Jan. 31, 1961 P. ZERNOV 2,969,930

CONTINUOUS REWINDER FOR WEB MATERIAL

Filed Sept. 22, 1958 9 Sheets-Sheet 1

FIG. 1

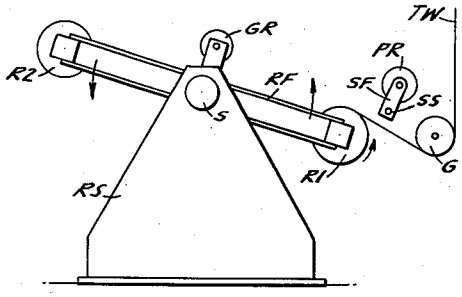


FIG. 2

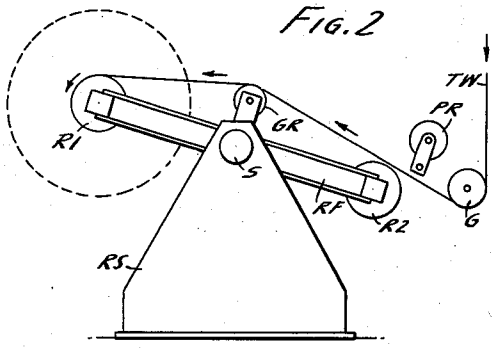


FIG. 3

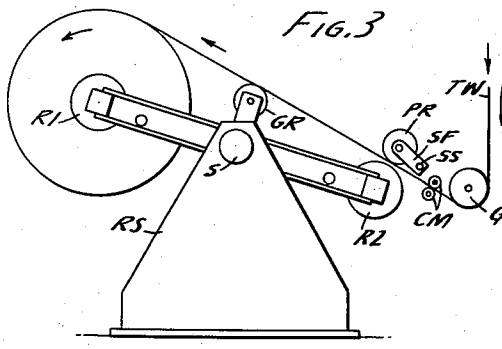


FIG. 4

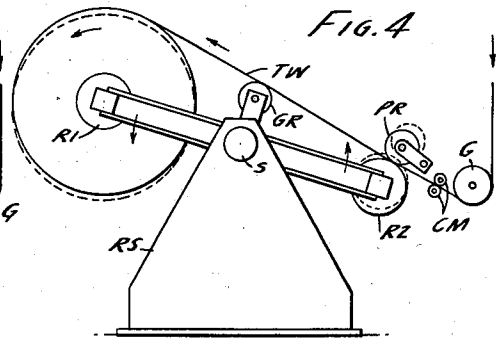


FIG. 5

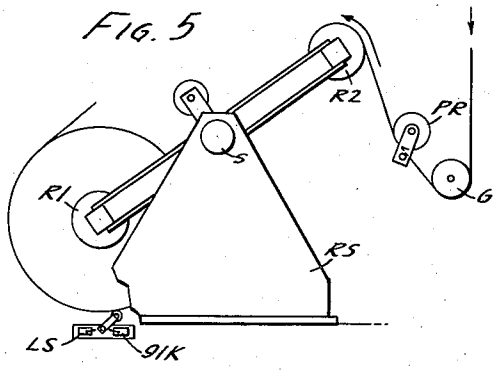
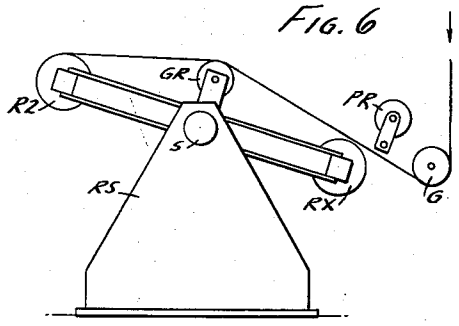


FIG. 6



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Jan. 31, 1961 P. ZERNOV 2,969,930

CONTINUOUS REWINDER FOR WEB MATERIAL

Filed Sept. 22, 1958 9 Sheets-Sheet 2

FIG. 8

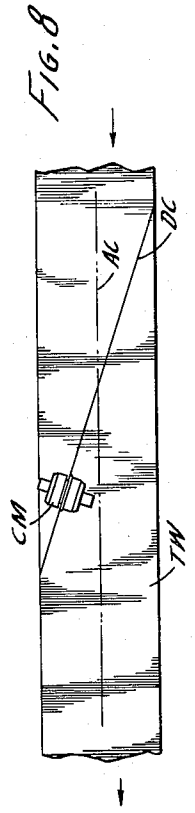
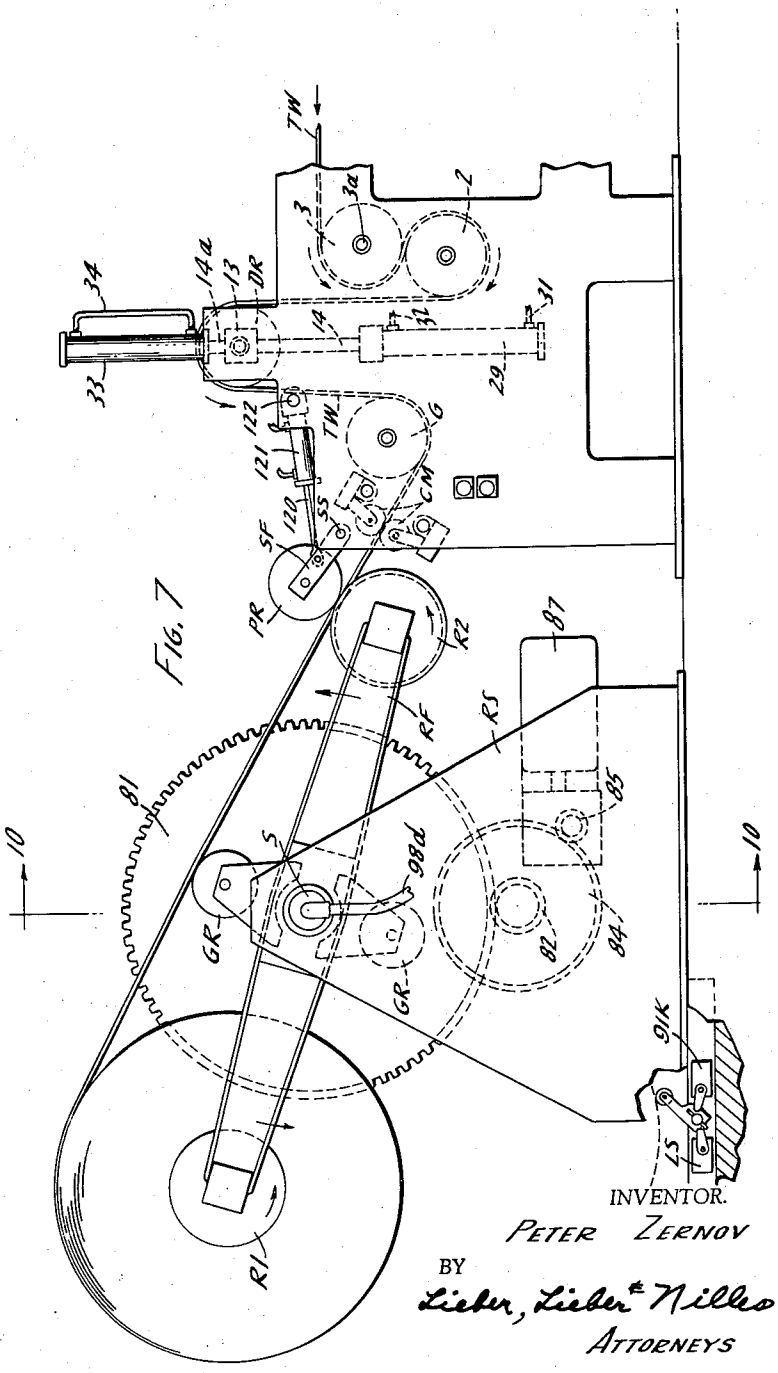


FIG. 7



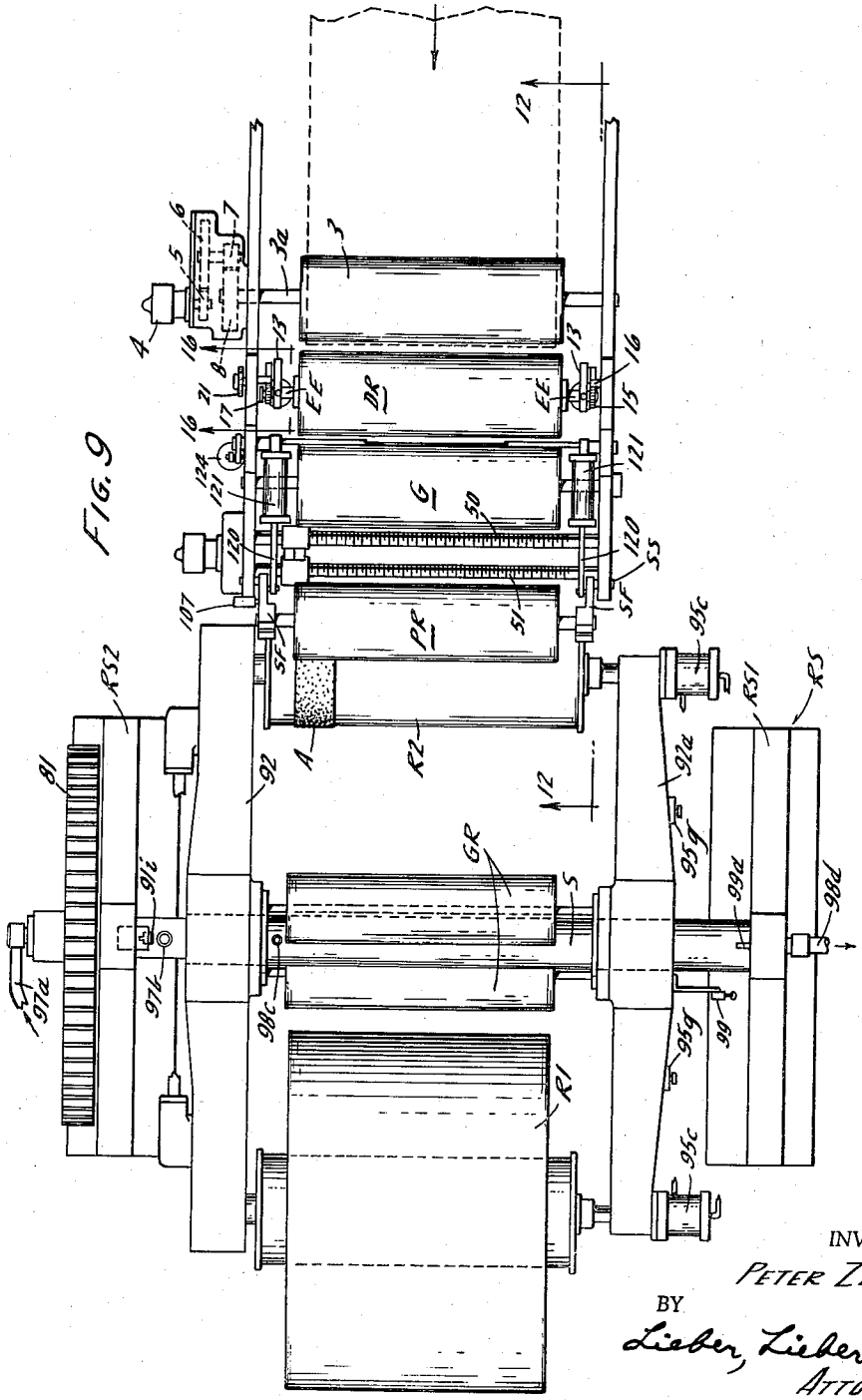
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Jan. 31, 1961 P. ZERNOV 2,969,930

CONTINUOUS REWINDER FOR WEB MATERIAL

Filed Sept. 22, 1958 9 Sheets-Sheet 3

FIG. 9



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Jan. 31, 1961 P. ZERNOV 2,969,930

CONTINUOUS REWINDER FOR WEB MATERIAL

Filed Sept. 22, 1958 9 Sheets-Sheet 4

FIG. 10

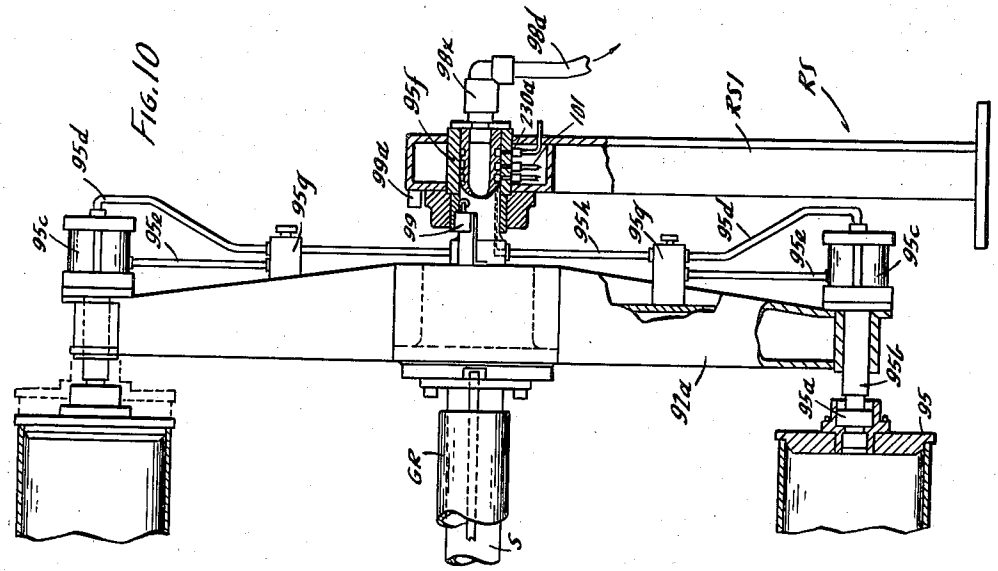
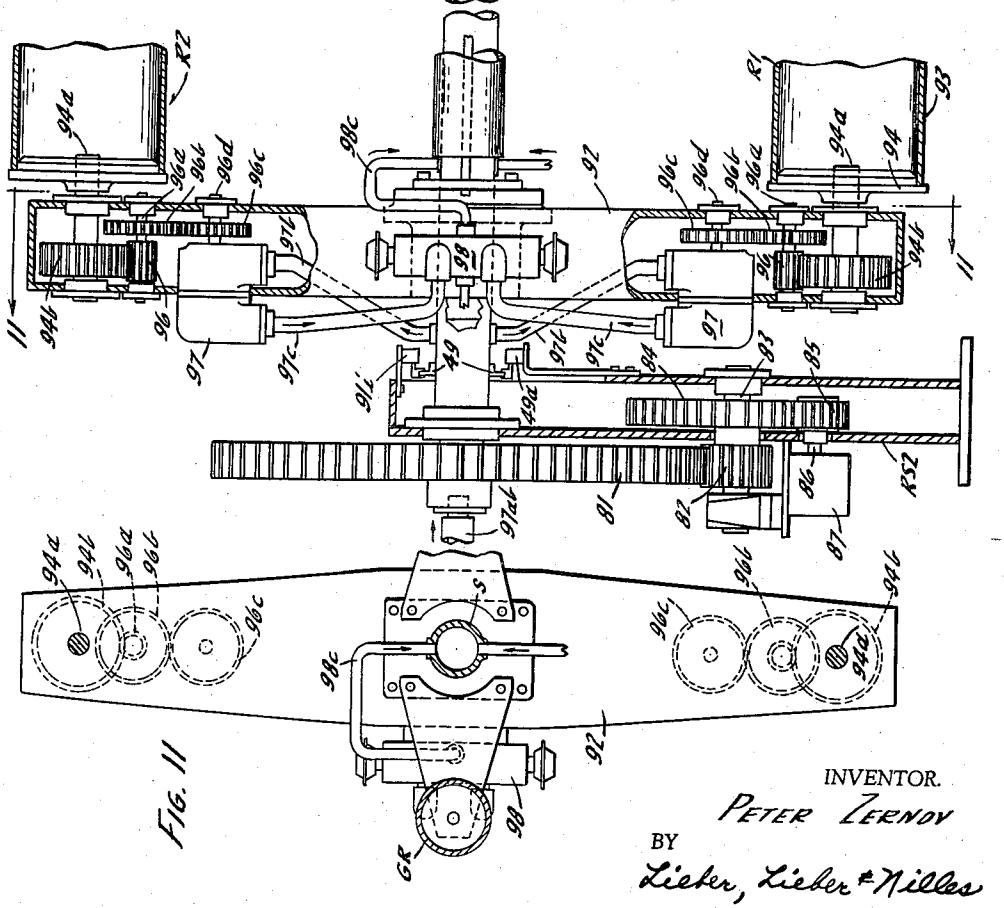


FIG. 11



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Jan. 31, 1961 P. ZERNOV 2,969,930

CONTINUOUS REWINDER FOR WEB MATERIAL

Filed Sept. 22, 1958 9 Sheets-Sheet 5

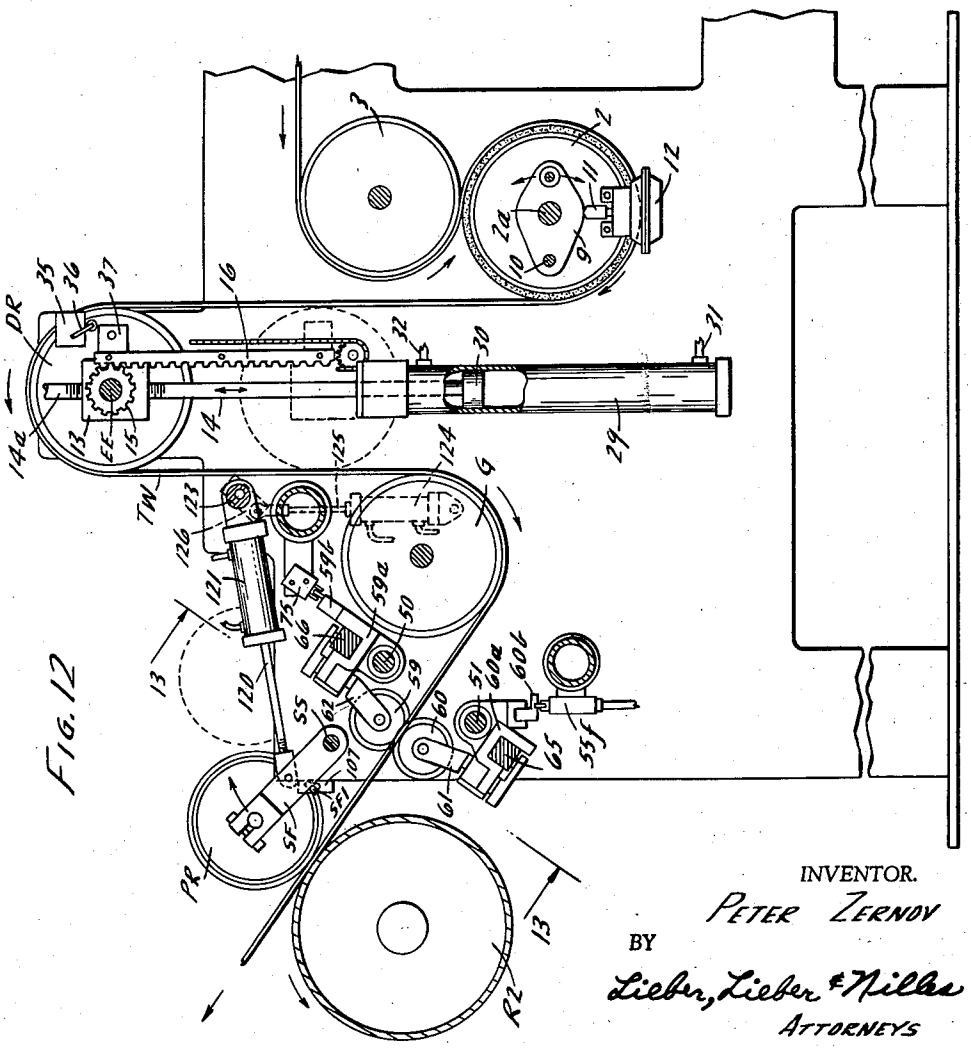


FIG. 12

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Jan. 31, 1961 P. ZERNOV 2,969,930

CONTINUOUS REWINDER FOR WEB MATERIAL

Filed Sept. 22, 1958 9 Sheets-Sheet 6

FIG. 13

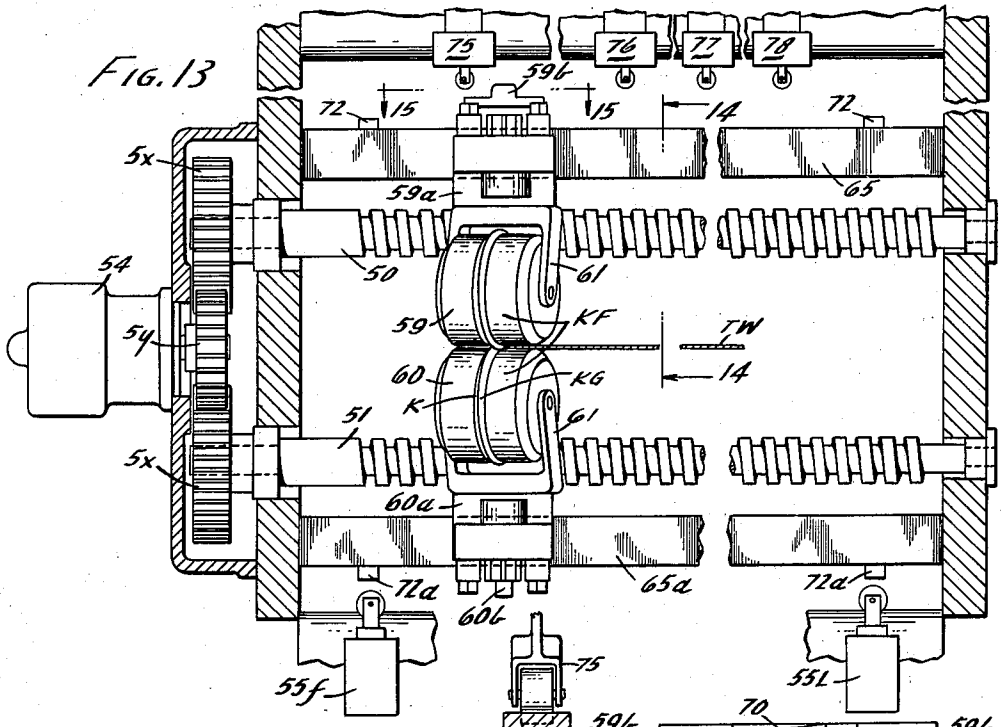


FIG. 14

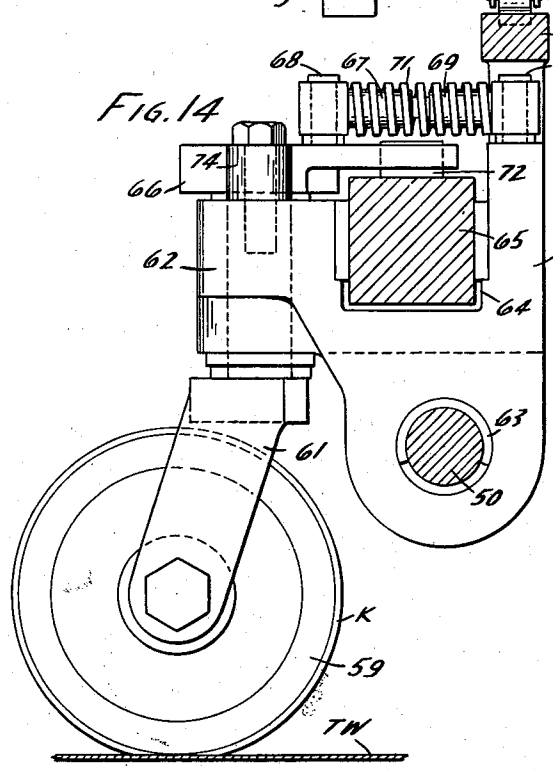
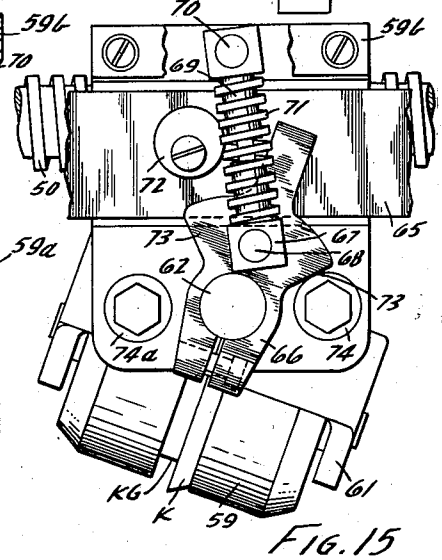


FIG. 15



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Jan. 31, 1961 P. ZERNOV 2,969,930

CONTINUOUS REWINDER FOR WEB MATERIAL

Filed Sept. 22, 1958 9 Sheets-Sheet 7

FIG. 16

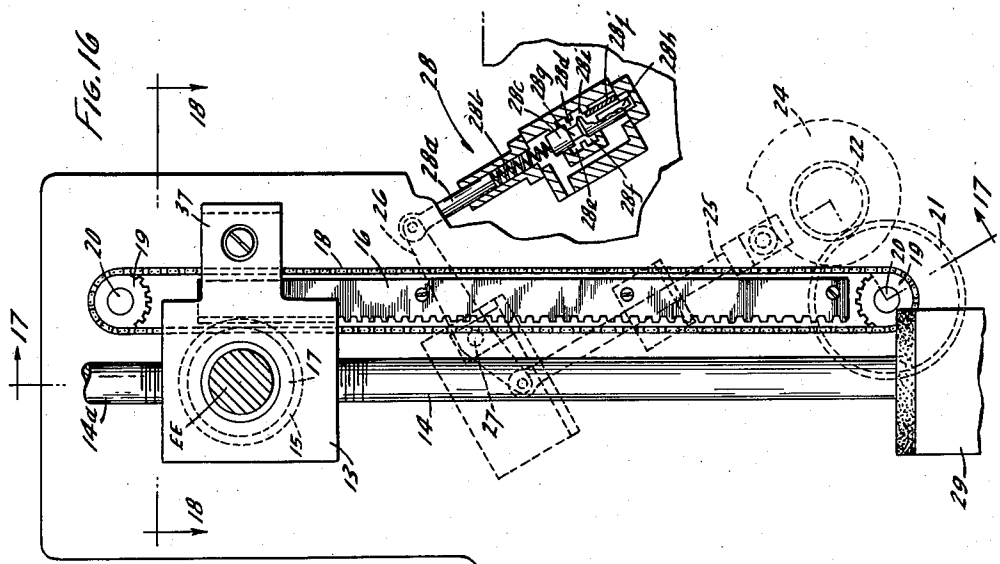


FIG. 17

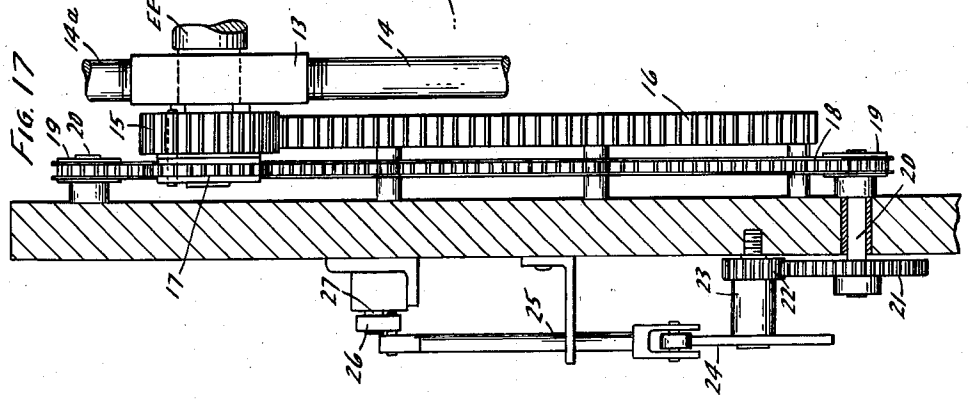
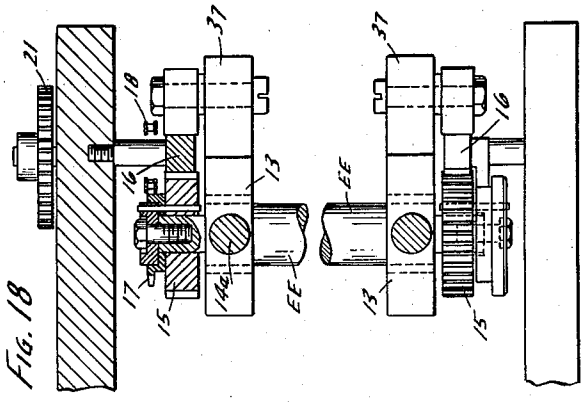


FIG. 18



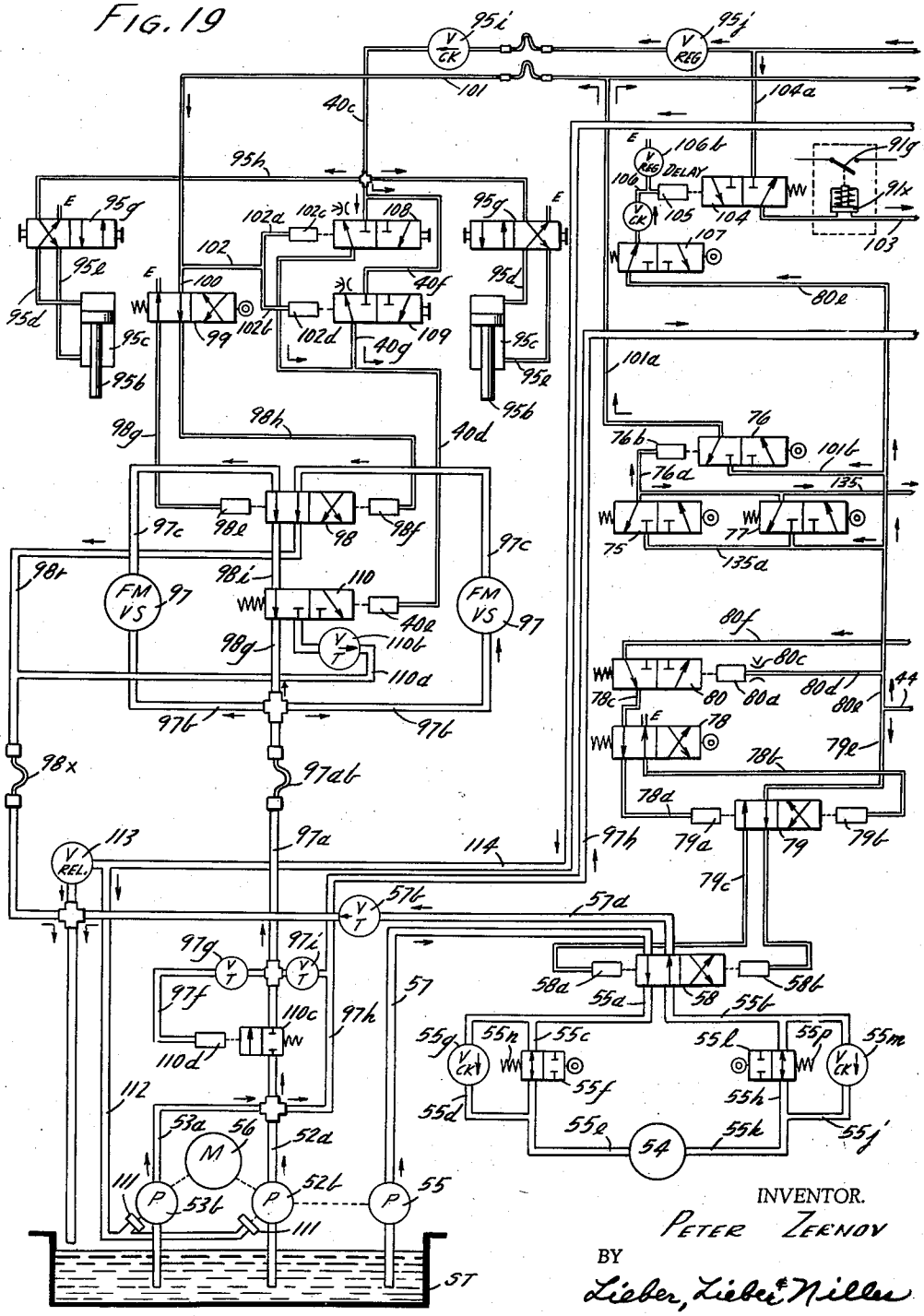
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CONTINUOUS REWINDER FOR WEB MATERIAL

Filed Sept. 22, 1958 9 Sheets-Sheet 8

FIG. 19



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Jan. 31, 1961 P. ZERNOV 2,969,930

CONTINUOUS REWINDER FOR WEB MATERIAL

Filed Sept. 22, 1958 9 Sheets-Sheet 9

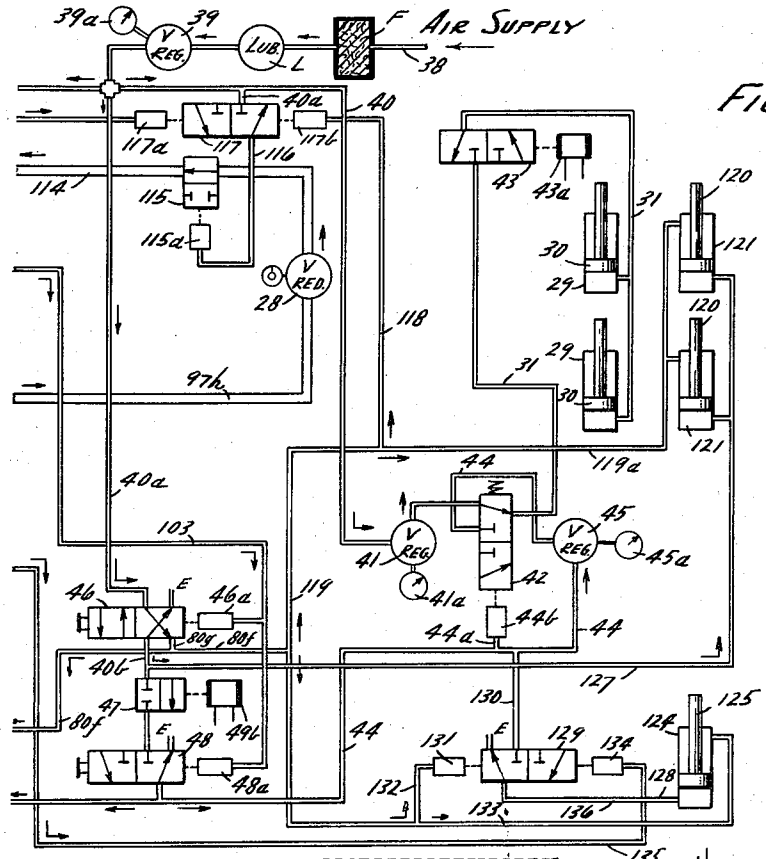


FIG. 20

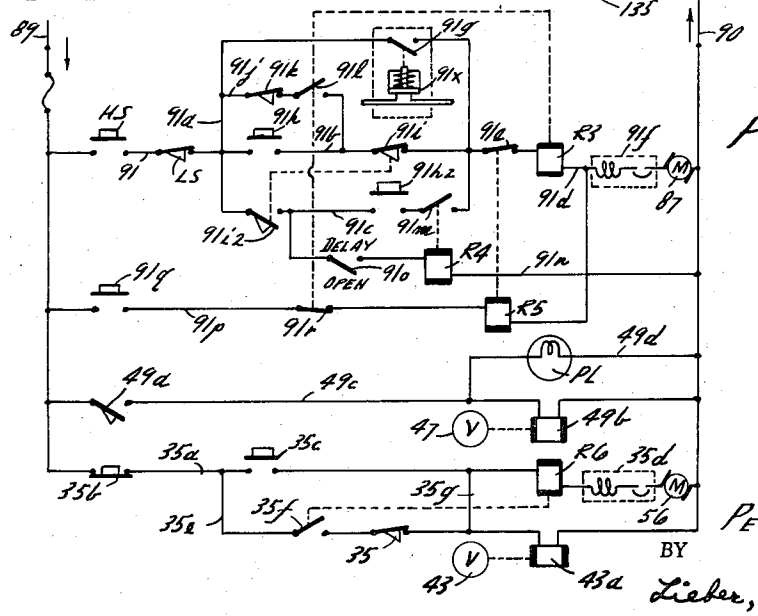


FIG. 21

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United States Patent Office 2,969,930 Patented Jan. 31, 1961

2,969,930

CONTINUOUS REWINDER FOR WEB MATERIAL

Peter Zernov, Milwaukee, Wis., assignor to Mercury Engineering Corporation, Milwaukee, Wis., a corporation of Wisconsin

Filed Sept. 22, 1958, Ser. No. 762,646

16 Claims. (Cl. 242—56)

The invention relates to continuous rewinders for web material.

As in all rewinding mechanisms or apparatus, means are provided for changing the winding material from a completed roll to a fresh roll without interruption in the supply or change of speed in the winding material being wound, the apparatus being capable of use for various web materials and in connection with various forms of material supply feeders. One object of the invention is to provide a continuous rewinder in which the web material supplied on the completion of one roll is cut from the oncoming web by a diagonal cut which greatly simplifies the attachment of the severed web to a new mandrel or its core and simplifies the construction of the machine.

While as noted above the rewinder may receive its web material from any suitable source of tensioned material, another object of the invention is to provide a stock or web material tensioning mechanism that may immediately precede the rewinder and act to control parts of the rewinder where such tensioning mechanism does not form a part of other material supply means.

The invention further consists in the several features hereinafter described and more particularly defined by claims at the conclusion hereof.

In the drawings:

Figs. 1 to 6 are diagrammatic views showing the general sequence of operations of a machine embodying the invention;

Fig. 7 is a side elevational view of a continuous rewinder embodying the invention shown associated with a tensioning material supply means;

Fig. 8 is a plan view illustrating the cut through the web;

Fig. 9 is a plan view of the apparatus shown in Fig. 7;

Fig. 10 is a vertical sectional view taken on the line 10—10 of Fig. 7 with the rolls in a vertical position, parts being broken away and parts being shown in section;

Fig. 11 is a detailed vertical sectional view taken on line 11—11 of Fig. 10;

Fig. 12 is a detailed vertical sectional view taken on the line 12—12 of Fig. 9;

Fig. 13 is a detailed vertical sectional view taken on the line 13—13 of Fig. 12.

Fig. 14 is a detailed vertical sectional view taken on the line 14—14 of Fig. 13;

Fig. 15 is a detailed horizontal sectional view taken on the line 15—15 of Fig. 13;

Fig. 16 is a detailed vertical sectional view taken on the line 16—16 of Fig. 9;

Fig. 17 is a detailed vertical sectional view taken on the line 17—17 of Fig. 16;

Fig. 18 is a detailed horizontal sectional view taken on the line 18—18 of Fig. 16;

Fig. 19 is a diagrammatic view of part of hydraulic and air control circuits, pumps, and valves used in connection with the apparatus shown;

Fig. 20 is a continuation of the diagram shown in Fig. 19; and

Fig. 21 is a circuit diagram of electrically controlled parts used in connection with the apparatus shown in Fig. 7.

For a clearer understanding of the invention, reference is made to Figs. 1 to 7 in which RS designates a roll stand, RF a roll-carrying frame including a centrally disposed shaft S rotatably mounted in the sides of the stand and having web roll receiving rolls R1 and R2 rotatably mounted in its end portions, said frame RF also having guide rolls GR mounted on opposite sides thereof adjacent the shaft S. Associated with the rolls R1 and R2 is a pressure roll PR mounted on a swinging frame SF pivoted on a shaft SS. TW represents the tensioned web.

Referring to Fig. 1, the squared or straight across end of the web TW is brought down over a guide roll G and adhesive secured to the roll R1. Each roll R1 or R2 may as indicated in Fig. 9 include a mandrel having a layer A of tape material mounted thereon provided with an adhesive outer surface or may include a mandrel and a core mounted on the mandrel and having a layer of adhesive or adhesive carrying material thereon. Throughout these specifications it is to be understood that the term "roll" or "web roll" means a roll having a mandrel or a mandrel and a core. With the stock secured to the roll R1 the frame RF is rotated to the position shown in Fig. 2 and the roll R1 is rotated to wind up the material on said roll, the web or stock then being guided from the roll G over one of the guide rolls GR. When the desired amount of material has been wound up on the roll R1, the cutting mechanism CM indicated in Figs. 3 and 4 is brought into operation to make a diagonal cut across the web as indicated at DC in Fig. 8. In the position shown in Fig. 3, the roll R2 is now in a position to receive the web and a portion of its surface has an adhesive coating adjacent one side to receive a part of the cut (or pointed end) of the web, as for example, that represented between the inner side and the line AC in Fig. 8, and just before the cutting operation and as shown in Fig. 3, the pressure roll PR is brought down, through the swinging of the frame SF, close to the web while the roll R1 continues to pull the stock forwardly. Directly thereafter as the cutting mechanism CM is operated to make the diagonal cut end DC (Fig. 8), the roll PR is brought down into pressing engagement with this end of the web as shown in Fig. 4 while the cut end of the rolled-up web is carried away from the roll R2, the roll R2 being rotated to start the wind-up of this second roll. Thereafter, the frame RF is rotated as shown in Fig. 5 to bring the first wound roll of stock on the roll R1 down to position near the floor where it may be readily removed and which position may be determined by a limit switch LS as the roll R2 continues to be rotated to wind up the web material thereon.

As soon as the first wound roll of stock is removed from the frame and from its supporting roll R1, either this roll or a similar roll is replaced in the frame RF which is then rotated in a counter-clockwise direction to the position shown in Fig. 6 so that the roll R2 now occupies the position shown for the roll R1 in Fig. 2 and the roll RX is now in position to receive the stock for a third roll. The roll R2 is continuously rotated to build up the second roll of stock thereon, and when the conditions shown in Fig. 3 have been reached, another diagonal cut is made across the web similar to that described in Fig. 4 except the position of the cutting means is reversed so that the tip end of the on coming web is on the opposite side from that shown in Fig. 8, and this newly cut end is then adhesively attached to the roll RX

of Fig. 6 when the stock on roll R2 has been built up to the desired amount so that roll RX now takes on stock for a third roll as the cycle is repeated, it being noted that once the stock is connected to one of the rolls as shown in Fig. 1, the movement of the stock continues regardless of its transfer from one roll to another.

It is to be noted that the hydraulic motors and pumps and their control valves, the air motors and their control valves, the relays, switches, and solenoids forming the electrical controls are of known construction and available on the open market and that no claim is here made to invention in these parts per se but only in combination with the apparatus as hereinafter described and that in connection with this apparatus some of the piping and some of these controls have not been shown on the apparatus for the sake of clearness and brevity but have been shown in the diagrammatic views hereinafter referred to.

Referring now to Figs. 7, 9, 12, and 16 to 18, where a tensioned out feed supply means for the stock has not been provided, then the web to be rewound is carried into the bight of a pair of feed rolls 2 and 3 rotatably mounted on the frame of the machine, the roll 3 of which may be driven in any suitable manner as by a motor 4 connected by reduction gearing 5, 6, 7, and 8 to the shaft 3*a* for the roll 3, and provision may be made for stopping the drive of this roll when further stock is not desired. The roll 2 as indicated in Fig. 12 is a rubber covered roll which may be brought into varying pressure contacts with the web by mounting its shaft 2*a* on a pair of spaced swinging arms 9 (one being shown) pivoted at 10 and each of which is adapted to be engaged by the piston 11 of an air motor cylinder 12 suitably supplied with compressed air under the control of the operator. From the feed roll 2 the web passes over a dancer or tensioning roll DR so that beyond this roll the web becomes the tensioned web TW passing over the guide roll G.

For regulating the position of the roll DR, its shaft ends EE are journalled in boxes 13 adjustably mounted on spaced piston rods 14, each end carrying a rotatable gear 15 meshing with a fixed positioned rack 16 so that as the rods 14 are moved up and down, the gears 15 are turned as they travel on the rack 16. Affixed to one of the gears 15 is a sprocket 17 that meshes with an endless chain 18 that is trained between sprockets 19 mounted on shafts 20 suitably journalled in the frame of the machine so that as the sprocket 17 is turned, the chain 18 is driven to revolve the sprockets 19. The shaft 20 for the lower sprocket carries a gear 21 that meshes with a gear 22 on a shaft 23 carrying a cam 24. The cam 24 is engaged by a rollered tappet rod 25 suitably guided adjacent the frame of the machine and operatively connected to one arm of a lever 26 pivotally mounted at 27 on the frame of the machine and operatively connected at its other end to a pressure reducing valve 28 of known construction and controlling the pressure of the hydraulic pump or pumps hereinafter described. Air motor cylinders 29, one on each side of the machine, have the pistons 30 for the rods 14 working therein, the pressure air being introduced into the lower end of each cylinder from a supply pipe 31 and the upper end of each cylinder having a vent connection 32. The upper end of each rod 14 has an extension 14*a* associated with a hydraulic dash pot 33 which includes a piston (not shown) by which hydraulic fluid is transferred from one side of this piston to the other through a run around pipe connection 34. The cylinders 29 are supplied with air under a predetermined substantially constant pressure which as hereinafter described is raised and lowered.

In case of breakage of the web a limit switch (Fig. 12) 35 has its actuator 36 in the path of movement of an arm 37 on one of the boxes 13 so that as the dancer roll reaches the limit of its upward travel, the switch 35 is actuated to stop the machine as hereinafter described.

Referring to Fig. 20, a compressed air supply pipe 38 with its filter F, lubricator L, and pressure regulator valve 39 with its associated gauge 39*a* has a branch connection 40 provided with a high pressure regulating valve 41 with its associated gauge 41*a* leading to a three way spring returned manually controlled air-operated valve 42 connected to the pipe 31 to supply air to the cylinders 29. A solenoid operated air valve 43 in the pipe 31 allows air to flow to cylinders 29 only while the pumps hereinafter described are operating. A low pressure air supply pipe 44 provided with a pressure regulator valve 45 and its associated gauge 45*a* also leads to the valve 42 to supply low pressure air to the pipe 31 when the valve 42 is shifted to its other position as hereinafter described. The gauges 41*a* and 45*a* advise the operator of the tensioning pressure applied to the dancer roll DR.

A branch pipe 40*a* leads to a four way pre-set control, manually operated, air pressure returned valve 46, from which leads a pipe 40*b* through a solenoid operated roll positioning valve 47 to another manually operated, air pressure returned control valve 48 with which the pipe 44 connects. With the valve 46 pre-set by the operator to an open position, as the last end of a roll such as R1 being wound up passes to this roll, the operator actuates the valve 48 to admit air from pipes 38, 40*a*, 40*b* to pipe 44 which through a branch pipe 44*a* operates an air cylinder 44*b* to shift valve 42 to connect pipe 44 past the manually controlled reduced pressure regulator 45 to pipe 31 and cylinders 29 to reduce the operating pressure on the dancer roll. The solenoid operated valve 47 prevents the passage of operating air to the valve 48 until one of the rolls R1 or R2 is in the position shown in Figs. 3, 4 or 7, at which time one or the other of two pins 49 (see Fig. 10) on the shaft S can trip the actuator of a limit switch 49*a* (Fig. 21) that controls the solenoid 49*b* and the lighting of the light PL, said switch and the coil of the solenoid being in a conductor 49*c* connected across the supply lines 89 and 90 and the light PL being in the branch conductor 49*d*. The switch 49*a* acts to locate the empty roll in position for change-over.

It is to be noted that the knob shown in connection with some of the valves shown in Figs. 19 and 20 has been used as a symbol for manual control, and that the eccentric member shown in these figures has been used as a symbol for a cam control of certain of the valves.

The web TW after passing over the idler guide roll G passes through a cutter section before attachment to one of the web rolls R1 or R2. The web cutting means includes a traversing carriage, a rotary cutter mounted on said carriage and adapted to be shifted to different angular positions relative thereto to make a diagonal or bias cut across the tensioned web.

Referring to Figs. 13 to 15, a pair of parallel feed screws 50 and 51 are journalled in spaced relation in the sides of the frame of the machine, and each carries a gear 5*x* meshing with a common drive gear 5*y* whose shaft is driven at a predetermined constant speed by a reversible hydraulic drive motor 54 whose starting operation is under the control of the operator. Referring to Fig. 19, the motor is operated by pressure fluid delivered by a variable volume rotary hydraulic pump 55 driven by an electric motor 56, said pump having an output fluid pressure pipe 57 leading to an air-operated two way reversing valve 58 that controls the operating fluid flow to either a pipe 55*a* or a pipe 55*b* and a return pipe 57*a* leading to a pump sump in the supply tank ST and including an adjustable throttle valve 57*b*. The pipe 55*a* has branches 55*c* and 55*d* connected to a common pipe 55*e* that leads to one side of the motor 54. The branch 55*c* has a cam operated valve 55*f* to allow free flow of pressure fluid therethrough or to restrict and then shut off this flow to the pipe 55*e*. The branch 55*d* contains a check valve 55*g* to permit the flow of operating fluid to the pipe 55*e* in the driving direction to the motor 54 and to cut off the return flow to pipe 55*a* in the reverse direction. The pipe 55*b* has branches

55*h* and 55*j* connected to a common pipe 55*k* that leads to the other side of the motor 54. The pipe 55*h* has a cam operated valve 55L similar to valve 55*f* and the pipe 55*j* has a check valve 55*m* similar to the valve 55*g* and for similar purposes. Each of the valves 55*f* and 55L are two way spring returned valves.

The reversing valve 58 determines which of the pipes 55*a* or 55*b* shall be the input liquid pressure pipe for the pump 54 from the pipe 57 and which of these pipes will be connected with the return 57*a*. The valve 58 acting in conjunction with the cam operated valves 55*f* or 55*h* controls the starting and stopping of the motor 54, the starting being under manual control and the stopping being under automatic control as hereinafter described.

Referring to Figs. 13 to 15, a pair of cylindrical roller cutters 59 and 60, each having a bevelled edge knife K and a cooperative groove KG for the knife of the other cutter, are journalled in each instance in the forked arms 61 of a vertically disposed spindle shaft 62. The faces of the roller portions KF of the cutters 59 and 60 are of compressible frictional material such as rubber to provide a good contact between these rolls and the webs so that the knives will be rotated during the cut. As the mounting of the spindle for each cutter 59 or 60 in its carriage and carriages 59*a* or 60*a* are identical, that for the cutter 59 has been shown in Figs. 14 and 15 and will be described. The shaft 62 for the cutter 59 is vertically pivotally mounted in the carriage 59*a* which has a feed nut portion 63 in which the feed screw 50 works and a square grooved portion 64 in which a transversely disposed square guide bar 65 secured to the frame works. The upper end of the shaft 62 is clamped to one end of a spindle shift lever 66 which forms part of a toggle linkage, the other link of which is formed by a rod member 67 pivotally connected at one end at 68 to the lever 66 and slidably telescopically connected with another rod member 69 that is pivotally connected at one end to a pin 70 on the carriage, a spring 71 being interposed between these rod members and acting through this link to hold the lever 66 in a position to which it may be shifted by one or the other of eccentrically adjustable stops 72 adjacent opposite ends of the bar 65. The lever has oppositely disposed stop engaging projections 73, one of which may engage a stop 74 on the carriage and the other of which engages a stop 74*a* on the carriage when said lever 66 has been shifted past center by one of the stops 72, the spring carrying link 67, 69, and 71 then acting to hold the lever 66 against one of the stops 74 or 74*a*, the lever being shown in Fig. 15 as engaging the stop 74. Thus the swinging of the lever 66 turns the spindle shaft 62 to position the cutter 59 at an acute angle relative to a transverse plane through the web TW. The spindle 62 for the cutter 60 is similarly mounted and similarly positioned at an acute angle relative to the transverse plane through the web by the same kind of toggle linkage above described cooperating with stops 72*a* similar to the stops 72 on a square guide bar 65*a* similar to the guide bar 65 and similarly associated with the carriage 60*a* which also has a nut portion similar to the nut portion 63 in which the feed screw 51 works. Thus as the feed screws 50 and 51 are revolved, the carriages 59*a* and 60*a* are moved transversely of the web while the cutters 59 and 60 having been placed in an angled position, by the stops above described, relative to the transverse plane of the web make a diagonal or bias cut across the web TW first in one angled direction across one section of the web and then in an oppositely angled direction across the next section of the web. It is to be noted that the web TW is disposed between the cutters 59 and 60 during cutting and that the cutters turn due to their contact with the moving web.

During the travel of the cutters 59 and 60 diagonally of the web, one of the carriages operates a series of fluid control valves and the other carriage other fluid control valves and as hereinafter described controls the operation of the contact or pressure roll PR during the cutting operation. As shown, the carriage 59*a* has a cam projection 59*b* adapted to actuate pressure air controlling valves 75, 76, 77, and 78, and the carriage 60*a* has a cam projection 60*b* adapted to actuate hydraulic cut out controlling valves 55*f* and 55L, all shown in Fig. 19. The valves 75 and 77 are spring returned, three way valves operated near the center of the cutter stroke that control other valves hereinafter described, and the valve 76 is a three way valve operated at about the center of the cutter stroke to control other valves hereinafter mentioned. The valve 78 is a spring returned, four way valve that is disposed adjacent the back side of the apparatus for operation by the cam 59*b* as the carriage 59*a* completes its travel from left to right as viewed in Fig. 13 and controls the air cylinders 79*a* and 79*b* of a four way valve 79 that through air pipes 79*c* and 79*d* respectively supplies operating air to air cylinders 58*a* and 58*b* for the reversing valve 58. The operating air for pipes 79*c* and 79*d* is supplied to the valve 79 by a pipe 79*e* connected with an extension of pipe 44 which receives air from three way valve 48. The air cylinders 79*a* and 79*b* are supplied with air from valve 78 by pipes 78*a* and 78*b*. One or the other of the pipes 78*a* and 78*b* is connected to a common supply pipe 78*c* which is the outlet pipe of a spring returned, three way valve 80 operated by an air cylinder 80*a* which has a throttling orifice 80*c* connection with a pipe 80*d* forming a branch of a pipe 80*e* also connected to the extension of pipe 44. The inlet air supply pipe 80*f* for the valve 80 connects with an outlet 80*g* from the valve 46.

With the above construction, as the operator moves first the valve 46 and then the valve 48 to reduce the tension on the dancer roll as above described, some of the air in pipe 44 passes to pipe 79*e*, valve 79, pipe 79*d* to air cylinder 58*b* to shift valve 58 to the position shown in Fig. 19 in which hydraulic fluid from pump 55 is supplied through pipe 57, valve 58, pipes 55*a*, 55*d* past check valve 55*g* to pipe 55*e* to the motor 54 to turn the feed screws 50 and 51 to move the carriages 59*a* and 60*a* from left to right as viewed in Fig. 13. At this time since the cam 60*b* has operated to shift the valve 55*f* to its closed position when the carriage 60 comes to its initial leftward position, the pipe 55*c* is closed while the cam 60*b* is in contact with it and then is moved to its open position by its spring 55*n* when the carriage 60*a* moves away from it. At this time the valve 55L has been moved to open position by its spring 55*p* so that the fluid from the pump 54 is free to return via pipes 55*k*, 55*h*, including open valve 55L, pipe 55*b*, valve 58 to return pipe 57*a*. At the end of its travel to the right the cam 60*b* on carriage 60 shifts the valve 55L to first decelerate and then cut off the return flow to the pump to stop the motor 54. Also at the end of the cutter stroke to the right the cam projection 59*b* has engaged and shifted the valve 78 to its position to shift valve 79 to its other position to in turn shift valve 58 to its reverse position, but at this time the valve 80 is in its "off" position and air from its cylinder 80*a* is slowly exhausting through the orifice 80*c* to the pipes 80*e* and 44 to the exhaust port of the valve 48 which with the valve 46 is then in its initial or "off" position.

When, however, the next cut through the web is to be made and the valves 46 and 48 again operated, air from pipes 44, 80*e*, and 80*d* operates cylinder 80*a* to shift valve 80 to its open position so that air from pipe 80*f* (supplied by valve 46) can pass through valve 80 to pipe 78*c* through the previously carriage-shifted valve 78 to the pipe 78*b* and air cylinder 79*b* to shift valve 79 to deliver pressure air from pipes 44, 79*e* to pipe 79*d* to operate air cylinder 58*b* to shift valve 58 to its reverse position so that pressure fluid from pump 55 and pipe 57 now flows to pipe 55*b*, pipes 55*j* and 55*k* to the motor 54 to turn it in the opposite direction and thereby turn

the feed screws 50 and 51 in the opposite direction to move the carriages 59*a* and 60*a* from the right to the left hand side of the machine as viewed in Fig. 13, the check valve 55*m* and the cam operated valve 55L functioning the same way as the valves 55*g* and 55*f* previously described. As the carriage 60*a* nears the end of its leftward movement, it shifts the valve 55*f* to first throttle and then shut off the return flow of fluid from pipe 55*e* to pipes 55*a* and 57*a* so that the motor 54 is again stopped ready to repeat the cycle of cuts from alternate sides of the web TW. In each instance when the carriages 59*a* and 60*a* come to the end of their stroke, the stops on the bars 65 and 65*a* act to shift these carriages from one of their angular positions to the other.

Referring to Figs. 7 and 9 to 11, the roll stand RS is formed by spaced uprights RS1 and RS2 carrying journals for the shaft S which is hollow and provided with hydraulic liquid passages and air supply passages. The shaft S carries a bull gear 81 meshing with a pinion 82 on a lay shaft 83 rotatably carried by the upright RS2 and carrying a gear 84 meshing with a pinion 85 on the output shaft 86 of a geared head reversible electric motor 87 carried by the frame whereby through the reduction gearing above named the shaft S is turned to change the angular position of the frame RF.

Referring to Fig. 21, the motor 87 is in a circuit connected across supply lines 89 and 90 and including a conductor 91 having a hand switch HS and a wound roll operated limit switch LS and is connected to branch conductors 91*a*, 91*b*, and 91*c* that connect with a conductor 91*d* which has a normally closed switch 91*e*, the coil of a relay R3 and an overload protector 91*f* therein. Conductor 91*a* includes a normally open air pressure operated switch 91*g*. Conductor 91*b* has a switch 91*h* therein operable by one of the pins 49 and which on being shifted bridges contacts 91*i*2 in conductor 91*c*. Conductor 91*c* includes a manually operated switch 91*h*2 and a relay operated switch 91*m*. A conductor 91*j* includes a wound roll operated limit switch 91*k* and a normally open switch 91*l* operated by relay R3 and is connected across the conductors 91*a* and 91*b* beyond the switch 91*h*. A conductor 91*n* connects conductor 91*c* to the line 90 between contacts 91*i*2 and switch 91*h*2 and includes a delayed opening switch 91*o* and the coil of relay R4 that includes switch 91*m*. A conductor 91*p* connects line 89 with conductor 91*d* beyond the relay R3 and includes a manually operable "reverse rotation" switch 91*q*, a switch 91*r* controlled by relay R3 and the coil of a relay R5 that controls switch 91*e*.

With the above electric circuit to rotate the turnover frame RF counter-clockwise, switch HS is closed and switch 91*h* is closed so that current flows through conductors 91, 91*b*, and 91*d* to the motor 87 to start it. This current flow energizes relay R3 to close switch 91*l* and opens switches 91*o* and 91*r*. When the frame RF has been rotated to a position in which a full roll has been lowered to the position shown in Fig. 5, the limit switches LS and 91*k* will be opened to open the circuit to the motor 87, it being noted that switch 91*k* will stop the motor when the wound roll is slightly above the floor. The switch 91*h* is a spring-returned switch so that it opens immediately after operation, but since the relay R3 has been energized and switch 91*l* closed, current continues to flow from conductor 91 to conductors 91*a*, 91*j* around the switch 91*h*. With the motor 87 "on" the turnover frame rotates counterclockwise until one of the pins 49 on the shaft S engages the actuator of switch 91*i* and moves it to open conductor 91*b* and engage contacts 91*i*2. Opening conductor 91*b* de-energizes relay R3 and opens the motor circuit, but current can flow from conductors 91 and 91*c* to conductor 91*n* (since switch 91*o* is a late-opening switch) so that relay R4 is energized to close switch 91*m*. Under these conditions the operator may close switch 91*h*2 so that current from conductor 91 can flow through conductor 91*c*, switches 91*i*, 91*h*2, and 91*m* to 91*d* to momentarily start the motor 87, this circuit being interrupted by the energization of relay R3 and the opening of switch 91*o*. Thus by pressing the jog button switch 91*h*2, the motor 87 may be started and stopped while the switch 91*i* is in contact with the contacts 91*i*2. The motor 87 and hence the turnover frame may necessarily be stopped at any time by the operator's opening of the switch HS. To facilitate the loading of the new core and the initial setup, which requires adjusting of the limit switches 91*i* and 49*d*, the reversible motor 87 may be turned in a clockwise direction by the operator closing switch 91*q* so that current flows from conductor 89 to conductor 91*p* including closed switch 91*r* and coil of relay R5 to the motor through reverse connections (not shown). Energization of relay R5 opens switch 91*e* so that the circuit connections between this switch and conductor 91 are ineffective. The reverse rotation of the motor 87 and hence the clockwise rotation of the turnover frame RF is stopped by the operator's opening of switch 91*q*. It is also to be noted that the automatic operation of the roll frame controlled switch 49*a* by the turning of the shaft S as previously explained is of assistance to the operator in bringing a roll R1 or R2 to its proper position to start a new winding operation.

Referring to Figs. 10 and 11, each of the rolls R1 or R2 is a multi-part structure rotatably mounted in an outer end portion of the arms 92 and 92*a* that form the roll carrying frame RF. Each roll includes a mandrel 93, here shown as a metal tube though it may be an expanding type mandrel to receive a paper or other suitable core, if desired, this mandrel being carried at one end by a chucking head 94 having a shaft 94*a* journalled in the arm 92 and carried at its other end by a chucking head 95 that is rotatably journalled at 95*a* on the reciprocal piston rod 95*b* of an air cylinder motor 95*c* that is carried on the arm 92*a*, the piston portion of said motor having its rod 95*b* slidably mounted in said arm to engage with or release said head 95 from the mandrel 93 which through this clamping action is also clamped to the head 94. The motor cylinders 95*c* are double acting cylinders having pipes 95*d* and 95*e* that each connect through a reversing valve 95*g* mounted on the arm 92*a* with a supply pipe 95*h* including a part of rotary air distributor 95*f*, between the shaft S and a part of pipe 95*h* in the arm 92*a*, indicated in Fig. 10. The pipes 95*d* and 95*e* are shown in Fig. 19 in each instance leading to a manually operable reversing valve 95*g* that connects with the common air supply pipe 95*h* that is supplied by a branch pipe 40*c* of pipe 38, this branch including check valve 95*i* and a pressure regulator valve 95*j*. The reversing valves 95*g* are mounted on the arm 92*a* and one of the rotary air connections 95*f* that have not been indicated in detail in Fig. 19 form parts of the pipe 95*h* while the other of said rotary air connections connects with air supply pipe 101. Operation of either of the valves 95*g* by the operator will either release or clamp the chuck head 95 to its roll core or mandrel 93.

Each shaft 94*a* carries a gear 94*b* meshing with a pinion 96 on a lay shaft 96*a* journalled in the arm 92 and carrying a gear 96*b* meshing with a gear 96*c* on a drive shaft 96*d* of a rotary hydraulic motor 97. The oil or liquid supply for each of these motors comes from a supply pipe 97*a* having a rotary connection 97*ab* leading into the hollow at one end of shaft S that connects by branch pipes 97*b* to the motors 97. The return flow of fluid from each motor includes a pipe 97*c* that connects with an air operated change over switching valve 98 mounted on the arm 92 and from which leads a return pipe including a pipe 98*c* that leads into the hollow of the shaft S (that is blocked off from the inlet as indicated in Fig. 10) and a pipe 98*d* having a rotary connection 98*x* with the shaft S and connected with return pipe 57*a*, this return piping being indicated on Fig. 19 as one pipe designated 98*r*. The air motors 98*e* and 98*f* for the valve 98 are respec-

tively connected by pipes 98*g* and 98*h* to a four way change over spring returned selector valve 99 mounted on the turnover shaft S adjacent the arm 92*a* and mechanically operated by a cam 99*a* on the roll stand RS1 as the turnover RF reaches the position shown in Fig. 3. This valve receives operating air from a pipe 100 that connects with branch pipes 101 and 102. Branch pipe 100 is a part of the rotary air distributor 95*f*. Branch pipe 101 connects with a supply pipe 101*a* which may connect through valve 76 with a pipe 101*b* that connects through pipe 80*e* with pipe 44 so that it is dependent upon the operation of valve 48. Valves 46 and 48 we have seen are manually operable, but they are also respectively returned to their initial positions by air cylinders 46*a* and 48*a* which connect with a supply pipe 103 that includes the air pressure cylinder 91*x* for the switch 91*g*. Air flow to pipe 103 is controlled by a pilot actuated air delayed acting timer valve 104 which receives operating air from a pipe 104*a* connected with supply pipe 40*c* and which acts to supply air to the pipe 103 to return the valves 46 and 48 to their initial position after actuation by the operator. This valve 104 is spring returned and is operated to return valves 46 and 48 by the delayed action actuator 105 supplied with air from a pipe 106, provided with a check valve 106*a* and a pressure regulator 106*b*, connected with a spring returned three way valve 107 that is operated by a cam SF1 on one of the arms SF of the contact or pressure roll PR to establish flow of operating air from the pipes 80*e* and 44 when the valve 48 has been operated.

The pipe 102 has branches 102*a* and 102*b* respectively connecting with air cylinders 102*c* and 102*d* that act to return manually operated three way valves 108 and 109 mounted on one of the arms of frame RF to their initial positions. The valves 108 and 109 are duplicates, and two are used so that one of them will be readily accessible to the operator when operation is required. Valves 108 and 109 control air supply from pipe 40*c* to a pipe 40*d* to supply operating air to the operating cylinder 40*e* of a spring returned directional hydraulic control valve 110. The valve 108 receives air from pipe 40*c* and delivers it direct to pipe 40*d*. The valve 109 receives air from a branch pipe 40*f* connected with pipe 40*c* and delivers this air through a pipe 40*g* to the pipe 40*d*. A valve 110 controls the flow of pressure fluid through a branch pipe 98*g* of pipe 97*a* to a pipe 98*i* that connects in one position of the valve 110 with the valve 98 and in another position of the valve 110 with a return pipe 110*a* leading to the return pipe 98*r* and containing a pressure regulator valve 110*b*. This valve 110 functions to bring the empty roll up to web speed before cutting the web TW, and the adjustment of valve 110*b* by the operator determines the speed of the motors 97 and hence the speed of rotation of the rolls R1 or R2.

The hydraulic pressure supply pipe 97*a* for the roll operating motors 97 connects with branch pipes 52*a* and 53*a* at the output sides of the pumps 52 and 53 which are also driven by the main drive electric motor 56.

One or the other of the motors 97 is always operating while at times the other motor will also be operating when a new roll of material is to be rewound. With the above construction and assuming that the motor 56 is operating to drive the pumps 52 and 53 and referring to Figs. 2 and 19, the motor 97 for roll R1 (at right hand side of Fig. 19) is operating to wind up the oncoming web and the valves 98 and 110 are in the position shown in Fig. 19, motive fluid passes from pipe 97*a* and right hand pipe 97*b* to right hand motor 97 and right hand pipe 97*c* through valve 98 to return through pipes 98*r* and 57*a* while other fluid from pipe 97*a* passes to the left hand pipe 97*b* to one side of the left hand motor 97 and also passes through pipe 98*g*, valve 110, pipe 98*i*, valve 98, left hand pipe 97*c* to the other side of the left hand motor 97 so that this motor is stalled. At this time the turnover frame RF is in a position where the valve 47 has been shifted by its solenoid 49*b* to its "on" position and valve 99 has been shifted by the cam 99*a* to its other position, but until valves 46 and 48 have been operated by the operator, valve 99 cannot receive operating air. When on the operation of the valve 46 by the operator to make the cut as previously described the valve 99 in its shifted position does not receive operating air until the valve 76 has been shifted at about the center of the cut. Then the valve 99 conducts air from pipe 101 to pipe 98*h* and air pilot cylinder 98*f* to shift the valve 98 to the left to connect the left hand motor 97 in driving relation with the pipe 97*a* while air is exhausting from cylinder 98*e*, but this action can occur only when the solenoid operated valve 47 is "on." Thus valves 46, 47, 48, and 76 have to be operated before valve 99 becomes effective to shift valve 98 to a position where the motor 97 for roll R1 is shut off and a driving circuit to the motor 97 for roll R2 is established. To bring the roll frame RF to the position shown in Fig. 2 where the valve 47 becomes operable, it may be necessary for the operator to operate the jog button 91*h*2 to bring the limit switch 49*a* into closed position.

Before the right hand motor 97 has fully wound up its web and when the frame RF is in the new roll receiving position shown in Fig. 2, the operator actuates either the valve 108 or 109 to energize air cylinder 40*e* to shift valve 110 to the left while the valve 98 is still in the position in which the roll is being driven by its motor 97. When under these conditions valve 110 is shifted so the connection of pipe 98*g* with pipe 98*i* is cut off and a connection between pipe 98*i* and pipe 110 is made, the operating fluid for the left hand pump 97 for roll R2 passes via pipe 97*a*, left hand pipe 97*b*, the pump 97, left hand pipe 97*c* to the valve 98 to the return pipe 98*r*. When the valve 108 or 109 is shifted, it stays in this position until the air passes through pipe 101. At the time this new roll, roll R2, is being speeded up as above described by the operation of valve 108 or 109 and the valve 110, the valve 48 has not been operated. Then when the operator through his operation of valves 46 and 48 starts the operation of the cutting mechanism as previously described and the pressure roll PR is brought into contact with the web as hereinafter described, the cam 59*b* of the carriage 59*a* operates the valve 76 and the pressure roll PR is operating, the air is admitted to valve 99 as above described to shift valve 98 and through the pipe 102 and branch pipes 102*a* or 102*b* and air cylinders 102*c* or 102*d* return the valve 108 or 109 and in doing so open the air cylinder 40*e* of valve 110 to exhaust through the valve 108 or 109 and allow the valve 110 to return to stop the motor 97 for roll R1 while the motor for roll R2 continues to rotate to wind up the oncoming web material on this roll.

As the web now winds on this roll R2, it pushes the pressure roll upwardly so that the cam SF1 on one of the arms SF moves out of contact with the valve 107 which then allows operating air from pipe 80*e* to pass to pipe 106 and air pilot cylinder 105 to shift valve 104 to its other position in which pipe 104*a* connects with pipe 103 and air then acts through pressure cylinder 91*x* to shift switch 91*g* to its closed position. Air from pipe 103 also passes to air pilot cylinders 46*a* and 48*a* to return valves 46 and 48 to their initial positions allowing venting of air through pipes 44 and 80*e*. The closing of switch 91*g* allows current from line 89 to pass through then closed switches HS and LS in conductor 91 to conductor 91*a* including switch 91*g* to conductor 91*d* including then closed switch 91*e*, coil of relay R3, overload 91*f*, the motor 87 to the return line 90. Operation of the motor 87 swings the turnover frame RF counterclockwise away from roll PR toward the position shown in Fig. 5. While the pipe 80*e* through the valve 107 is then connected with pipe 106 to the air cylinder 105 since due to valves 106*a* and 106*b* the release of air from this cylinder 105 is delayed, the valve 104 is not returned by its spring until the limit switch

91*i* has returned to its normal position in contact with parts of conductor 91*b*, and therefore, current from line 89 continues to flow via conductor 91, conductors 91*a* and 91*j* (switches 91*k* and 91*j* being closed) to conductor 91*d* to the motor 87 even though switch 91*g* has opened until the current to said motor is shut off when, as shown in Fig. 5, the filled roll R1 has operated the limit switch 91*k* and then the limit switch LS.

At this position of the turnover frame RF and while the roll R2 is being wound, the valve 95*g* for the chuck motor 95*c* for the roll R1 is operated by the operator to withdraw the chucking head 95 for this roll so that the tube 93 forming part of this roll R1 can be removed from the frame RF and a new tube for new roll RX inserted in head 94 and clamped in position by the reverse operation of the valve 95*g*, after which the operator through his actuation of the switches heretofore described controlling motor 87 again starts this motor to bring the turnover frame RF to its position shown in Fig. 6 as determined by the limit switches heretofore described which is the same position as that shown in Fig. 1, and the cycle of operations is repeated.

Referring to Fig. 21, the motor 56 is connected across the lines by a conductor 35*a* that includes a manually operable stop switch 35*b*, a manually operable start switch 35*c*, the coil of a relay R6, an overload protective device 35*d*, and the motor. A branch conductor 35*e* connects with conductor 35*a* between the switches 35*b* and 35*c* and with the line 90 and includes a switch 35*f* controlled by relay R6, the limit switch 35 previously mentioned, and the coil of solenoid 43*a* that actuates the valve 43 previously mentioned. There is also a branch connector 35*g* that connects with conductor 35*a* between switch 35*c* and relay R6 and with conductor 35*e* between switch 35 and the coil of solenoid 43*a*. With this arrangement, on closing of switch 35*c* by the operator current flows from the line 89 through conductor 35*a* energizing relay R6 and starting the motor 56. Energization of relay R6 closes switch 35*f* so that current can pass through conductor 35*e*, switches 35*f* and 35 and coil of solenoid 43*a* and also through branch connector 35*g* to conductor 35*a*, relay R6, and the motor 56 when part of the circuit through conductor 35*a* is broken by the operator's release of the switch 35*c*. The motor 56 then continues to operate to drive the pumps 52, 53, and 55 until the operator breaks the circuit by the opening of switch 35*b*. Should the dancer roll DR due to breakage of the web material move to its upper position, it opens switch 35 so that current then passing through conductor 35*g* is cut off and the motor 56 stops.

Passage of operating fluid through pipe 97*a* is controlled by a spring returned two way hydraulically operated valve 110*c* that is used to prevent a sudden surge to the motors 97 when starting pumps, and its running position is controlled by a hydraulic actuator cylinder 110*d* supplied from the pipe 97*a* above the valve by a pipe 97*f* including an adjustable throttle valve 97*g*. A branch pipe 97*h* connected below the valve 110*c* connects through an adjustable throttle valve 97*i* to the pipe 97*a* above the valve. Each of the pumps 52 and 53 are of known construction of the variable volume pressure compensated type, each having a remote hydraulically controlled governor 111 to control pump delivery pressure, these governors being connected in series with an oil pressure pipe 112 connected with a pressure relief valve 113 discharging to the return 57*a* and with a branch 114 that leads to the output side of the pressure reducing valve 28 whose spring loaded valve member 28*a* is controlled as previously described by the dancer roll DR through gearing operated cam 24 so that the dancer roll controls the pumps 52 and 53 through the governors 111.

While the reducing valve 28 is of known construction, because of its operation by a cam, it has been shown in section in Fig. 16 and includes a cam actuated rod 28*a* slidably mounted in its housing and engaging with one end of a pressure regulating spring 28*b*, whose other end engages a throttling valve 28*c* that is slidably mounted in a bore 28*d* in the housing which has an inlet chamber 28*e* and an outlet chamber 28*f*, the valve 28*c* having a reduced diameter portion 28*g* to allow more or less operating fluid to pass from chamber 28*e* to chamber 28*f*. The lower end of the valve 28*c* is bored out to provide a chamber 28*j* slidably sealed at its outer end by a plug 28*h* and provided with a restricted port 28*i* connecting chambers 28*j* and 28*f*. With this construction, operating fluid passing to chamber 28*e* can flow from inlet chamber 28*e* and the passage formed by the reduced diameter portion 28*g* to the outlet chamber 28*f*, but some of this fluid also flows through port 28*i* into chamber 28*g* and acts against the loading pressure of the spring 28*b* to shift the valve 38*c* to a throttling position to tend to cut off the inlet chamber 28*e* from the outlet chamber 28*f* so that the greater the loading of the spring 28*b* by the cam, the greater will be the pressure delivered to the pump governor which, of course, in turn determines the pump pressure.

Once the pressure on the dancer roll has been set for any particular web, that setting remains the same. However, the dancer roll controls the position of the cam 24 which, in turn, determines the pressure delivered to the fluid motors 97. As the diameter of the roll increases, the tension in the web decreases. This decrease causes the dancer roll to move up, thus changing the position of the cam 24 which, in turn, shifts tappet rod 25 to increase the pressure output of the pump by means of the reducing valve 28, as above described.

Thus, an increase in the diameter of the roll being built up requires an increase in pressure to the fluid motor because of the longer moment arm being developed and in order to main constant tension on the web. In other words, this governing mechanism acts to increase the pressure output of the pumps 52 and 53 as the web roll builds up so that the speed of the web being wound on the roll R1 or R2 will be substantially the same from the start to the finish of the winding operation. It is noted that while the r.p.m. of the motors decreases as the web builds up, more power is required to drive these motors to keep the speed of the web being wound up substantially constant, and the increased output of the pumps 52 and 53 as determined by the governors 111 accomplishes this result.

The pumps 52 and 53, for example, may be vane type pumps in which the vanes on the driven rotor work in a housing including a peripheral ring portion that is shiftable eccentrically relative to the rotor, the governor acting to shift this ring to its full output position.

The valve 28 may also be cut off by a valve 115 in the pipe 114 moved to cut off position by a single acting air cylinder 115*a* that receives operating air through a pipe 116 that receives air from a three way valve 117 that receives its operating air from a branch 40*a* of pipe 40 when the air cylinder 117*b* is energized. The pipe 97*h* delivers fluid from the output side of the pumps 52 and 53 which after passing the reducing valve 28 flows through pipes 114 and 112 to the governor valves 111. The position of valve 117 is determined by air cylinders 117*a* and 117*b*. Cylinder 117*a* receives its operating air from pipe 101 and cylinder 117*b* receives its operating air from a pipe 118 that is a branch of a pipe 119 that is a branch of pipe 80*f* controlled by the valve 46.

The various valves, pumps, and motors and their controls that have been described in connection with the operation of the rolls R1 and R2 are under the control of the operator trough his operation of the valves 46 and 48 and the manual controls of certain of the valves that have been mentioned. In each case when the roll frame RF has been brought to a position in which one end is lowered, a mandrel 93 which has previously been treated to receive an adhesive, either at its left hand end or at its right hand end depending upon which way the cut of the web has been made, is chucked into the frame by the operator's operation of the air motor 95*c* mounted there-

on and operating one of the chucking heads **95**. Thereafter, when the controls are operated as previously to bring this chucked roll up to speed and the knives have been operated under the control of the operator's operation of the valves **46** and **48** to make the cut, the cut end of the web which has been carried along with the other part of the web that has been wound up on the other roll is brought into contact with the adhesive face of the new roll by the action of the roll RP as hereinafter described and which may be designated as a contact roll mounted on a swinging frame SF.

Referring to Figs. 7 and 12, the frame SF is given two downward swinging movements. The first downward swinging movement is provided by piston rods **120** on opposite sides of the machine connected at their outer ends to the swinging frame members SF and each operating in a double acting air cylinder **121** which is pivoted at its rear end **122** on an eccentric oscillatory shaft **123** so that each piston and its cylinder forms an extensible link which on the application of pressure to the rear end of the pistons swings the frame SF down to bring the contact roll PR to a position within a short distance of the web TW then passing between it and the new roll.

Thereafter, as the cutting mechanism operates to make a diagonal cut across the web as the tip end of this cut comes under the roll PR, another double acting air cylinder **124** is operated to move its piston rod **125** upwardly to swing a crank arm **126** attached to the eccentric shaft **123** to turn this shaft so as to further extend the extensible piston operated links **120** so as to further swing the arms of the frame SF down to bring the contact roll PR into pressing engagement with the cut end of the oncoming web so as to press this cut end between it and the adhesive coated portion of one of the feed rolls which may be the roll R1, and this action is timed to continue until the web has been firmly secured to the roll R1 so that as the roll R1 which is now up to speed rotates, a new winding of the web material is started on this roll. As the contact roll PR reaches the end of its downward movement, the cam SF1 on one of the arms SF shifts the valve **107** to its cut off position so that valve **104** cannot be operated.

Referring to Fig. 20, the air cylinders **120** receive air at their lower ends through a pipe **127** that connects with the pipe **40***b* that is controlled by the valve **46**. These same cylinders receive air at their upper ends to raise the contact roll PR through a connection **119***a* with the pipe **119** which it has been noted is connected with the pipe **80***f* that is also controlled by the valve **46**. The air cylinder **124** connects at its lower end through a pipe **128** that connects with a three way valve **129** that receives operating air from a pipe **130** connected with the pipe **44**, and this valve **129** is operated in one direction by an air cylinder **131** connected by a pipe **132** with a pipe **133** supplying the upper end of the air cylinders **124**, which pipe connects with the pipe **80***f* controlled by the valve **46**, and it is operated in the opposite direction by an air cylinder **134** supplied with air from a pipe **135** that gets its air either through the valve **75** or the valve **77**. The lower end of the cylinder **124** is supplied with air from the pipe **130** through the valve **129** by a pipe **136**.

The cutter carriage tripped valves **75** and **77** receive air from pipe **44** via pipe **80***e* and a branch pipe **135***a*, and each of these valves discharges to the pipe **135** which also has a branch **76***a* supplying air to a pilot cylinder **76***b* that shifts valve **76** to its initial position. When the valve **75** is shifted by the cam **59***b* on carriage **59***a* to supply air through pipe **135***a* to pipe **135** and the pilot cylinder **134**, the valve **129** is shifted to admit air from pipes **130** and **136** to the lower end of cylinder **124** to actuate the piston **125** to swing the crank **126** and eccentric **123** as previously described to bring the contact roll PR into engagement with the web to press it against the adhesive surface on the rewind roll while the cutting mechanism completes its cut. This occurs at the time the knives are moving over the central portion of the web and continues until the knives have completed their cut.

At about the center of the cutter stroke the cam **59***b* actuates the valve **76** allowing air from pipe **80***c* to pass via pipe **101***b* to pipes **101***a* and **101** to actuate pilot air cylinder **117***a* to actuate valve **117** to supply air from pipes **38**, **40**, **40***d* to a pipe **116** to actuate a cylinder **115***a* to move shut off valve **115** to its closed position and thus cut off the reducing valve **28** and allow the governor valves **111** to move to a low pressure position. Thereafter, the cam **59***b* actuates the valve **77** sending air to the pilot cylinder **76***b* to move the valve **76** back to its initial position to exhaust the air from lines **101***a*, **101**, and **100** and therefore from the lines **98***h* and **98***g* and cylinders **98***f* and **98***e* controlling valve **98** and also exhaust air from the pilot cylinder **117***a* of valve **117** to allow this cylinder to operate the cylinder **115***a* to operate the cut off valve **115**.

As the web now attached to its roll builds up or if the jog button switch **91***h*2 is depressed, the contact roll will be raised by the raising of the arms SF so that the valve **107** moves off of its operating cam SF1 and is moved by its spring to establish air flow from the pipe **80***e* to the pipe **106***a* and pilot cylinder **105** to shift valve **104** to direct operating air from the pipe **40***c*, via pipe **101***a* to pipe **103** and thence to the pilot cylinders **46***a* and **48***a* for the valves **46** and **48** respectively. Valve **46** then connects air pipe **40***a* with pipes **80***f* and **119** to return the pistons of the main throw contact roll cylinders **121** back to normal and also through the air from pipe **80***f* to the pipe **133** supplies air to the upper end of the cylinder **124** to return the piston **125** and its eccentric **123** back to its normal position. The shifting of valve **48** to its initial position establishes exhaust flow through it from the pipe **44**, and this deenergizes air cylinder **44***a* for the valve **42** so that the dancer roll DR3 is again operating in its high pressure setting and air to one of the pilot cylinders **79***a* or **79***b* is exhausted depending upon the position of the valve **78**, it being noted that this valve **78** is operated by the cam **59***a* at the end of the rightward cutting stroke. For the next cut across the web the above cycle is repeated, but in this instance the cam **59***b* on nearing the center of the web actuates the valve **77** which then acts in the same way as the valve **75** to supply air to the pilot cylinder **134** to shift the valve **129** so as to again move the contact roll PR as previously described into contact with the web. Thereafter, cam **59***b* again trips valve **76** for the purposes previously described and then trips the valve **75** which then acts in the same way as the valve **77** did in making the previous cut across the web.

While the cutters **59** and **60** are each shown as provided with a cutting knife so that the cut is made from both sides of the web material which is desirable for heavy stock, other cutting means may be employed, for example, there may be instances where a single knife cutter on one of the carriages does the cutting and may or may not cooperate with a groove in the anvil cutter roll on the other carriage to make the cut.

What I claim as my invention is:

1. In a winding machine, the combination of a stand, a turnover frame rotatably mounted on said stand, means for rotating said frame to bring it to different positions, roll supports mounted in spaced relation on said frame including web rolls, each having an adhesive coated portion, means for individually rotating said roll supports, means for supplying web material to said roll supports for winding thereon, cutting means, in advance of said frame and including a movable cutter for making a bias cut across the web material while web material is being wound up on one of the roll supports and the other roll support is disposed adjacent said cutting means, said cutting means being located immediately in advance of said other roll support whereby cutting of the web occurs before it reaches said other roll support, and means for

exerting pressure upon the cut end of the web material as it reaches said last named roll support to bring it into binding contact with the adhesively coated portion of this roll support to start the wind up of web material thereon.

2. The winding machine as defined in claim 1, in which the cutting means includes a carriage, and means for moving said carriage back and forth transversely of the web and carrying the movable cutter which is a rotary cutter angularly movable relative to the carriage and disposble under the control of the carriage at alternately biased angles to the web.

3. The winding machine as defined in claim 2, in which the carriage is driven by means including a reversible motor and means controlled by the carriage for reversing the drive of said motor.

4. The winding machine as defined in claim 2, in which the carriage is separately driven by a rotary motor.

5. The winding machine as defined in claim 2, in which the cutter carriage controls the means for exerting pressure upon the cut end of the web material.

6. In a winding machine, the combination of a stand, a turnover frame rotatably mounted on said stand, power driven means for rotating said frame in either direction, control means for said power driven means to control the angular position of said frame, roll supports rotatably mounted in spaced relation on said frame and including removable web rolls having adhesively coated portions, means for supplying web material to said roll supports, means, under the control of the operator and of the roll being wound up, for rotating each of said supports, cutting mechanism controlled by the operator for making a bias cut across the web material while one of said supports is winding up web material thereon and the other of said supports is rotating in a position ready to receive the cut end of the web, said cutting mechanism being located immediately in advance of the other of said supports whereby cutting of the web occurs before it reaches the other of said supports, and means for bringing the cut end of the web into contact with the adhesively coated portion of said last named roll support to attach the web material thereto.

7. The winding machine as defined in claim 6, in which the power driven means for rotating the turnover frame includes an electric motor, and an electrical supply circuit for said motor and the control means includes manually operated switches and wound roll operated limit switches in said circuit.

8. The winding machine as defined in claim 6, in which the means for rotating each of said roll supports includes a rotary motor and a source of power for each motor and control means for said power source to supply power to the motor for one of the rolls and as the wind up of web material on said one roll is being completed to supply power to start the rotation of the other roll during the time the cut web material is attached thereto and thereafter through control means operated by said other roll continue the rotation of other roll.

9. The winding machine as defined in claim 8, in which the rotary motors are fluid pressure operated motors and the source of power for each motor is a pump having a power output fluid pressure operated governor, a pressure reducing valve for controlling said governor, and means controlled by the build up of web material on a roll support to control said pressure reducing valve.

10. The winding machine as defined in claim 9, in which the means controlled by the build up of web material on a roll support to control said pressure reducing valve is a cam and a web engaging member for operating said cam.

11. The winding machine as defined in claim 9, in which the means controlled by the build up of web material on the roll support to control said pressure reducing valve is a cam and a swinging arm engageable with the web and moved thereby to actuate said cam.

12. The winding machine as defined in claim 6, in which the means for rotating each roll support is a rotary hydraulic motor and a source of pressure liquid for said motor, and valve means for controlling said pressure liquid to supply the same to one of said motors to rotate one of said roll supports while rendering said pressure liquid ineffective to operate the motor for the other roll support, valve means operable in conjunction with said first named valve means to supply pressure fluid to the other said motors while the first named motor is operating, manually controlled means for controlling said last named valve means, means controlled by said cutting means as it makes its cut across the web to shift said first named valve means to interrupt the drive of said first named motor and its roll support and continue the drive of the second named motor and its roll support to wind up material on said last named roll support after it has been cut by said cutting mechanism.

13. The winding machine as defined in claim 12, wherein the second named valve means is fluid pressure operated to supply said pressure fluid to the other of said motors and the manually controlled means for controlling this second named valve means is a source of fluid under pressure and valve means operable by the operator to control said source of pressure fluid.

14. In a winding machine, the combination of a stand, a turnover frame rotatably mounted on said stand, means for rotating said frame to bring it to different positions, roll supports mounted in spaced relation on said frame including web rolls, each having an adhesive coated portion, means for supplying web material to said roll supports for winding thereon, means for individually rotating said roll support, cutting means, in advance of said frame and including a movable cutter for making a bias cut across the web material while web material is being wound up on one of the roll supports and the other roll support is disposed adjacent said cutting means, said cutting means being located immediately in advance of said other roll support whereby cutting of the web occurs before it reaches said other roll support, and means, controlled by said cutting means, and including a contact roll, for exerting pressure upon the cut end of the web material as it reaches said last named roll support to bring it into binding contact with the adhesively coated portion of this roll support to start the wind up of web material thereon.

15. The winding machine as defined in claim 6, in which the means for supplying web material to said roll supports includes a dancer roll movable to different positions, and in which the means for rotating each of said roll supports includes a rotary motor and a source of power for each motor and the means controlled by said dancer roll for varying the output of said power source.

16. The winding machine as defined in claim 6, in which the means for rotating each of said roll supports includes a fluid rotary motor mounted on said turnover frame and a source of power for each motor, and means, controlled by a web condition during winding, to vary the output of said power source.

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