coil 128 and these buttons are located at convenient locations upon the machines as shown in Fig. 1. The control relay of which the relay coil 128 is a part makes possible the continual energization of lines 80 and 181 which are used to feed current to various switches of the system for the automatic and intermittent starting and stopping or reversing of the conveyor motors 30 and 30'.

A line 90, which is part of the circuitry of the banding machine 13, leads to a relay coil 168 which exerts a "triggering" effect upon a series of gate relay coils 174, 194, 199 and 200; the repeated energizing and de-energizing of relay coil 168, as caused by repeated operations of the banding machine, acts to cause the successive energizing and self-holding of the first three gate relay coils, while the energizing of the relay coil 200 which follows thereafter causes the collapse of the entire gate relay system by the opening of contacts 203 which feed current to the line 177 which is a main supply line to all the gate relay coils. Thus the gate relay system is reset back to its original de-energized condition ready to start anew the next cycle of operation for the machine.

As part of the banding machine 13, there is connected in series between lines 114 and 115, as seen at the lower portion of Fig. 7, a series of push buttons 141, 142 and 143 which are provided for the required occasional manual control of the banding machine, but which are not actuated during the normal automatic operation of the machine.

The operation or functioning of the present invention is as follows:

Preliminary to the actual handling of rolls R, the circuitry and mechanism of the present invention must be readied for actual operation. This is accomplished by

closing of the master switch 50 to energize the lines 110 and 111 to supply alternating current to the primary side of the transformer T. The lines 114 and 115 which lead from the secondary side of the transformer will provide current at reduced voltage to the entire control system of the present invention. Only the motors 30, 30', 100, 101, and 102 will have access to the original full voltage as supplied by the extension of lines L1, L2 and L3 as effected by the closing of the master switch 50.

Since the normal at-rest position of the banding machine switches 164 and 166 is as shown in Fig. 7, the energizing of lines 114 and 115 will result in the immediate energizing of the relay coil 168. This will cause the closing of contacts 210 which supply current to line 172 which in turn feeds through the normally closed contacts 208 to the gate relay coil 174. Current to hold relay coil 174 will then enter through the holding line 176 which is supplied by line 177 leading from the closed contacts 203 of the relay coil 200. Also, the energizing of coil 174 will cause the closing of contacts 178 so that current is supplied through lines 82, 83 and 84 to energize the stop-roller valve 70 which, when thus energized, will lower the stop-roller frame 61 and the roller 48 to prepare for the delivery of the first roll R.

At the same time, if the band chute 42 should happen to be empty and thus not ready for the banding cycle to begin, the band chute switch 170 will have its contacts 169 closed which will result in the immediate energization of the banding motor reversing relay coil 167 which will then start the motor 101 in reverse direction to feed banding material or strap into the band chute 42 until the switch 170 is actuated so that contacts 169 open and cut off current to the relay coil 167 thus stopping the banding machine motor 101. Now the machine of the present invention is fully readied to begin operation.

The first step is to start the conveyor motors 30 and 30' which drive the conveyor belts 12 and 14 respectively. This is accomplished by momentarily pressing the conveyor starter button 127 which energizes the conveyor relay coil 128 which is capable of holding itself through contacts 131, the line 130 and the two normally closed conveyor stop buttons 125 and 126. The closing of contacts 131 also feeds current into lines 80, 149, 151, 152, 153 and 154 to energize motor relay coil 155 which starts the motor 30'. Energizing of relay 155 also causes the closing of contacts 217 to supply current from line 151 to lines 122, 123 and 124 back to energize the motor relay coil 135 and also start the motor 30. Both of these motors will then continue to run until interrupted by some phase of the automatic cycle which follows.

Before a roll R is delivered to the conveyor belt 12, a deck feed button 156 is pressed to energize the platform stop valve 106 which will release a roll R from the upstream end of the platform 10 to roll forward onto the wrapper rollers 11. Then the push button 118 is pressed to energize line 116 leading to the wrapper roller motor relay coil 119 which maintains itself through contacts 121 and the normally closed wrapper roller stop button 117. After the wrapping is applied to the roll R, the button 158 is pressed to activate the wrapper roller discharge valve 107 to finally release a roll R from the wrapper rollers 11 to the conveyor belt 12. Meanwhile the wrapper roller motor may continue to run or it may be stopped by pressing stop button 117 as desired.

As soon as the roll R is deposited upon the moving conveyor belt 12 it starts moving toward the banding machine 13. As soon as the forward end of the roll enters the banding machine it will strike the elevated stop roller 46 and be brought to a halt thereby. At the same instant, the roll R also strikes the switch bar 77 which actuates switch 75 to effect the opening of contacts 146, the de-energizing of coil 135 and the stopping of the conveyor motor 30 which drives belt 12. Meanwhile conveyor motor 30' is unaffected and continues to run.

The closing of contacts 159, which occurred simul-

aneously with the opening of contacts 146, brings in current from line 85 to lines 86, 161 and 87 from where it branches off to supply lines 162 and 88 to simultaneously energize the banding machine motor relay coil 145 and the banding machine valve 165, respectively. The energizing of these two units, i. e., 145 and 165, will simultaneously cause the starting of the banding motor 101 and extend the banding machine against the roll R to apply tightly a band about the forward end of the roll. The resultant inward movement of the banding machine against the roll R will automatically cause the opening of the switch 166. As soon as this takes place, current is cut off to line 90 and the relay coil 168. This results in the opening of contacts 210 and the closing of contacts 136, the latter providing a path for current to flow through closed contacts 203, through lines 188, 189 through contacts 219, through line 191, through contacts 187, closed by previous energization of 174, and through lines 192 and 193 to thus energize the second gate relay coil 194, which is self-holding through line 196 from the holding line 176. The energizing of this second gate relay coil 194 results in the opening of contacts 208 and the closing of contacts 197.

As soon as the banding machine starts its cycle, it automatically resets the sealer crank switch 160 so that contacts 163 become closed and contacts 164 become opened. Immediately thereafter the band chute 42 empties so that the band chute switch 170 is actuated to close contacts 169 and open contacts 144. Hence current is not interrupted to the coil 145 and the electric valve 165 at this time, although it does come in by a slightly different path, i. e., through line 91 instead of line 87. However, as soon as the sealing of the band is completed, the sealer switch 160 is again actuated to re-open contacts 163 and close contacts 164. This de-energizes line 91 so that the banding motor 101 stops and the banding machine retracts to its out-of-the-way position as caused by the de-energization of the relay coil 145 and the valve 165. The retraction of the banding machine then causes the closing of switch 166 and this again re-energizes line 90 to energize relay coil 168 and cause the opening of contacts 136 and the closing of contacts 210.

The closing of contacts 210 along with the earlier closing of contacts 197 acts to cause the energizing of the third gate relay coil 199 which is like the other gate relay coils in that it is also self holding through a contact 202.

The aforementioned retraction of the banding machine and the attendant closing of the switch 166 closes the final link in the lines 92, 93, 94 and 95 to thus energize the banding motor reversing relay coil 167 to cause the reversing of the banding motor 101. The reversed operation of the banding motor is such as to cause the reloading of banding material into the band chute 42 from the supply reel. When the chute becomes full, switch 170 is automatically actuated to break contacts 169 and cut off current to line 95 and thus bring the banding motor 101 to a stop again. This completes the entire operating cycle of the banding machine.

While the banding machine motor 101 has been running in reverse to reload the band chute 42, the aforementioned energization of the third gate relay coil 199 causes the opening of the contacts 220 and cuts off current to the line 84 so as to deenergize the stop-roller control valve 70. This will act to cause the lowering of the stop-roller frame 60 and the stop roller 46 so as to clear the way for the forward movement of the roll R. Simultaneously with the lowering of the frame 60, the switch bar 77 will be released to actuate the switch 75 and close the contacts 146. This will cause the immediate energizing of the relay coil 135 and re-start the motor 30 to move the roll R ahead and onto the conveyor belt 14, which has continued running up to this time. As the roll R passes through the banding machine, the stop roller frame 61 is being urged upwardly but cannot rise because of

the weight of the roll R against it. However, the roller 48 prevents excessive friction and allows the roll R to move forward. However, as soon as the trailing end of the roll R passes the roller 48, the roller 48 will pop upwardly and in doing so will actuate the switch 180 to simultaneously open contacts 132 and close contacts 179. The opening of contacts 132 breaks the flow of current from the line 80 to the lines 149, 151, 152, 153, 154 to de-energize relay coil 155 and stop the motor 30', as well as to open contacts 217 and thus cut off current to the relay coil 135 and stopping the motor 30 as well. Simultaneously with the stopping of the motors 30 and 30', the aforementioned closing of contacts 179 made possible the supplying of current from lines 181 and 182 to the lines 96, 183 and 184 to energize the motor reversing relay coil 185 of the motor 30' and thus start the latter in reverse to back up the conveyor 14 and the roll R riding thereon. The roll R will back up until it strikes the elevated stop-roller 48 and also strike the switch bar 78 to actuate the switch 76. The latter will cause the opening of contacts 147 and break the current to lines 183 and 184 to thus de-energize the reversing relay coil 185 of the motor 30' and bring the motor to a stop. Simultaneously to switch contacts 159' are closed to automatically restart the banding cycle of the banding machine 13 which will be continued to completion in a sequential operation exactly as described earlier when the co-parallel switch 159 was closed by the end of the roll R entering the banding machine.

At this time it is well to remember that before the banding machine is restarted for the banding of the trailing end of the roll R, the relay coils 199 and 168 still remain energized so that while the contacts 201 are closed, the contacts 186 are still open. However, as soon as the banding machine starts its cycle it immediately actuates the switch 160 and opens the contacts 164, as explained for the banding of the forward end of the roll. Thereupon, relay coil 168 is immediately de-energized to again close contacts 186. As soon as this happens a momentary burst of current will be allowed to flow from lines 177, 188, 189 and 190 to momentarily energize the critical "unlocking" relay 200 which causes the momentary opening of contacts 203 which breaks current to the main supply line 177 of the holding line 176. As soon as the holding line 176 is de-energized, even momentarily, the "collapse" or de-energizing of all the gate relay coils 174, 194, 199 and 200 will result.

As the banding machine 13 finishes the banding and sealing phase and retracts itself away from the trailing end of the roll R, the automatic closing of contacts 164 and the switch 166 will again re-energize the relay coil 168 and thus close the contacts 210. It is recalled that the slightly earlier collapse of relay coil 194 will have caused the closing of contacts 208. This, along with the closing of contacts 210, will once again start building up the gate relay system by the energization of relay 174. Hence, once again contacts 178 are closed to energize the stop roller control valve 70 and reset the roller frames 60 and 61 back to their original starting position and ready for a brand new roll R. For this the roller 48 will be depressed below the level of the conveyor belts while the roller 46 will be urged upwardly against the roll R. The lowering of the stop roller 48 and the consequent closing of contacts 132 will result again in the energizing of relay coil 155 and restart the conveyor motor 30' to carry off the completely banded roll R, and permit the freed roller 46 to pop upwardly to be in position for a new roll.

The freshly banded roller R will proceed down the moving conveyor belt 14 until it strikes and actuates the switch 205 and cause the opening of contacts 206 which de-energizes 155 and stops the motor 30' and the conveyor belt 14. Meanwhile, the banding machine 13 has been busy reloading its band chute 42 to make ready

for a complete new cycle of operation of the present invention. When this is finished, the first overall cycle is fully completed. Both conveyors 12 and 14 are stopped.

In order that a complete new cycle can begin, it is first necessary to unload the conveyor 14 of its roll. This is accomplished by momentarily pressing the starter button 207 of the discharge conveyor 15. Pressing the button 207 will feed current through lines 204, 97 and 209 to energize the motor relay coil 211 to start the discharge conveyor motor 102. It is to be noted that the relay coil 211 is self-holding through the contacts 222. The relay coil 211 also causes the closing of contacts 223 thus introducing current through lines 136, 137, 138, 153 and 154 to energize coil 155 and also restart the conveyor motor 30' to discharge the roll R onto the belt 15. As the roll R moves down conveyor 15 it will eventually strike switch 215 and open the contacts 98 to again de-energize coil 211 and bring the motor 102 to a halt.

If for some reason it becomes necessary to reverse the discharge conveyor motor, this may be done by pressing the reversing button 226 to close the contacts 227 and thus energize the reversing relay coil 224 and run the motor 102 in reverse.

Having thus described the construction and operation of the present invention, what I desire to protect and secure by Letters Patent is defined in the following claims:

1. In combination; a banding machine that is operable incident to its being energized, through one banding cycle, a power driven conveyor leading to the receiving side of said banding machine for the endwise conveyance of a roll thereon into said banding machine to a position for the application of a band about its forward end portion, a power driven conveyor at the discharge side of said machine for receiving the roll from the first conveying means and to coact therewith for the conveyance of the roll through the banding machine after receiving a band about its forward end portion, and reversible to reverse the direction of movement of the roll after passing through the machine to dispose its rearward end portion in position for receiving a band thereabout, and means operable by the moving roll, incident to the disposition by a conveyor of an end portion thereof in banding position to energize said machine for a banding operation.

2. The combination recited in claim 1 including roll stop means at the receiving and discharge sides of the banding machine against which the roll ends are caused to be abutted by the conveyors to position the roll for the application of the bands at definite locations thereon.

3. The combination recited in claim 1 including roll stop means at the receiving and discharge sides of the banding machine against which the roll ends are caused to be abutted by the conveyors to position the roll for the application of the bands at definite locations thereon, and means operable by the roll incident to its advancement into the banding position to banding position as determined by an engaged stop means to stop the conveyor on which the roll is then being moved.

4. The combination recited in claim 1 including roll stop means at the receiving and discharge sides of the banding machine against which the roll ends are caused to be abutted by the conveyors to position the roll for the application of the bands at definite locations thereon, and means operable by the roll incident to its advancement into the banding position to banding position as determined by an engaged stop means to stop the conveyor on which the roll is then being moved, and means associated with each of said roll stop means for energizing the banding machine incident to the stopping thereby of the roll in a band receiving position.

5. The combination recited in claim 2 including power control means whereby the driving means for the first mentioned conveyor will be de-energized coincident with

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the engagement of the roll being advanced on the conveyor with the stop device at the discharge side of the machine, and will be re-energized incident to the retraction of the engaged stop for advancement of the roll onto a second mentioned conveyor.

6. In combination, a banding machine that is operable through one complete cycle upon being energized, to apply and secure a band under tension about that portion of a roll disposed therein, a power driven conveyor at the receiving side of said banding machine for the endwise conveyance of a roll thereon into said machine for the reception of a band about its forward end portion, another conveyor at the discharge side of said banding machine operable in conjunction with the first mentioned conveyor to advance said roll, after receiving a band about its forward end portion, through said banding machine; the second mentioned conveyor being reversible for a reverse movement of the roll received thereon from the first mentioned conveyor to position its rearward end portion in said machine for receiving a band thereabout, a retractable and extendable stop device at the discharge side of the banding machine and initially extended for engagement by the forward end of a roll as advanced by the first mentioned conveyor, to stop the roll for the application of a band about its forward end portion, a retractable and extendable stop device at the receiving side of said banding machine, and means for causing it to be extended for engagement by the rearward end of said roll when moved in the reverse direction, to stop the roll with its rearward end in position in the banding machine to receive a band thereabout, and control means positioned for actuation by and coincident with the movement of a roll end into engagement with a stop device to effect the energization of the banding machine.

7. The combination recited in claim 6 wherein said stop devices are individually actuated between retracted and roll stopping positions by means operating under control of the moving roll and the banding machine.

8. The combination recited in claim 6 wherein said stop devices are individually actuated between retracted and roll stopping positions by means operating under control of the moving roll and the banding machine, and comprising a pressure medium cylinder corresponding to each stop device, a source of fluid pressure medium, a solenoid valve for controlling the application of fluid pressure medium from said source to said cylinder

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for the coordinated extension and retraction of said stop devices and coacting switch devices operable by the moving roll and the banding machine to control the operation of the solenoid valve.

9. In combination, a banding machine that is operable incident to its being energized to operate through one complete banding cycle, a motor driven conveyor belt leading to the receiving side of said banding machine for the conveyance of a roll thereon into said banding machine for the application of a band thereabout, a motor driven conveyor belt, aligned with the first mentioned conveyor belt to receive the roll therefrom and leading from the discharge side of said banding machine, independently operable roll stop devices at the receiving and discharge sides of the banding machine, means for coordinating the movement of said stop devices to cause the stop device at the receiving side of the machine to be retracted and that at the discharge side to be extended for the stopping of a roll as advanced by the first mentioned conveyor belt for the application of a band about its forward end, means operable by the roll, incident to its engaging said stop, to energize the banding machine and to stop said first mentioned conveyor, means operable incident to the banding machine reaching the end of the banding cycle to retract the extending roll stop and to energize the conveyor belts for the advancement of said roll through the banding machine, means operable with the advancement of the roll through the machine for extending the retracted stop at the receiving side of the banding machine and means operable incident thereto for reversing the belt conveyor at the discharge side of the banding machine to cause it to return the roll against one of said stops, means operable with the engagement of said stop to again energize the banding machine, for the application of a band about the trailing end of the roll, and means operable by the banding machine, when the banding cycle is completed to energize the conveyor belt at the discharge side of the machine for the off bearing of the roll thereon.

10. The combination recited in claim 9 including means operable coincident with the engaging of a stop by the end of the roll to position the roll to receive a band, whereby to affect the de-energization of the motor driving the roll conveying belt.

No references cited.