Sept. 5, 1939. A. O. MICKELSON ET AL 2,171,667

ROLL-WINDING MECHANISM

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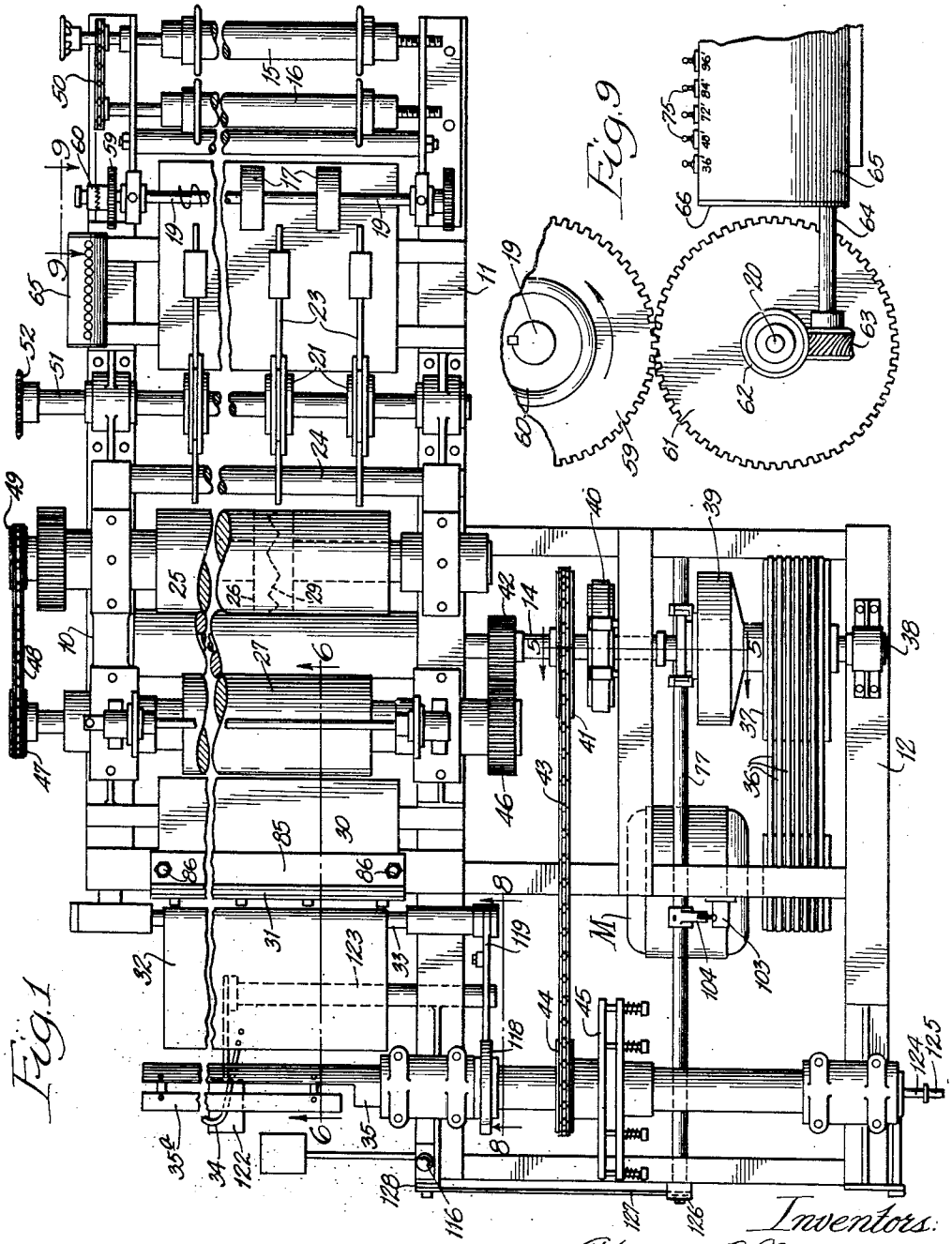


Fig. 1



Fig. 9

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ROLL-WINDING MECHANISM

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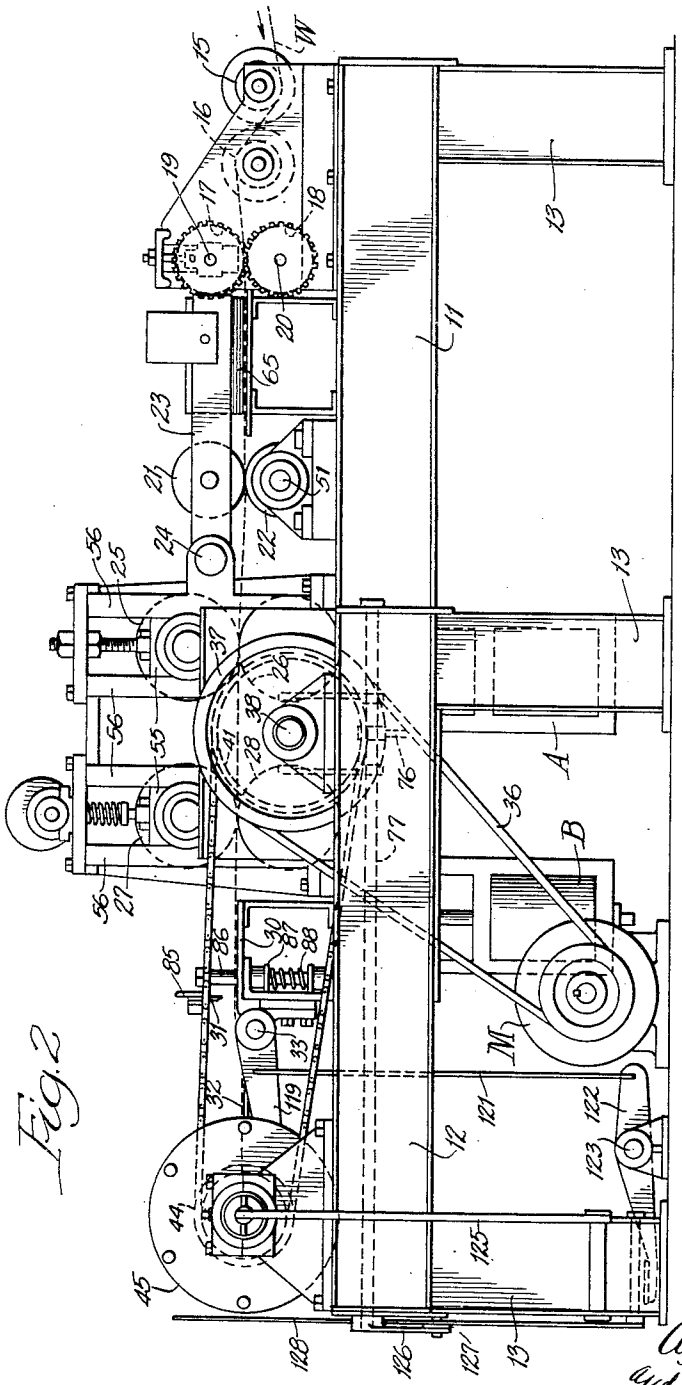


Fig. 2

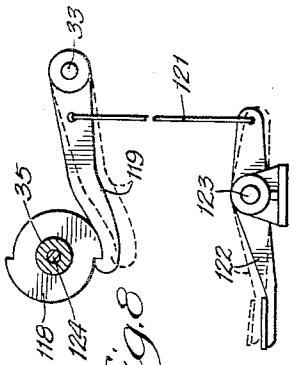


Fig. 8

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ROLL-WINDING MECHANISM

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Fig. 3

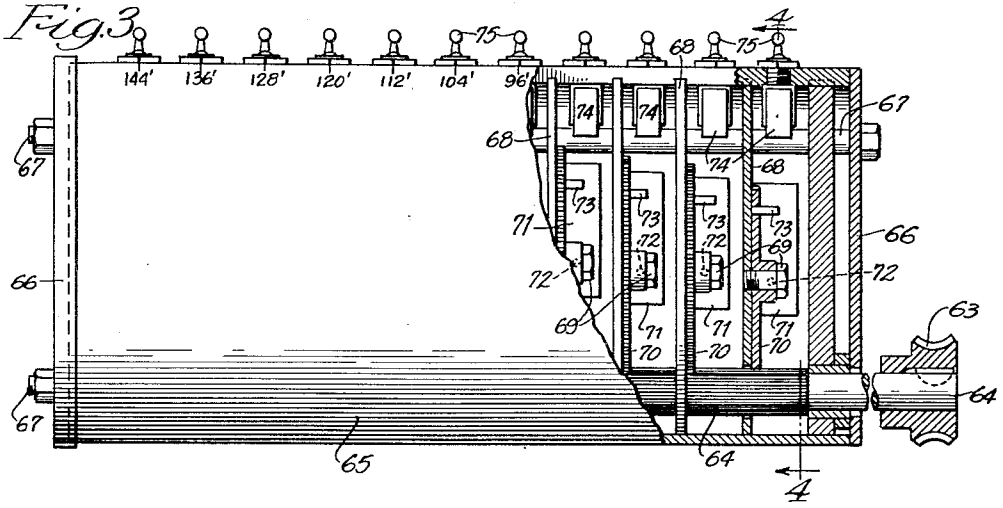



Fig. 4

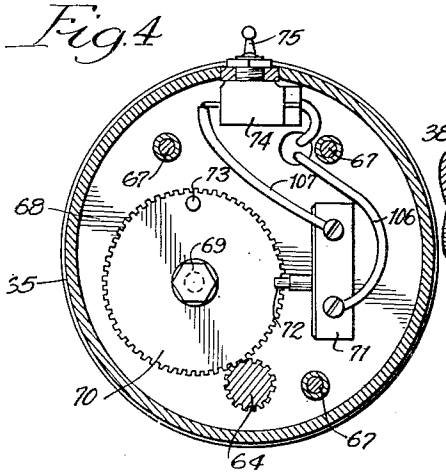
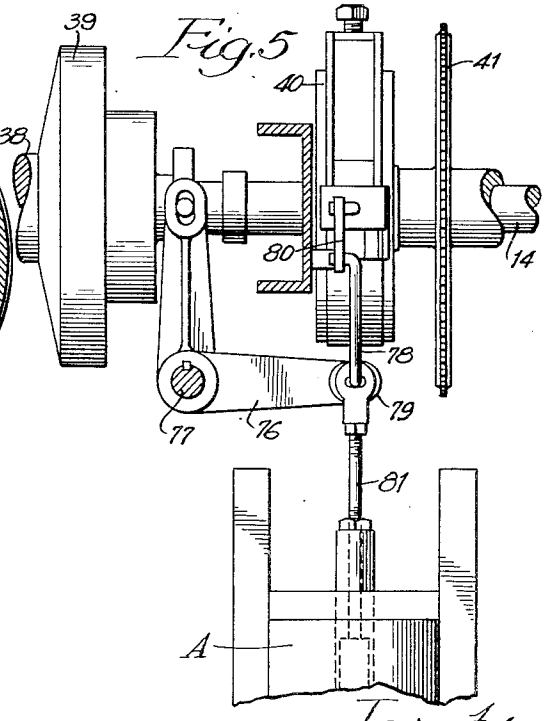



Fig. 5




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Fig. 6

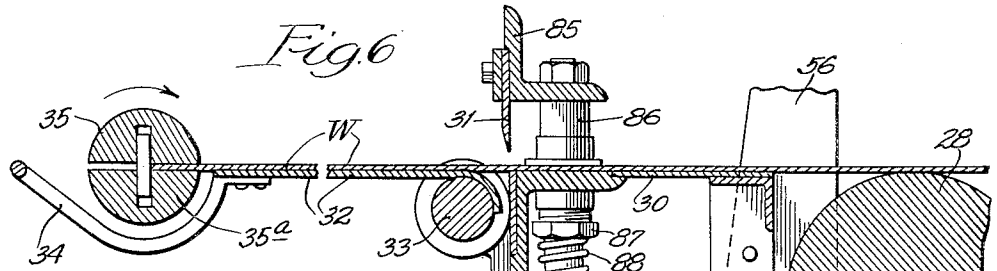
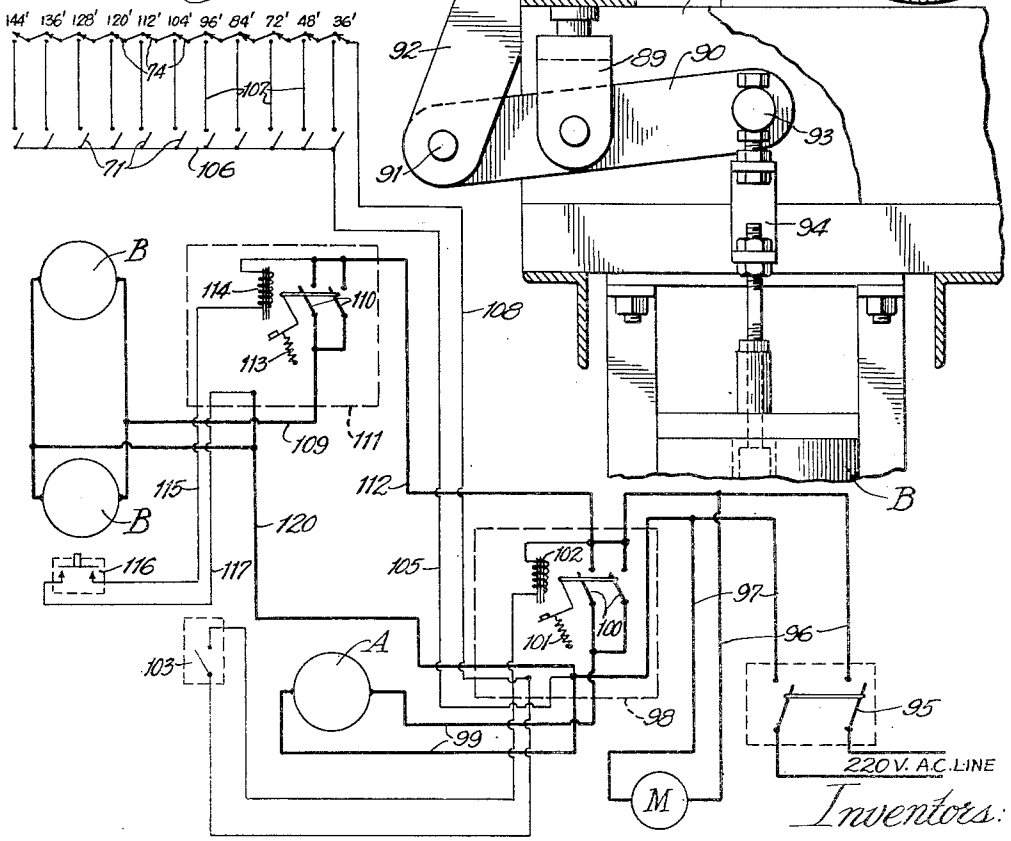



Fig. 7




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Patented Sept. 5, 1939

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# UNITED STATES PATENT OFFICE

2,171,667

## ROLL-WINDING MECHANISM

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Application October 16, 1937, Serial No. 169,370

5 Claims. (Cl. 33—132)

The present improvements are directed to a machine through which a web of sheet material such, for example, as roofing paper, drawn from a supply roll, may be advanced a predetermined distance concurrently with a winding of its leading end into a smaller roll, movement of the web being halted automatically when a measured length thereof has advanced to permit of severing of the web and removal of the roll containing a desired length of the material. A mechanism for this purpose can be used to advantage in preparing for the market serviceable rolls of roofing paper or other material the lengths of which may vary considerably.

The features of improvement with which the present invention is concerned relate to an electrical mechanism in which is comprised a plurality of circuits each with a controlling switch, the closing of a selected switch operating to advance the web through a predetermined distance while the leading end thereof is being wound into a roll upon a mandrel. When the web travel is halted the wound portion thereof may be severed with the aid of electrical mechanism. The starting and stopping of the several feeding mechanisms is under the control of electrical instrumentalities as well. These several operating units are interconnected electrically in a novel manner, all as will be fully explained hereinafter.

Various objects and advantages, as will appear in the succeeding specification and claims, are attained by the suggestive embodiment of our invention which is illustrated in the accompanying drawings in the manner following:

Figure 1 is a plan view of the machine in its entirety;

Fig. 2 is a side elevation thereof;

Fig. 3 is a side elevation, partly broken away, of the box containing the switch mechanism;

Fig. 4 is a transverse section taken on line 4—4 of Fig. 3;

Figs. 5 and 6 are details in section taken, respectively, on lines 5—5 and 6—6 of Fig. 1;

Fig. 7 is a wiring diagram of electrical interconnections between the several operating mechanisms comprised in the machine;

Fig. 8 is a fragmentary sectional view taken on line 8—8 of Fig. 1; and

Fig. 9 is a fragmentary view in elevation taken as indicated by the line 9—9 of Fig. 1.

The present roll winder may be applied to a machine having a bed comprising spaced horizontal I-beams 10, 11 and 12, which are carried upon supporting legs 13. A web W, which enters from a roofing machine or is unwound from a reel (not shown) is adapted for travel through the machine to be acted upon by various agencies which are mounted upon the bed between the beams 10 and 11. To one side, above and below the beams 11 and 12, we have located some of the transmission, controls, etc., all as will now be explained.

Proceeding from right to left (as viewed in Figs. 1 and 2) the web advances successively under and over idler rolls 15 and 16; thence between opposed pairs of measuring wheels 17 and 18, one above the other, and mounted respectively upon shafts 19 and 20; thence between a plurality of opposed pairs of pressure wheels 21 and 22 of which the former (the upper) are mounted each upon a weighted arm 23 pivoted as at 24; thence between a pair of shafts 25, 26 on which are mounted an anvil roll and a special diamond point head with slitters, respectively, the head containing any shape of knives desired to longitudinally slit the web; thence between a pair of spaced feed rolls 27, 28 for pulling the web through the machine; thence over a table 30 (Fig. 6) with which is operatively associated a guillotine knife 31 under the separate control of the operator; thence in measured lengths over a platform 32 which is mounted to swing upon a shaft 33 in response to an upward force applied to a handle 34; and thence on to a gripping mandrel 35 where it is gripped and wound into a roll. These several mechanisms are interconnected to operate in timed relation.

From a motor M power is transmitted through belts 36 to a pulley 37 on a main shaft 38 equipped with a clutch 39 in connection with a second shaft 14 coaxial therewith on which is a brake 40, a sprocket wheel 41, and a gear 42; a chain 43 running from this sprocket to a second sprocket 44 transmits power to a compensating clutch 45 in connection with the mandrel 35; the gear 42 drives a meshing gear 46 upon the shaft for one of the lower feeding rolls; and from a sprocket wheel 47 mounted on the same feeding roll shaft a chain 48 runs over a sprocket 49 on the adjacent feeding roll shaft whereby both pairs of feeding rolls are operated in unison. The two idler rolls 15 and 16 past which the sheet first travels may be shifted endwise in unison when interconnected by a chain-sprocket assembly 50 as shown in Fig. 1. Also the shaft 51 which mounts the lower set of pressure wheels 22 may be equipped with a sprocket wheel 52 adapted to be driven from the sprocket 47 when a chain drive connection (not shown) is estab-

lished therebetween, in which event the chain 48 is not used.

The shafts for the upper feeding rolls 25 and 27 are mounted in bearing blocks 55 which are vertically slidable in supporting guides 56. With the aid of screw and/or tension mechanism each pair of feeding rolls may be maintained under pressure, in accordance with common practice. In like manner, the upper measuring wheel shaft 19 is adjustable toward and from its lower companion shaft 20. In response to power applied through the several driving connections heretofore described, the web W is drawn through the machine by frictional engagement therewith of the feeding rolls, and in so proceeding the web imparts to the measuring wheels a rotary motion which continues through a peripheral distance that is determined by advance of the web. Advantage is taken of this fact to measure selected lengths of the traveling web which is concurrently rewound upon the mandrel, and to operate the guillotine knife to sever the measured length of the web which is temporarily halted for this purpose. For accomplishing these ends we use certain mechanism which is electrically controlled, all as will now be explained.

Upon the measuring wheel shaft 19 is mounted a gear 59 in disconnectable driving relation with a collar 60 that is mounted fast on this same shaft; in mesh with this gear is another gear 61 with an associated worm 62 adapted to drive a worm wheel 63 on a toothed shaft 64 which extends longitudinally through a control box 65 containing a multiple switch mechanism. The switch box, as shown (see Figs. 3 and 4), is cylindrical with heads 66 at its opposite ends interconnected by tie rods 67. In spaced relation transversely within the box are a plurality of fixed plates 68, each mounting (1) a stud 69 upon which is rotatably supported a pinion 70 in mesh with the toothed shaft 64, and (2) a micro-switch 71, such as shown in Patent 1,960,020 from which extends a retractible actuating finger 72, whose exposed end lies in the path of a pin 73 which is carried on the pinion near its periphery. As suitable conductors, an electrical connection is extended from each micro-switch to a single-pole double-throw toggle switch 74 whose operating lever 75 is disposed exteriorly of the box convenient for manipulation. The several pinions are shown as increasing progressively in size according to their positions lengthwise of the box, the associated micro-switch finger in each instance being mounted at such an elevation that its actuating finger is disposed about radially of the pinion, so that as the pin 73 passes the finger the latter is depressed to effect a closing and immediate reopening of the switch.

The clutch and brake mechanism in the cross shaft are interconnected as best shown in Fig. 5. For operating the movable clutch element connection is made therewith by the weight end of a bell crank lever 76 mounted fast on a rock shaft 77, a link connection 78 extending from the power end 79 of the lever to a toggle or other device 80 at the ends of the band forming part of the brake mechanism. A connection 81 extends from the power end of the lever to the core of a solenoid A which may conveniently be mounted in a frame depending from the machine bed. According to the mechanisms just described, the solenoid, when actuated, will release the clutch concurrently with application of the brake so as to halt quickly all operation of (1) the feeding rolls, and (2) the winding mandrel.

Referring now to Fig. 6, the guillotine knife 31 is carried upon an angle bar 85 which is supported at spaced points at the upper ends of a pair of guide rods 86 each having an adjustable collar-nut 87 against which an upward pressure is exerted by a compression spring 88 which bears against the machine frame. The lower end of each rod is fitted with a yoke 89 which is pivotedly joined to a lever 90 (of the second class) having for its fulcrum a pivoted connection 91 with a fixed bracket arm 92. The power end of the lever is joined at 93 with a link 94 adjustably connected to the core of a solenoid B. Two such solenoids may be employed, one in connection with each rod, and both electrically interconnected, so that, upon operation thereof, the two rods are pulled down in unison to cause descent of the knife with a consequent shearing of the web.

Referring now to Fig. 7 which shows a diagram of the wiring connections, the motor M is connected to a suitable power line by means of a switch 95 and leads 96, 97. These leads go also to a magnetic contactor relay 98 and are then connected to the brake solenoid A through leads 99 and a switch 100. This switch which is normally held open by a spring 101 is adapted to be closed by a solenoid 102 one side of which connects to one of the leads 96 and the other to the lead 97 through a switch 103 which is operated by an arm 104 on the shaft 77 (Fig.1). This switch 103 is closed during the winding operation as will later be described.

A lead 105 connects one of the main leads 97 with a bus bar 106 from which connections are made to all of the micro-switches 71. Each micro-switch is adapted to be connected to one end of a switch bar 107. A series of switches 74 (Fig. 3) which may be of the toggle type are connected in series with each other and joined through a lead 108 in series with the switch 103.

Thus it will be seen that as each one of the switch levers 75 is thrown, that switch will be connected to its corresponding switch bar 107. With the switch 103 closed, the motor will be in operation as will be presently explained, and as the web advances and is wound on the mandrel, the toothed shaft 64 (Fig. 3) is rotated, thereby rotating all of the pinions 70. The result is that the micro-switches 71 will be closed successively, and when the micro-switch corresponding to the closed switch 74 is closed, current will flow through the switch bar 107, through the closed switch 103, and will energize the relay 102 thereby closing the switch 100, thus energizing the brake solenoid A which disengages the clutch in connection with the winding mechanism. The brake is simultaneously applied, thereby bringing the winding operation to a halt. The micro-switch instantly opens so as to be ready for succeeding operations.

The next step is to sever the web by means of the knife 31. This is done by energizing the solenoids B. Referring again to Fig. 7, the solenoids B are shown as connecting through a lead 120 with the power lead 97 and through a lead 109 with a switch 110 in a contactor 111, the opposite side of the switch connecting through a lead 112 with the other main power lead 96. The switch 110 which is normally held open by a spring 113 is adapted to be closed by a solenoid 114 which connects on one side with the lead 112 and on the other side through a lead 115 with a hand switch 116, and thence through a lead 117 with the lead 120 in the contactor 111. The

operator severs the web, after its motion has ceased, by closing the switch 116 thereby causing current to flow through the solenoid 114 to close the switch 110, thus energizing the two solenoids B.

The mandrel comprises a jaw 35a movable radially so as to grip or release the web. To insert the web, the jaw should recede, and the open space thus afforded should align with the web, as shown in Fig. 6. The mandrel carries a cam 118 (Figs. 1 and 8) having two faces either of which is adapted to be engaged by a detent 119 pivotally maintained at 33 and operated by means of a link 121 from a foot lever 122 pivotally mounted at 123.

In order to reset the mandrel the operator applies pressure to the lever 122, thereby raising the detent 119 from the normal dotted line position of Fig. 8 to the full line position therein shown. While holding the detent in that position, the mandrel is rotated by momentarily throwing in the clutch as will presently be described, thereby bringing the cam 118 to the position indicated in Fig. 8 where the mandrel occupies the rotative position shown in Fig. 6. At the same time the web advances a short distance in response to movement of the feed rolls. To guide the web into the opening between the two halves of the mandrel, the operator may grasp the handle 34 so as to raise the table 32 to the proper height to permit the web to slide in between the two halves of the mandrel, as shown in Fig. 6. Movement of the web is thereupon stopped by throwing out the clutch after which the foot may be removed from the lever 122.

The movable jaw of the mandrel is opened and closed by means of a rod 124 extending axially through the mandrel shaft, as shown in Fig. 1 and adapted to be operated by a lever 125 which is under control of the operator. The details of this gripping mechanism form no part of this invention.

Manual control of the winding mechanism is effected by the rock shaft 77 which operates the clutch operating lever 76. This shaft has at one end a lever 126 which connects through a link 127 with a hand starting lever 128 (see Figs. 1 and 2). It carries also the arm 104 for operating the switch 103, so that, when the clutch 38 is disengaged, the switch 103 is open as well. When the operator desires to start operation of the mechanism, the lever 128 is moved to the right, as shown in Fig. 1, thereby throwing in the clutch 39 and at the same time closing the switch 103. The web advances at a uniform rate and, since the rotative speed of the mandrel on which it is wound will depend upon the diameter of the roll which varies as the roll builds up, provision is made to drive the mandrel somewhat faster than the speed of the web at the smallest diameter; the resulting slippage in the mandrel drive is taken care of by the compensating clutch 45 in a well known manner.

As indicated in Fig. 3, the several clutch operating switch levers 75 are made to co-operate with the pinions 70 of different sizes so as to provide means for stopping the winding operation when any selected one of many lengths of the web is wound on the roll. Each switch lever is therefore correlated to a given length of web travel. In each instance the length of web so wound will correspond to one complete revolution of the pin 73 which co-operates with the associated switch lever 75 thrown to connect that switch to the corresponding switch bar 107. Thus a very simple, rapid, and accurate means is provided for electrically controlling the distance of web advance concurrently with a rewind operation thereof. To determine the length of web which will be so rewound in each operation, it is necessary only to pull a selected switch by which everything else is controlled. For example, to effect a change in each web advance will require merely that the appropriate switch be thrown.

We claim:

1. In a web rewind machine, means for winding the web on a mandrel, means operable by movement of the web for measuring the length of the web so wound, a series of switches each corresponding to a predetermined length of web wound on the mandrel, means operable by the web as it is wound on the mandrel for selectively energizing one of the switches, and means operable by current flowing through the switch so energized for stopping the web at a point corresponding to the setting of said switch.

2. In a web rewind machine, means for winding the web on a mandrel, means operable by movement of the web for measuring the length of the web so wound, electrically operated means for stopping the web when any one of a number of predetermined lengths has been wound on the mandrel, a series of leads, a series of manually-operable, pre-set switches adapted to selectively connect any one of said leads to one pole to a source of electric current, another series of electric switches adapted to connect said leads one at a time with the other pole, the latter series being closed successively as predetermined points in the winding of the web on the mandrel are reached, and means for stopping the web when current flows through a lead and its corresponding switches.

3. In a web rewind machine, means for winding the web on a mandrel, rotary means operable by movement of the web for measuring the length of the web so wound, electrical means for stopping the web, a plurality of switches operably connected to the rotary measuring means, and a plurality of selective pre-set controls any one of which may be operably connected to a corresponding one of the switches so as to cause its switch to close a circuit to stop the web when a predetermined length of web corresponding to its switch has been wound on the mandrel.

4. In a web rewind machine, means for winding the web on a mandrel, rotary means operable by movement of the web for measuring the length of the web so wound, electrical means for stopping the web, a plurality of micro-switches, a plurality of switch closing means each corresponding to a desired length of web and driven by a shaft operably connected to the rotary measuring means, and a plurality of selective pre-set controls any one of which may be operably connected to a corresponding one of the switches so as to cause its switch to close a circuit to stop the web when a predetermined length of web corresponding to its switch has been wound on the mandrel.

5. In a web rewind machine, means for winding the web on a mandrel, rotary means operable by movement of the web for measuring the length of the web so wound, electrical means for stopping the web, a plurality of micro-switches, a plurality of rotary switch closing means geared to the rotary measuring means each corresponding to a desired length of web wound on the mandrel and adapted to momentarily close a mi-

cro-switch on each revolution thereof and promptly open the same to set the apparatus to start the next roll, a plurality of selective switch closing means each corresponding to a desired length of web and driven by a shaft operably connected to the rotary measuring means, and a plurality of selective pre-set controls each operably connected to one of the switches so as to cause its switch to close a circuit to stop the web when a predetermined length of web has been wound on the mandrel.

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