July 24, 1962 W. E. AULEN 3,045,940

THREE-DRUM WINDER

Filed July 1, 1958 4 Sheets-Sheet 1

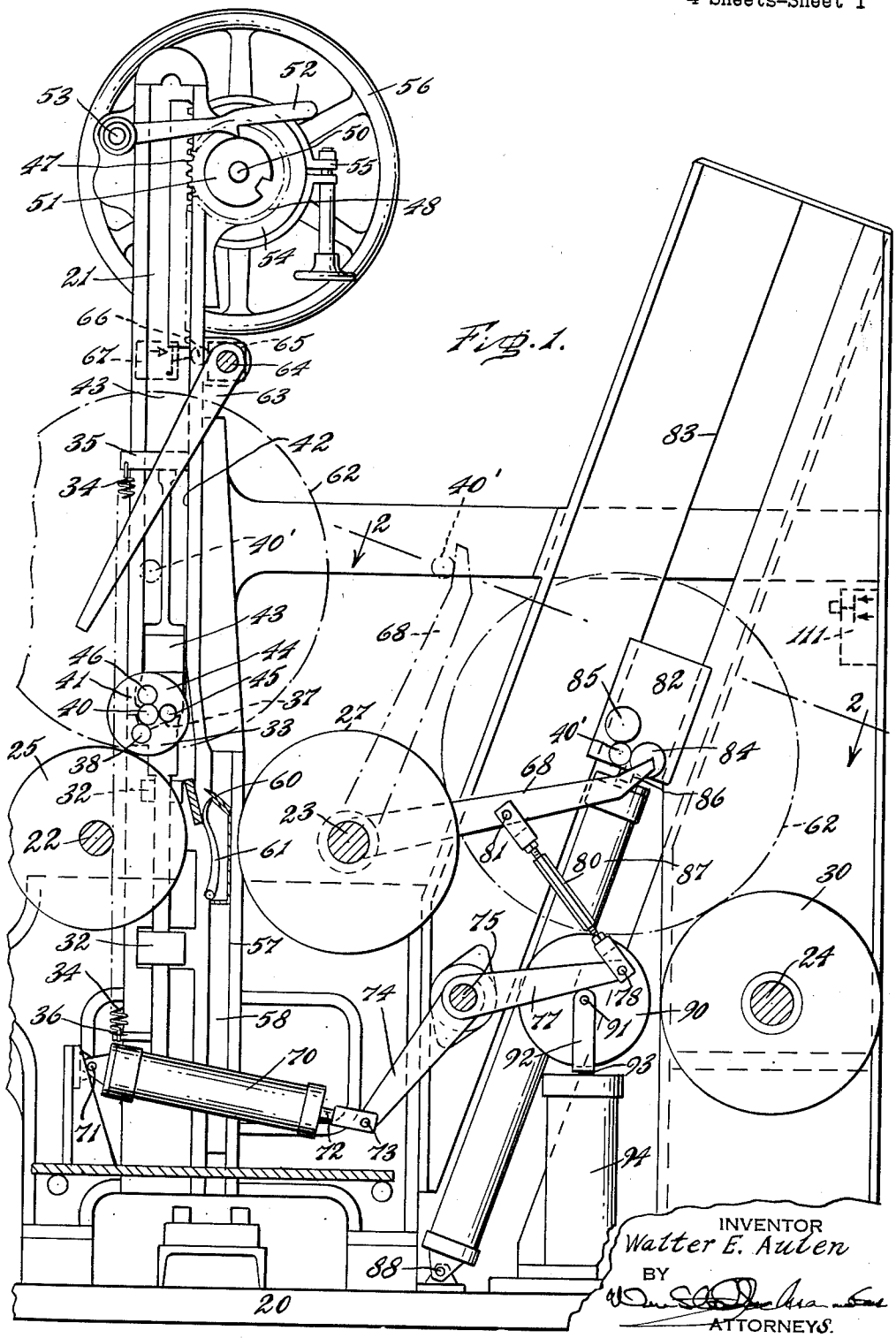


Fig. 1.

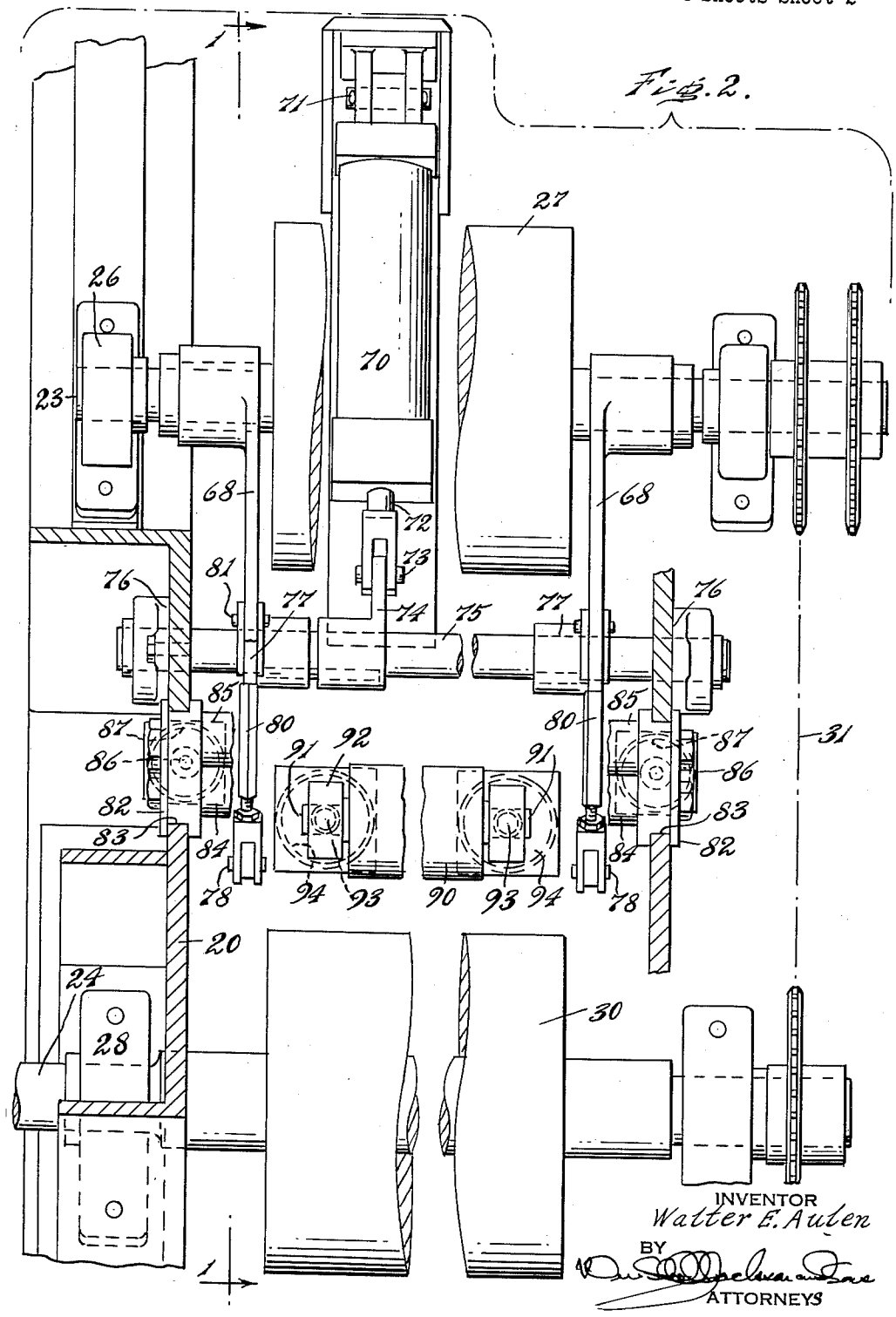
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Fig. 2.



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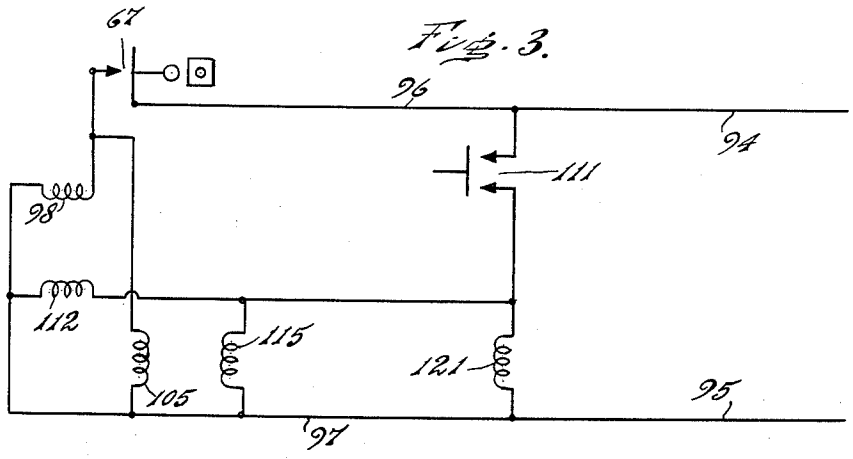


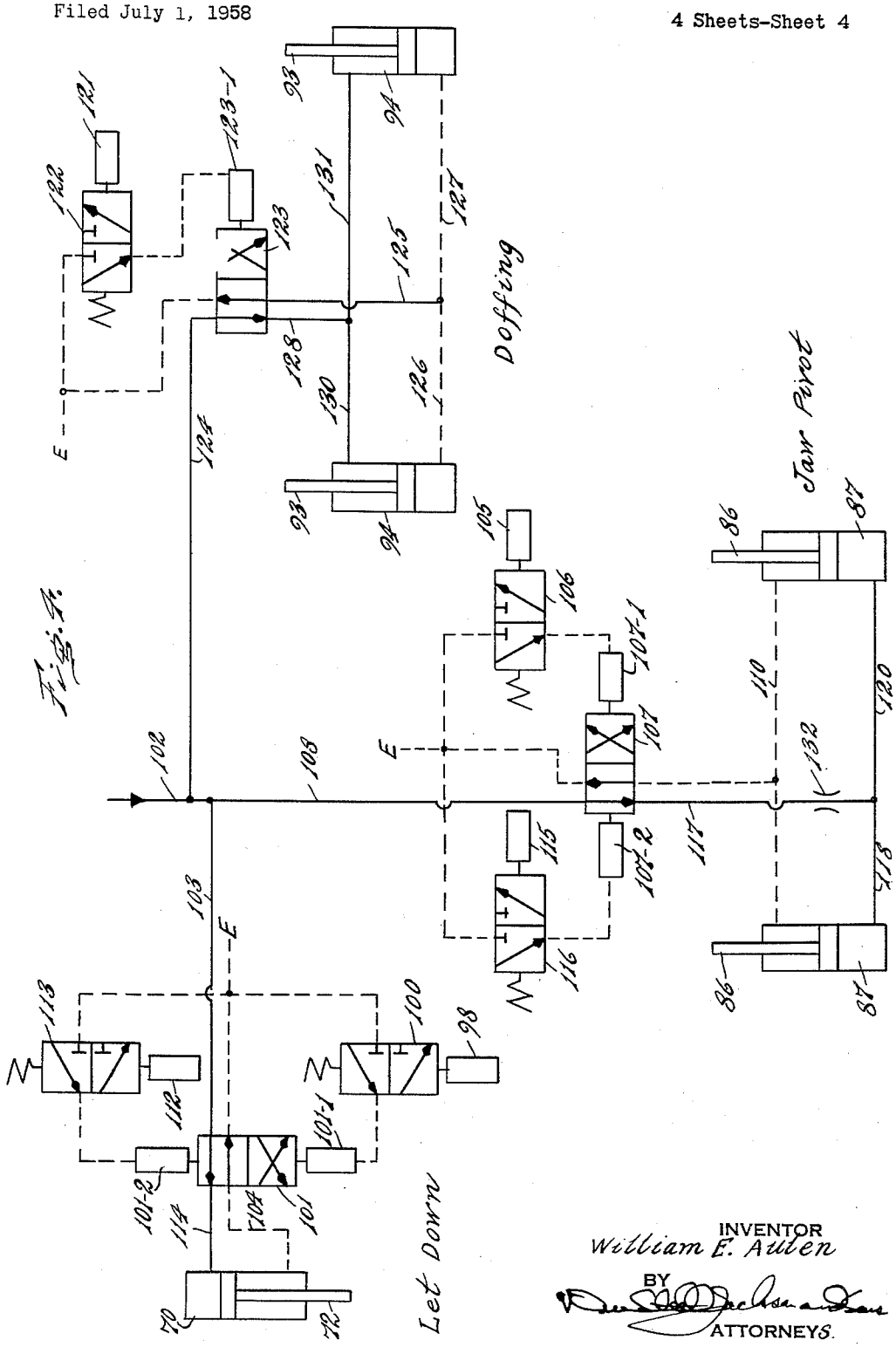
Fig. 3.

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THREE-DRUM WINDER

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United States Patent Office

3,045,940
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3,045,940

THREE-DRUM WINDER

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Filed July 1, 1958, Ser. No. 745,921
2 Claims. (Cl. 242—66)

The present invention relates to improvements in three-drum winders of the character which are employed in winding of material such as cloth, plastic sheet, paper, and the like.

A purpose of the invention is to protect against the possibility that a roll winding on the two front drums will rock back and forth between one drum and the other and not wind evenly on both of the front drums.

A further purpose is to assure that a roll winding on the front drum of a three-drum winder will wind equally from both front drums.

A further purpose is to permit winding at higher speeds on a three-drum winder.

A further purpose is to wind larger rolls.

A further purpose is to apply load downwardly on the pivots of the roll which is being wound on the front drum.

A further purpose is to place the frontmost drum lower than the second drum so as to predispose the roll against moving backward after it begins to wind on the front drums.

Further purposes appear in the specification and in the claims.

In the drawings I have chosen to illustrate one only of the numerous embodiments in which my invention may appear, selecting the forms shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

FIGURE 1 is a diagrammatic fragmentary end section of a three-drum winder according to the invention, the section being taken on the line 1—1 of FIGURE 2.

FIGURE 2 is a fragmentary section of FIGURE 1 on the line 2—2. This is generally a plan section.

FIGURE 3 is an electrical circuit diagram of the device of the invention.

FIGURE 4 is a hydraulic circuit diagram of the winder of the invention.

In the prior art, in using three-drum winders, difficulty has been encountered in handling the roll after it moves forward to wind on the two front drums.

This has exhibited itself particularly by a tendency of the roll to wind unequally on the two drums, rocking back and forth between one limiting position in which the roll rolls on the front drum and another limiting position in which the roll rolls on the middle drum. This rocking tendency may become so pronounced as to cause the roll to jump back to the rear drum or jump forward out of the machine.

This difficulty has limited both the size of the rolls and the speed of winding.

According to the present invention, continuous contact between the roll and the front and middle drums is assured, and protection is provided against the rocking tendency, and against the tendency of the roll to move either rearward or forward unexpectedly. Increased speed of winding and greater roll size are made possible.

In accordance with the invention, the front drum of the three drums is placed lower, so that the middle drum provides support against the force component which might otherwise permit the roll to move rearward. Furthermore, in accordance with the invention, the pivots of the roll winding on the front and middle drums are biased toward the center line between these drums to protect against a tendency of the roll to move forward.

Considering now the drawings in detail, the winder of the invention is provided with a frame 20 having uprights 21 at the two ends and having three shafts 22, 23 and 24, each of which is driven in the same direction by suitable driving means. The shaft 22 is supported in the frame by suitable bearings (not shown) and has keyed thereon the rear drum 25. The shaft 23 is journaled in the frame on bearings 26 and has keyed thereon middle drum 27. The shaft 24 is journaled on the frame in bearings 28 and has keyed thereon front drum 30. The driving interconnection between the drums is suggested by sprocket and chain mechanism 31 shown in FIGURE 2.

In the preferred embodiment front and middle drums 30 and 27 are suitably made larger than rear drum 25 and front drum 30 is placed forward and substantially below the middle drum 27, the line of centers suitably being at an angle between 10 and 30 degrees and preferably about 20 degrees to the horizontal as shown. The winding machine above the rear drum has lower guideways 32 which extend upwardly as well known in the art and guide lower jaws 33 which are spring urged upwardly into pivot position by helical tension springs 34 acting between spring abutment 35 on the frame and spring abutment 36 on the lower jaws. The lower jaws have at their upper ends socket portions 37 and pivot rolls 38 pivoted on axes parallel to the shell axis which pivotally engage the pivot ends 40 of the shell 41 on which the roll is wound.

The uprights of the frame above the lower jaws have guideways 42 which receive and guide upper jaw slides 43 which have at their lower ends upper jaws 44 which carry at their lower ends bearing rolls 45 and 46 on axes parallel to the shell axis, which respectively engage top portions of the pivot ends 40 of the shell.

The slides 43 for the upper jaws at their upper ends carry racks 47 which engage with pinions 48 which are keyed on shaft 50 extending across and journaled in the frame, which carries single tooth ratchet 51 which is engaged by pawl 52 pivoted on girt rod 53.

The shaft 50 carries keyed thereon a suitable brake drum 54 which is engaged by the bands of a suitable adjustable brake 55 as well known in the art. The shaft 50 at one end has keyed thereon a hand wheel 56.

Between the rear and the middle drum, there are at the sides of the machine vertical guideways 57 which guide a gate 58 which has at the upper end knives 60 and threading fingers 61 as well known in the art.

The introduction of the new shell and the cutting of the material will be accomplished in any suitable way, as by hand or otherwise, as well known in the art. Thus while the material is winding on the front and middle roll the new shell 41 is placed in the upper and lower jaws above the material, and turns with the material against the rear roll until cutting takes place. At the time of cutting the gate rises and the knives 60 cut the material, and the threading fingers as well known carry the forward cut end around the shell 41. The roll then winds as in conventional practice on the rear drum until it has increased to the size shown at 62 and is ready for transfer. Transfer to the front and middle drum can be made in any suitable manner as well known in the art, either manually, or preferably by transfer arms 63 pivoted on shaft 64 on the frame, and extending down to a position behind the pivot ends 40′ of the shell. The transfer arms are manipulated by any suitable lever as well known.

As the transfer arms move forward, cam 65 on shaft 64 engages switch operator 66 on normally open switch 67 (FIGURES 1 and 3), to close this switch for the purpose later explained.

As the roll moves forward to a position above the middle drum 27, the roll pivot 40′ comes in contact with

let down arms 68 which form the subject matter of my copending U.S. patent application, Serial No. 738,232, filed May 27, 1958, for Winding Machine, and which are pivoted on shaft 23 and operated hydraulically. Pneumatic cylinder 70 pivoted on the frame at 71 has a piston and rod assembly 72 which is pivotally connected at 73 with lever 74 keyed on shaft 75 journaled on the frame at 76. The shaft 75 also has keyed thereon at opposite ends levers 77, which are pivotally connected at 78 to adjustable links 80 which pivotally connect at 81 intermediate ends of the let down arms.

When the let down arms operate, the roll 62 at the time of completion of transfer is resting against front drum 30 and middle drum 27. In this position, pivot jaws 82 sliding in guideways 83, which extend diagonally upwardly and forwardly at the front of the machine, engage the pivot ends 40' of the roll. The pivot jaws have at each end bearing rollers 84 which are on the forward side of the pivot and rollers 85 which are above and to the rear of the pivot, each of the rollers 84 and 85 being on axes parallel to the axis of the cloth roll, and resisting any tendency to urge the cloth roll pivot out of the journal provided by the pivot jaws 82.

Each of the pivot jaws 82 is downwardly urged by a piston rod 86 which has a piston acting in a hydraulic (pneumatic) cylinder 87 which is pivoted on the frame at 88.

When the cloth roll 62 is wound to the size suitable for doffing, it has of course pushed the pivot jaws 82 up along the guideways 83 against the action of the cylinders 87. At this point cutting is accomplished as already described. In order to doff and load the cloth roll on a truck, hoist, or the like, a doffing roll 90 is actuated which is placed below the roll of cloth, and is pivoted on an axis 91 parallel with the axis of the roll of cloth on bearing supports 92 which are mounted on piston rods 93 connected with pistons acting in hydraulic (pneumatic) cylinders 94 shown in FIGURES 1, 2 and 4.

Considering now the electrical circuit of FIGURE 3, electrical leads 94 and 95 connected to a suitable source, for example, of alternating current at commercial frequency, are connected respectively to leads 96 and 97. Lead 96 is in series with normally open let down control switch 67, which is also in series with solenoid 98 which operates pilot valve 100 shown on FIGURE 4 of hydraulic (air) valve 101 to connect hydraulic fluid (air) from high pressure source 102 through pipe 103 and pipe 104 to the side of cylinder 70 which causes the piston rod to move into the cylinder and moves the let down arms down, transferring the cloth roll to the front and middle drums. The solenoid 98 is connected across to the other side of the electrical line at 97. Switch 67 is in series also in a separate parallel branch with solenoid 105 which operates pilot valve 106 of hydraulic (air) valve 107 to admit high pressure hydraulic fluid (air) from pipe 102 and pipe 108 through pipe 110 to the side of bearing slide pressure cylinders 87 which brings downward pressure against the cloth roll pivots. The opposite side of solenoid 105 is connected to the opposite side of the line 97.

Normally open push button switch 111 (FIGURES 1 and 3) when closed by the man operating the winder energizes solenoid 112 which operates pilot valve 113 of hydraulic (air) valve 101 to introduce hydraulic fluid from high pressure source 102 and pipe 103 through pipe 114 to the side of let down cylinder 70 which raises or retracts the let down arms. The other side of solenoid 112 is connected across to the other side of the line at 97. Also switch 111 is, in a separate parallel branch, in series with solenoid 115 which operates pilot valve 116 of hydraulic (air) valve 107 to connect high pressure hydraulic (air) fluid from pipes 102 and 108 to pipes 117, 118 and 120 which connect to the ends of bearing slide pressure cylinders 87 which cause these cylinders to retract the bearing jaws. The other side of solenoid 115 is connected to the other side of the line at 97.

Also on a separate parallel branch switch 111 is in series with solenoid 121 which operates pilot valve 122 which manipulates hydraulic (air) valve 123 to connect high pressure fluid through pipes 102, 124, 125, 126 and 127 to the ends of doffing cylinders 94 which tend to doff the cloth roll.

In the opposite position of pilot valve 122, high pressure fluid from pipe 124 connects through pipes 128, 130 and 131 with the side of doffing cylinders 94 which retract the doffing pistons.

The pilot valves and hydraulic valves themselves are conventional and of well known character, and are illustrated according to the JIC Standards in FIGURE 4.

In view of the fact that the construction of the valves as shown in FIGURE 4 conforms to JIC Standards, the detail of the valve construction will not be defined in words, except to explain the operation of the valves as follows:

Each of solenoid valves 101 and 107 is thrown in one direction by the air cylinders 101–1 or 107–1 at one end, and is thrown in the opposite direction by the air cylinders 101–2 or 107–2 at the opposite end. When the respective controlling solenoids 98, 112, 106 and 115 are deenergized, air pressure connected to the cylinders 101–1, 101–2, 107–1 and 107–2 acts in opposed relation, but in case one of the solenoids 98, 112, 105 and 115 is energized, the corresponding pilot valve 100, 113, 106 or 116 opens and connection from the interior of the solenoid valves 101–1, 101–2, 107–1 or 107–2 connects the main valve air cylinder to exhaust E, thus making the opposing air cylinder effective to shift the main valve 101 or 107 in the required direction. When the pilot valve 100, 113, 106 or 116 is deenergized, it closes off the leakage of air pressure from the air cylinder 101–1, 101–2, 107–1 and 107–2 to exhaust and the air pressure is effective to hold the main valve in normal intermediate position.

All of the pilot valves shown in FIGURE 4 are spring urged to return to initial position when the solenoid deenergizes.

Main valve 123 is operated by air cylinder 123–1 which is of the differential pressure type, having air acting on both ends, and holding the valve 123 in normal position except when solenoid 121 is energized, which allows air from one end of differential pressure cylinder 123–1 to escape to exhaust E, in which case the main valve 123 shifts to its operated position.

In operation, when a cloth roll is winding on the front drum and the middle drum, under hold-down pressure of the pivot jaws 82, a new shell is placed in position on the rear jaws above the rear drum, and as soon as the cloth roll on the front and middle drums has wound to proper size, cutting is accomplished and the forward cut end of the cloth is threaded on the new shell by raising the gate in any suitable manner, which may be manually or mechanically. At this stage the roll on the front and middle drums is turning without connection with the cloth being received by the winder. Doffing is accomplished by closing push button switch 111, which raises or retracts pivot jaws 82, and retracts let down arms 68, and raises doffing roll 90 so as to eject the fully wound cloth roll onto a suitable truck, hoist, or the like.

When the roll winding on the rear drum has wound to a considerable size for transfer as shown at 62 at the left, it is transferred to the middle drum against the let down arms in any suitable way, preferably by transfer arms 63 which can be operated manually or mechanically, and, as the transfer arms move forward, the cam 65 on the transfer arms closes switch 67, which moves the let down arms downward, and at the same time applies hydraulic pressure to the pivot jaws 82 so that they urge the pivots 40' of the cloth roll downward as it is supported on the front and middle drums.

It will be evident that as the let down arms come down, the pivot jaws **82** come down in timed relation to the let down arms to engage the pivots. This is accomplished by the fact that the pivot jaw cylinders have a relatively long stroke, and also by virtue of the fact that a speed control needle valve is employed at **132** in pipe **117**.

It will be evident that the pressure downward by the pivot jaws **82** permits satisfactory winding even though there may be some eccentricity in the shell and therefore in the cloth roll due to warpage or otherwise.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a three-drum winder for stock, front, middle and rear drums rotatably supported and operating on parallel axes, the rear drum being the drum first contacted by the stock, let down arms cooperating with the middle drum, adapted to receive the pivot of a roll of cloth resting on the middle drum and hold the same from downward movement against the force of gravity, means for lowering the let down arms to lower and support the roll of cloth on the front and middle drums cooperating together, pivot jaws movable from a position above the pivots of the roll of cloth when supported on the front and middle drums to a position engaging the pivots of the roll of cloth supported on the front and middle drums and urging such pivots downward, and means for moving the pivot jaws downward including means for retarding the downward movement of the pivot jaws to permit the let down arms to place the roll of cloth on the front and middle drums before the pivot jaws engage the pivots on the roll of cloth.

2. In a three-drum winder for stock, front, middle and rear drums pivotally supported on parallel axes, the rear drum being the drum first contacted by the stock, the front drum being positioned below the middle drum, pivot jaws for a roll above the rear drum, separate pivot jaws for a roll supported on the front and middle drums and means for urging the pivot means for a roll supported on the front and middle drums resiliently downward.

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