Dec. 25, 1962 M. W. REIF ETAL 3,070,323

PAPER ROLL UNWIND AND TRANSFER MECHANISM

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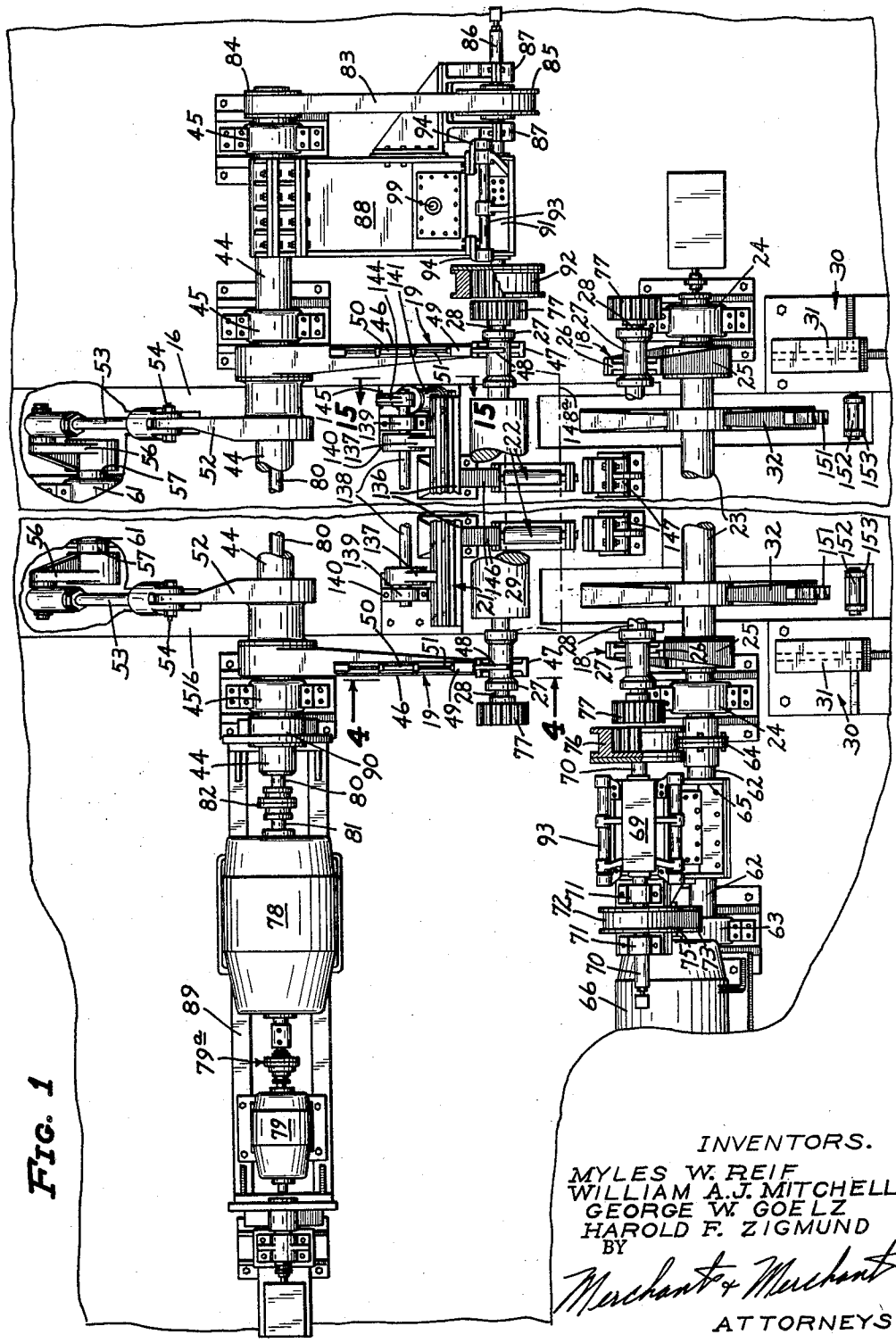


FIG. 1

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FIG. 2

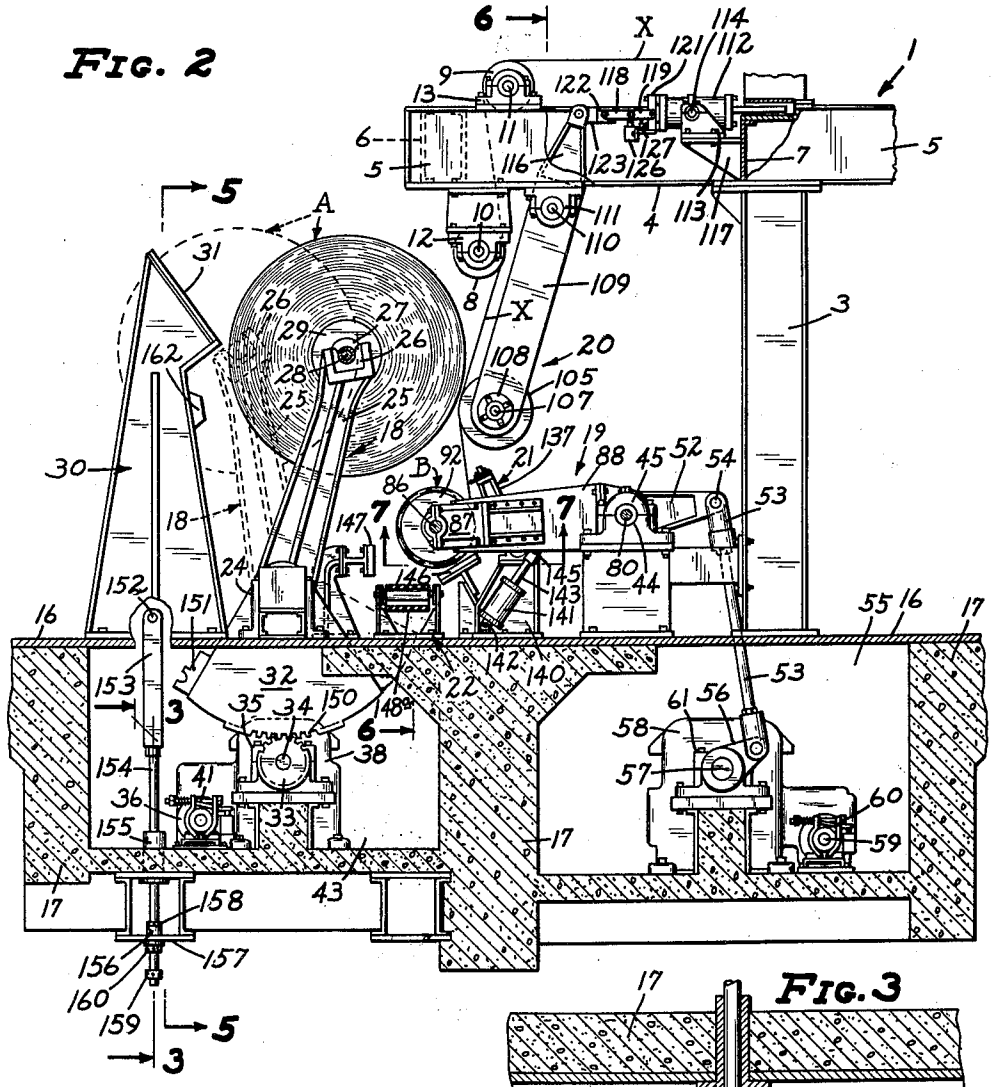


FIG. 3

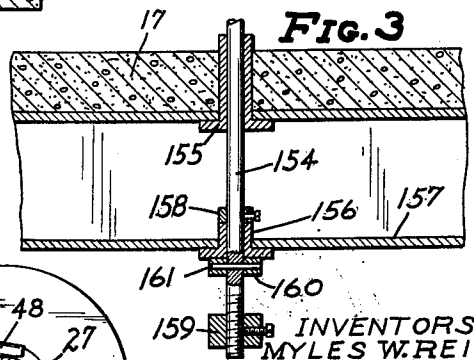
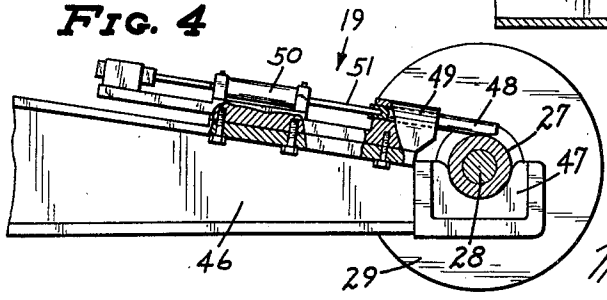


FIG. 4



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PAPER ROLL UNWIND AND TRANSFER MECHANISM

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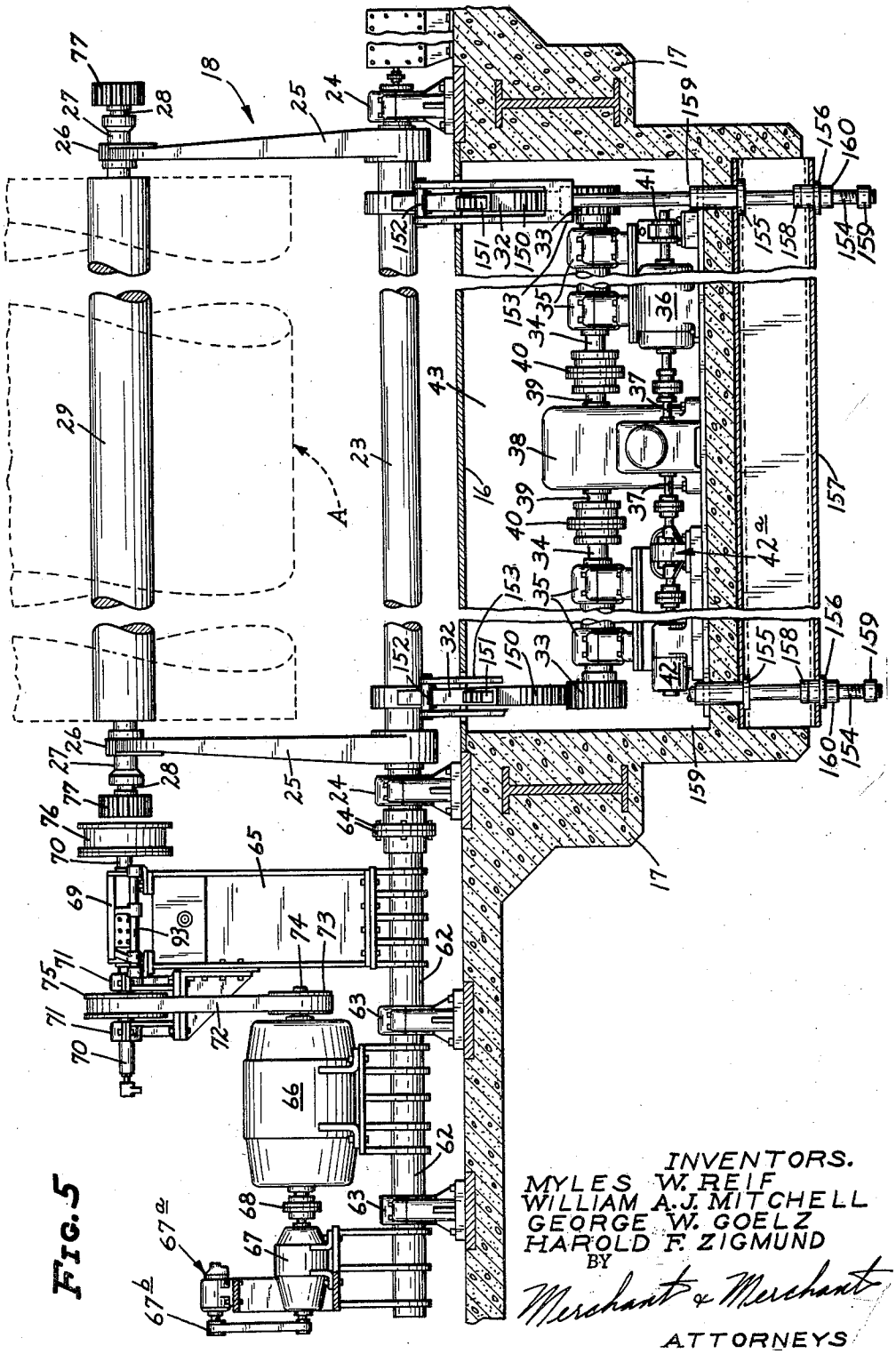


FIG. 5

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PAPER ROLL UNWIND AND TRANSFER MECHANISM

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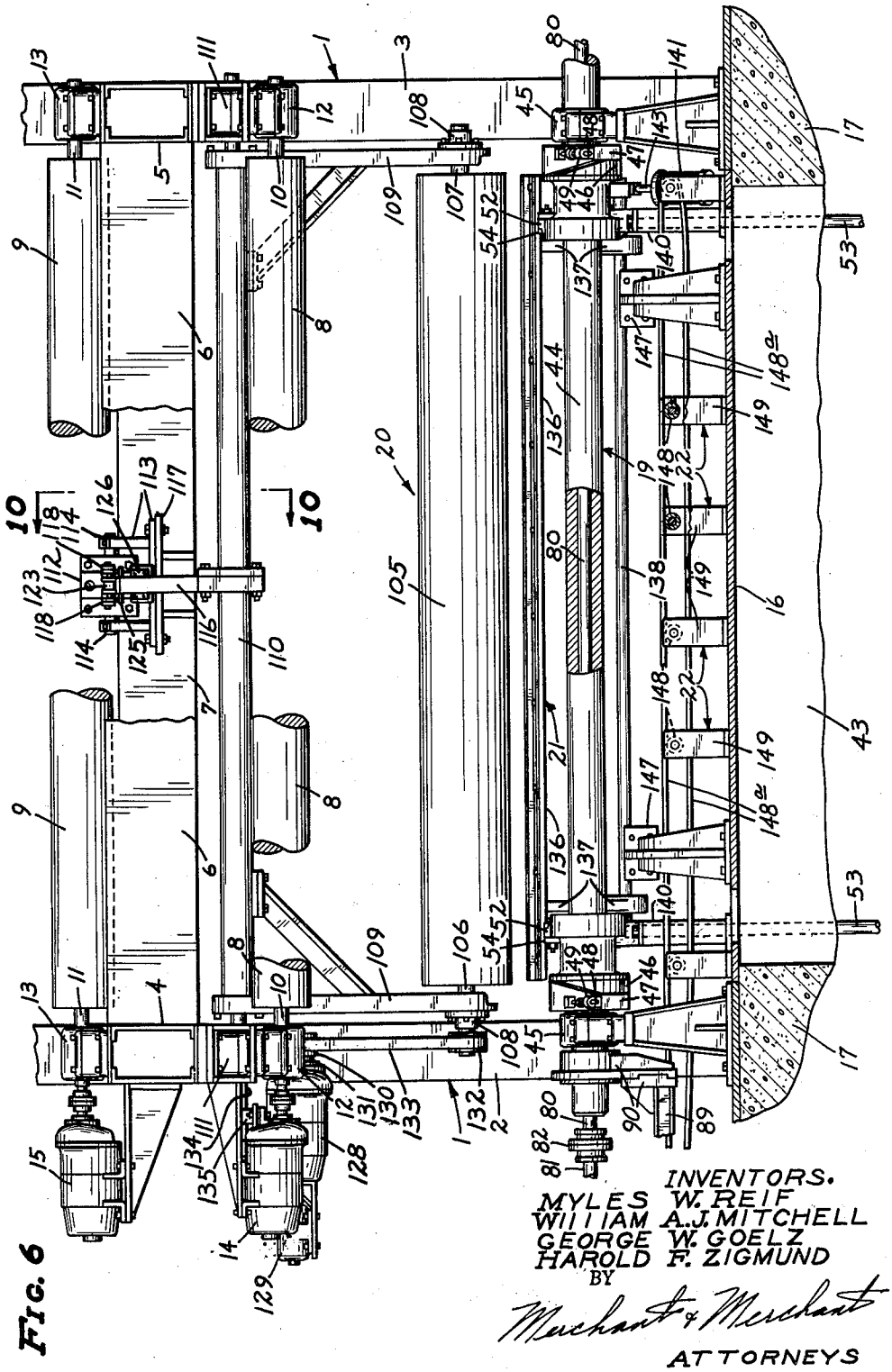


FIG. 6

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PAPER ROLL UNWIND AND TRANSFER MECHANISM

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FIG. 7

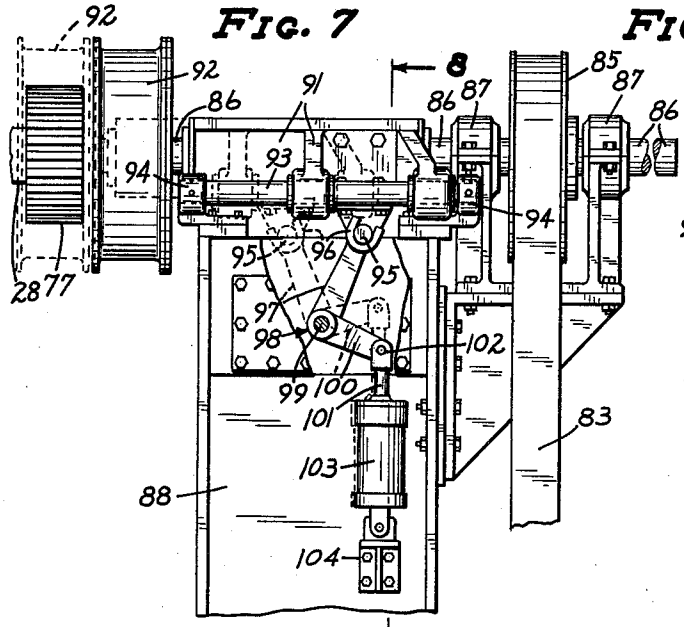


FIG. 8

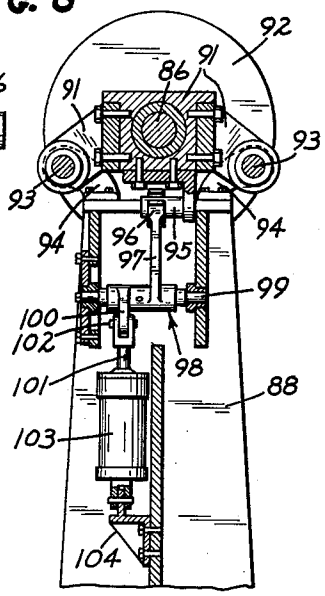


FIG. 9

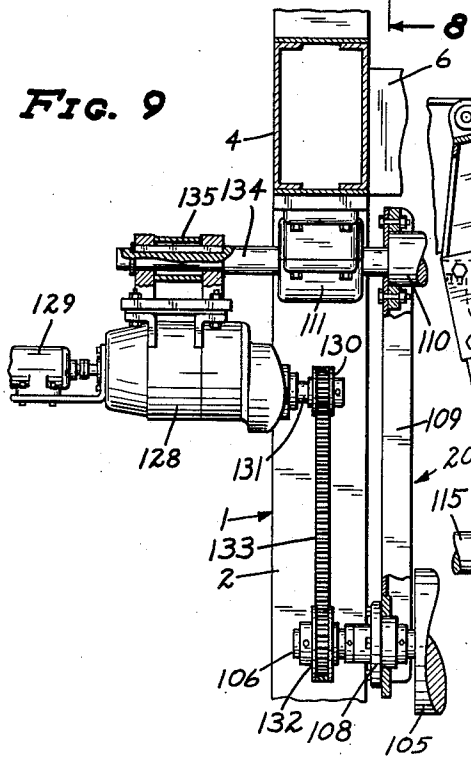


FIG. 10

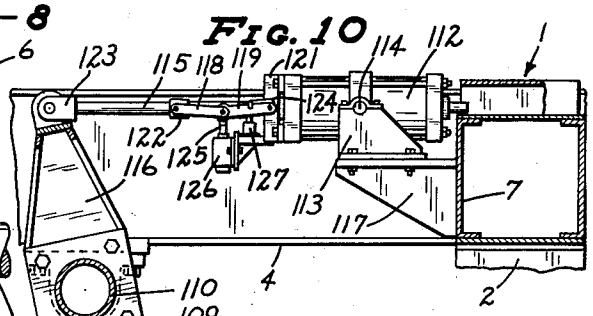
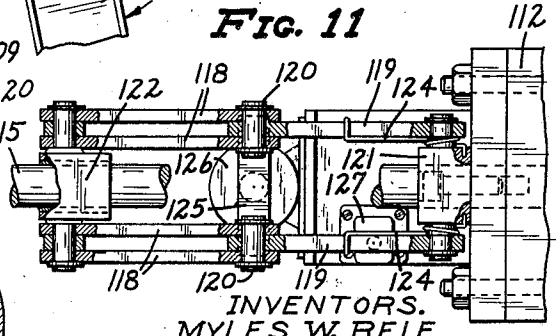


FIG. 11



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PAPER ROLL UNWIND AND TRANSFER MECHANISM.

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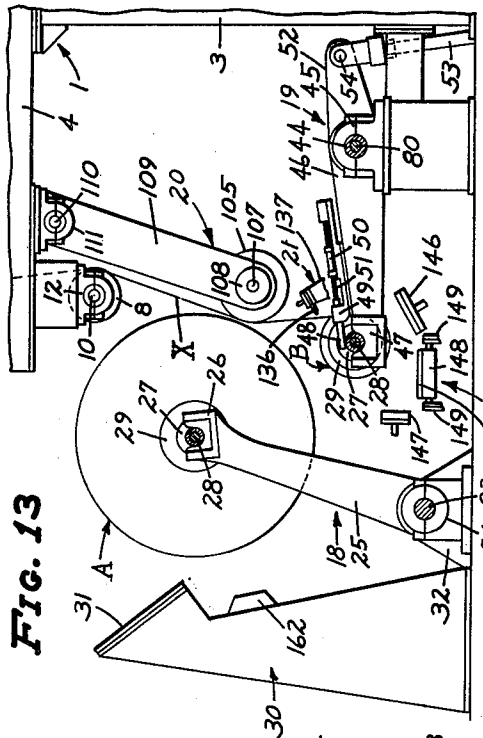


FIG. 13

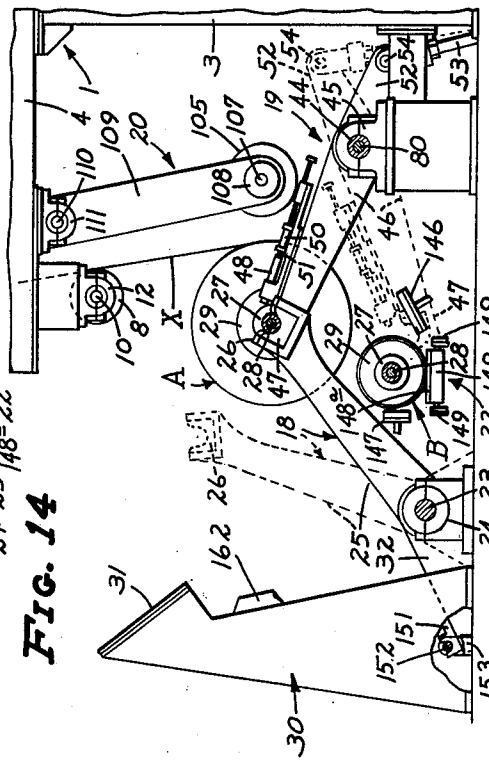


FIG. 14

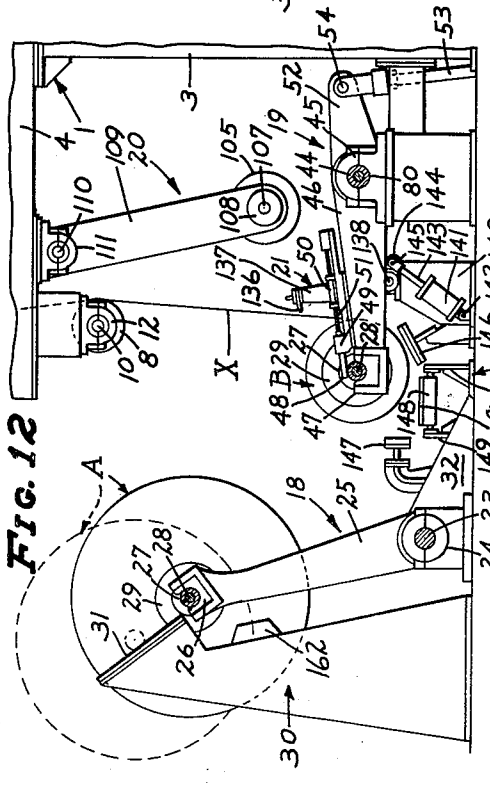


FIG. 12

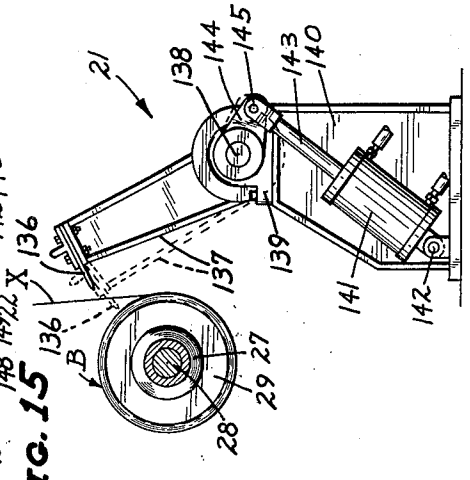


FIG. 15

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United States Patent Office 3,070,323 Patented Dec. 25, 1962

3,070,323

PAPER ROLL UNWIND AND TRANSFER MECHANISM

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Filed May 12, 1960, Ser. No. 63,695
7 Claims. (Cl. 242—58.2)

Our invention relates to improvements in paper treating machines, and more particularly to a web roll unwind and transfer mechanism utilized in the feeding of a web into a paper treating machine, and in the splicing of the web of a new web roll to the web of a substantially exhausted web roll being fed to the machine.

In paper treating machines, such as coating machines, it is often desired to coat or otherwise treat a substantial quantity of paper, supplied in a plurality of large rolls, during a single run of the machine. In order to eliminate undue waste of time in splicing a new roll to the web of a roll which is near exhaustion, and to maintain uniformity in the treatment of the web, it has been found highly advantageous to effect splicing of the web of the supply roll to the web of the roll being unwound, or parent roll, while the supply roll is being rotated at a peripheral speed equal to the normal linear speed of the web being unwound from the parent roll.

An important object of our invention is the provision of a web roll unwind and transfer mechanism by means of which a supply web roll is rotated at a peripheral speed to match the speed of linear travel of a web being unwound from a parent roll, whereby said supply roll may be spliced to the web of the parent roll without substantially decreasing the speed of the web moving through the machine.

Another object of our invention is the provision of primary and secondary web roll supports, and of novel means for transferring a web roll from the primary support to the secondary support after a supply web roll on the primary support is spliced to the web of a roll on the secondary support, following removal of the exhausted roll from the secondary support.

Another object of our invention is the provision of primary and secondary web roll supports, novel means for independently moving said supports to effect loading of the primary support with a supply web roll, transporting of the supply roll to a splicing position relative to a web being unwound from a parent roll on a secondary support, removal of the exhausted parent roll from the secondary support, and transfer of the supply roll from the primary support to the secondary support without reducing the normal speed of unwinding movement of the web from either the supply or parent rolls.

A still further object of our invention is the provision of means for applying splicing pressure to a web being unwound from a parent roll against an adhesive equipped supply roll, without placing undue strain on the unwinding web, whereby to preclude distortion or tearing of the web.

Still another object of our invention is the provision of means, including a motor, for moving the primary support from its load position, wherein it receives a supply web roll, to a transfer position, wherein the web roll is transferred to a secondary support, and of releasable means for stopping movement of the primary support at an exact point at which such transfer is to be made.

Another object of our invention is the provision of safety means for uncoupling the primary support moving motor from operative engagement with the primary support in the event of continued movement of the primary support beyond said transfer position.

The above, and still further highly important objects and advantages of our invention will become apparent from the following detailed specification, appended claims, and attached drawings. Referring to the drawings, which illustrate the invention, and in which like reference characters indicate like parts throughout the several views:

FIG. 1 is a fragmentary view in top plan of a paper roll unwind and transfer mechanism made in accordance with our invention, some parts being broken away and some parts being shown in section;

FIG. 2 is a view in side elevation of the unwind and transfer mechanism of FIG. 1, on a reduced scale, the receiving end of a paper treating machine being shown associated therewith, some parts being broken away, and some parts, including a foundation being shown in section;

FIG. 3 is an enlarged fragmentary section taken substantially on the line 3—3 of FIG. 2;

FIG. 4 is an enlarged fragmentary detail taken substantially on the line 4—4 of FIG. 1, some parts being broken away and some parts being shown in section;

FIG. 5 is a transverse section taken substantially on the line 5—5 of FIG. 2, on an enlarged scale, some parts being broken away;

FIG. 6 is an enlarged transverse section taken substantially on the line 6—6 of FIG. 2, some parts being broken away and some parts being shown in section;

FIG. 7 is an enlarged fragmentary view in bottom plan, as seen from the line 7—7 of FIG. 2;

FIG. 8 is a fragmentary transverse section taken substantially on the line 8—8 of FIG. 7;

FIG. 9 is an enlarged fragmentary detail of the drive means for the splicing roll of our invention, corresponding to a portion of FIG. 6, some parts being broken away and some parts being shown in section;

FIG. 10 is an enlarged fragmentary section taken substantially on the line 10—10 of FIG. 6;

FIG. 11 is a fragmentary view in top plan of a portion of the mechanism of FIG. 10, on an enlarged scale, some parts being broken away, and some parts being shown in section;

FIGS. 12, 13 and 14 are diagrammatic views corresponding to FIG. 2 and showing various positions of some of the parts; and

FIG. 15 is an enlarged fragmentary detail in side elevation of the web cutting mechanism of our invention, as seen from the line 15—15 of FIG. 1.

Referring with greater detail to the drawings, the numeral 1 refers generally to the frame of a paper treating machine, which may be a printing press, or a paper coating machine. Inasmuch as this machine does not, in itself, comprise the instant invention, detailed showing and description thereof is omitted, in the interests of brevity. The portion of the frame 1 shown, is at the input end of the paper treating machine and includes a pair of laterally spaced upright legs 2 and 3, horizontally disposed longitudinal frame members 4 and 5 supported by the legs 2 and 3 respectively, and horizontally disposed parallel transverse frame members 6 and 7. The portion of the instant paper treating or coating machine, illustrated, includes a pair of feed rollers 8 and 9 the respective shafts 10 and 11 of which are journalled in suitable bearings 12 and 13 respectively that are suitably mounted on the frame members 4 and 5, the rollers 8 and 9 being driven by respective motors 14 and 15, see particularly FIG. 6. As shown particularly in FIG. 2, a web X of paper or the like to be coated or otherwise treated, is entrained over the feed rollers 8 and 9 and fed thereby

into the machine. The frame 1, as well as the unwind and transfer mechanism of our invention, to be described, rests on a floor plate or the like 16 that overlies a suitable foundation 17.

The unwind and transfer mechanism of our invention comprises generally, a primary web roll support 18, a secondary support 19, web splicing mechanism 20, web cutting mechanism 21, and a core conveyor 22. The primary support 18 is movable from a web roll loading position shown in FIG. 12, to a web splicing position shown in FIG. 13 and by full lines in FIG. 2, and from thence to a web roll transfer position shown in FIG. 14.

The secondary support 19 is movable from a transfer position, shown in FIG. 14, at which point the secondary support 19 receives the web roll carried by the primary support 18, and indicated by the reference character A, in a direction to move the web roll out of engagement with the primary support 18, to permit return of the primary support 18 to its loading position, from thence in the opposite direction to a splicing position shown in FIGS. 2, 12 and 13, and from thence to a core discharge position shown by dotted lines in FIG. 14. The web roll, after its transfer from the primary support 18 to the secondary support 19, is indicated by the reference character B.

The primary support 18 comprises a horizontally disposed shaft 23 journalled at its opposite end portions in bearings 24 that are supported by the foundation 17, and a pair of laterally spaced parallel supporting arms 25 that extend radially outwardly from the shaft 23, one each adjacent one of the bearings 24, see particularly FIG. 5. The arms 25 are keyed or otherwise rigidly secured to the shaft 23 by suitable means, not shown, the radially outer ends of the arms 25 being provided with upwardly opening arcuately recessed bearings 26 for reception of spool-like elements 27 that are journalled on axially aligned trunnions 28 at opposite ends of a cylindrical web roll core 29. It will be noted that the arms 25 support the web roll core 29 in spaced parallel relation to the axis of swinging movement of the arms 25 the same being the axis of the shaft 23. The core 29, with a web roll A wound thereon, is loaded into the bearings 26 of the arms 25, when the primary support 18 is disposed in its load position illustrated in FIG. 12 and by dotted lines in FIG. 2, by an overhead crane or the like, not shown. A pair of laterally spaced loading guides 30 are provided with guide faces 31 which engage the spool-like elements 27 and to guide the same into the bearings 26.

Means for imparting swinging movements to the primary support 18 to its various above-mentioned positions, comprises a pair of like gear segments 32 rigidly secured to the shaft 23 in axially spaced relationship, a pair of drive gears 33, one each in meshing engagement with a different one of the gear segments 32, axially aligned drive shafts 34 that are journalled in bearings 35 supported from the foundation 17, each gear 33 being rigidly mounted on a different one of the shafts 34, and a drive motor 36. The motor 36 is operatively coupled to one end of an input shaft 37 of a conventional speed reducing power transmission mechanism, not shown, but which may be assumed to be contained within a housing 38. The shafts 34 are operatively coupled to opposite ends of an output shaft 39 of the power transmission mechanism, by means of conventional shaft couplings 40. A conventional brake 41 is utilized to stop rotation of the shaft of the motor 36 and the shaft 37 to properly position the primary support 18 at its several stations. As second motor 42, operating through a torque limiting clutch 42*a* coupled to the opposite end of the input shaft 37 is utilized to impart movement to the primary support 18 to splice and final transfer positions at very low speed and torque. With reference particularly to FIGS. 1 and 5, it will be seen that the gear segments 32 extend downwardly through spaced openings in the floor plate 16, the above-described driving means for the primary support 18 being contained within a compartment or chamber 43 in the foundation 17.

The secondary support 19, like the primary support 18, comprises a horizontally disposed shaft 44 that is journalled in spaced bearings 45 in spaced parallel relation to the shaft 23, and a pair of parallel support arms 46 that are rigidly secured at their inner ends to the shaft 44 in axially spaced relation, and which at their outer ends are provided with upwardly opening, arcuately recessed bearings 47 similar to the bearings 26 of the primary support arms 25. With reference to FIG. 1, it will be seen that the outer ends of the secondary support arms 46 are laterally offset from the outer ends of the primary support arms 25, and that the spool-like elements 27 are of sufficient axial length to be received in the arcuately recessed bearings 26 and 47 simultaneously, as occurs when the primary and secondary supports are moved to their respective transfer positions.

Inasmuch as a greater portion of the web X has been unwound from a given web roll B subsequent to its being transferred to the secondary support 19, the weight thereof is considerably less than that of a web roll A. Therefore, in order to prevent a premature unloading of the web roll B from the supporting arms 46, due to the upward pull on the web X by the feed rollers 8 and 9, we provide releasable locking means in the nature of a pair of extensible and retractable rod-like fingers 48 that are longitudinally slidably mounted in bearings 49 carried by the outer end portions of the arms 46, for movements into and out of overlying spaced relationship to their respective bearings 47, see particularly FIG. 4. Extending and retracting movements are imparted to the fingers 48 by means of fluid pressure cylinders 50 and cooperating piston equipped plunger rods 51 that are rigidly connected to the fingers 48. Fluid under pressure from a suitable source, not shown, is introduced selectively to opposite ends of the cylinders 50 to extend or retract the locking fingers 48, through suitable conduits, not shown, and controlled in the conventional well known manner.

Rigidly secured to the radially inner ends of the secondary support arms 46, are crank arms 52 that are pivotally connected at their outer ends each to the upper end of a different one of a pair of pitman arms 53, as indicated at 54. The pitman arms 53 extend downwardly through suitable openings in the floor plate 16 into a second chamber 55 in the foundation 17. The lower ends of the pitman arms 53 are pivotally connected to the radially outer ends of a pair of crank arms 56 that are rigidly secured to the opposite ends of an output shaft 57 of a power transmission mechanism contained within a housing 58, the transmission mechanism having an input shaft 59 that may be assumed to be driven and controlled in the same manner as the input shaft 37 above-described with respect to the primary support driving means. As shown in FIG. 2, the shaft 59 is provided with braking means 60 similar to the brake 41. It will be appreciated that the motor, not shown, which drives the input shaft 59, as well as the motor 36, is reversible as to direction. Like the shafts 34, the opposite end portions of the shaft 57 are journalled in suitable bearings 61, one of which is shown in FIG. 2.

For the purpose of relieving strain on the web X, as the same is being unwound from the secondary roll B into the machine, it is important that means be provided to impart unwinding rotation to the web roll B at speeds commensurate with the linear speed at which the web X is moved by the feed rollers 8 and 9. It is equally important that, in order to splice the web of the primary web roll A to the tail end portion of the secondary web roll B, without reducing the speed of movement of the web X into the machine, unwinding rotation be imparted to the primary web roll A at speed commensurate with the linear speed or movement of the web X, to prevent tearing of the web when the splice is made. Hence, we

provide novel means for imparting unwinding rotation to the web rolls A and B, now to be described.

A mounting shaft 62 is journalled in bearings 63 in axial alignment with the primary support shaft 23, and is connected thereto for common rotation therewith by a shaft coupling 64, see particularly FIG. 5. Rigidly mounted on the mounting shaft 62 for common rotation or rocking movements therewith, is a radially extended supporting structure 65, a driving motor 66 and a selsyn generator 67 coupled to the driving motor 66 by a coupling 68. A second generator 67*a* is utilized to energize a tachometer, not shown, and is driven from the generator 67 by an endless drive belt 67*b* entrained over pulleys on the shafts of the generator 67 and 67*a*. A bearing 69 is mounted on the radially outer end of the supporting structure 65 for sliding movements toward and away from the adjacent primary support arm 25, the bearing 69 journalling a primary drive shaft 70 on the extended axis of a primary web roll core 29 mounted in the bearings 26 of the primary support 18. The primary drive shaft 70 is further journalled in spaced stationary bearings 71 on the supporting structure 65, and axially slidable therein in common with the movable bearing 69. The shaft 70 is driven from the motor 66 by an endless transmission belt 72 entrained over a pulley 73 fast on the shaft 74 of the motor 66, and a second pulley 75 keyed or otherwise secured to the shaft 70 for common rotary movements therewith and for axial sliding movements relative thereto.

The primary drive shaft 70 is adapted to be operatively coupled to the core 29 of a primary web roll A mounted on the support arms 25, by means of releasable clutch mechanism including a clutch member 76 mounted on the inner end of the drive shaft 70, and the adjacent one of a pair of clutch elements 77, one each rigidly mounted on the extreme end of a different trunnion 28 of the core 29. The clutch mechanism may be any one of a number of commercially available structures, such as disclosed in the United States Letters Patent 2,237,864, the same being a fluid pressure operated clutch. Preferably, when it is desired to impart unwinding rotation to the primary web roll A, the shaft 70 together with its clutch member 76 is moved axially toward the web roll A until the clutch member 76 is disposed in overlying concentric relation to the adjacent clutch element 7. The motor 66 is then energized, as is the clutch mechanism, to rotate the web roll A in an unwinding direction.

The secondary web roll B is rotated in an unwinding direction by mechanism substantially identical to that immediately above described in connection with the primary web roll A, the secondary web roll driving mechanism comprising a drive motor 78 to which is coupled a selsyn generator 79 by means of an electrically controlled clutch 79*a*, an elongated shaft 80 connected to the shaft 81 of the motor 78 by a shaft coupling 82, an endless drive belt 83 entrained over a pulley 84 on the shaft 80 and a second pulley 85 slidably keyed to a secondary drive shaft 86. The shaft 86 is longitudinally slidably journalled in bearings 87 carried by a supporting structure 88 substantially identical to the supporting structure 65 but mounted fast on the shaft 44 in outwardly spaced relation to one of the secondary supporting arms 46. With reference to FIGS. 1 and 6, it will be noted that the shaft 44 of the secondary support 19 is axially bored, the shaft 80 extending axially therethrough and being journalled therein. The drive motor 78 and selsyn 79 are mounted on a base structure 89 that is rigidly secured to the adjacent end of the shaft 44, by means of a supporting bracket or the like 90. It will be further noted that, while the driving motors 66 and 78 are disposed outwardly of the same end of their respective supports 18 and 19, the drive shaft supporting structures 65 and 88 are disposed each at an opposite end of its respective one of the primary and secondary supports. Like the supporting structure 65, the supporting structure 88 is provided with a drive shaft journal bearing 91 which journals the secondary drive shaft 86 for rotation and longitudinal movements axially of a web roll core 29 carried by the secondary support arms 46. At its inner end, the secondary drive shaft 86 carries a clutch member 92, identical to the clutch member 76 and engageable with the adjacent clutch element 77 in the manner above-described with respect to the clutch member 76.

The supporting structures 65 and 88 carry identical mechanisms for shifting their respective bearings 69 and 91 in opposite directions, whereby to move their respective clutch elements 76 and 92 into and out of encompassing relationship with their adjacent clutch members 77. One of these mechanisms is shown in detail in FIGS. 7 and 8, the same being mounted on the supporting structure 88. As there shown, the bearing 91 is mounted on a pair of spaced parallel slide bars 93 carried by brackets 94 on the supporting structure 88, the bearing 91 carrying a transversely extending pin 95 that is contained within the bifurcated end 96 of an arm 97 of a bell crank 98. The bell crank 98 is mounted on a transverse shaft 99 journalled in suitable bearings in the supporting structure 88, the bell crank 98 including a lever arm 100 that is pivotally connected to the upper end of a generally vertically disposed plunger rod 101, as indicated at 102. The plunger rod 101 is provided with the usual piston, not shown, but contained within a fluid pressure cylinder 103 that is pivotally secured at its lower end to a mounting bracket 104 fast on the supporting structure 88. The cylinder 103 is adapted to receive fluid under pressure selectively at its opposite ends from a source of fluid under pressure, not shown, the flow of fluid to and from opposite ends of the cylinder 103 being controlled by conventional and well known means, not shown. Obviously, the operation of the cylinder 103 is controlled independently of the operation of the corresponding cylinder, not shown, but associated with the supporting structure 65 and bearing 69, inasmuch as their respective clutch mechanisms are operated at different times during a given cycle of operation of the unwind and transfer mechanism, as will hereinafter appear.

The splicing mechanism 20 of our invention includes a pasting roller 105 having axially outwardly extending shafts 106 and 107 at its opposite ends, these shafts being journalled in bearings 108 for rotation on an axis parallel to the axes of the web rolls A and B. The bearings 108 are rigidly secured to the lower end portions of supporting arms 109 which have their upper ends anchored to opposite end portions of a rockshaft 110, the opposite diametrically reduced ends of which are journalled in bearings 111 rigidly secured to opposite sides of the machine frame 1, the axis of the rockshaft 110 being parallel with the axis of the pasting roller 105. Rocking movements are imparted to the rockshaft 110 to move the pasting roller 105 between an inoperative position shown in FIGS. 12 and 14, and an operative position wherein the pasting roller 105 engages the web X and moves the same into engagement with a previously paste-equipped primary roll A, as indicated in FIGS. 2 and 13, by a fluid pressure cylinder 112 and linkage therebetween and the rockshaft 110. With reference particularly to FIGS. 10 and 11, it will be seen that the cylinder 112 is pivotally connected to a supporting bracket 113, as indicated at 114, the cylinder 112 being provided with a piston equipped plunger rod 115 that is pivotally connected at its outer end to a crank acting element 116 rigidly secured to the rockshaft 110 intermediate its ends. The bracket 113 is bolted or otherwise rigidly secured to a mounting shelf 117 that is welded or otherwise rigidly secured to the intermediate portion of the transverse frame member 7. In actual practice, when the pasting roller 105 is disposed in its splicing position of FIGS. 2 and 13, the primary support 18 is moved to position the peripheral surface of the primary web roll A a distance approximately ¼ inch from the portion of the web X that is entrained over the pasting

roller 105. For stopping movement of the splicing roller 105 at its splicing position, otherwise referred to as a pre-splice position, we provide pairs of cooperating toggle links 118 and 119, each pair being disposed at an opposite side of the plunger rod 115. The adjacent inner ends of the links 118 and 119 are pivotally connected by pivot pins 120, the opposite ends of the links 119 being pivotally connected to a trunnion equipped bracket 121 secured to the adjacent end of the cylinder 112. The outer end of the links 118 are pivotally secured to a trunnion equipped collar 122 which slidably engages the plunger rod 115, and which is adapted to engage a bifurcated head 123 on the outer end of the plunger rod 115, the head 123 being pivotally connected to the crank-acting element 116. A pair of torsion springs 124 yieldingly urge the toggle links 118 and 119 in a downward direction to an over dead center relationship, as shown in FIG. 10, against an actuator member 125 that is operated by a solenoid 126 rigidly mounted on the cylinder 112. As the plunger rod 115 is moved from the left to the right with respect to FIG. 10, to move the pasting roller to its pasting position, the plunger rod 115 moves axially through the collar 122 until, when the pasting roller 105 is disposed in its above-described pre-splicing position, the collar 122 abuts the head 123 to stop further movement. Then, when it is desired to effect a splice between the web roll A and the web X, the solenoid 126 is energized to impart upward movement to the actuator 125 to swing the toggle links 118 and 119 upwardly through dead center relationship. The cylinder 112 is then enabled to impart further movement to the plunger rod 115 in a direction to move the pasting roll 105 the remaining distance necessary to effect splicing contact between the web X and the adhesive equipped primary roll A. The solenoid 126 is deenergized by suitable controls, not shown, but which may be assumed to be operatively associated with the web cutting mechanism 21. A switch 127, interposed in an indicating circuit, not shown, is closed by the toggle link 119 in its below dead center position, to provide the operator with an indication that the toggle links 118 and 119 are in proper position to stop movement of the pasting mechanism 20 at the pre-splice position.

In order that the web X being unwound from the secondary roll B be not placed under undue strain at any time prior to and during the splicing operation, we provide means for imparting rotary movement to the pasting roller 105 at a speed corresponding to the speed of linear movement of the web X. This means comprises a motor 128, to which is coupled a tachometer generator 129, the speed of the motor 128 being controlled by conventional means, not shown, a pulley 130 rigidly mounted on the output shaft 131 of the motor 128, a second pulley 132 rigidly mounted on one end portion of the pasting roller shaft 106, and an endless drive belt 133 entrained over the pulleys 130, 132. As shown particularly in FIG. 9, the rockshaft 110 is provided with a reduced diameter extended end portion 134 to which is keyed or otherwise rigidly secured a motor mounting base 135 for the pasting roller drive motor 128. With this arrangement, the motor 128 swings in common with the roller supporting arms 109, whereby to maintain the center distance between the pulleys 130 and 132 in all positions of the splicing mechanism 20.

When the web of the primary roll A has been spliced to the web X being unwound from the secondary roll B, it is desirable that the web X from the secondary roll B be severed quickly whereby a minimum length of the web X of double thickness be introduced into the coating machine. Hence, the web cutting mechanism 21 is utilized, the same comprising an elongated cutting blade 136 that extends generally transversely of the machine below the path of travel of the pasting roller 105, the blade being mounted at its opposite end portions on the upper ends of a pair of generally upstanding arms 137 that are rigidly secured to a horizontally disposed rockshaft 138 journalled in bearings 139 mounted on floor plate supported brackets 140, see particularly FIGS. 1 and 15. Means for imparting rocking movements to the rockshaft 138 to swing the cutting blade 136 into and out of cutting engagement with the web X being unwound from the secondary web roll B in the splicing position thereof, comprises a fluid pressure cylinder 141 that is pivotally secured to one of the brackets 140, as indicated at 142, a cooperating piston equipped plunger rod 143, and a crank member 144 rigidly secured to the adjacent end of the shaft 138, the radially outer end thereof being pivotally secured to the outer end of the plunger rod 143, as indicated at 145. The fluid pressure cylinder 141 is adapted to be interposed in a conventional fluid pressure system, not shown, and may be controlled in a well known manner.

Means for disposal of the substantially exhausted web roll B and the web roll core 29 thereof, comprises the conveyor 22 and the braking pads 146 which engages the web roll B when the secondary support 19 is moved to its web roll release position of FIG. 14. As shown in FIGS. 2 and12–14, the braking pad 146 slopes downwardly toward the conveyor 22, the web roll B being guided thereby onto the conveyor 22 after the releasable locking fingers 48 have been retracted and the arms 46 of the secondary support swung downwardly to a level wherein the spool-like elements 27 are out of engagement with their respective bearings 47. A pair of stop members 147 mounted at the side of the conveyor 22 opposite the braking pad 146 prevent the released or discharged secondary roll from rolling laterally off of the conveyor 22. As shown, the conveyor 22 comprises a plurality of horizontally disposed conveyor rolls 148 journalled in supporting legs or the like 149 and an endless conveyor belt 148*a* entrained over the rolls 148.

With the several parts of the unwind and transfer mechanism in their positions of FIG. 12, a primary web roll A, equipped with adhesive, is loaded into the primary support 18. The clutch member 76 is then advanced to encompass its cooperating clutch element 77 and the motor 66 energized to impart rotation to the primary web roll A in an unwinding direction. As the speed of rotary movement of the primary web roll A approaches a point wherein the peripheral speed thereof matches the speed of linear movement of the web X being unwound from the secondary roll B, the primary support 18 is moved to its position of FIG. 13, and the splicing mechanism 20 is also moved to its position of FIG. 13. Movement of the primary support 18 from its loading position of FIG. 12 to substantially its splicing position of FIG. 13, is accomplished by the motor 36 running at relatively fast speed and high torque. As the secondary roll B approaches an exhausted state, the primary support 18 is slowly moved toward the web roll X by the motor 42 until the primary roll A is approximately ¼ inch from the adjacent web X. When the web X is almost all exhausted from the secondary roll B, the solenoid 126 is energized to cause the pasting roll 105 to move the web X into contact with the primary roll A for a length of time only sufficient to cause the web of the primary roll A to be adhered to the web X. Immediately thereafter, the paper cutting mechanism 21 is energized to sever the web X from the secondary roll B, as indicated by dotted lines in FIG. 15, after which the clutch member 92 is released from operative engagement with its respective clutch element 77 and retracted to its position of FIG. 1. The secondary support 19 is then caused to be moved to its dotted line position of FIG. 14 to discharge the core 29 with its substantially used up web roll B to the conveyor 22. During this time, the web X is being unwound from the primary roll A while the same is supported in the primary support 18. It will be appreciated that the primary roll A, before being unwound, is at least four or

more feet in diameter. Preferably, the primary roll A remains supported in the primary support 18 until the diameter thereof is reduced to approximately 40 inches. Thereafter, the primary support 18 is moved from its splicing position of FIG. 13 to its transfer position shown in full lines in FIG. 14. This movement is accomplished by operating the motor 42 through the clutch 42*a* at low speed and low torque. When the primary support 18 has reached its transfer position, the secondary support is moved upwardly to its transfer position of FIG. 14, from whence the secondary support continues to move upwardly, carrying with it the primary roll A, which now becomes a secondary roll B. The secondary support 19 moves upwardly until the spool-like elements 27 are elevated to a point where the outer ends of the primary support arms 25 may pass thereunder, the primary support 18 then being returned to its load position adjacent the loading guide 30.

The unwind and transfer mechanism of the present invention is controlled by a plurality of electrical circuits including limit switches and other conventional and well known control elements. These circuits, as well as the elements contained therein may be arranged in several ways; and, inasmuch as they do not, in themselves, comprise the instant invention, showing and description thereof are omitted in the interest of brevity.

For the purpose of the present example, it should suffice to state that control of the secondary support 19, to position the same at its several stations is had through a well known arrangement of limit switches, not shown, over travel of the secondary support 19 being controlled by the brake 60. In a similar manner, positioning of the primary support 18 at its splicing position is controlled by a limit switch means, not shown, in cooperation with the brake 41. In view of the fact that positioning of the primary support 18 at its loading and transfer stations must be very accurately controlled, we provide safety stop means for the primary support 18, now to be described.

With reference to FIG. 2, it will be noted that the gear segment 32 therein shown is provided with a circumferentially extended row of gear teeth 150 which intermesh with the teeth of the drive gear associated therewith. Although only one of the gear segments 32 is shown in FIG. 2, it may be assumed that the other gear segment 32 is identical thereto. When the primary support 18 is in its loading position of FIG. 12, and as indicated by dotted lines in FIG. 2, the driving gears 33 are in mesh with their respective gear segment teeth at one end of the rows 150 thereof; whereas, when the primary support 18 is disposed in its transfer position of FIG. 14, the teeth of the driving gears 33 are in mesh with the gear segment teeth at the opposite end of the row 150 thereof. The gear segments 32 are provided with recessed blocks 151 that are adapted to engage respective pin elements 152 at the upper bifurcated end portions 153 of elongated bars 154 within the chamber 43 of the foundation 17. The bars 154 are vertically disposed, and are mounted for vertical sliding movements in guide bushings or the like 155 in the foundation 17. The bars 154 extend downwardly through and are slidably mounted in lower guide bushings 156 that are rigidly mounted in a stop plate 157 supported in the foundation 17 below the chamber 43. The bars 154 are supported against downward movement, and to position their respective pin elements 152 above the level of the floor plate 16, by stop collars 158 which normally rest on the upper ends of the lower guide bushings 156. Set screw equipped rigid stop collars 159 are screw threaded to the lower threaded ends of the bars 154, in downwardly spaced relation to the stationary stop plates 157, and releasable stop elements in the nature of collars 160 are mounted on the bars 154 respectively by means of shear pins 161 in underlying abutting relationship to the lower guide bushings 156, and in overlying spaced relation to their respective rigid stop collars 159.

As above mentioned, the primary support 18 is advanced to its transfer position of FIG. 14 by the motor 42 driving the support 18 at low speed and low torque. The recessed blocks 151 of the gear segments 32 engage their respective pin elements 152 when the primary support 18 is precisely in its transfer position. This engagement of the recessed blocks 151 with their pin elements 152 provides sufficient resistance to the motor 42 to cause the clutch 42*a* to slip. Transfer of the roll from the primary support 18 to the secondary support 19 is then made by swinging the secondary support 19 upwardly, as above described. Should failure of the control mechanism occur, and the primary support be advanced to its transfer position with the motor 36 operating under high torque, the bars 154 will be pulled upwardly with sufficient force to shear the pins 161 associated with the collars 160 to permit swinging of the primary support 18 beyond its normal transfer position. When this occurs, the rows of gear teeth 150 will move beyond meshing engagement with their respective driving gears 33, thus uncoupling the motor 36 from the gear segments 32 and preventing damage to the motor 36. After the failure has been corrected, it is then necessary to reset the primary support 18 for normal operation.

In the event of failure of the motor 36 to stop when the primary arms 25 are swung to their roll shaft receiving positions shown in FIG. 12 and by dotted lines in FIG. 1, the teeth 150 of the gear segments 32 will move circumferentially out of engagement with their cooperating gears 33 and the arms 25 will move under the action of gravity and momentum into engagement with a pair of stop elements 162 on the loading guides 30. Subsequent to correction of the control means, the primary arms may be reset for continued normal operation.

The selsyns 67 and 79 are utilized to synchronize the speed of rotation of the roll driving shaft 86, operatively coupled to the motor 78, with the speed of rotation of the roll driving shaft 70 operatively coupled to the motor 66, at the time when the primary and secondary supports 18 and 19 respectively are in their transfer positions shown by full lines in FIG. 14. When the supports 18 and 19 are moved to these positions, the web roll is supported by both of said supports. The selsyn generator 67 operates as a "master" to energize the selsyn 79 which operates as a "slave" or receiver. To accelerate the speed of the motor 78, the clutch 79*a* is energized to couple the motor 78 to the slave selsyn 79. The selsyn 79 drives the motor 78 at the exact speed necessary to synchronize the speed of the shaft 86 with that of the shaft 70. With the shaft speeds synchronized, the clutch element 92 is energized to engage its cooperating clutch element 77. Simultaneously, the field winding of the motor 78 is energized, the clutch elements 76 disengaged from its cooperating element and withdrawn therefrom, and the drive motor 66 and clutch 79*a* deenergized. The web roll is then driven only by the motor 78 and at unchanged speed.

Our unwind and transfer mechanism, above described, is adapted to automatic or at least partial manual control. The same has been thoroughly tested and found to be completely satisfactory for the accomplishment of the objectives set forth.

While we have shown and described a commercial embodiment of our novel unwind and transfer mechanism, it will be understood that the same is capable of modification, and that modification may be made without departure from the spirit and scope of the invention, as defined in the claims.

What we claim is:

1. In a web roll unwind and transfer mechanism, primary and secondary supports having shaft bearing means for supporting shaft mounted web rolls on parallel axes, means mounting said supports for swinging movements

on spaced axes parallel to said first mentioned axes, said supports being so arranged that the paths of arcuate travel of the axes of their respective shaft bearing means intersect at a roll transfer position of said supports, means for imparting swinging movements independently to each of said supports, independent releasable means for imparting unwinding rotation to the web roll on each of said supports, means effecting pressure contact between an adhesive equipped primary web roll on said primary support and a web being unwound from a secondary roll on the secondary support to cause the web of said primary web roll to be adhered to said web of the secondary roll whereby to be unwound therewith, means for severing the web of the secondary roll, and means responsive to predetermined swinging movement of the secondary support for automatically removing the secondary roll therefrom, said secondary support subsequently receiving the primary roll from said primary support at said transfer position of the primary and secondary supports.

2. In a web roll unwind and transfer mechanism; primary and secondary supports having shaft bearing means for supporting shaft mounted web rolls on parallel axes, means mounting said supports for swinging movements on spaced axes parallel to said first mentioned axes; said supports being so arranged that the paths of arcuate travel of the axes of their respective shaft bearing means intersect; means for positioning to said primary support selectively in a web roll loading position, an intermediate splicing position, and a web roll transfer position at the point of intersection of said paths of travel of the bearing means axes; independent means for positioning said secondary support in an intermediate transfer position, wherein the axes of its respective shaft bearing means intersects the path of movement of the shaft bearing means axis of said primary support and a web roll is carried by both of said supports, and a pass position spaced from said transfer position wherein the web roll is released from the primary support and carried by the secondary support; said independent means further positioning said secondary support selectively in said transfer position thereof and a splicing position spaced from said transfer position; independent releasable means for imparting unwinding rotation to the web rolls on each of said supports, means effecting pressure contact between an adhesive equipped primary web roll on said primary support and a web being unwound from a secondary roll on the secondary support, when said supports are moved to their respective splicing positions, to cause the web of said primary web roll to be adhered to said web of the secondary roll, whereby to be unwound therewith; means for severing the web of the secondary roll; and means responsive to predetermined movement of said secondary support in a direction away from said transfer position and beyond said splicing position for automatically removing the severed secondary roll from said secondary support.

3. The structure defined in claim 1 in which said supports each comprise spaced arms having generally upwardly opening arcuately recessed bearings for reception of the shafts of said web rolls, said means for removing the secondary roll from said secondary support comprising a roll-engaging stop member disposed intermediate the paths of swinging movement of the arms of said secondary support and in the path of movement of said secondary roll during movement of said arms in a generally downward direction.

4. In a web roll unwind and transfer mechanism, primary and secondary supports having shaft bearing means for supporting shaft mounted web rolls on parallel axes, means mounting said supports for swinging movements on spaced axes parallel to said first mentioned axes, said supports being so arranged that the paths of arcuate travel of the axes of their respective shaft bearing means intersect at a roll transfer position of said supports, means for imparting swinging movements to said primary support between said transfer position and a load position spaced therefrom, said means comprising, motor means, a drive gear operatively coupled to said motor means, a gear segment in meshing engagement with said drive gear and connected to said primary support for common movements therewith, independent releasable means for imparting unwinding rotation to the web roll on each of said supports, means effecting pressure contact between an adhesive equipped primary web roll on said primary support and a web being unwound from a secondary roll on the secondary support to cause said primary web roll to be adhered to said web, whereby to be unwound therewith, means for severing the web of the secondary roll, means responsive to predetermined swinging movement of the secondary support for removing the secondary roll therefrom, said secondary support subsequently receiving the primary roll from said primary support at said transfer position of the primary and secondary supports, and safety means for holding said primary support against swinging movement in a direction away from said loading position beyond said transfer position, said safety means including a releasable member mounted in the path of movement of and operatively engaging said primary support to normally stop movement of said primary support at said transfer position thereof, said member being responsive to swinging force applied to said primary support in excess of the normal force applied thereto to permit further limited swinging movement of said primary support in the same direction.

5. The structure defined in claim 4 in which said releasable member comprises an elongated bar, said safety means further including a gear segment engaging element on said bar, means mounting said bar for longitudinal sliding movements and including a rigid stationary stop member adjacent said bar, a rigid abutment on said bar in longitudinally spaced relation to said gear segment engaging element, a transfer position stop element on said bar and engaging said rigid stop member, and a shearable connecting element positioning said transfer position stop element on said bar in spaced relation to said rigid abutment.

6. The structure defined in claim 5 in which said gear segment includes a row of gear teeth, said row being of sufficient length to have meshing engagement with said drive gear at the load and transfer positions of said primary support, said row of teeth moving circumferentially out of meshing engagement with said drive gear upon swinging movement of the primary support beyond said transfer position thereof.

7. The structure defined in claim 5 in which said motor means comprises a first motor adapted to impart movement to said primary support at relatively high speed from said load position toward said splicing position and a second motor adapted to impart movement to said primary carriage at relatively low speed and low torque to said transfer position, said shearable connecting element having sufficient shear strength to overcome the driving force delivered by said second motor upon engagement of the gear segment with the segment engaging element on said bar when the primary support reaches said transfer position, said shearable connecting element having insufficient shear strength to overcome the driving force of said first motor at high speed and high torque.

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