July 13, 1965 B. J. H. NELSON 3,194,151

CALENDER AND METHOD OF THREADING SAME

Original Filed Dec. 4, 1961 4 Sheets-Sheet 1

FIG. 1

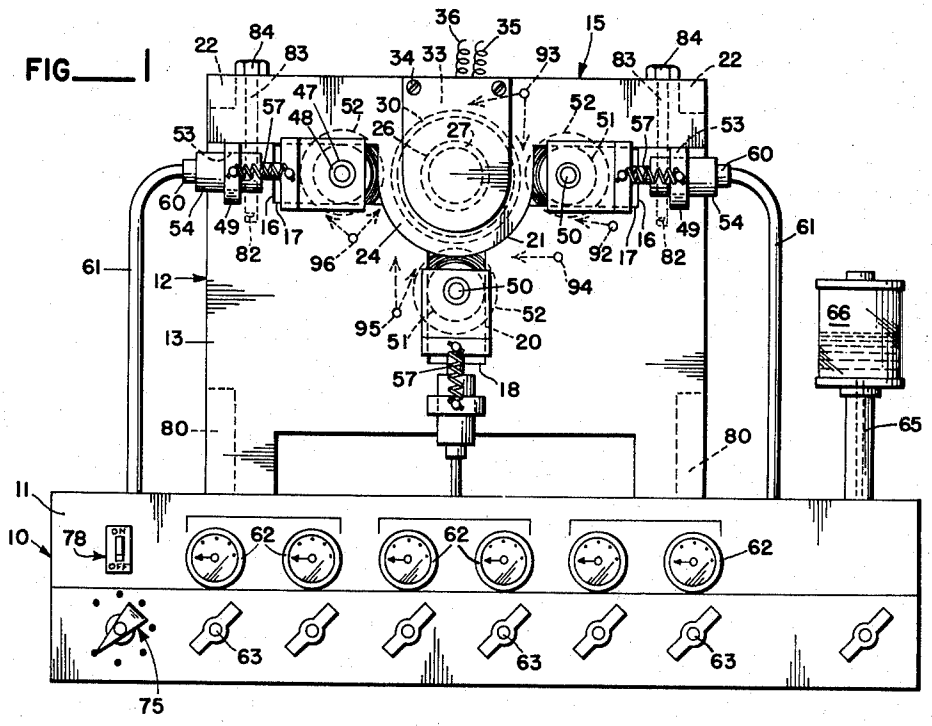


FIG. 3

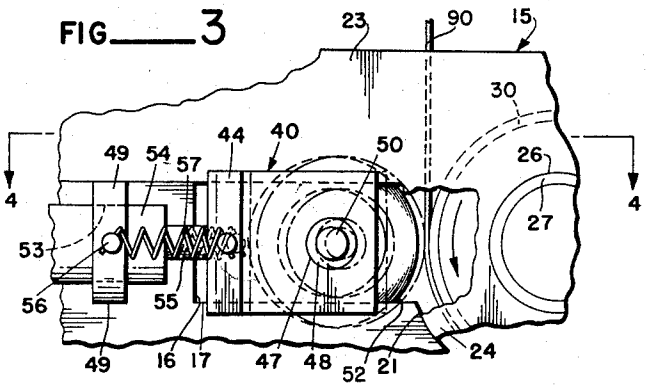
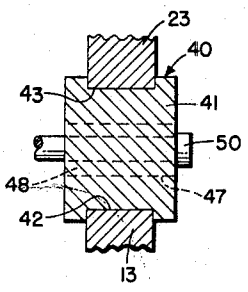


FIG. 5



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CALENDER AND METHOD OF THREADING SAME

Original Filed Dec. 4, 1961 4 Sheets-Sheet 2

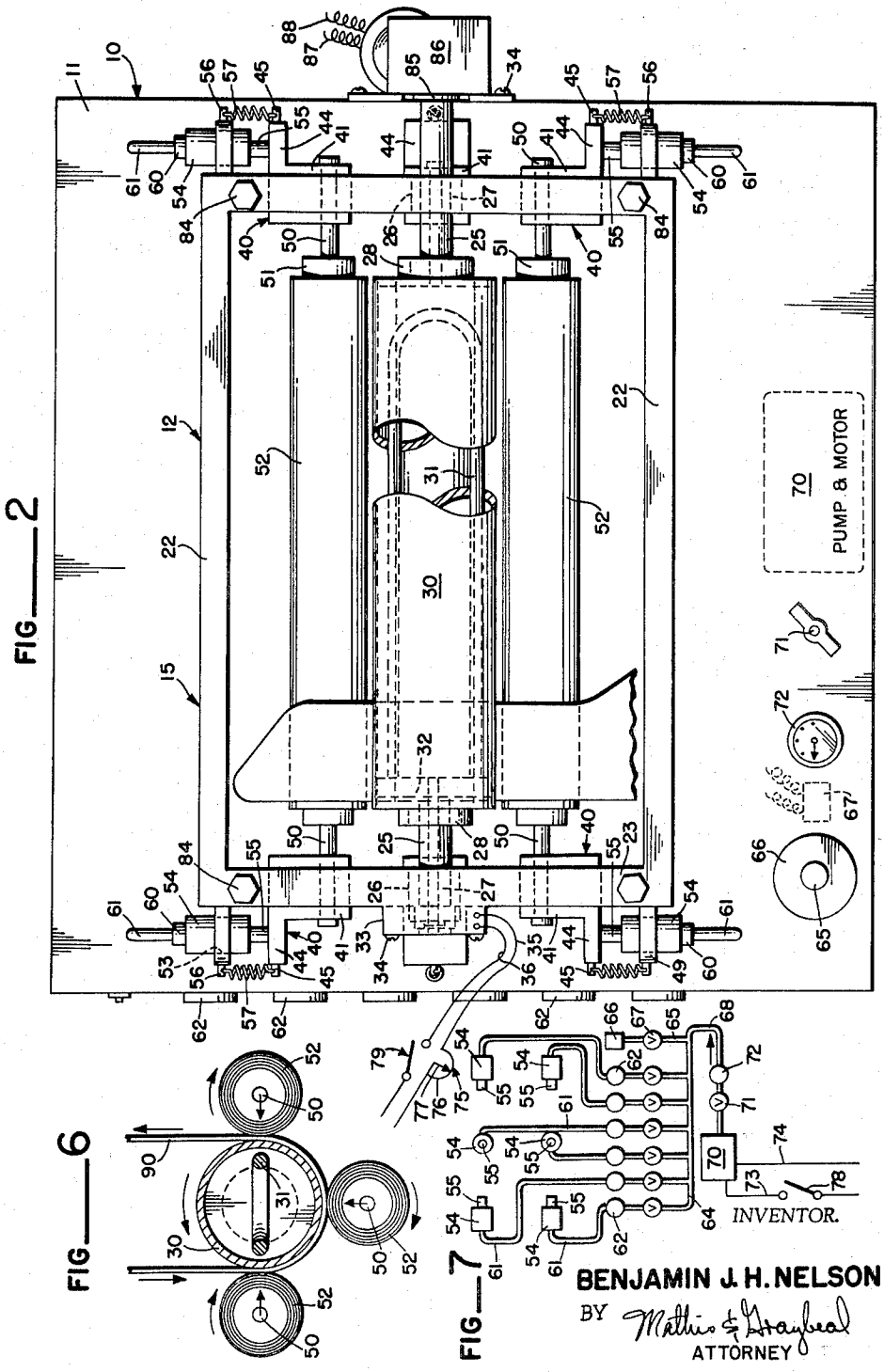


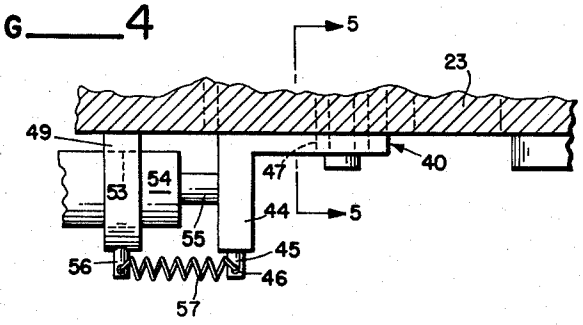
FIG. 2

FIG. 6

FIG. 7

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FIG. 4



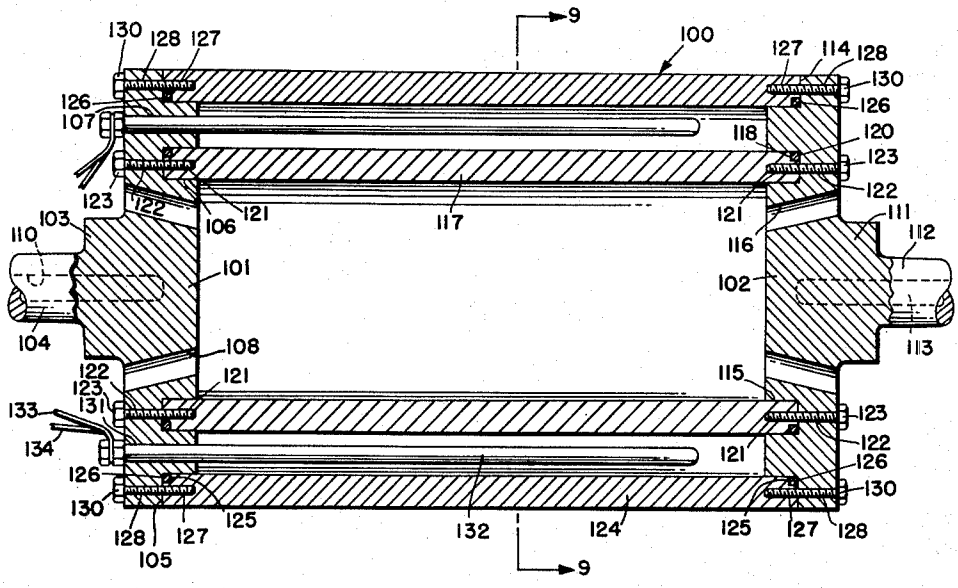


FIG. 8

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FIG 9

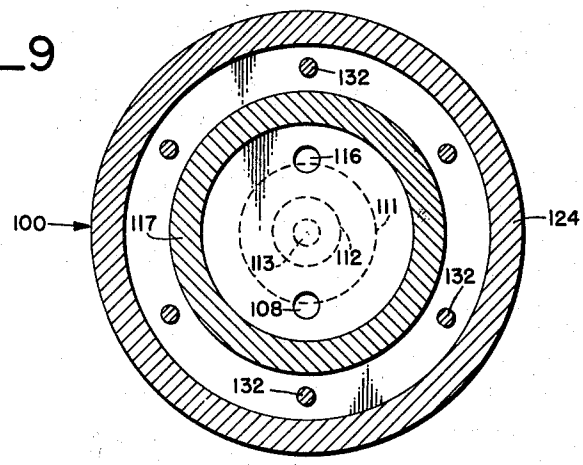
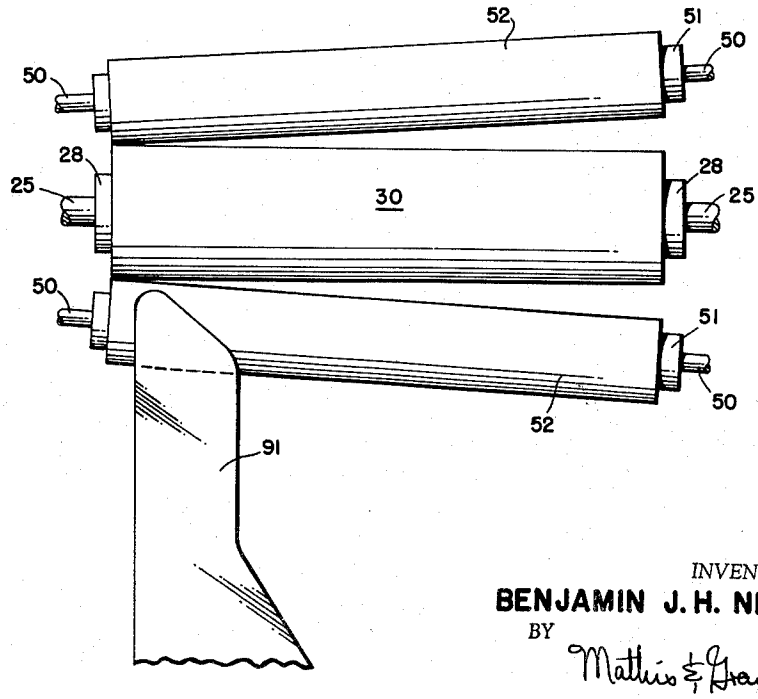


FIG 10



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3,194,151

CALENDER AND METHOD OF THREADING SAME

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Original application Dec. 4, 1961, Ser. No. 156,827. Divided and this application July 1, 1963, Ser. No. 292,804

6 Claims. (Cl. 100—35)

This application is a division of my co-pending application Serial No. 156,827, filed December 4, 1961, and entitled Paper Finishing Mechanism and Method, which application is a continuation-in-part of my prior application Serial No. 17,986, filed March 28, 1960, entitled Multi-Purpose Calender, and now abandoned.

The present invention relates to the calendering of paper, and more specifically to a particular technique of threading the web of paper into a calendering machine and to apparatus for practising such technique.

A principal object of the present invention is to provide a method for threading paper into a calender having a central roll and one or more auxiliary rolls positioned around the central roll, said method comprising skewing the auxiliary roll or rolls with respect to the central roll so that one end of each auxiliary roll is in nipping engagement with the central roll and the other end of each auxiliary roll is separated substantially from said central roll, and then threading the paper between the skewed rolls.

Another object of the present invention is the feature of assisting the threading of the paper web through the skewed rolls by the use of appropriately placed air jets.

A still further object of the present invention is the provision of a paper calendering mechanism that is both easier and safer to thread and is less subject to "jamming" than known conventional calendering mechanisms.

Other objects, features and advantages of the present invention include the provision of a paper calendering mechanism that includes a master roll and one or more auxiliary rolls positioned around the master rolls and journaled for rotation by means that are constructed to allow skewing of the auxiliary roll or rolls with respect to the central roll to facilitate the threading of the paper web into the calendering mechanism.

These and other objects, features and advantages of the paper calendering mechanism and techniques of the invention will be apparent from the following specific description of certain typical and therefore non-limitive embodiments of such techniques and mechanisms, taken together with the accompanying illustrations, wherein like letters and numerals refer to like parts, and wherein:

FIGURE 1 is an end elevational view of a specific embodiment of my invention in accordance with the preferred teachings thereof.

FIGURE 2 is a fragmentary plan view looking down on the calender and illustrates the central roll with the central section removed to more clearly depict the heating element in the roll.

FIGURE 3 on an enlarged scale, is a fragmentary end elevational view illustrating the means for adjusting the nip between the central roll and the auxiliary roll.

FIGURE 4 taken on line 4—4 of FIGURE 3, is a plan view looking down on the means for adjusting the nip between the central roll and the auxiliary roll.

FIGURE 5 is a fragmentary lateral cross-sectional view taken on line 5—5 of FIGURE 4 and illustrates the bearing means for maintaining the auxiliary roll in position in the calender frame.

FIGURE 6 is a schematic and elevational view illustrating the arrangement of the central calender roll and the three auxiliary rolls, and illustrates and shows the heating element in the central roll.

FIGURE 7 is a schematic diagram illustrating the hydraulic system for adjusting and controlling the pressures between each auxiliary roll and the central roll.

FIGURE 8 is a longitudinal diametrical cross-sectional view of another master roll and illustrates the details of construction of the same.

FIGURE 9 taken on line 9—9 of FIGURE 8, is a lateral cross-sectional view of master roll; and,

FIGURE 10 is a schematic plan illustrating the separation of the auxiliary rolls from the master roll for assistance in threading the paper through the calender.

Referring to the drawings, the calender 10 is shown to include a base 11. Supported on this base 11 is a roll frame 12. This roll frame 12 comprises two end members 13 and two side members. The upper edge of each end member 13 is recessed to receive bearing blocks and a top frame member 15. More particularly, the members 13 near their outer edges are stepped at 16. This step runs into an inwardly directed horizontal ledge 17. In the lower center portion of the member 13 is a slot having a bottom wall 18 and side walls 20. Each side wall 20 connects with the adjacent ledge 17 by means of curved wall 21. The top frame member 15 is in the configuration of a rectangular frame having longitudinal sides 22 and ends 23. In the central portion of the end 23 is a depending curved bearing support 24. Journalled in each of these two bearing supports 24 is a shaft 25. This shaft 25 is not a continuous shaft but is two independent shafts. In the support 24 is a drilled passageway 26 and in this passageway is a bearing 27. The end of each shaft 25 is journalled in said bearing 27.

On the inner end of each of the shafts 25 is a circular hub 28. This circular hub interfits with a hollow central roll 30. This roll is metal. In the interior of this roll is a heating element 31 in the configuration of a U-bend. The ends of this heating element are in an electrical adapter base 32 at the left of the roll as illustrated in FIGURE 2.

On the outside left face of the frame member 23 and overlying the central part of the depending support 24 is a commutator 33. This commutator 33 is attached to the frame member 23 by screws 34. Leading into the commutator 33 are electrical wires 35 and 36. The shafts 25 are hollow. The commutator 33 connects with the electrical adapter 32 through the hollow shaft 25 by suitable electrical connectors.

The top frame member 15 is supported on the upper and outer edges of the end members 13. The lower surface of the upper member 15, the step 16 and the ledge 17 define a guide channel for a bearing block 40. The bearing block has a main body 41. In the bottom surface is a groove 42 for interfitting with the ledge 17, and in the upper surface is a groove 43 for interfitting with the lower surface of the end member 23. On the outer edge of the block is an outwardly directed lug 44. And, projecting out of the lug 44 is a pin 45 having a drilled passageway 46 therein.

In the body 41 is a lateral drilled passageway 47. In this passageway is a bearing 48.

As is seen in FIGURE 2 there are three sets of bearing blocks with two blocks in each set. Also the two blocks in each set are aligned with one block associated with one end member and the other block with the other end member.

Journalled in the bearings 48 of a set of the blocks is a shaft 50. The central part of this shaft is of a larger cylindrical configuration 51. Surrounding the configuration 51 is a cylindrical fibrous mat 52 of the type em-

ployed in super-calender rolls. In fact, mat 52 makes this roll a supercalender roll.

On the upper and outer surface of the end member 13 and adjacent to the step 16 is a lug 49. In this lug is a central passageway 53. Positioned in the passageway 53 is a hydraulic cylinder 54 having a plunger 55.

The hydraulic cylinder 54 can be positioned in the bearing block by means of a pressure fit, a set screw or by welding.

The plunger 55 contacts the outer face of the lug 44 so as to move inwardly the bearing block 40.

On the outer edge of the lug 49 is a pin 56. A spring 57 connects the two pins 45 and 56 so as to pull the block 40 toward the lug 49.

On each cylinder 54 is an adapter 60. This adapter connects with a pipe or tube 61. In each pipe 61 is a pressure gauge 62 and a valve 63. The lines 61 connect with a main feeder line 64. In each line 61 the gauge 62 is positioned between the hydraulic cylinder 54 and the main line 64, and the valve 63 is positioned between the gauge 62 and the main line 64. The main line 64 branches into a reservoir line 65. This line connects with a hydraulic fluid reservoir 66. In the line between the reservoir 66 and the main line 64 is a valve 67.

The main line 64 also connects with a pressure line 68. A motor and pump combination 70 connects with the pressure line. In the line 68 between the main line 64 and the pump 70 are a valve 71 and a pressure gauge 72.

The motor and pump combination 70 are electrically actuated and controlled. There are two lead wires 73 and 74 leading to the motor 70. In the lead 73 is a switch 78. It is to be understood that connecting with the wiper 77 and the switch 78 is an appropriate source of electrical energy.

In the lead 35 there is a rheostat 75 having a number of resistances 76 and a wiper 77. In the lead 36 there is a switch 79.

In regard to details of construction of the calender it is seen that the end members are connected at their base by lower braces 80. These members are connected at their upper edges by the top frame member 15. The upper edges of the end members 13 are drilled and tapped as at 82. In the end 23 is a drilled passageway 83. The tapped hole 82 and the drilled passageway 83 are aligned. A bolt 84 is screwed into the tapped hole 82 so as to firmly position the frame members 15 on the roll frame 12. The central roll 30 can be removed by unscrewing the bolts 84 and removing the top frame member 15.

From this specific description of the invention it is seen that there is a central heated roll 30 and three auxiliary rolls 52. Referring to FIGURE 2 it is seen that the right end of the shaft 25 of the central roll 30 connects with an output shaft 85 of a motor 86. This motor drives the roll 30. The motor connects with an appropriate source of electrical power by means of wires 87 and 88. The central roll is of metal and may be heated to an appropriate temperature of 250–500° F.

The pressure between the central roll and the auxiliary can be readily varied. Also, the pressure between one auxiliary roll and the central roll can be different than the pressure between another auxiliary roll and the central roll.

Referring to FIGURE 6 it is seen that paper 90 is threaded between the three auxiliary rolls 52 and the central roll 30. As seen in this figure the central roll 30 rotates in a counterclockwise direction while the three auxiliary rolls rotate in a clockwise direction.

In FIGURE 10, with reference to the threading of paper in the machine, it is seen that with my particular calender 15 it is possible to move and skew the fiber rolls 52 with respect to the main metal roll 30. This is possible because of the bearing structure. As a result the fiber rolls are at an angle with respect to the master roll. With the fiber rolls being spaced apart from the master roll it is possible to thread the paper 90 in the calender. To assist the threading of the paper 90, the paper is slit so as to have a thin leading edge 91. The leading edge 91 goes between the roll 52 and the roll 30. With the paper firmly in place in the calender, the leading edge 91 broadens out so that the paper becomes the full desired width. As used throughout this description and in the claims the expression "nipping engagement" means that actual contact is made between one end portion of the positively driven master or central roll 30 and the adjacent end portion or portions of the auxiliary roll or rolls 52.

To also assist in the threading of paper in the calender, there are provided jet air ducts. It is seen that, under the right-hand fiber roll 52, there is a jet air duct 92. This air duct is underneath and to the right of this particular fiber roll and directs a stream of air somewhat tangentially to the left so as to direct the paper coming off the roll in a leftward direction. Positioned above and to the right of the metal roll 30 is an air duct 93. This air duct 93 is substantially over the nip between the right-hand fiber roll 52 and the metal roll 30. It directs the air in two directions: a downward direction toward the nip and a left-hand and downward direction over the top of the metal roll 30. Underneath the left-hand fiber roll 52 is an air duct 94. This air duct 94 is also to the left of the nip between the metal roll 30 and the lower fiber roll 52. The air duct 94 directs air in a leftward direction and toward the nip between the metal roll 30 and the lower fiber roll 52. To the left and somewhat below the center of the lower fiber roll 52 there is an air duct 95. This duct directs a jet stream of air upwardly and to the right and substantially tangentially to the surface of the roll 52 so as to direct the paper on the roll toward the metal roll 30. Also, the duct 95 directs air upwardly toward the nip between the metal roll 30 and the left-hand fiber roll 52. Underneath the left-hand fiber roll 52 is an air duct 96. This air duct directs air upwardly and to the right toward the metal roll 30 so as to force paper toward the metal roll 30. Also, the air duct 96 directs air in an upward and left-hand direction and substantially tangentially to the left fiber roll 52. This stream of air tends to force the paper coming from the fiber roll 52 in an upward direction.

As previously stated, in the conventional calender and supercalender, a number of workmen have lost and lose fingers in the threading of paper between the rolls. In threading the paper the workman stands back and grabs a wad of paper and throws this wad of paper in the opening. If he does not let go of the wad of paper in sufficient time, he may get his finger caught and then have one or more fingers crushed. It is seen that, with my machine, there is provided a relatively simple and safe manner of threading paper between the rolls. In fact, it is difficult to see how a person could lose a finger in the threading of my calender.

In FIGURE 8 there is illustrated another master metal roll 100. This roll comprises a first hub 101 and a second hub 102. The exposed face of the hub has a shoulder 103 and which shoulder 103 tapers down to a shaft or axle 104. In the inner or hidden face of the hub 101 there is a peripheral recess 105. This recess is in the outer edge of the hub. In the more central portion of the hub 101 there is a circular recess 106. Between the outer recess 105 and the circular groove 106 there is drilled in the hub a plurality of holes or openings 107. In the hub 101 are a plurality of vent holes 108. These vent holes 108 are between the shoulder 103 and the circular groove 106. Also, drilled in the axle 104 and the shoulder 103 is a recess 110.

In the hub 102, and on the exposed face, there is a shoulder 111. The shoulder 111 is reduced to an axle 112. In the axle 112 and the shoulder 111 there is a drilled recess 113. In the inner or hidden face and at the outer periphery there is a recess 114. This recess 114 corresponds to the circular recess 105 in the hub 101. Also, there is a circular recess 115 in the hub 102. The recess 115 corresponds to the recess 106 in the hub 101. There

are vent holes 116 in the hub 102. These vent holes are between the shoulder 111 and the circular recess 115.

In the circular recesses 106 and 115 there is positioned a cylinder 117. The cylinder 117 has the outer wall recessed at 118 so as to receive in an assembled position a gasket 120 or an O-ring 120. In the end walls of the cylinder 117 are a number of drilled tapped passageways 121. In the hubs 101 and 102 are a number of drilled holes 122. The drilled holes 122 are aligned with the tapped holes 121. As is readily appreciated, bolt 123 can be inserted through the holes 122 and screwed into the tapped holes 121. In this manner the hubs 101 and 102 are positioned with respect to the cylinder 117.

In the circular recess 105 there is positioned a metal cylinder 124. It is seen that this cylinder 124 is larger in diameter than the cylinder 117. The inner-outer edge of the cylinder 124 is recessed at 125. The roll 100 in assembled position has an O-ring 126 in this recess 125. The ends of the cylinder 124 have a plurality of tapped holes 127. The hubs 101 and 102 have a plurality of drilled passageways 128. It is to be understood that the tapped holes 127 and the drilled passageways 128 are in alignment. A bolt 130 projects through the hole 128 and is screwed into the tapped hole 127. It is to be realized that by tightening the bolt 130 the hubs 101 and 102 are drawn closer together and the O-ring 126 is squeezed so as to function as a gasket.

In the hub 101, and positioned between the holes 122 and 128 there are a plurality of drilled holes 131. Inserted in these holes is an electric heating element 132. On the outside of the hub 101 there is attached electric lead ends 133 and 134. In the toroidal space between the hubs 101 and 102 and the cylinders 117 and 124 there may be a compound which can withstand relatively high temperature without decomposing, having a low coefficient of expansion and which is a liquid at the higher temperatures, and is perfectly a liquid at room temperature. One such compound is tetraiodotetrasilane. The reason for a liquid in the toroidal space is that better results are achieved by having a liquid in contact with the cylinder 124 instead of depending upon convection from a gas and radiation.

The vent holes 108 allow the pre-passage of air in the central part of the metal roll 100. A beneficial result of this is that there is not created undue pressure due to the expansion of heated gas inside of the roll.

It is noted that the shafts 104 and 112 have drilled holes 110 and 113. This is so that the cooling liquid may be pumped into the drilled holes and thereby cool down the hubs. A longer life is realized by this.

Although I have described my invention as having a central roll and three auxiliary rolls, it is to be realized that in certain instances it may be desirable to have a central roll and only one or two auxiliary rolls or a central roll and more than three auxiliary rolls.

From the foregoing, various further modifications, adaptations and applications of the present invention will be apparent to those skilled in the art to which the invention is addressed, within the scope of the following claims.

What is claimed is:

1. A method for threading paper into a calender having a master roll and at least one auxiliary roll positioned around the master roll, said method comprising:

(a) skewing the auxiliary roll with respect to the master roll so that one end of the auxiliary roll is in nipping engagement with the master roll and the other end of such auxiliary roll is separated substantially from said master roll, and

(b) positively driving said master roll, with said master roll in turn frictionally driving the auxiliary roll by virtue of the nipping engagement of the said one end of the said auxiliary roll with the master roll, and then

(c) threading the paper between the skewed rolls.

2. A method for threading paper into a calender in accordance with claim 1, comprising assisting the threading of the paper through the skewed rolls by air jets.

3. A method for threading paper into a calender having a positively driven central roll and a plurality of auxiliary rolls positioned around the central roll, said method comprising:

(a) skewing the auxiliary rolls with respect to the central roll so that one end of each auxiliary roll is in nipping engagement with and frictionally driven by the central roll and the other end of each auxiliary roll is separated substantially from said central roll, and then

(b) threading the paper between the skewed rolls.

4. A method for threading paper into a calender in accordance with claim 3, comprising assisting the threading of the paper through the skewed rolls by air jets.

5. A calender for finishing paper comprising:

(a) an elongated, cylindrical central roll;

(b) first frame means journaling said central roll;

(c) a plurality of elongated, generally cylindrical auxiliary rolls arranged around the periphery of said central roll;

(d) second frame means journaling said auxiliary rolls;

(e) means urging one end of each auxiliary roll in nipping engagement with the central roll and spacing the opposite end of each said auxiliary roll away from said central roll, so as to skew the said auxiliary rolls with respect to the central roll; and

(f) means for positively driving said central roll, with said central roll in turn frictionally driving the auxiliary rolls by virtue of the nipping engagement of the said one end of each said auxiliary roll with the central roll.

6. A calender in accordance with claim 5, further comprising air jet means located on the infeed side of each assembly of said central roll and an auxiliary roll, said air jet means being positioned to assist the threading of the web of paper to be calendered into said calender.

References Cited by the Examiner

UNITED STATES PATENTS

162,635	4/75	Edwards et al.	100—168
665,472	1/01	Savery	100—162
1,054,721	3/13	Simon.	
2,190,941	2/40	Gardner	100—174
2,545,921	3/51	Goodwillie et al.	100—168 X

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