United States Patent [19]

Baba et al.

[11] **3,744,110**

[45] **July 10, 1973**

[54] **SIZING AND DRYING SECTIONAL WARPING MACHINE**

[75] Inventors: **Hirohito Baba**, Osaka; **Toshiyuki Takase**, Nishiwaki, both of Japan

[73] Assignees: **Baba Snagyo Kikai Kabushiki Kaisha**, Osaka-Fu; **Naigai Orimona Kabushiki Kaisha**, Nishiwaki-shi, Hyogo-ken, Japan

[22] Filed: **Oct. 1, 1971**

[21] Appl. No.: **185,661**

[52] **U.S. Cl.** **28/28**

[51] **Int. Cl.** **D03j 1/02**

[58] **Field of Search** 28/28; 242/131

[56] **References Cited**

UNITED STATES PATENTS

3,441,991 5/1969 Bryan 28/28

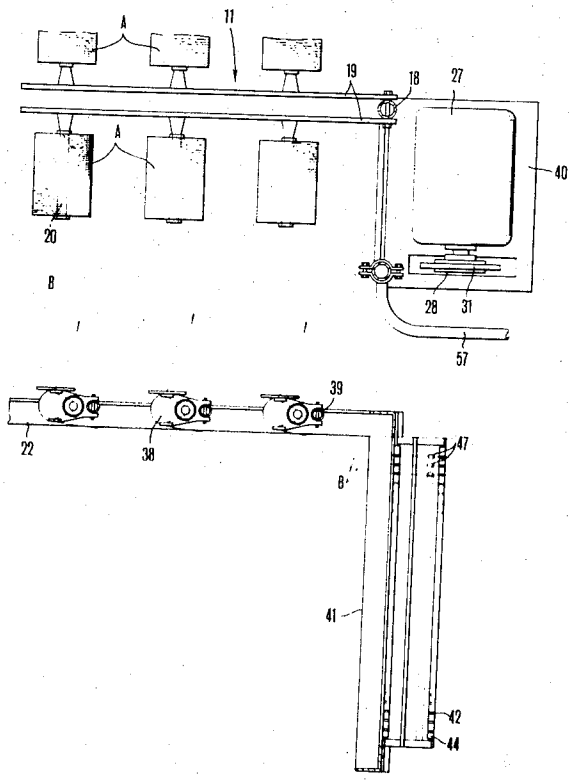
Primary Examiner—Louis K. Rimrodt

Attorney—Wenderoth, Lind & Ponack

[57] **ABSTRACT**

A sizing and drying sectional warping machine. The machine has a set of plural creels movable for replacement in a direction intersecting the travelling direction of the warp. A sizing apparatus for the warp passing between the front sectional warping machine and the winding device and a drying apparatus are provided and the portions of both the sizing and the drying apparatus through which the warp passes are constructed so as to have one-end-support, so that the warp can be loaded while holding the warp passing through the front reed on the side as it is. While sizing, drying and sectional warping are carried on in one creel, in the other creel replacement of the bobbin and the piece of warp are performed to prepare for next operation. By replacement of the creel the next sizing, drying and sectional warping operation can be carried out immediately.

4 Claims, 31 Drawing Figures



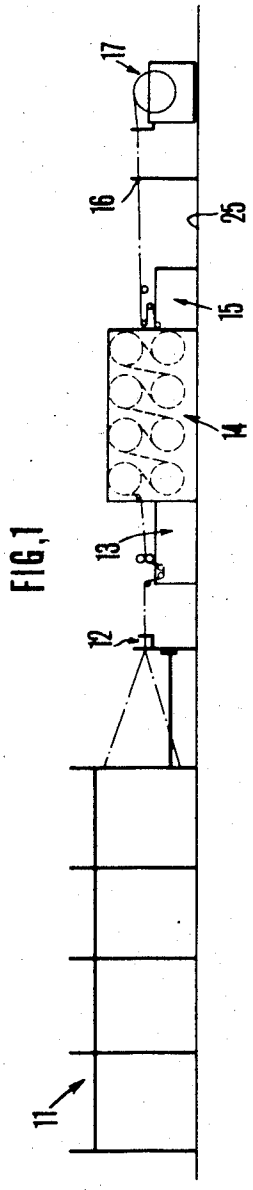


FIG. 1

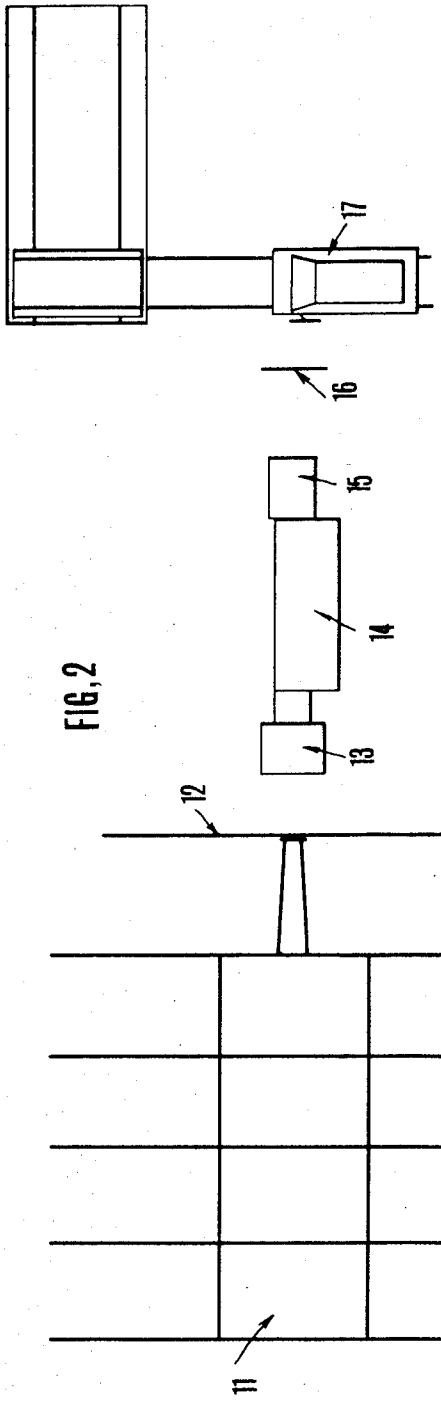


FIG. 2

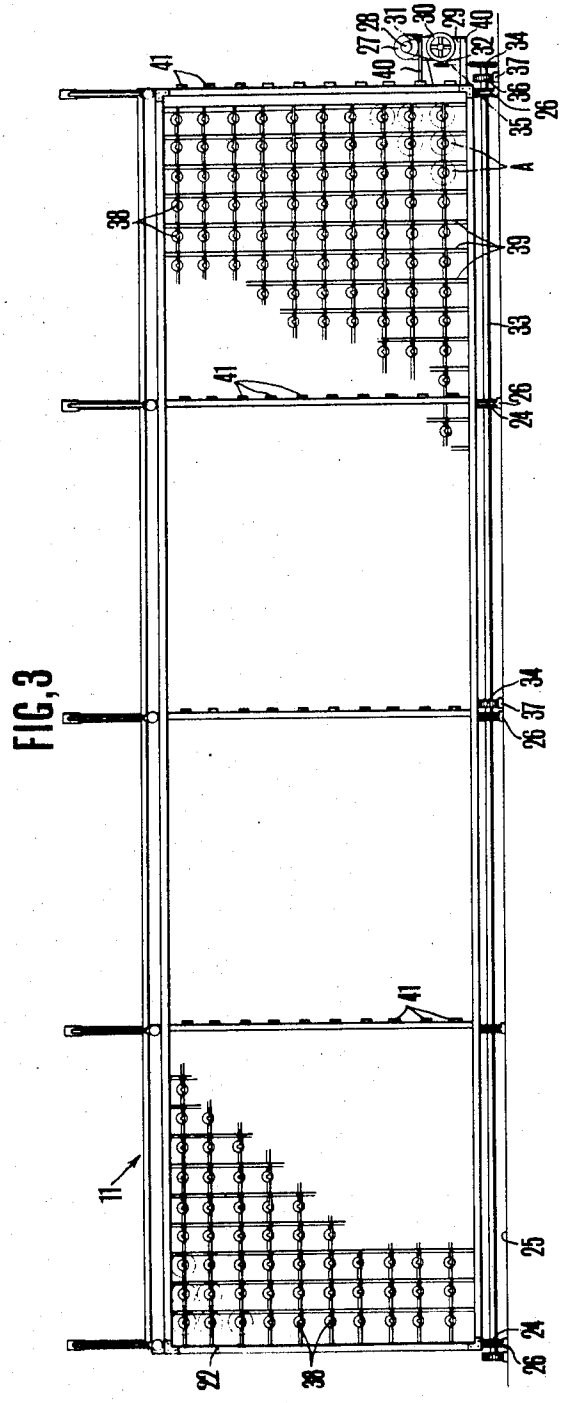
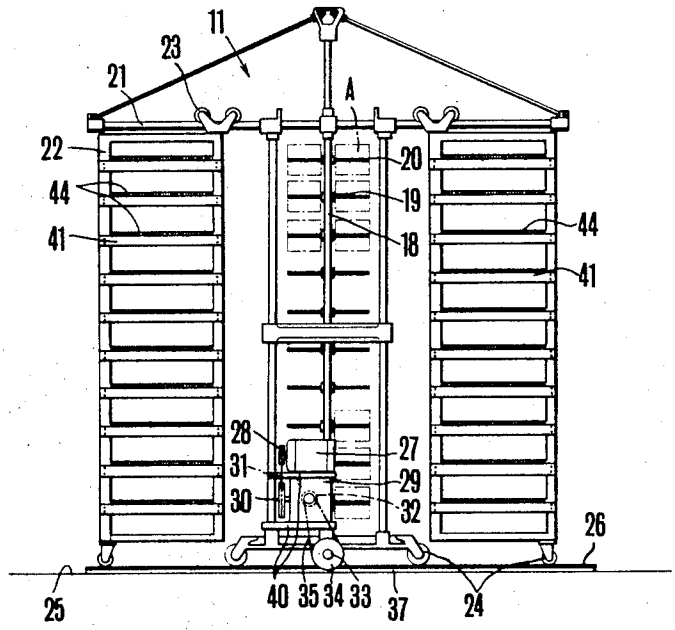
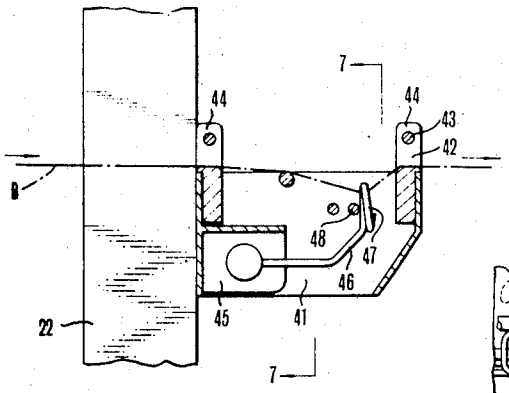

41
27
28
31
30
29
40
34
32
37
36
35
26
A
38
39
33
41
26
24
34
37
26
41
11
25
24
26
22
38

FIG. 3

FIG,4



FIG,6



FIG,7

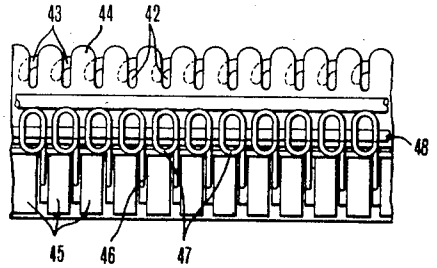


FIG. 5

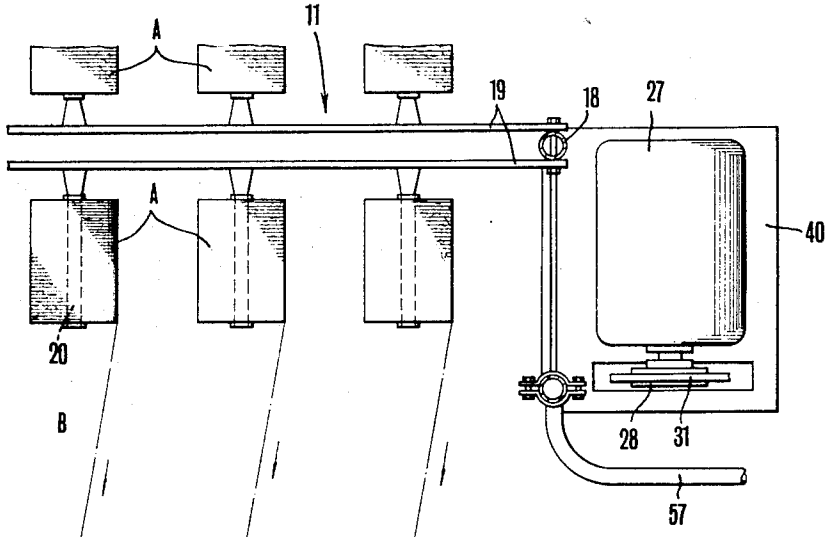


FIG. 8

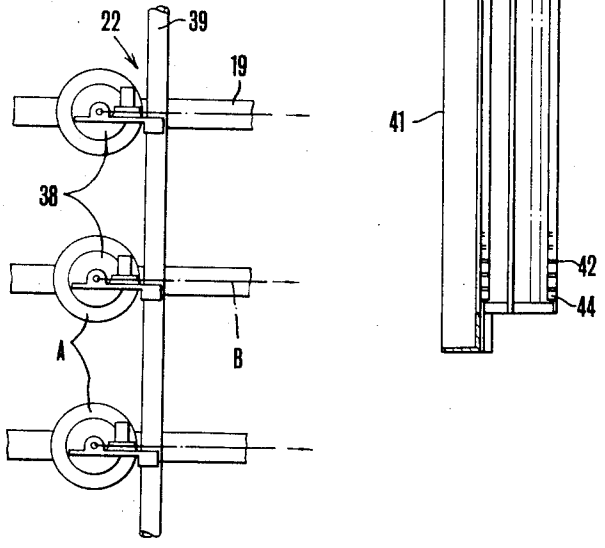


FIG. 9

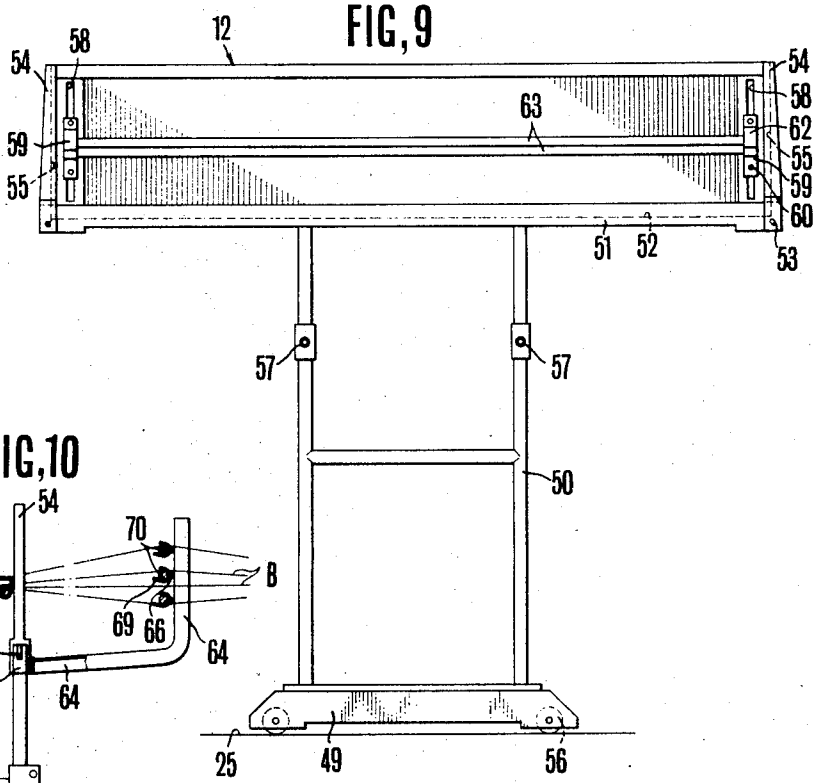
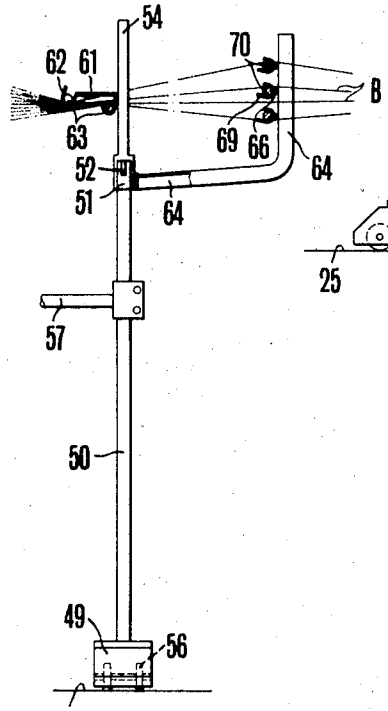
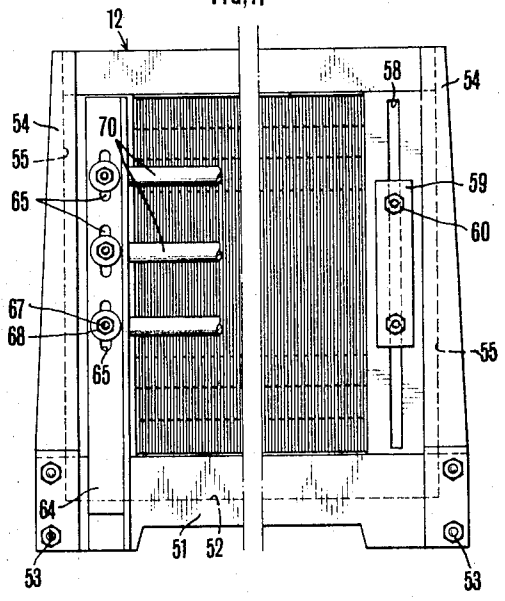

12
58
54
63
59
55
62
60
53
51
52
57
50
25
49
56

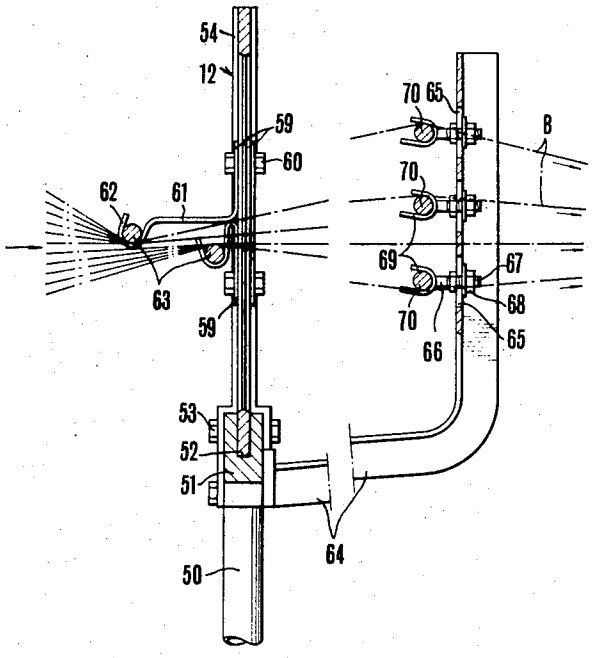
FIG. 10


54
62
61
70
B
63
69
66
64
52
51
57
50
49
56

FIG,11


12
58
54
54
70
55
65
59
60
67
68
65
55
64
51
52
53
53

FIG,12


54
12
59
60
62
61
63
59
53
52
51
50
64
70
65
B
70
69
67
68
70
66
65

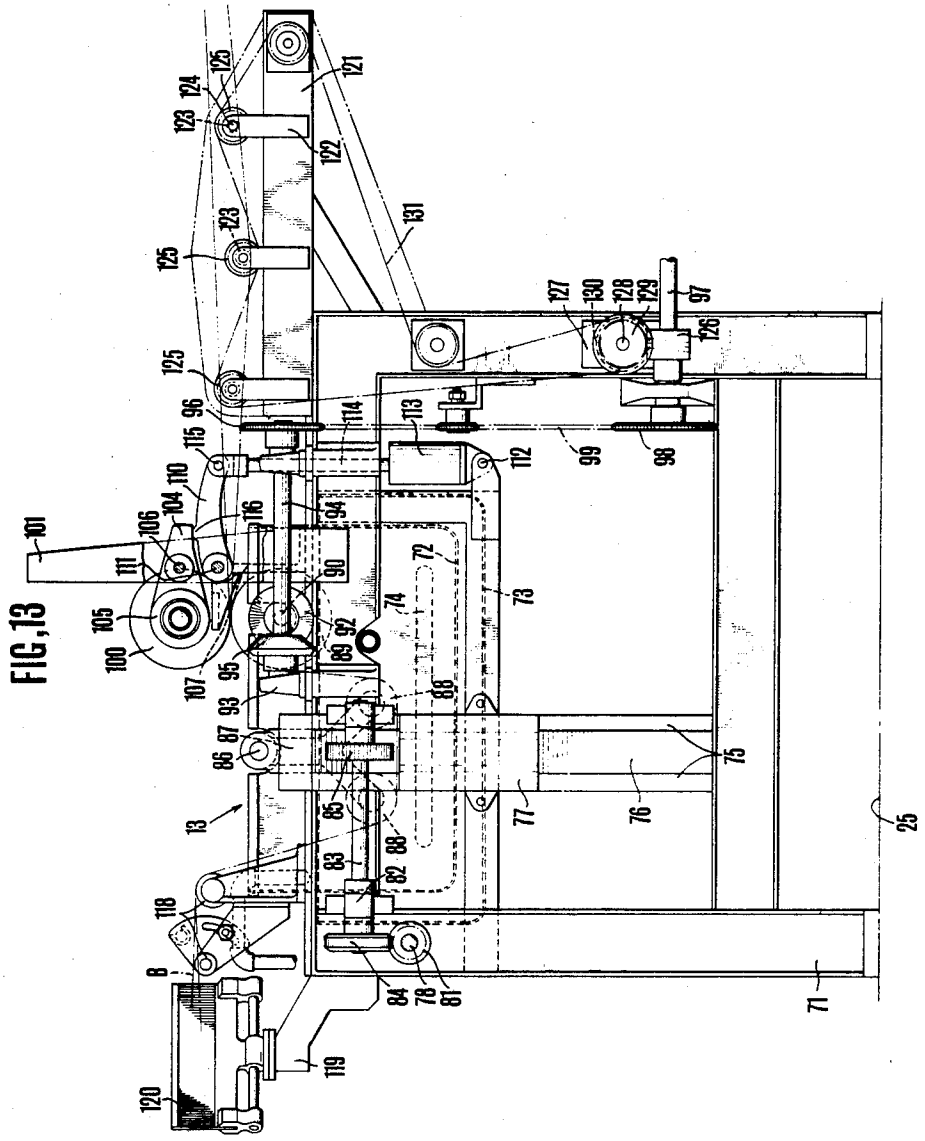
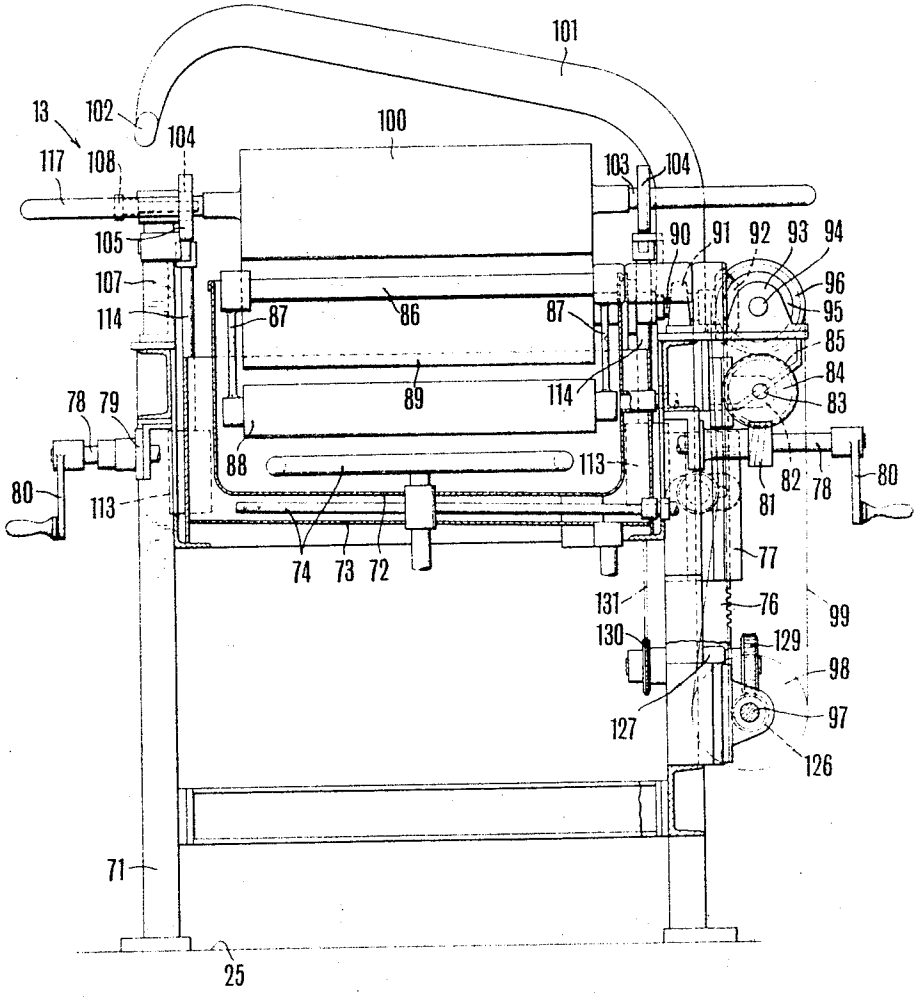

101
111
104
106
110
115
96
125
125
123
124
125
121
122
123
131
127
130
128
129
97
126
114
113
112
99
98
116
94
72
73
74
90
92
89
105
100
107
95
93
87
86
88
85
83
82
13
118
8
84
78
81
119
120
77
76
75
71
25

FIG. 13

FIG,14


101
13
102
104
100
117
108
103
104
105
90
91
92
93
94
107
96
114
87
86
87
95
85
89
114
84
78
79
83
88
113
82
78
80
80
113
81
74
73
72
77
131
76
99
130
129
98
127
97
126
71
25

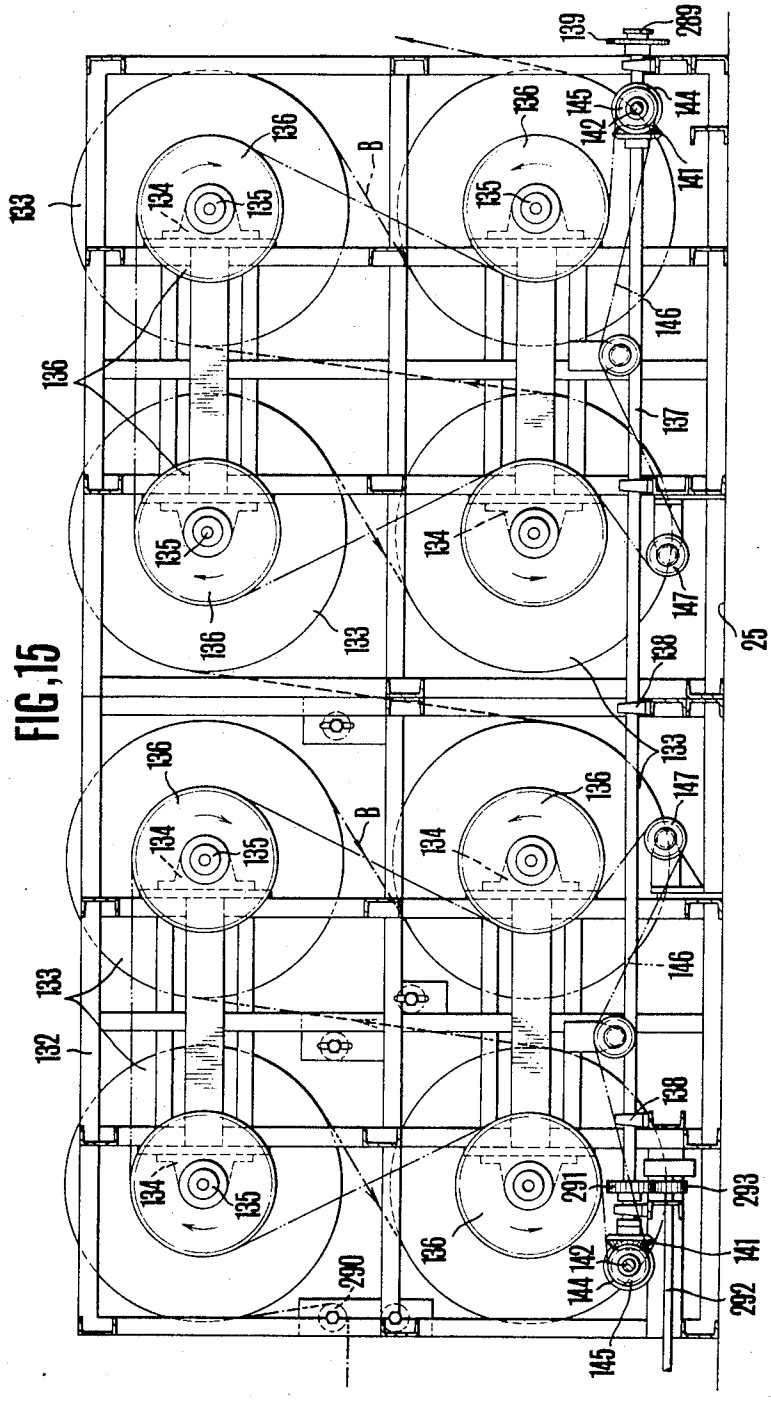
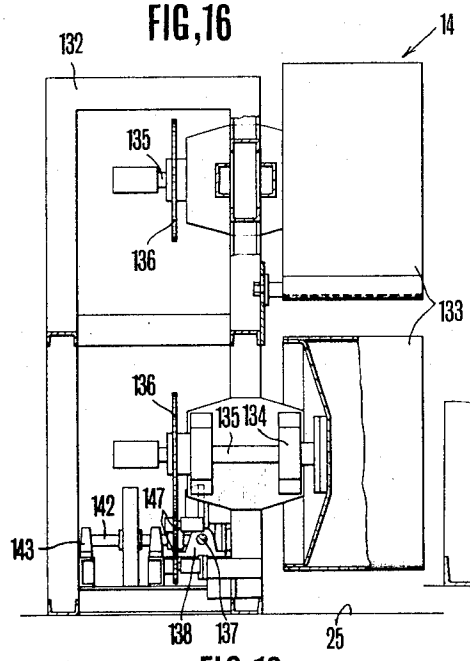
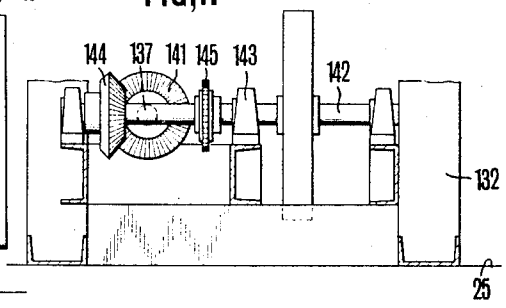

139
289
136
145
142
144
141
133
134
135
B
146
137
147
25
138
132
291
293
292
290

FIG. 15

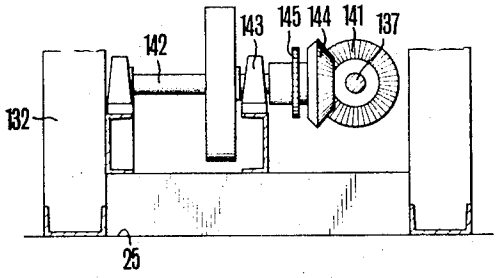
FIG,16



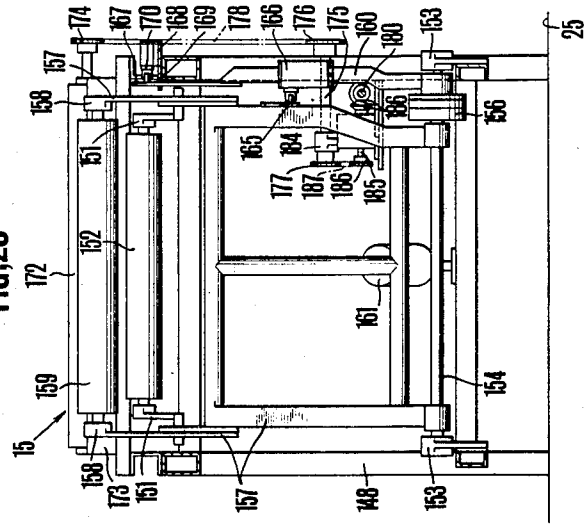
FIG,17



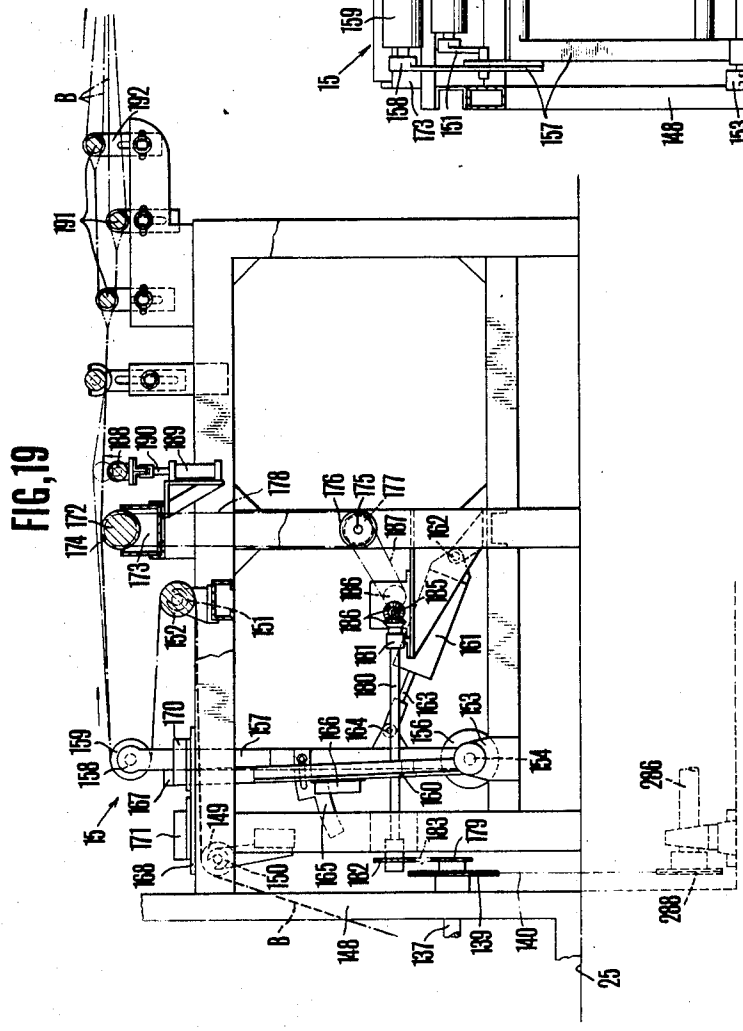
FIG,18



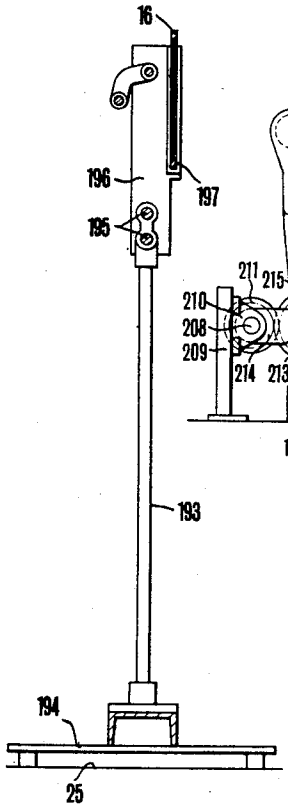
FIG,20



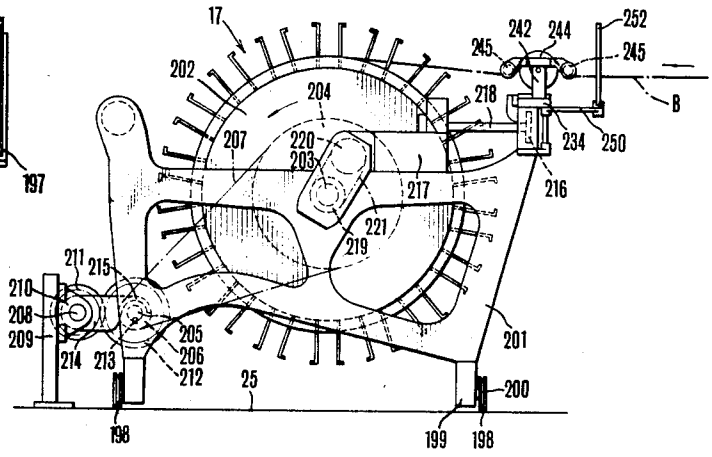
FIG,19



FIG,21



FIG,23



FIG,25

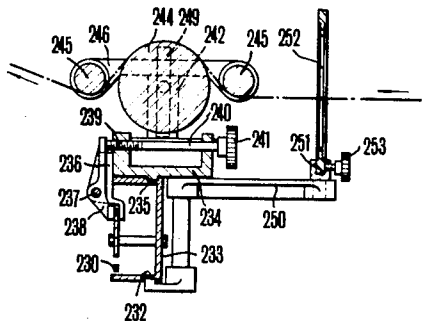


FIG. 22

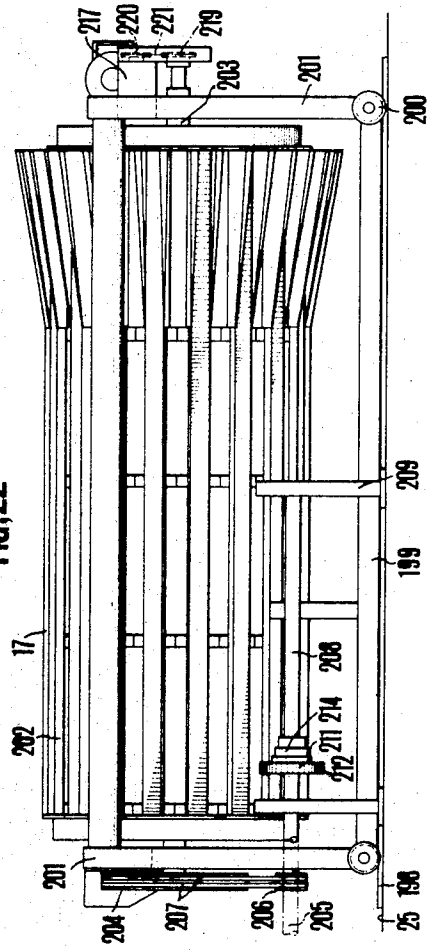

217
220
221
219
203
201
200
209
199
17
208
202
214
211
212
201
198
204
207
206
205
25

FIG. 24

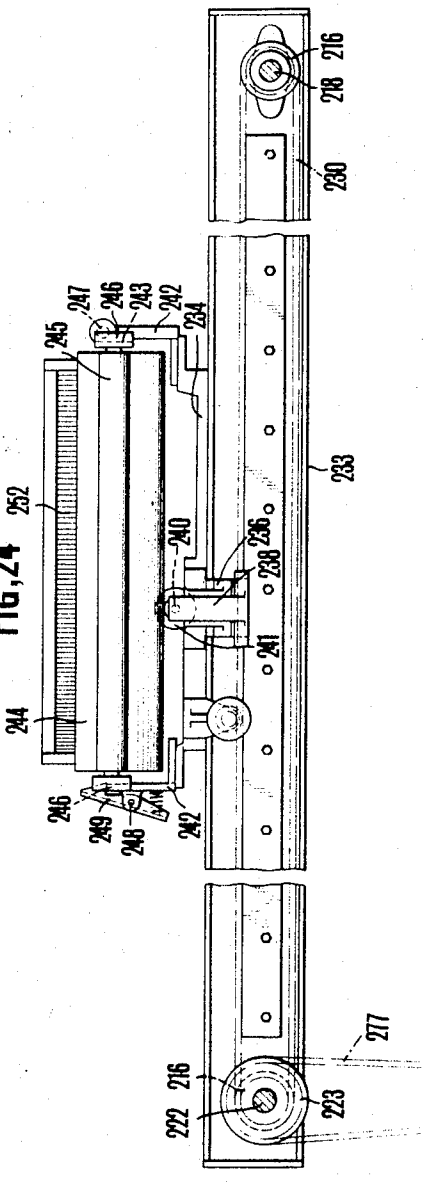

216
218
230
247
246
243
242
234
245
233
252
240
236
238
241
244
246
249
248
242
277
216
222
223

FIG.26

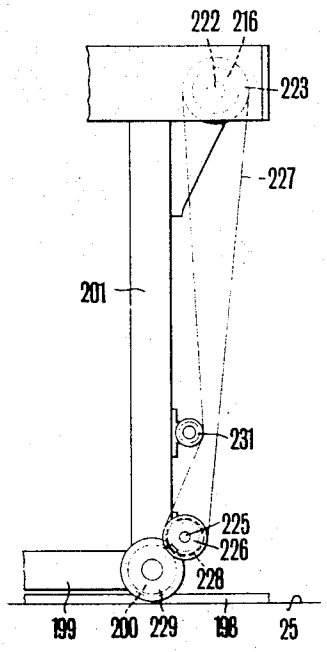


FIG.27

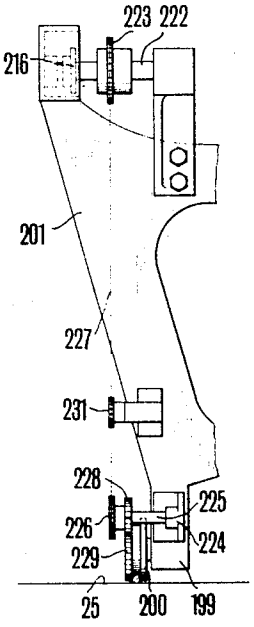
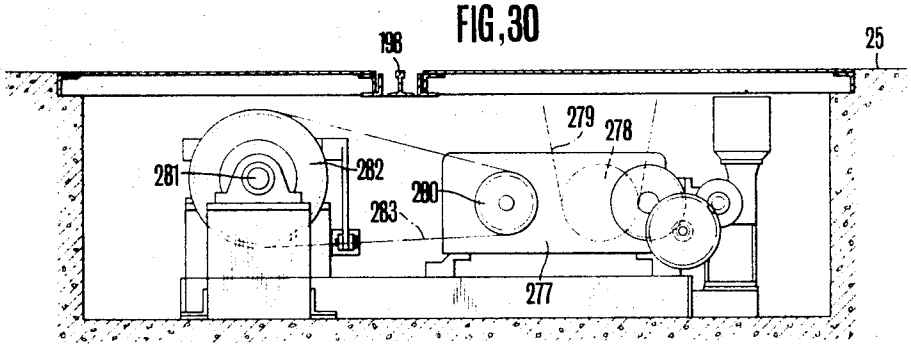


FIG.30



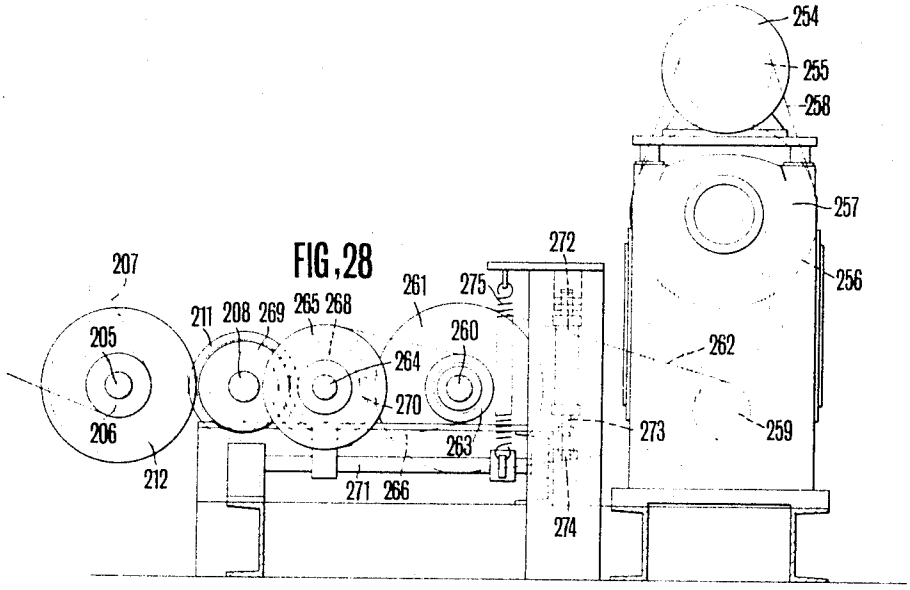

254
255
258
257
256
207
205
206
212
211
208
269
265
268
261
275
272
260
264
270
262
273
259
263
271
266
274

FIG. 28

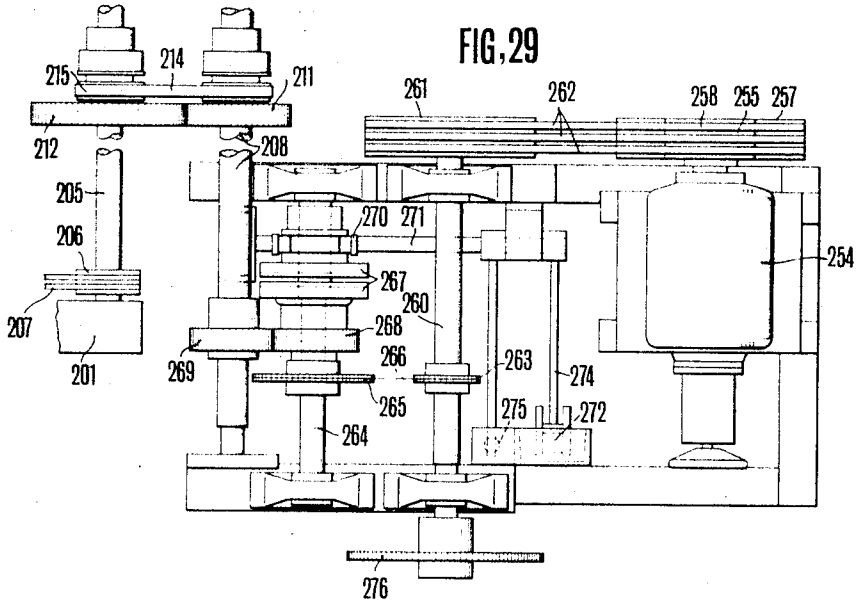

215
214
211
212
208
205
206
207
201
269
261
262
258
255
257
270
271
254
267
260
268
266
263
274
265
275
272
264
276

FIG. 29

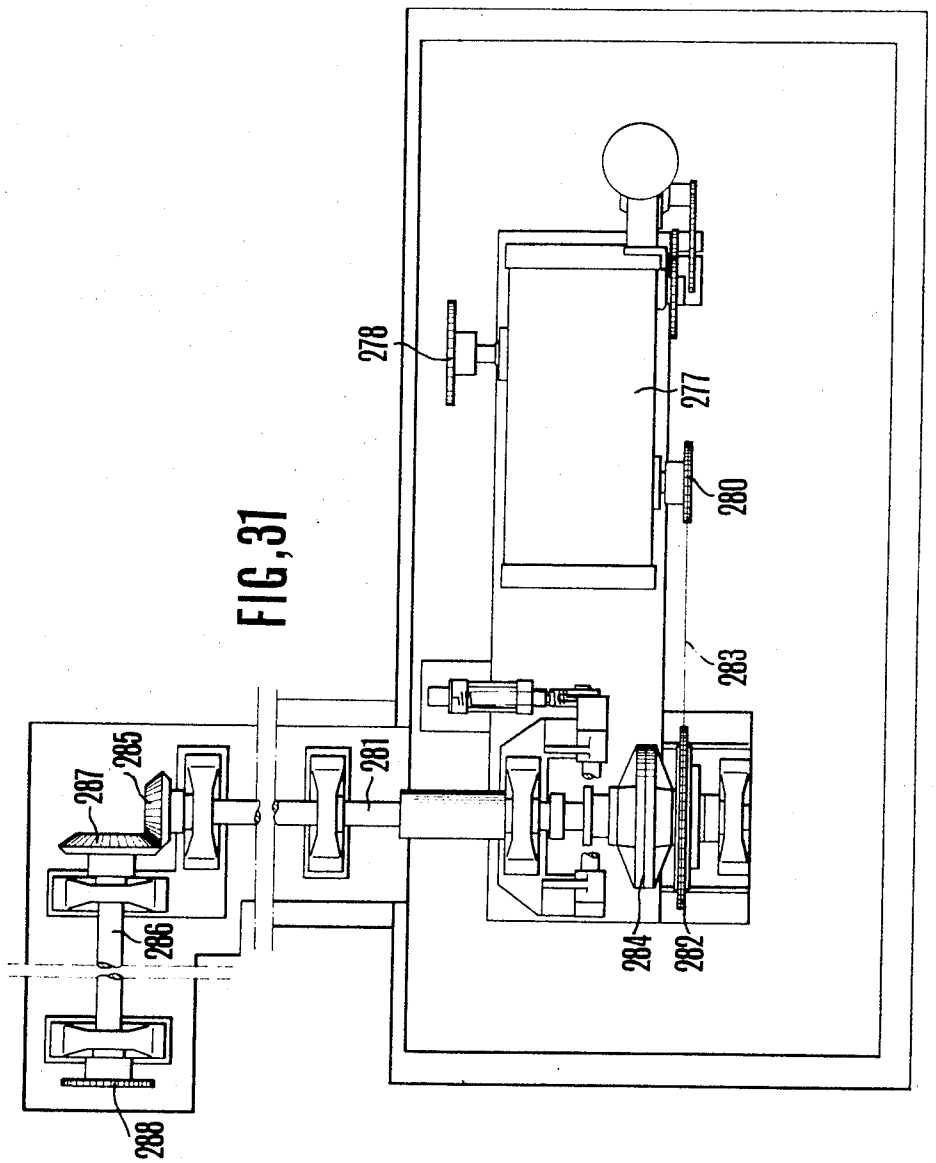


FIG. 31

SIZING AND DRYING SECTIONAL WARPING MACHINE

The present invention relates to a sizing and drying sectional warping machine.

Heretofore, yarn warp has been dyed previously in hanks, sized manually and dried in the sun (called a hank sizing process).

The hanks of warp yarn are wound upon a wrap beam, the beam is arranged on a creel and then wound on a drum, but this method and the defect of bringing about a reduction of operation efficiency due to excessive labour and time loss since the method must go through various processes.

The object of the present invention is to entirely mechanize the sizing process of warp previously dyed by eliminating manual work and to provide a device wherein sizing and drying apparatus are installed between the bobbin creel and the sectional warping and winding. The sizing process is completed during the sectional warping operation and accordingly, the hank sizing process is completely omitted and the warp from the creel may be replaced very easily.

The object abovementioned is accomplished by the parts and combinations constructing the present invention, and an embodiment thereof will now be illustrated with the accompanying drawings and the detailed explanation described hereinafter.

FIG. 1 is a side view of the sizing and drying sectional warping machine,

FIG. 2 is a plan of the same above,

FIG. 3 is an enlarged side view of the creel,

FIG. 4 is an enlarged front view of the same creel,

FIG. 5 is an enlarged plan of the same creel, partially broken,

FIG. 6 is a longitudinally sectioned side view of a switch attached to the creel,

FIG. 7 is a section along the line 7—7 in FIG. 6,

FIG. 8 is a side view of warp guide attached to the creel,

FIG. 9 is a back view of the rear reed,

FIG. 10 is a side view of the said above, partially broken,

FIG. 11 is an enlarged front view of the same rear reed,

FIG. 12 is a longitudinally sectioned side view of the principal part of the same above,

FIG. 13 is a side view of the sizing apparatus,

FIG. 14 is a longitudinally sectioned back view of the principal part of the same above,

FIG. 15 is a side view of the drying apparatus,

FIG. 16 is a longitudinally sectioned back view of the principal part of the same above,

FIG. 17 is a longitudinally sectioned back view showing the drive transmission mechanism of the drying apparatus,

FIG. 18 is a front view of the same above,

FIG. 19 is a partially longitudinally sectioned side view of the tension controlling apparatus,

FIG. 20 is a longitudinally sectioned back view of the same above,

FIG. 21 is a longitudinally sectioned side view of the front reed,

FIG. 22 is a front view of the winding warping drum,

FIG. 23 is a side view of the same above,

FIG. 24 is a front view showing the principal part of the same above,

FIG. 25 is a longitudinally sectioned side view of the principal part of the same above,

FIG. 26 is a back view of the drive transmission mechanism of the same above,

FIG. 27 is a side view of the same above,

FIG. 28 is a side view of the driving part,

FIG. 29 is a plan of the same above,

FIG. 30 is a side view of the same above,

FIG. 31 is a plan of the same above.

Element 11 in FIG. 1 and FIG. 2 is a creel and in front of the creel are arranged successively the rear reed 12, the sizing apparatus 13, the drying apparatus 14, the tension controlling apparatus 15, the front reed 16 and the winding warping machine 17 in a straight line.

The creel 11 mentioned above is shown in FIG. 3 through FIG. 8, in the creel 11 the horizontal members 19. In required steps and having horizontal axis are installed between the post member 18 facing each other front and rear and the spindle 20 the axis of which is horizontal is disposed insertedly at an interval lengthwise along both sides of the horizontal member 19, the bobbin A is supported fittedly on this spindle 20. 21 is rail extended transversely from the upper end of the post member 18 with the axis thereof being horizontal. On this rail 21 are embarked the wheels fixed on the front and rear upper edges of the frame 22 and supported movably so that the interval of the frame may be adjusted with respect to the side of the post member 18 when required. In addition, each of the wheels 24 fixed at the lower edges of the post member 18 and of the frame 22 is embarked on a plurality of rails 26 laid on the floor 25 to cross said creel 11. 27 is a motor mounted on the base plate at the front lower portion of the front side post member 18. The belt 31 is stretched around the pulley 28 of the motor 27 and the pulley 30 on the input side of the reduction gear mounted on the base plate 40 right below the motor 27. Chain the chain 35 is wound around the sprocket 32 on the output side of the reduction gear 29 and the sprocket 34 mounted on the shaft 33 of said wheel 24 to drive the shaft 33, and the pinion 36 mounted on the shaft 33 is meshed with the rack installed on the floor 25 to be parallel with the rail 26 and thereby the creel 11 is movable outward with the motor 27.

38 is a guide fixed to direct forwards by bending at about 90° after drawing to the side of the frame 22 the warp yarn B on bobbin A supported with the spindle 20 on the juxtaposed vertical rod 39 arranged on the frame 22 to correspond to each of said spindles 20 on the frame 22. 41 is an arm extended sideways horizontally with a required interval between the front and rear of the outside of the frame 22, and on the upper edge of the arm 41 are arranged V-shaped notches 42 to hold each warp B bent and directed forward by the guide 38 at spaced intervals. Guide 44 having an arc-shaped rod 43 directed outward from a side of the notch 42, prevents the warp B from floating from the opening at the upper edge of the notch 42. On the arm 41 located at the outermost end are arranged guides 44 in two lines front and rear. The number of notches 42 on the arc-shaped rod of the guide 44 increases from the rearmost end to the outer-most end. In addition, between the guides 44 of the arm 41 at the outermost end are put a number of microswitches equal to the number of notches 42. The warp B travelling between said guides 44 is passed through the annular rod 47 at the

end of the operation rod **46** of the microswitch **45** and the operation rod **46** rises to contact the stopper **48** by the tension of the warp B. However, in the event that the warp B is broken, the operation rod **46** is turned downward by its own gravity, and the sizing apparatus **13**, the drying apparatus **14** and the winding warping machine **17** are connected electrically to stop simultaneously by the closing of the microswitch **45**.

The rear reed **12** shown in FIG. **9**, FIG. **10**, FIG. **11** and FIG. **12** is supported by fixing the horizontal member **51** parallel with the rail **26** on the upper end of the post **50** erected upright on the base plate **49** parallel with the rod **26**, fitting the lower edge of the rear reed **12** into the groove **52** provided between both ends at the upper edge of the horizontal member **51**, and removably attaching the lower end of the vertical member **54** to both ends of the horizontal member **51** with the clamping device **53** comprising bolts on which nuts are screwed. The edges at both ends of said rear reed **12** are then fitted into the grooves **55** provided between the upper and lower ends of the inner surfaces facing each other of both vertical members **54**.

Underneath the base plate **49** are disposed the wheels **56**. The post **50** and the front post member **18** of the creel **11** are joined together with the connecting rod **57**, and thereby the base plate **49** supporting the rear reed **12** travels together with creel **11**. **58** is an oblong hole both ends of which are located up and down at the edge of the rear reed **12**. **59** is a pair of plates belonging to the oblong hole **58** and are contacted to the front and rear surfaces of the rear reed **12**. Through the plates **59** and the oblong hole **58** is inserted the clamping device **60** comprising a bolt on which a nut is screwed and thereby the plates **59** are attached to be adjustable vertically. To the plate **59** located at the rear side of the rear reed **12** is fixed one end of plate member **61**, a set of which consists of upper and lower members. In the U-shaped portion **62** at the other end directed rearward is supported the end of the rod **63** the axis of which is horizontal, and thereby the warp B before passing through the rear reed **12** is collected in the center between the upper and lower portions of the rear reed **12** and between the rods **63**. **64** are arms directed forward from both ends of the front side of the horizontal member **51**. In the end portion directed upward of the arm **64** are formed the oblong holes **65** in three steps vertically, both ends of which are directed vertically. In the oblong hole **65** is inserted the screw threaded portion **67** of the end directed forward of the attaching shaft **66** and is attached with the nut **68** screwed on the screw-threaded portion **67**. In addition, on the end of the attaching shaft **66** is fixed a U-shaped rod **69** both ends of which are directed rearward, and thereby the rod the axis of which is horizontal is installed in the U-shaped rod **69** so that the warp B passing through the rear reed **12** is separated into several vertical steps as required with each of the rods **70**.

FIGS. **13** and **14** show the sizing apparatus **13**. **71** is a frame opened at the upper side thereof, arranged on the floor **25**. At the upper portion within the frame **71** are arranged respectively the sizing tank **72** opened at the upper edge thereof and the hot water tank **73** encircling the outside of the sizing tank **72** from the lower side thereof to heat the sizing tank **72** and within both tanks is arranged the pipe **74** heated with steam. **75** are two lines of vertical guide rails laid on said frame **71** on the outside of the sizing tank **72**. Between the rails **75** is fitted the rack **76** to be movable vertically, and the rack **76** is prevented from being released by the plate member **77** connected securedly to the rails **75** at the side edges thereof to cover the rack **76** midway between the upper and lower ends of the rails **75**. **78** is a shaft passed through the rear portion of the frame **71** from one side to the other side thereof and journaled with the bearing **79**. On both ends of the shaft **78** are mounted the handles **80** respectively. Worm gear **81** mounted on one end of the shaft **78** is meshed with the worm wheel **84** mounted on one end of the shaft **83** journaled with the axis thereof horizontally by the bearing **82** outside of the frame **71**. The pinion **85** mounted on the other end of the shaft **83** is meshed with said rack **76**. When the shaft **78** is turned by the handle **80**, then the worm gear **81**, the worm wheel **84** and the rack meshed with the pinion **85** on the shaft **83** are moved vertically. **86** is a shaft member directed from one side to the other side within the upper edge of the sizing tank **72**. One end of the shaft member **86** is fixed at the upper end of said rack **76**, and reverse Y-shaped arms **87** are fixed on either end of the shaft **86** at the upper ends thereof. Between the lower ends of the arms **87** are rotatably supported the ends of the rollers **88** arranged in two lines front and rear. **89** is a roller located in front of the rollers **88** to be parallel with the rollers **88** and submerged into the sizing tank **72** at the lower periphery thereof, and the shaft **90** at one end of the roller **89** is rotatably supported at one end with the bearing **91** on the upper edge on one side of the frame **71**. Bevel gear **92**, mounted on the end of the shaft **90**, is meshed with the bevel on one end of the shaft **94** supported with the bearing **93** to direct longitudinally both ends thereof at outside of the frame **71**. Around the sprocket **96** at the other end of the shaft **94** and the sprocket **98** of the input shaft **97** is stretched the chain **99** so that the roller **89** is forcibly turned.

Immediately above the roller **89** is disposed the roller **100** the lower periphery of which contacts the upper periphery of the roller **89**. **101** is an arm of nearly reverse L-shape in front, which is fixed on the upper edge at one side of the frame **71** along the axis of the roller **100** and above the roller **100** at the end thereof. At the rear surface of the front end of the arm **101** is formed the hook **102**. **103** are shafts projected from both ends of the roller **100** and the projected shafts **103** are supported by self adjustable bearings **105** provided at the ends of the plate member **104**. The center of the plate member **104** at one side is pivoted in the inside surface of the end of said arm **101** with the shaft **106** and the center of the plate member **104** on the other side is supported on the supporting member **107** erected upright from the upper edge on the other side of the frame **71** by removably inserting pin **108**. On the inside of the end of the arm **101** and the upper portion of the supporting member **107** and also below the shaft **106** and the pin **108** are pivoted the ends of the rotary plates **110** respectively with the shaft **111**. At the front end of the rotary plate **110** is pivoted with the pin **115** the front end directed upward of the piston rod **114** of the cylinder **113** which is pivoted at the frame **71** at the end thereof with the pin **112**. The lug **116** in the central portion at the upper edge of the rotary plate **110** contacts the lower edge of the front end of the plate member **104**, thereby the piston rod **114** is raised by the air pressure led into the cylinder **113**, the rotary plate **110** using the shaft **111** as its fulcrum is turned counter-

clockwise in FIG. 13, and the lug 116 of the rotary plate 110 forcibly turns the rotary plate 104 using the shaft 106 as its fulcrum also in the same direction and thereby the roller 100 is pressed against the roller 89.

117 is a grip rod formed on the extension of the projected shaft 103 at the other end of the roller 100. 118 are guide rods arranged in two lines front and rear located right above the upper edge at the rear side of the frame 71. 119 is a bracket directed upward from the upper edge at the rear side of the frame 71, and on the upper edge of the bracket 119 is fixed the lower edge of the reed 120.

121 are arms projected forward from both sides of the upper edge at the front side of the frame 71. Between the front and rear portions of each of the facing arms 121 are erected upright the legs 122 directed upward. Between the legs 122 are rotatably supported the projected shafts at the end of the roller 123 the axis of which is horizontal, and on the projected shaft 124 is mounted the sprocket 125. 126 is a worm gear mounted on the input shaft 97, the worm gear 126 is meshed with the worm wheel 129 on the shaft 128 supported with the bearing 127 mounted on the frame 71. On the shaft 125 is fixed the sprocket 130, and around the sprocket 125 and the sprocket 130 is stretched the endless chain 131.

FIGS. 15, 16, 17 and 18 show the drying apparatus 14 located in front of the sizing apparatus 13. 132 is a frame erected upright on the floor 25 along the warp B outside of the travelling path of the warp B. Between the front and rear ends of the side of the frame 132 facing to the travelling path of said warp B are fixed the drums 133 (8 in number) having a distance vertically and longitudinally at the outside end of the pipe shafts 135 supported on the bearings 134 of the frame 132 so that the axis thereof are horizontal, and steam is supplied from the pipe shafts 135 to the interior of the drums 133 to heat them.

136 are sprockets mounted on the inner ends of the pipe shafts 135 respectively. 137 is a rotary shaft supported with the bearings 138 and passing through longitudinally at the lower portion of the frame 132. The rotary shaft 137 is driven by winding the chain 140 around the sprocket 139 at one end thereof.

141 are bevel gears mounted on both ends of the rotary shaft 137. Supported with the bearing 143 mounted on the frame 132 at a right angle to the rotary shaft 137, the bevel gear 144 mounted on the shaft 142 is meshed with said bevel gear 141, thereby the drive is transmitted to the shaft 142. Also mounted on the shaft 142 is the sprocket 145. Each of the drums 133 is driven forcibly in a direction with a given speed by winding the endless chain 146 around each of the four front and four rear sprockets 136 and around the sprocket 145. 147 are sprockets mounted on the frame 132 to be engaged with the chain 146 to eliminate slack of the chain 146.

FIGS. 19 and 20 show the tension controlling apparatus 15 located in front of the drying apparatus 14, 148 is a frame disposed on the floor 25 to be located right below the travelling path of the warp B. On the upper edge at the rear end of the frame 148 is rotatably supported the ends of the roller 149 in the bearings 150 of the frame 148 so that the axis thereof crosses the warp B. The ends of the roller 152 are supported rotatably in the bearings 151 on the upper edge at both sides of the frame 148 to be parallel therewith in front of the roller 149.

At the lower portion between the rollers 149 and 152 are rotatably supported the ends of the shaft 154 with the bearings 153 at both lower sides of the frame 148. One end of the shaft 154 is severed, and a magnetic clutch 156, which is set free when a predetermined resistance is applied to the severed portion of the shaft 154, is interposed to make the severed portion engageable and disengageable. 157 is a rocking frame fixed to the other end of the shaft 154 and the portion located inside the magnetic clutch 156 respectively at the lower end thereof. The ends of the roller 159 are supported rotatably on the bearings 158 in between at the upper end on both sides located higher than the roller 149 of the rocking frame 157. 160 is a rocking rod fixed at the lower end thereof on the portion located outside the magnetic clutch 156 at one end of the shaft 154. 161 is a cylinder pivoted with the pin 162 within the frame 148 in front of the rocking frame 157 at the end thereof. The front end of the piston rod 163 of the cylinder 161 is pivoted with the pin 164 in front of the rocking frame 157, and thereby the rocking frame 157 is afforded retreating rotatability for restoring by the air pressure compressed in the cylinder 161.

165 is an operation piece projected rearward from one side of the rocking frame 157. 166 is a switch mounted on the rocking arm 160 to make the magnetic clutch 165 engage when the rocking frame 157 is rocked forward. 167 is an operation plate formed upwardly from the upper end of the rocking rod 160. The oblong hole 169 is formed with both ends thereof directed longitudinally in the plate 168 on the upper edge at one side of the frame 148 to define the rocking rod 160, and in the oblong hole 169 is inserted the operation plate 167. Furthermore, the switch 170 contacting the operation plate 167 at the point where the operation plate 167 is stopped after being rocked forward is mounted on the frame 148, and thereby is connected electrically so that feed is accelerated when the switch is turned on (described later). 171 is a switch on the frame 148 to be contacted by the rocking frame 157 when the rocking frame 157 reaches a point just before the completion of its retreat, and is connected electrically so that feed is decelerated when the switch 171 is turned on (described later). 172 is a roller mounted to be located in front of the roller 152 and with the axis thereof parallel with the roller 152, the lower periphery of the roller 172 is to be held submerged in the tank 173 for receiving wax. 174 is a sprocket mounted on the shaft at the end of the roller 172. Between the sprocket 174 and the sprocket 176 of the double sprocket 176 and 177 of the shaft 175 supported by the frame 147 is stretched the chain 178. 179 is a sprocket mounted on the rotary shaft 137. 180 is a shaft supported with the bearing 181 of the frame 148 to be rotatable with both ends thereof directed longitudinally. Between the sprocket 182 mounted on the end of the shaft 180 and the sprocket 179 is stretched the chain 183, and the drive is transmitted by meshing the bevel gears mounted on the end of the shaft 180 and the end of the shaft 185 supported with the bearing 184. In addition, between the sprocket 186 on the end of the shaft 185 and the sprocket 177 is stretched the chain 187. 188 is a roller located in front of the roller 172 and does not contact to the warp B during operation time. This roller rises with the piston rod 190 of the cylinder

189 to part the warp B from the roller 172 during shut down. 191 are rods arranged longitudinally in three steps to separate the warp B of sheet like shape after the sizing and drying operation, and the ends of the rods 191 are supported with the arms 192 of the frame 148.

FIG. 21 shows the front reed 16. 193 is a post member erected upright from the base plate 194. On both ends of the shaft member 195 fixed on the upper end of the post member 193 at the central portion thereof and with both ends thereof directed transversely, is fixed the lower end of the side plate 196. Said front reed 16 is supported by inserting both ends thereof in the groove 197 directed downward from the upper edges of the inner surface of the side plate 196 facing each other.

FIGS. 22, 23, 24, 25, 26 and 27 show the winding warping machine 17. 198 are rails of two lines laid on the floor 25 to be at a right angle to the travelling direction of the warp B. On the rails 198 are embarked the wheels 200 of the truck 199 and in the side frames 201 erected upright from the edges on both sides of the truck 199 are rotatably supported the projected shafts 203 at both ends of the drum 202.

204 is a pulley mounted on one end of the drum 202 and the belt 207 is stretched between the pulley 204 and the pulley 206 of the rotary shaft 205 supported in between both ends of the truck 199. 208 is a shaft parallel with the rotary shaft 205 in front of the rotary shaft 205. Shaft 208 is supported with the bearing 210 of the leg member 209 erected upright on the floor 25, and the gear 211 is fixed on the shaft 208. Gear 212 arranged on the rotary shaft 205 is meshed with the gear 211, and to make the gear 212 movable axially with respect to the rotary shaft 205, the key 213 is fitted in the rotary shaft 205 throughout the length thereof. 214 is a rotary plate pivoted to the shaft 208 at one end thereof on one side of the gear 211. Hook 215 at the other end of the rotary plate 214 is located at the side of the gear 212 and fitted on the rotary shaft 205 from the upper end, and thereby the gears 211 and 212 are meshed with each other when the hook 215 is fitted on the shaft 205 even if the truck is travelling. 216 are sprockets mounted on both ends of the upper member 233 at the back of the truck 199. Between the sprockets 216 is stretched the endless chain 230. Sprocket 216 is mounted on the output shaft 218 of the reduction gear 217, and between the sprocket 219 in the center of the side of the drum 202 and the sprocket 220 on the input side of the reduction gear 217 is stretched the chain 221 and drive is transmitted. On the shaft 222 of the sprocket 216 is mounted the sprocket 223 and on the shaft 225 supported with the bearing 224 of the truck 199 is mounted the sprocket 226 below the shaft 222. Between the sprockets 223 and 226 is stretched the chain 227, and drive is transmitted to move the truck 119 by meshing the gear 228 mounted on the shaft 225 and the gear 229 fixed to said wheel 200. 231 is a sprocket to eliminate the slack of the chain 227 and 232 are grooves formed in both the upper and lower ends of the upper member 233 at the back of the truck 199. In the grooves 232 is fitted the projected line 235 of the travelling body 234 rested on the upper member 233 and is made to serve as the guide for travelling. The lower end of the fast body 236 fixed on the front side of the travelling body 234 at the upper end thereof is protruded to one side of the chain 230, and also the lower end of the movable body 238, pivoted to the front side of the travelling body at the middle between the upper and lower ends, is projected to the other side of the chain 230 in front of the lower end of said fast body 236. And the front end of the screw stock 240 screwed in the tapped hole 239 formed in the travelling body 234 from the back side to the front side of the travelling body 234 is protruded to the back side of the upper end of the movable body 238. At the end of the screw stock 240 are mounted the knob 241. 242 is supporting members erected upright facing each other at both ends of the travelling body 234. In the bearings 243 on the facing sides at the upper ends of the supporting members 242 are rotatably supported the ends of the rollers 244. 245 are rollers of two lines located in the front and in the rear of the roller 244. The ends of the rollers 245 are supported with both ends of a side member 246, and the center of the side member 246 located at one side is pivoted on the upper end of the supporting member on one side with the shaft 247. On the upper edge of the side member 246, located at the other side is engaged the hook 249 pivoted to the supporting member 242 on the other side with the shaft 248 to prevent rise-up.

250 is an arm directed backward from the travelling body 234, and the lower edge of the reed 252 is fitted in the groove 251 in the upper edge of the arm 250 and is fixed with the screw 253.

FIGS. 28, 29, 30 and 31 show the drive transmission mechanism. 254 is a motor and between the pulley 255 of the motor 254 and the pulley 257 on the input side of the reduction gear 256 is stretched the belt 258. Between the pulley 259 on the output side of the reduction gear and the pulley 261 on the shaft 260 is stretched the belt 262 and between the sprocket 263 on the shaft 260 and the sprocket 265 on the shaft 264 disposed to be parallel with the shaft 260 is stretched the chain 266. On the shaft 264 is mounted the gear 268 engageable and disengageable by using the clutch 267. The gear 268 is meshed with the gear 269 on the shaft 208 and the operating body 270 for engaging and disengaging the clutch 267 is fixed on the shaft 271 supported rotatably. Rotation of the shaft 271 is performed by pivoting the end of the piston rod 273 of the cylinder 272 to the lug 274 of the shaft 271. 275 is a spring to turn the shaft 271 for restoring, and 276 is sprocket mounted on the shaft 260. Around the sprocket 276 and the sprocket 278 on the input side of the speed change gear 277, the speed of which is changed by the switches 170 and 171, is wound the chain 279, and between the sprocket 280 on the output side of the speed change gear 277 and the sprocket 282 on the shaft 281 is stretched the chain 283. Mid-way along the shaft 281 is interposed the clutch 284 for engaging and disengaging, and the bevel gear 285 mounted on the end of the shaft 281 and the bevel gear 287 mounted on the end of the shaft 286 are meshed with each other. Around the sprocket at the other end of the shaft 286 is wound the chain 140.

Furthermore, drive is transmitted from the sprocket 276 to the sprocket 189 on the shaft 97 and the shaft 137 respectively.

With the gear 291 mounted on the rotary shaft 137 is meshed the gear 193 mounted on the shaft 292 parallel with the rotary shaft 137, and drive is transmitted between the shaft 292 and the shaft 97 through gears.

In the sizing and drying sectional warping machine according to the present invention described above, the bobbin A previously dyed is set on the spindle **20** on the creel **11** in order of warp required. The warp B of the bobbin A taken outside respectively through the guide **38** is directed forward and led forward being inserted in the notch **42** of the guide **44.** Thereupon it is passed through the annular rod **47** of the operation rod **46** incorporated with the guide **44** located at the formost end. Thereby the front end of the warp B, which is being passed through the rear reed **12,** is passed to the reed **12** and is separated up and down by contacting the rod **70** in front in order of the warp B as required.

Thus, the front end of the warp B is taken out forward and passed through the sizing apparatus **13,** and the operation is that connection of the plate member **104** and the supporting member **107** is initially released by pulling out the pin **108.** Then, when the grip rod **117** is pulled upward the roller **100** is inclined round in the bearing **105** located opposite with respect to the rod **117** as the fulcrum, and the roller **100** is set free with respect to the roller **89** by engaging the rod **117** on the hook **102.**

Now, when the pinion **85** is rotated by driving the shaft **83** of the worm wheel **84** meshed with the worm gear **81** with the rotary operation of the handle **80,** the rollers **88** of the arm **87** are raised from the surface of the sizing fluid in the tank **72** together with the rack **76** meshed with the pinion **85.** Accordingly, the warp B drawn forward passing through the lower periphery of the roller **88** from the guide rod **118,** is pulled out to contact to the upper periphery of the roller **89.** Thereafter by rotating the handle **80** in a direction opposite that above mentioned the rollers **88** of the arm **87** are submerged in the sizing tank, and by releasing the rod **117** from the hook **102** the warp B is held between the lower periphery of the roller **100** and the upper periphery of the roller **89,** but thereupon the pin **108** is pushed in toward the plate member **104** and the supporting member **107.**

The warp B passed between the rollers **100** and **89** is pulled out forward after contacting the roller **123,** led from the guide roller **290** through the upper and front periphery of the upper drum **133** of the rearmost line, and then, led to the upper drum **133** from the following front side through the rear and lower periphery of the lower drum **133,** and with similar means is pulled out forward passing successively each drum **133** in front through the side opposite the one-end-supported side of the drum **133.**

Thereafter, the warp B is separated by the rod **191** after passing through the upper peripheries of the rollers **149, 152, 159** and **172** of the tension controlling apparatus **15** in front. It is then passed successively through the front reed **16,** the reed **252,** the rollers **245** and **244** and engaged to the periphery at one end of the drum **202** of the winding warping machine **17** to wind up thereon.

As above mentioned, when all of the apparatus is operated simultaneously to wind up the warp B from the creel **11** on the drum **202** of the winding warping machine **17,** the warp B from the creel **11** is sized as it is passing through the tank **72** of the sizing apparatus **13,** dried while contacting the drum **133** of the drying apparatus, and thereafter wound up on the drum **202** of the winding warping machine **17,** and wound and warped while the truck **199** of the drum **202** is moved slowly to one side using the rails **198** as the guide and the travelling body **234** having the reed **252** to the other side.

And, when the sectional warping stops, the warp B is cut in front of the reed **16** and is kept in a state of being passed through the reed **16.** It is then pulled out from the open side formed as the result of the one-end-support of the drums **133** of the drying apparatus **14** and from between the roller **100** and **89** with the roller **100** parted from the roller **88** and **89** risen from the surface of the fluid in the sizing apparatus **13** while winding the warp B on the front reed **16** pulled out from the groove **197,** and the front reed **16** is supported on the side of the creel **11.**

And then, the creel **11** is moved sideways with the pinion **36** meshed with the rack **37** by starting the motor **27.** The reed **12** is also moved sideways and thereafter the warp B is cut at the rear of the rear reed **12.** Then the end of the warp B drawn out from the bobbin A set on the spindle **20** in a second creel to be in an order of warp arrangement required for sectional warping and said cut warp B passed to the rear reed **12** are pieced and preparation for the next sectional warping is completed.

The adjacent creel **11** previously prepared as above described is moved to the rear of the sizing apparatus **13** by means of guide rails **26.** Thereafter the warp B pieced in an order as required and wound on the other front reed **16** is passed from the open side formed as the result of the one-end-support of the sizing apparatus **13,** and the drying apparatus **14,** and the front reed **16** is set by fitting in the groove **97,** and also the front end of the warp B passed through the front reed **16** is drawn forward and wound up on the drum **202** of the winding warping machine **17.**

The group of the drums of the sizing apparatus positioned in between the creel and the warping machine carrying out sectional warping are one-end-supported respectively. Therefore after sectional warping of the preceding warp is finished, the warp is cut in front of the front reed of the drying apparatus, and when the warp is to be removed from the drying apparatus and the sizing apparatus while winding the warp kept in the state of being passed through the front reed, since the group of the drums and of the rollers of both apparatus are one-end-supported respectively, it will be easy to remove the wrap from the open side thereof. Thereby, the reed wound with the warp and removed is supported temporarily at the rear of the sizing apparatus and moved sideways together with the creel. The replacement of the bobbin and change of piece of warp arrangement are performed to make preparation for the next sizing and warping.

While another adjacent creel prepared similarly as above mentioned is protruded to the rear of the sizing apparatus, thw warp wound on said front reed is passed to the group of the rollers of the sizing apparatus and that of the drums of the drying apparatus respectively from the open side of the one-end-support while unwinding. Simultaneously the reed is returned back to the initial position and the winding operation of the warping machine is performed, and these operations are repeated. The difficulty and expenditure of long time intervals caused by the frequent replacement of bobbins on the creel and piece of warp, inefficiency of the machine brought about due to long downtime spent during the time interval above mentioned and many a

year for depreciation of the machine may be eliminated by using the apparatus according to the present invention. In addition, the apparatus according to the present invention will demonstrate useful effects such as, while sizing, drying and sectional warping are carried on in one creel, in another creel replacement of the bobbins and piece of warp are performed to make preparation for the next operation, and immediately after completion of sizing, drying and sectional warping the next sizing, drying and sectional warping may be carried out easily and speedily so that downtime of the machine can be shortened.

What I claim is:

1. In a sizing and drying sectional warping machine comprising a movable creel, a rear reed, a sizing apparatus including a plurality of rollers, a drying apparatus also including a plurality of rollers, a front reed and a winding device for winding said warp and pulling it from a creel through said rear reed, said sizing apparatus, said drying apparatus and said front reed, the improvement comprising means to move said creel transversely to the travelling direction of the warp, said rollers of said sizing apparatus and said drying apparatus being supported on only one common side, said front and rear reeds being mounted so as to be movable and at least one additional creel, rear reed and front reed adapted to replace said first mentioned creel, rear reed and front reed, whereby when one sectional warping operation is completed, said first mentioned creel, rear reed and front reed can be removed together with the warp extending therebetween and immediately replaced by said additional creel, rear reed and front reed previously preapred with warp extending therebetween.

2. The improvement as claimed in claim **1** wherein said rear reed is mounted so as to be moved transversely to the travelling direction of the warp.

3. The improvement as claimed in claim **1** further including a tension applying means positioned between said drying apparatus and said winding apparatus.

4. The improvement as claimed in claim **1** wherein said front reed is mounted so as to be easily removable.

* * * * *