April 9, 1946. F. LAMBACH 2,398,232

WARPING OR BEAMING MACHINE

Original Filed Nov. 21, 1941 6 Sheets-Sheet 1

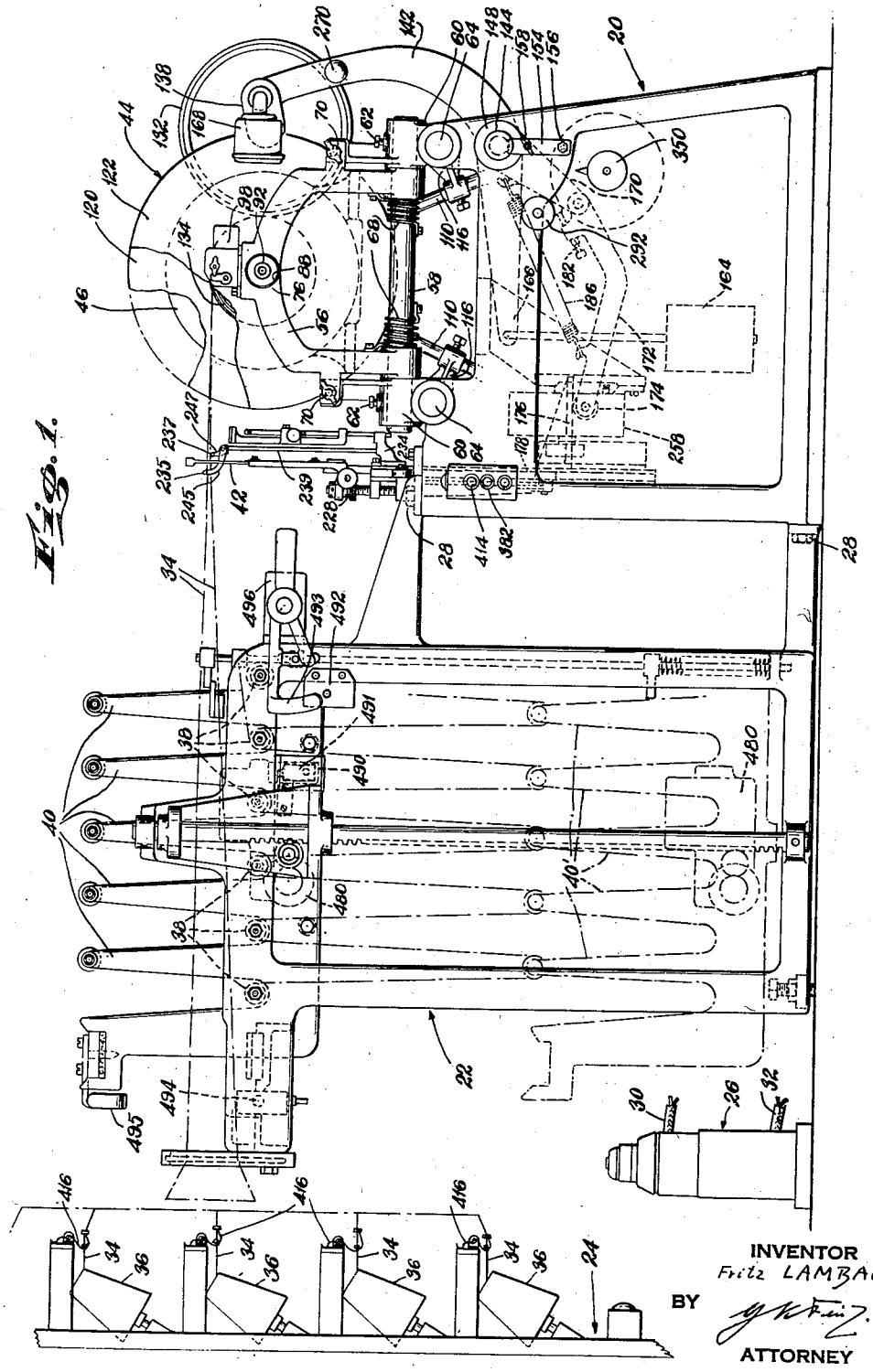

Fig. 1.

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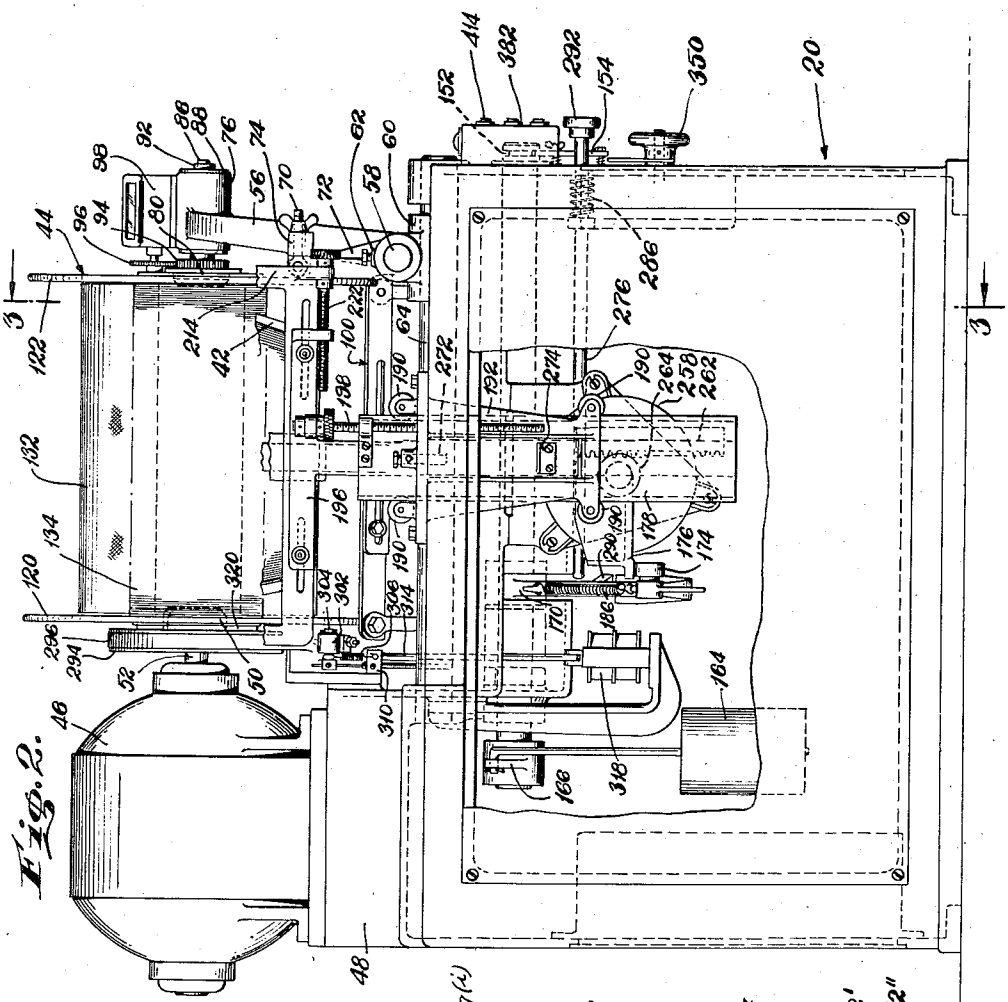

Fig. 2.

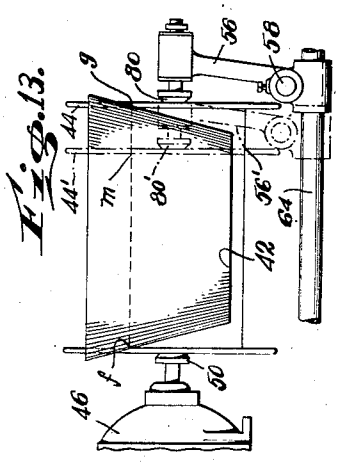

Fig. 13.

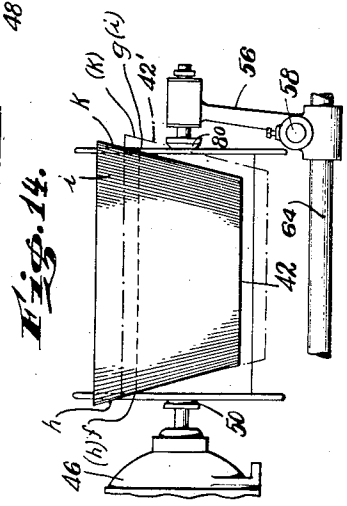

Fig. 14.

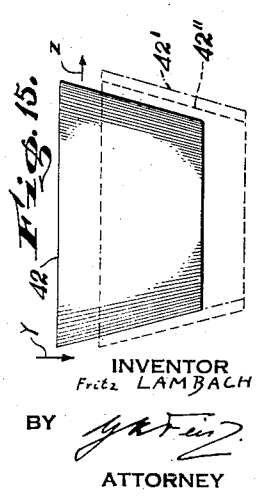

Fig. 15.

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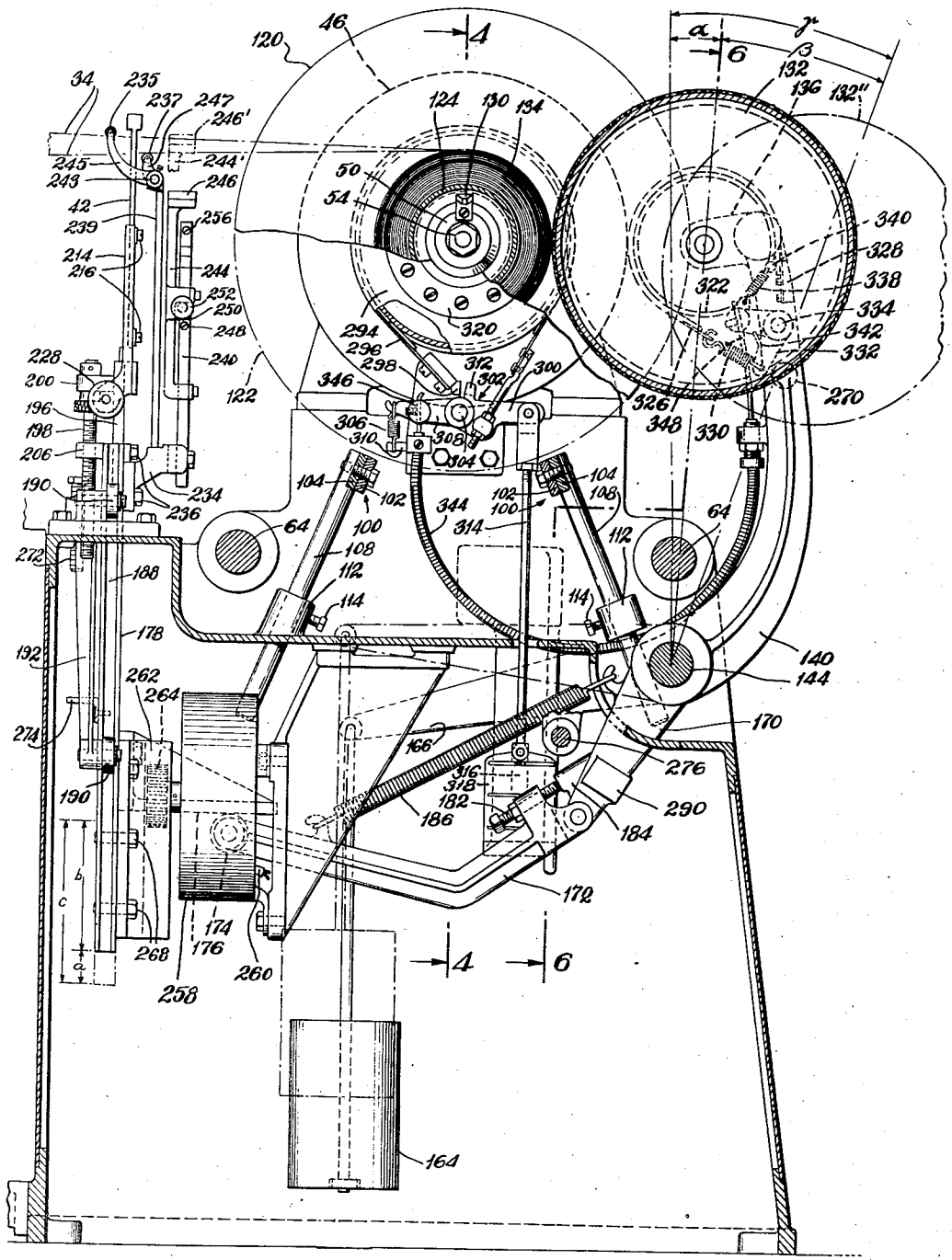

Fig. 3.

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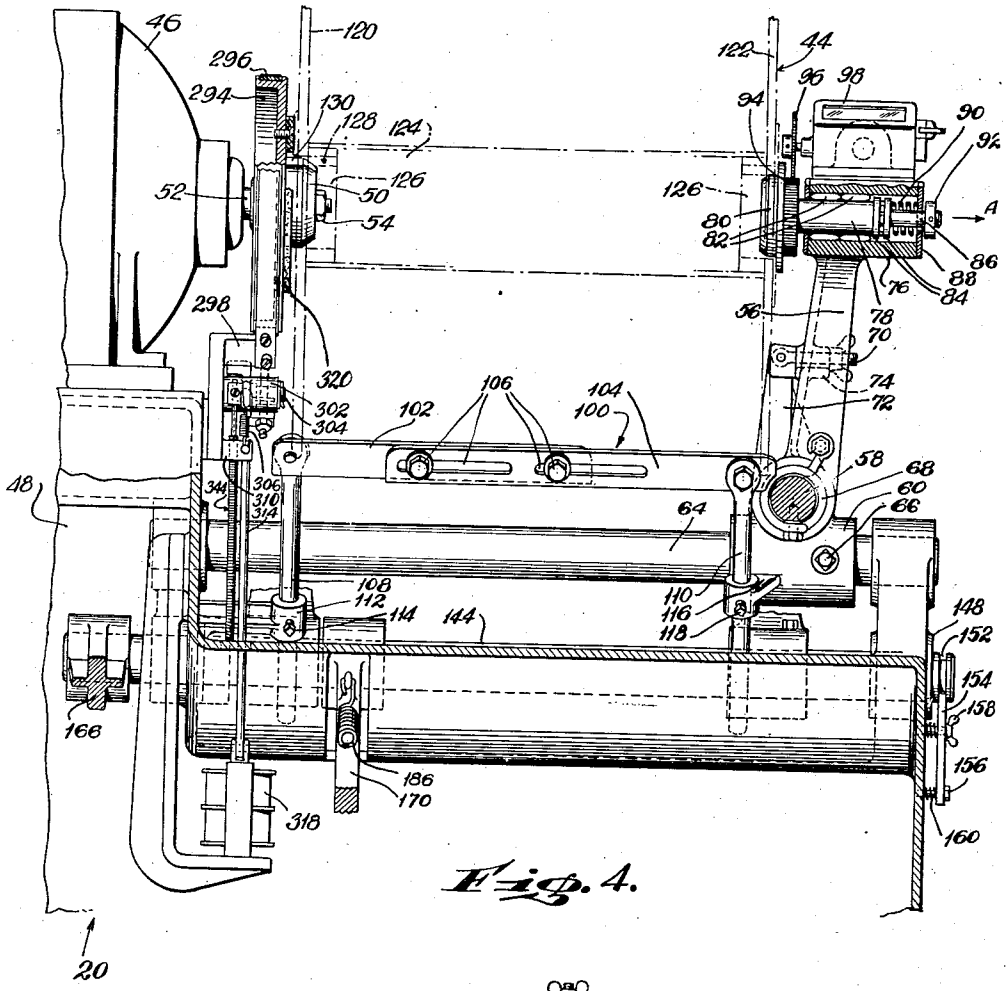

Fig. 4.

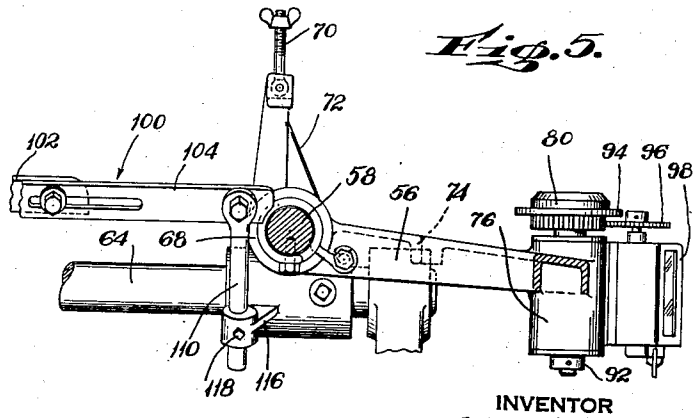

Fig. 5.

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Fig. 6.

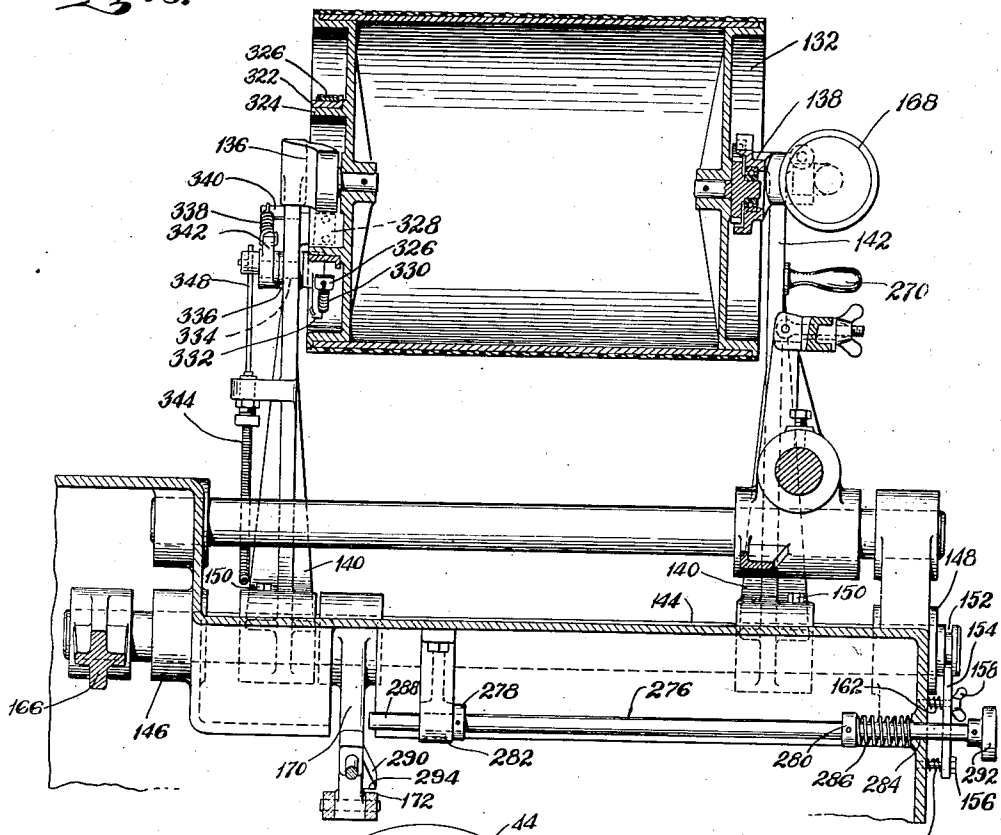
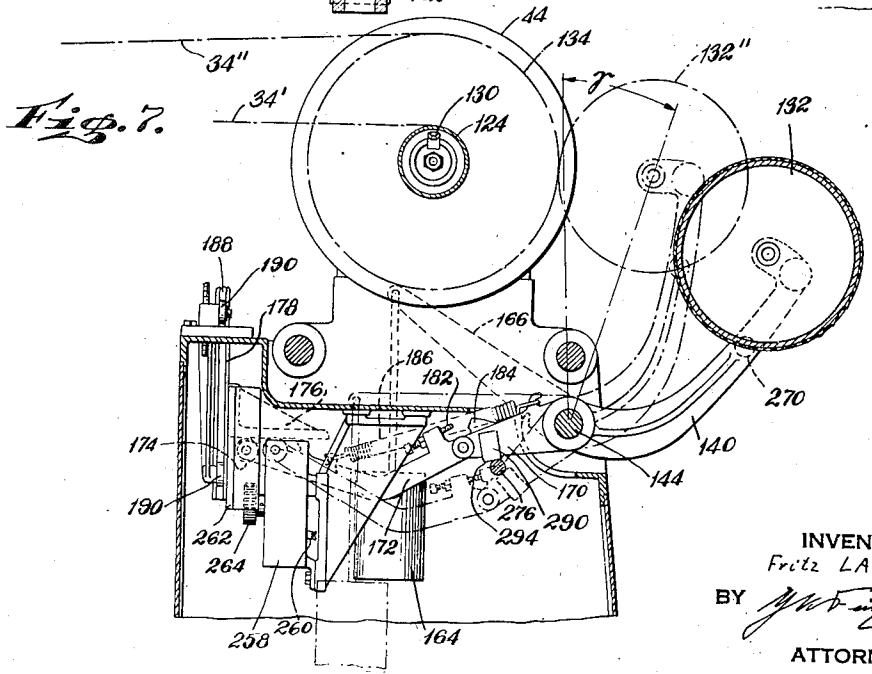


Fig. 7.



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WARPING OR BEAMING MACHINE

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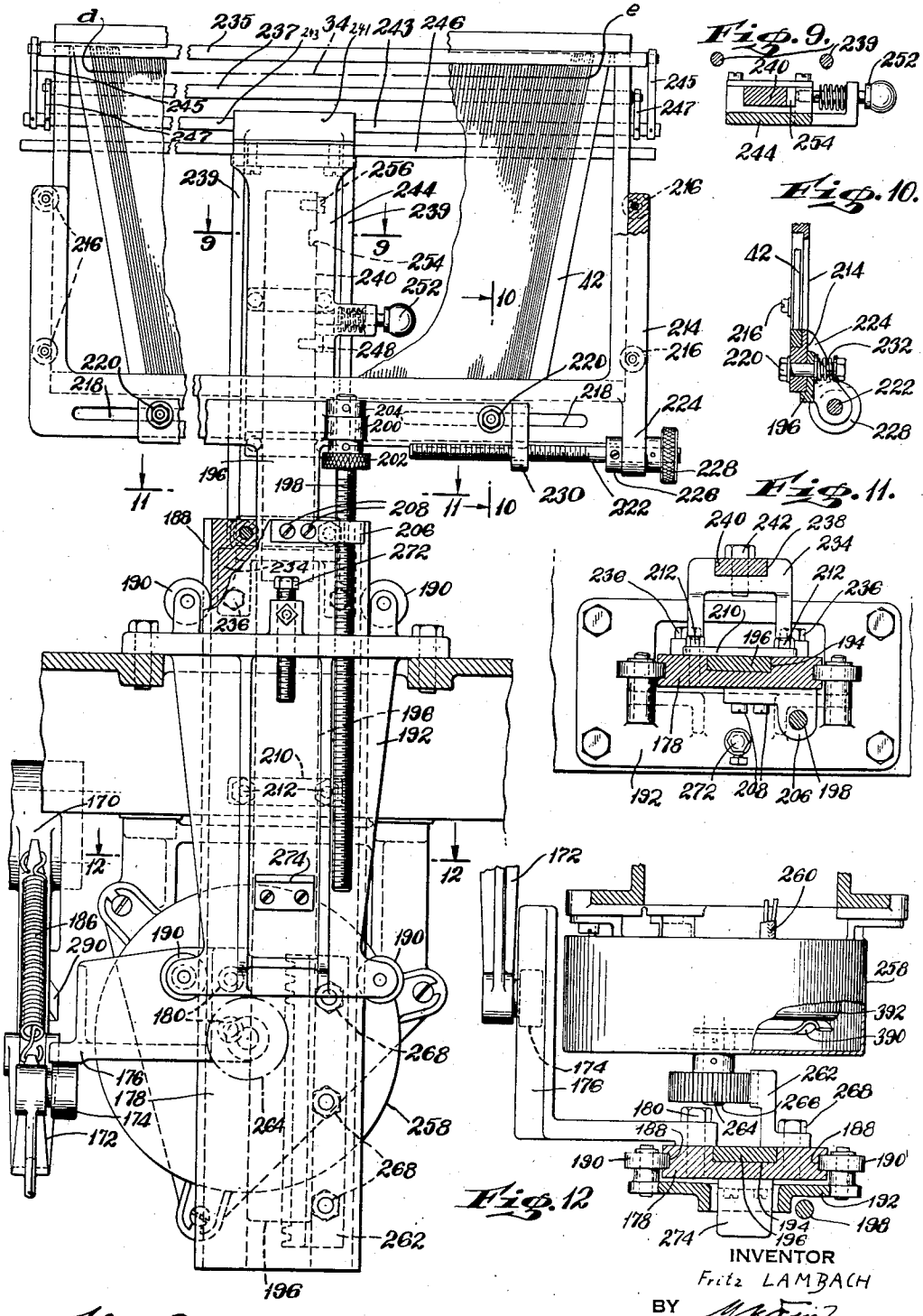

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

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2,398,232

UNITED STATES PATENT OFFICE

2,398,232

WARPING OR BEAMING MACHINE

Fritz Lambach, Tenafly, N. J.

Application September 24, 1942, Serial No. 459,539, which is a division of application Serial No. 419,835, November 21, 1941, now Patent No. 2,324,612, dated July 20, 1943. Divided and this application April 24, 1944, Serial No. 532,414

22 Claims. (Cl. 28—38)

This application is a divisional application divided out of my patent application Serial #459,539 filed September 24, 1942, for a "Warping or beaming machine," and said patent application Serial #459,539 being a divisional application divided out of my patent application Serial #419,835, filed November 21, 1941, for a "Warping or beaming machine," which has matured into Patent #2,324,612 issued on July 20, 1943.

My invention relates to textile machines, and more particularly to warping or beaming machines.

An object of my invention is to improve upon the construction of warping or beaming machines as now ordinarily made.

My invention consists in certain novel features of construction of my improvements as will be hereinafter fully described.

Further objects and advantages of the invention will be apparent from the following disclosure of an embodiment thereof.

In the accompanying drawings are:

Fig. 1 an elevational view of a warping plant including a creel, a storage device, a warper and an A. C. to D. C. motor generator set, only the end portion of the creel being shown in the drawings,

Fig. 2 an elevational view of the warper as seen from the storage device, some parts of the warper being broken away,

Fig. 3 a sectional view of the warper taken on line 3—3 of Fig. 2, in an enlarged scale,

Fig. 4 a sectional view of the upper portion of the warper taken on line 4—4 of Fig. 3, illustrating the bracket carrying the idling head in its operative upright position,

Fig. 5 a fragmentary view of the right hand end of the warper as shown in Fig. 4, wherein, however, the bracket carrying the idling head is shown in its lowered inoperative position,

Fig. 6 a sectional view of the upper portion of the warper taken on line 6—6 of Fig. 3,

Fig. 7 a sectional view of the upper portion of the warper similar to that shown in Fig. 3 illustrating the pressure roll and the controlling mechanism connected therewith in different positions, some parts of the warper being omitted or broken away for the sake of better illustration,

Fig. 8 a fragmentary elevational view of the warper illustrating a slidable carriage with an adjustable reed and table mounted thereon,

Fig. 9 a sectional view of a detail taken on line 9—9 of Fig. 8,

Fig. 10 a sectional view of a detail taken on line 10—10 of Fig. 8,

Fig. 11 a sectional view of a detail taken on line 11—11 of Fig. 8,

Fig. 12 a sectional view of a detail taken on line 12—12 of Fig. 8,

Figs. 13 and 14 a diagrammatic illustration of various relative positions between the reed and a beam, and

Fig. 15 a diagrammatic illustration of the movement of the reed during its adjustment from the first position into the second position as shown in Fig. 14.

Referring now to Fig. 1, 20 generally indicates a warper, 22 generally a so-called storage device, 24 generally indicates a creel, and 26 generally indicates an A. C. to D. C. motor generator set. The storage device 22 is connected with the warper 20 by means of screws 28. The creel 24 is arranged at a suitable distance from the storage device. The A. C. to D. C. motor generator set 26 is supplied with alternating current from an electrical source (not shown) through the line 30 and delivers the direct current to the various electrical equipments of the warping plant through a multiple conductor cable 32.

During the normal operation of the warping plant, the warp yarns 34 travel from the bobbins 36 mounted in the creel through the space between a stationary gripping means 38 and a movable gripping means 40 of the storage device 22 and thence through a reed 42 to a beam 44 inserted into the warper 20 and driven by an electromotor 46.

The storage device 22 serves to unwind a portion of the warp 34 from the beam 44 in case of breakage of yarn by displacing the movable gripping means 40 from its inactive position shown in full lines into its active position 40' shown in dash and dot lines. Reference is had to my Patent #2,302,700 relating to a "Storage device for a temporary unwinding of a portion of the warp from the beam on a warping or beaming machine," issued on November 24, 1942, for a more detailed description of the construction and operation of the storage device 22.

Although Fig. 1 illustrates a preferred arrangement of a warping plant wherein the warper is used in combination with a storage device of a certain construction, the warper according to the present invention may be used without a storage device, if desired. Furthermore, if the warper is used in combination with a storage device, the latter may be of any suitable type.

As best shown in Figs. 2 and 4, the driving electromotor 46 is mounted on the frame 48 of the warper 20. The electromotor is directly coupled

with a driving means or driving head 50 keyed to the shaft 52 of the electromotor and held in its position by a nut 54, so that the driving head rotates at the same speed as the shaft of the electromotor. The electromotor may be started by means of the start switch 382 and may be arrested by means of the stop switch 414, both switches being arranged in a box mounted on the frame of the warper as shown in Figs. 1 and 2. A bracket 56 (see Figs. 1, 2, 4, and 5) is swingably mounted on a stationary rod 58 carried by supporting elements 60 and held in its position by set screws 62. The supporting elements 60 are slidably arranged on rods 64 carried by stationary parts of the frame of the warper. The supporting elements 60 may be held in any adjusted position by means of set screws 66 (see Fig. 4). For the purpose of balancing the weight of the bracket 56 and the parts connected therewith in the intermediate positions of the bracket between its operative upright position shown in Fig. 4 and its inoperative horizontal position shown in Fig. 5, two torsion springs 68 are wound around the rod 58, one end of each torsion spring being secured to the rod, the other end of each torsion spring being secured to the bracket. The bracket may be held in its upright position by means of a locking screw 70 swingably mounted on a stationary extension 72, which may be engaged with a complementary locking member 74 on the bracket.

A bearing 76 arranged on the bracket 56 carries the shaft 78 of an idling head 80. The rotatable shaft 78 rests on rollers 82 of the bearing and is arranged with play in the bearing, i. e. the shaft may also be shifted in the direction of its longitudinal axis. One side of a thrust ball bearing 84 mounted on a shiftable rod 86 extending through a hole in a cover plate 88 of the bearing 76 is in contact with the end of the shaft 78 of the idling head. A spring 90 arranged between the plate 88 and the other side of the ball bearing 84 tends to urge the latter against the end of the shaft 78. The idling head 80 and its shaft 78 may be shifted to a certain extent in the direction of the arrow A against the action of the spring 90. The movement of the rod 86, ball bearing 84, shaft 78 and idling head 80 in the opposite direction under the action of the spring 90 is limited by a set collar 92 secured to the projecting end of the rod 86.

A gear 94 keyed to the shaft 78 of the idling head meshes with a pinion 96 keyed to the shaft of a shut off counter 98 mounted on top of the bearing 76. The shut off counter 98, which may be of any well known type, serves to cause an automatic stoppage of the warper as soon as the beam 44 has performed a predetermined number of revolutions for which the shut off counter has been set.

As best shown in Figs. 3 and 4, a pair of adjustable rest bars 100 is arranged in the space below the space occupied by a beam 44. Each rest bar comprises two members 102 and 104, which are adjustable with respect to each other by means of a slot and screw connection 106. The rest bars 100 are connected with rods 108 and 110 at the ends thereof. The rod 108 is slidably and adjustably arranged in a bore of an arm 112 mounted on the frame of the warper. A set screw 114 serves to hold the rod 108 in the adjusted position. The rod 110 is slidably and adjustably arranged in a bore of an extension 116 of the adjustable supporting element 60 and is held in its position by a set screw 118. Thus, the rest bars 100 may be adjusted in a certain position with respect to a beam 44 by means of the rods 108, 110 and set screws 114, 118, while the length of the rest bars may be adapted to the width of the beam used by means of the slot and screw connection 106. Therefore, the warper may be used for beams of various sizes and shapes.

Fig. 4 indicates a beam 44 of usual form in dash and dot lines. The beam has flanges 120 and 122 at the ends of its hollow core 124, and the center hole 126 is provided with a longitudinal notch 128.

Now, the insertion of an empty beam 44 into the warper shall be described. For this purpose the supporting elements 60 carrying the bracket 56 and the rods 110 of the rest bars 100 are brought into a predetermined position in accordance with the width of the beam to be inserted. Of course, if the supporting elements 60 are already in the proper position, a special adjustment thereof become superfluous. The bracket 56 is swung into the horizontal position shown in Fig. 5, whereupon the empty beam may be easily placed into the warper by sliding the flange 120 along the rest bars, until one end of the center hole 126 comes into engagement with the driving head 50. The conical shape of the driving head 50 facilitates the engagement and causes a slight lifting of the flange 120 away from the rest bars 100. During the engagement of the driving head 50 with the center hole 126 of the beam, a key 130 arranged on the driving head is brought into engagement with the longitudinal notch 128 to establish a positive drive of the beam. Now, the bracket 56 is swung into its upright position shown in Fig. 4, so that the idling head 80 comes into engagement with the other end of the center hole 126. The idling head is also of conical shape, so that the flange 122 of the beam is slightly lifted away from the rest bars 100 to secure a free rotation of the beam. During the engagement of the idling head 80 with the center hole of the beam, the idling head may be shifted to a certain extent in the direction of the arrow A (Fig. 4) against the action of the spring 90, if the position of the supporting element 60 does not exactly correspond to the width of the beam inserted. In other words, the above described play of the idling head 80 and its shaft 78 allows for slight differences in the width of the beams of a certain standard size. After locking the bracket 56 in its upright position by means of the screw 70, the operation of the warper may be started.

In order to remove a full beam from the warper after the termination of the warping operation, the bracket 56 is swung into the horizontal position shown in Fig. 5, whereby the idling head 80 is disengaged from the center hole of the beam and the flange 122 of the beam drops onto the rest bars 100. Now, the operator has free access to the flange 122 and may easily remove the beam from the warper by sliding its flange 120 along the rest bars 100.

According to Figs. 1, 2 and 3, a pressure roll 132 of a width somewhat smaller than the distance between the flanges 120 and 122 of the beam 44 rests against the winding 134 on the beam. As best shown in Fig. 6, the pressure roll 132, which is selected in accordance with the standard size of the beam to be inserted into the warper, is exchangeably journalled in roller bearings 136 and 138 carried by arms 140 and 142 mounted on a rod 144 rotatably and shiftably arranged in bearings 146 and 148 of the frame of

the warper. The longitudinal axis of the rod 144 is substantially parallel to the longitudinal axis of the beam 44. The arm 140 is fixed to the rod 144 in any suitable manner, while the arm 142 is slidably and adjustably arranged on the rod 144, so that the distance between the arm 140 and the arm 142 may be adjusted in accordance with the width of the pressure roll 132 selected. The arm 142 is held in its position by means of a set screw 150. One end of the rod 144 projects from the frame of the warper and has a groove 152 for engagement with an adjusting plate 154 mounted on the frame by means of a cap screw 156 and a thumb screw 158. The adjusting plate 154 resting against springs 160 and 162 wound around the shafts of said screws serves to hold the rod 144 in a predetermined position. The position of the adjusting plate and the shiftable rod 144 carrying the assembly of the arms 140, 142 and pressure roll 132 may be varied to a certain extent by means of the thumb screw 158, so that the pressure roll may be brought into proper registering position with the beam. In other words, the described adjustment of the rod 144 carrying the pressure roll 132 by the adjusting means 154, 158 allows for slight differences in the width of beams of a certain standard size.

The pressure roll 132 is pressed against the winding 134 on the beam by means of a weight 164 carried by an arm 166 secured to the rod 144.

A combined speedometer and odometer 168 (Figs. 1 and 6) mounted on the arm 142 serves to indicate the circumferential speed of the pressure roll 132 and the winding 134 and the length of the warp wound on the beam 44.

As best shown in Figs. 1, 2, 3, 6 and 7, a crank 170 keyed to the rod 144 is pivotally connected with one end of an actuating member 172. The other end of the actuating member carries a roller 174, which is in engagement with a cam 176 secured to a slidable carriage 178 by screws 180 (see also Figs. 8 and 12). A set screw 182 (Figs. 6 and 7) arranged on the actuating member 172 cooperates with an abutment 184 on the crank 170 and determines the angle between the member 172 and the crank 170 as long as the pressure roll 132 contacts the winding 134 on the beam. A tension spring 186 stretched between hooks of the crank 170 and actuating member 172 tends to bring the set screw 182 into engagement with the abutment 184 and to hold the roller 174 of the member 172 in cooperative engagement with the sliding cam surface 176.

As best shown in Figs. 3, 8 and 12, the carriage 178 has a groove 188 on each side thereof for engagement with four guide rollers 190 mounted on a member 192 secured to the frame of the warper, so that the carriage may be moved through the distance $c=a+b$ (see Fig. 3) by means of the controlling mechanism 170, 172, 174, 176, when the swingable support 140, 142, 144 carrying the pressure roll 132 is moved through the angle $\gamma=\alpha+\beta$ during the building up of the winding 134 on the beam 44.

According to Figs. 8, 11 and 12, the carriage 178 has a channel 194 for receiving the main portion of a T-shaped holder 196 carrying the reed 42 of divergent shape in a manner to be described hereinafter. The holder 196 is slidably arranged in the channel 194 for an adjustment of the reed 42 in vertical direction by means of an adjusting screw 198. Said adjusting screw passing through the hole of a lug 200 of the holder 196 and having a set collar 202, 204 on each side of the lug is screwed into the threaded hole of a member 206 secured to the carriage 178 by screws 208. A plate 210 mounted on the carriage by screws 212 serves to clamp the holder 196 against the base of the channel 194.

As best shown in Figs. 8 and 10, the frame of the divergent reed 42, the width of which increases from its lower portion toward its upper portion, is inserted into a recess of a support 214 and is held in its position by screws 216. The support 214 is connected with the head of the holder 196 by means of two slot and screw connections 218, 220 for an adjustment of the reed 42 in horizontal direction by means of an adjusting screw 222. Said adjusting screw passing through the hole of a lug 224 of the support 214 and having a set collar 226, 228 on each side of the lug is screwed into the threaded hole of an extension 230 of the head of the holder 196. Springs 232 wound around the shafts of the screws 220 and arranged between the holder 196 and the nut cause a certain friction to secure the position of the support 214 and the reed 42 with respect to the holder.

Furthermore, a bracket 234 is mounted on the slidable carriage 178 by means of screws 236 as best shown in Figs. 3, 8 and 11. Said bracket 234 has a recess 238 for receiving a holder 240 secured to the bracket by means of a screw 242. A member 244 carrying a bar or table 246 is slidably arranged on the holder 240 and is held in its normal inactive position by means of a stop screw 248 which is screwed into the holder 240 and forms an abutment for an extension 250 of the member 244. After the termination of the warping operation the member 244 and table 246 may be shifted into an upper active position 244', 246' as shown in dash and dot lines in Fig. 3 to bring the yarns of the warp 34 into a straight plane and facilitate the pasting of a strip onto the warp before the yarns are severed. A spring trigger 252 arranged on the member 244 is automatically engaged with a notch 254 on the holder 240 to hold the member 244 and the table 246 in the upper active position. A stop screw 256 arranged on the holder 240 limits the upward movement of the member 244 to prevent an undesired disengagement of the member 244 from the holder 240.

As best shown in Figs. 1, 3 and 8, two rods 235 and 237 of glass or any other suitable material for guiding the warp 34 are also mounted on the carriage 178. For this purpose two vertical supporting bars 239 carrying a member 241 having on each side thereof a horizontal supporting rod 243 secured thereto are secured to the bracket 234 mounted on the slidable carriage 178. Arms 245 carrying the guiding rod 235 and arms 247 carrying the guiding rod 237 are rotatably and adjustably mounted on said supporting rods 243. The arms 245 and 247 are held in their positions by set screws or the like.

Moreover, a rheostat 258 mounted on a stationary part of the warper and electrically connected with the field of the electromotor 46 by lines 260 is controlled by the slidable carriage 178 as best shown in Figs. 2, 3, 7, 8 and 12. For this purpose, a rack 262 meshing with a pinion 264 keyed to the shaft 266 of the rheostat 258 is secured to the carriage 178 by screws 268. Thus, an upward movement of the carriage 178 by the controlling mechanism 170, 172, 174, 176 owing to a movement of the swingable support 140, 142 and the pressure roll 132 through an angle γ during the building up of the winding on the beam causes a rotation of the shaft of the rheostat 258, so that the operating speed of the

shaft of the electromotor 46 and the beam 44 directly coupled therewith is automatically changed from a predetermined normal value to a lower value in order to obtain a substantially constant travelling speed of the warp yarns resulting in a substantially constant tension in the warp yarns as the diameter of the winding 134 increases.

Assume, at the start of a warping operation the adjustable divergent reed 42 is set in such a way, that the warp 34 (indicated by dash and dot lines in Fig. 8) passes between the points *d* and *e* of the reed. During the building up of the winding 134 on the beam the diameter of the winding is increased, so that the warp is lifted from a lower level into a higher level, for example, from the position 34' into the position 34'' as shown in Fig. 7. At the same time, the swingable support 140, 142 carrying the pressure roll 132 is moved through the angle γ, so that the carriage 178 supporting the reed 42 is lifted by means of the controlling mechanism 178, 172, 174, 176 through the distance *c* (see Fig. 3). Preferably, the members of the controlling mechanism are arranged and shaped in such a way, that the lifting of the reed corresponds to the lifting of the warp and the latter always passes between the two points *d* and *e* of the reed.

Obviously, the guiding rods 235, 237 and the table 246 connected with the carriage 178 are lifted simultaneously with the reed 42. Such a lifting of the guiding rods 235, 237 in dependence on the building up of the winding on the beam 44 eliminates a change in the angle between the warp yarns 34 and said guiding rods, so that the tension in the warp yarns remains substantially constant during the operation of the warper, with the result of a uniform winding on the beam.

If, after the start of the warping operation, the operator should find out, that the yarns of the warp are not uniformly distributed over the width of the beam inserted into the warper, the desired uniform distribution of the yarns may easily be obtained by a slight re-adjustment of the reed 42 in vertical and/or horizontal direction by the adjusting means 198, 202 and/or 222, 228.

When the warping operation is terminated and the warper is arrested, the pressure roll is in the position 132'' indicated by dash and dot lines in Figs. 1 and 7. According to Fig. 7, the pressure roll then is still between the flanges of the beam 44. In order to render possible the removal of the full beam in the direction of its longitudinal axis as described above, the pressure roll should be further swung by hand into the position shown in full lines in Fig. 7. For this purpose, a handle 270 is arranged on the arm 142 (see Figs. 1 and 6). During this manual swinging of the pressure roll from the position 132'' (Fig. 7) in clockwise direction, a further lifting of the reed 42 and the table 246 is undesired, as the warp remains in the same level. Therefore, adjustable means are provided for rendering inoperative the controlling mechanism 170, 172, 174, 176 when, after the termination of the warping operation, the pressure roll 132 is moved away from the winding on the beam. As best shown in Figs. 2, 3, and 8, an adjustable set screw 272 is arranged on the member 192 for cooperation with an abutment 274 secured to the slidable carriage 178. The adjustable set screw 272 may be set in such a way, that the abutment 274 contacts the set screw substantially simultaneously with the stoppage of the warper, when, for example, the pressure roll and the members of the controlling mechanism are in the position shown in dash and dot lines in Fig. 7, i. e. the pressure roll is in the position 132''. Now, when the pressure roll is moved away from the winding on the beam and the pressure roll and the crank 170 are swung into the position shown in full lines in Fig. 7, the carriage 178 and the cam 176 mounted thereon are arrested by the set screw 272, so that the actuating member 172 is swung about the pivot between said member and the crank 170 against the action of the spring 186, while the roller 174 of the member 172 slides along the surface of the cam 176. Thus, the controlling mechanism 170, 172, 174, 176 is rendered inactive, and the swinging of the pressure roll away from the winding on the beam does not cause a further lifting of the reed and the table. If it is desired to produce a winding of a diameter smaller than that shown in Fig. 7, the position of the set screw 272 is changed in such a way, that the abutment 274 contacts the screw 272 after a short stroke. Thus, the stopping means 272, 274 may be adjusted for windings of various diameters.

In order to hold the pressure roll 132 in the extreme position shown in Fig. 7 against the action of the weight 164 and the spring 186 during the exchange of a beam, the following automatic locking mechanism is arranged. According to Figs. 3 and 6, a locking rod 276 carrying two set collars 278 and 280 is shiftably arranged in stationary bearings 282 and 284. A spring 286 arranged between the bearing 284 and the set collar 280 tends to urge the set collar 278 against the bearing 282, so that the end 288 of the rod 276 extends into the path of a cam 290 arranged on the crank 170 keyed to the shaft 144. The other end of the spring loaded locking rod 276 projecting from the frame of the warper carries a knob 292 secured thereto. During the warping operation of the device, the locking rod 276 is in a level above the cam 290. When, at the end of the warping operation, the crank 170 and cam 290 reach the position shown in dash and dot lines in Fig. 7, the locking rod 276 is still above the cam 290. Now, when the pressure roll 132 is moved away from the beam and the crank is swung into the position shown in full lines in Fig. 7, the inclined surface of the cam 290 contacts the locking rod 276 and displaces same against the action of the spring 286, whereupon, after disengagement of the inclined surface of the cam from the locking rod, the spring 286 returns the locking rod into its normal position now below the cam 290, so that the locking rod 276 comes into engagement with the straight locking surface 294 of the cam 290 and holds the pressure roll 132 in its extreme position. In order to release the pressure roll after the exchange of a beam, the locking rod 276 is pulled out against the action of the spring 286 by gripping the knob 292. Then, the pressure roll may be returned into its starting position, whereupon the locking rod 276 may be released, so that the latter is automatically returned by the spring 286 into the position above the cam 290 as shown in Fig. 6.

The warper shown in the drawings has a first brake associated with the drive and a second brake associated with the pressure roll, and means are provided for causing a substantially simultaneous application of said two brakes when the warper is arrested.

According to Figs. 2, 3 and 4 a portion of the drive head 50 keyed to the shaft 52 of the electromotor 46 is in the form of a brake drum 294. One end of a brake band 296 embracing said drum is secured to a stationary element 298, the other end of said brake band is secured to an arm 300 of a double armed lever 302 pivoted to the element 298 at 304. A tension spring 306 stretched between the other arm 308 of the double armed lever 302 and an extension 310 of the stationary element 298 tends to turn the double armed lever 302 in counter-clockwise direction as viewed in Fig. 3 to hold the brake in released condition. The rotation of the lever 302 in counter-clockwise direction is limited by a lug 312 of the lever 302 adapted to abut against a projecting portion of the stationary element 298. The arm 300 of the lever is hinged to one end of a link 314, the other end of which is pivoted to the core 316 of a solenoid 318 electrically connected with the electrical braking control means as fully described in my Patent #2,324,612 relating to a "Warping or beaming machine." An energization of the solenoid 318 causes a movement of the lever 302 in clockwise direction for an application of the brake 294, 296.

According to Figs. 3 and 4, a ring 320 of leather or any other suitable material is mounted on the surface of the brake drum 294 facing the flange 120 of the beam. When a beam is inserted into a warper, the flange 120 is pressed against said ring 320, so that the ring assists in the driving of the beam by friction.

As best shown in Figs. 3 and 6, a brake drum 322 is secured to a hub 324 of the exchangeable pressure roll 132. When the pressure roll is inserted into the bearings on the supporting arms 140, 142, a brake band 326 may be placed around the drum 322. One end of said brake band 326 is connected with a lug 328 on the arm 140, the other end of said brake band is connected with one end of a compensating means or tension spring 330 having its other end connected with a crank 322 keyed to a shaft 334 journalled in a bearing 336 of the arm 140. A tension spring 338 stretched between a pin 340 arranged on the arm 140 and an arm 342 keyed to the shaft 334 tends to move the crank 332 in clockwise direction as viewed in Fig. 3 to hold the brake in released condition.

The first brake 294, 296 associated with the drive of the warper and the second brake 322, 326 associated with the pressure roll are coupled with each other by means of a Bowden wire 344. One end 346 of said Bowden wire is secured to the arm 308 of the double armed lever 302, while the other end 348 of the Bowden wire is connected with the arm 342. Thus, an energization of the solenoid 318 causes an application of the first brake 294, 296 and, substantially at the same time, an application of the second brake 322, 326 through the medium of the Bowden wire and the tension spring 330 compensating for differences in the brakes. On the other hand, a deenergization of the solenoid 318 permits a movement of the lever 302 in counter-clockwise direction by the spring 306 for an automatic release of the two brakes. Of course, any other coupling between the two brakes and any other compensating means arranged between the two brakes could be used, if desired.

As pointed out above, the rheostat 258 serves to cause an automatic reduction of the operating speed of the driving electromotor 46 from a predetermined normal degree to a lower degree, so that a substantially constant travelling speed of the warp yarns resulting in a substantially constant tension in the yarns is obtained during the operation of the warper. The normal travelling speed of the warp yarn is determined by said predetermined normal operating speed of the electromotor at the start of the warping operation. Different yarns of different size and/or material require different travelling speeds to obtain the proper tension in the yarns. Therefore, an additional electrical adjusting means or a hand rheostat 350 (see Figs. 1 and 2) is arranged on the warper for the adjustment of said predetermined normal operating speed of the driving electromotor 46.

It has been found that a wide speed range of the electromotor 46 directly coupled with the drive 50 of the beam may be obtained by using a D. C. electromotor and connecting the hand rheostat 350 with the source of direct current in such a way, that the rheostat 350 controls the voltage of the direct current supplied to the electromotor of the warper.

As will be apparent from the description of the warper, the warper has the following features: The bracket 56 carrying the idling head 80 is adjustably mounted on the rods 64 so as to permit the insertion of beams of various widths, the pressure roll 132 is exchangeable so as to permit the selection of a pressure roll capable of cooperation with a beam of predetermined width, and the divergent reed 42 is adjustable in horizontal and vertical direction. Therefore, the warper may be used for winding yarn in various gauges, i. e. number of yarns per inch, on beams of various widths as will be explained hereinafter in connection with Figs. 13–15.

If, for example, the warper has been used previously for warping yarn in a gauge of 30 yarns per inch on a beam of a width of 10", and if, during the next warping operation, the warper shall be used for warping yarn in the same gauge of 30 yarns per inch on a smaller beam of a width of 8", the following steps are carried out: Assume, during the previous warping of the yarn on the 10"-beam, the beam 44, the bracket 56 with the idling head 80, and the reed 42 are in the position shown in full lines in Fig. 13, and a warp of 300 yarns passes between the points *f* and *g* of the reed. Now, the bracket with the idling head is brought into the dash and dot line position 56', 80', so as to permit the insertion of an 8"-beam 44'; the motor 46 and the driving head 50 coupled therewith remain in their position. A pressure roll capable of cooperation with an 8"-beam is substituted for the pressure roll used previously. The reed 42 remains in its position. 60 yarns are taken away from the warp, so that a warp of 240 yarns only passes between the points *f* and *m* of the reed 42, said points being spaced from each other at a distance of 8". Therefore, the beam of a width of 8" receives 240 yarns per 8", or, in other words, the yarns are wound on the 8"-beam in the same gauge of 30 yarns per inch, as they have been wound previously on the 10"-beam.

If, for example, the warper has been used previously for warping yarn in a gauge of 30 yarns per inch on a beam of a width of 10", and if, during the next warping operation, the warper shall be used for warping yarn in a different gauge of 25 yarns per inch on a beam of the same width of 10", the following steps are carried out: As-

sume, during the previous warping of the yarn on the 10''-beam, the beam **44**, the bracket **56** with the idling head **80**, and the reed **42** are in the position shown in full lines in Fig. 14, and a warp of 300 yarns passes between the points *f* and *g* of the reed. Now, the bracket with the idling head remains in its position relative to the rod **64** so as to permit the insertion of another 10''-beam. The pressure roll is not exchanged. The reed **42**, however, is brought into the position **42'** as shown in dash and dot lines in Fig. 14, so that the point *h* takes the place of the point *f* and the point *i* takes the place of the point *g*. Furthermore, 50 yarns are taken away from the warp in the space between the points *i* and *k*, so that a warp of 250 yarns passes between the points *h* and *i* of the reed in the position **42'**, said points being spaced from each other at a distance of 10''. Therefore, the beam of a width of 10'' receives 250 yarns per 10'', or, in other words, now the yarns are wound on the 10'' beam in a gauge of 25 yarns per inch. In order to move the reed from the full-line position **42** into the dash and dot line position **42'**, preferably at first the reed is shifted in a vertical direction Y (see Fig. 15) so that it comes into the intermediate position **42''** as shown in dash lines, whereupon the reed is moved from said intermediate position **42''** into the new position **42'**, in a horizontal direction Z. Of course, the horizontal and vertical adjustment of the reed could be reversed or carried out simultaneously, if desired.

Although preferably the individual objects of the invention are applied to a warping plant in the combination described, the individual objects of the invention may be applied individually or in partial combination to warping or beaming machines. It is emphasized that the merits of the invention are not limited to the described and illustrated combination, but the individual objects of the invention per se also have inventive merits. Without stating that all the individual objects of the invention are enumerated, it may be mentioned that, for example, the direct coupling between the driving electromotor and the driving means of the beam could be arranged in a warper, which is not equipped with means permitting the insertion of the beam in the direction of its longitudinal axis, or that the means for adjusting the warper to the size of the beam to be inserted could be arranged in a warper which has no direct coupling between its drive and the driving means of the beam, or that the controlling means for lifting the reed in accordance with the increase of the diameter of the winding on the beam could be arranged in a warper wherein the automatic controlling means for reducing the speed of the drive are separated from said controlling means for lifting the reed, etc.

I have described a preferred embodiment of my invention, but it is clear that numerous changes and omissions may be made without departing from the spirit of my invention.

What I claim is:

1. A warping or beaming machine comprising: a drive for rotating a warp beam, a carriage, said carriage being slidable in vertical direction, a reed mounted on said carriage, the width of the reed increasing from the lower portion of the reed toward the upper portion thereof, means for adjusting the position of the reed in horizontal direction, means for adjusting the position of the reed in vertical position, a pressure roll, and a loaded swingable support carrying said pressure roll for urging same against the winding on the warp beam, said loaded swingable support being associated with said carriage for lifting same with the reed in dependence on the building up of the winding on the warp beam, and said pressure roll being exchangeably mounted on said support.

2. A warping or beaming machine comprising: a drive for rotating a warp beam, a carriage, said carriage being slidable in vertical direction, a reed mounted on said carriage, a pressure roll, a loaded swingable support carrying said pressure roll for urging same against the winding on the beam, stopping means for limiting the upward movement of said carriage, a controlling mechanism connected with said swingable support, said controlling mechanism being associated with said carriage for lifting same with the reed during the building up of the winding on the warp beam, and means for rendering inoperative said controlling mechanism when after the termination of the warping operation the pressure roll is moved away from the winding on the warp beam and the carriage is stopped by said stopping means.

3. A warping or beaming machine as claimed in claim 2, said stopping means being adjustable for windings of various diameters.

4. A warping or beaming machine as claimed in claim 2 including locking means for holding the support in its extreme position with the pressure roll moved away from the winding on the warp beam.

5. A warping or beaming machine comprising: a drive for rotating a warp beam, a carriage, said carriage being slidable in vertical direction, a reed mounted on said carriage, a pressure roll, a loaded swingable support carrying said pressure roll for urging same against the winding on the warp beam, stopping means for limiting the upward movement of said carriage, a cam surface arranged on said slidable carriage, and a controlling mechanism for lifting the carriage during the building up of the winding on the beam, said controlling mechanism including a crank connected with said support, an actuating member pivoted to said crank, and a tension spring stretched between said crank and said actuating member for holding the latter in cooperative engagement with said cam surface, said tension spring permitting a movement between said crank and said actuating member when after the termination of the warping operation the pressure roll is moved away from the winding on the warp beam and the carriage is stopped by said stopping means.

6. A warping or beaming machine comprising: a drive for rotating a warp beam, a movable carriage, a reed mounted on said carriage, a table adjustably mounted on said carriage, means for holding the table in an adjusted position, and automatic control means associated with said carriage for displacing same with the reed and the table in dependence on the building up of the winding on the beam.

7. A warping or beaming machine comprising: a drive for rotating a warp beam, a movable carriage, a reed adjustably mounted on said carriage, means for holding the reed in an adjusted position, a table adjustably mounted on said carriage, means for holding the table in an adjusted position, and automatic control means associated with said carriage for displacing same with the reed and the table in dependence on the building up of the winding on the beam.

8. A warping or beaming machine comprising: a drive for rotating a warp beam, a carriage, said carriage being slidable in a straight line, a reed for the passage of warp to be wound on said warp beam, guiding means for guiding said warp, said reed and said guiding means being mounted on said movable carriage, and a movable member arranged for contacting engagement with the winding on the warp beam, said movable member being associated with said slidable carriage for displacing same with the reed and the guiding means in dependence on the building up of the winding on the warp beam.

9. A warping or beaming machine comprising; a drive for rotating a warp beam, a movable carriage, a divergent reed for the passage of warp to be wound on said warp beam, said divergent reed being adjustably mounted on said movable carriage, means for adjusting said divergent reed in the direction of its longitudinal axis, means for adjusting said divergent reed in the direction of its transverse axis, guiding means for guiding said warp, said guiding means being mounted on said movable carriage, and automatic control means associated with said movable carriage for displacing same with the divergent reed and the guiding means in dependence on the building up of the winding on the warp beam.

10. A warping or beaming machine comprising: a drive for rotating a warp beam, a movable carriage, a reed for the passage of warp to be wound on said warp beam, said reed being mounted on said movable carriage, guiding means for guiding said warp, said guiding means being adjustably mounted on said movable carriage, means for holding said guiding means in an adjusted position, and automatic control means associated with said movable carriage for displacing same with the reed and the guiding means in dependence on the building up of the winding on the warp beam.

11. A warping or beaming machine comprising: a drive for rotating warp beam, a reed for the passage of warp to be wound on said warp beam, a table for a temporary support of said warp, said reed and said table being movable relative to said warp beam, and automatic control means associated with said movable reed and table for displacing same simultaneously in dependence on the building up of the warp beam.

12. A warping or a beaming machine comprising: a drive for rotating a warp beam, a movable carriage, a reed for the passage of warp to be wound on said warp beam, a table for a temporary support of said warp, said reed and said table being mounted on said movable carriage, and automtic control means associated with said movable reed and table for displacing same simultaneously in dependence on the building up of the warp beam.

13. A warping or beaming machine comprising: a drive for rotating a warp beam, a reed arranged for the passage of warp to be wound on said warp beam, guiding means arranged for guiding said warp onto said warp beam, said guiding means being movable relative to said warp beam, and automatic control means associated with said movable guiding means for displacing same in dependence on the building up of the winding on the warp beam whereby a substantial change in the angle between the warp and the guiding means is eliminated.

14. A warping or beaming machine comprising: a drive for rotating a warp beam, a reed arranged for the passage of warp to be wound on said warp beam, guiding means arranged for guiding said warp onto said warp beam, said guiding means being movable relative to said warp beam, and a movable member arranged for contacting engagement with the winding on the warp beam, said movable member being associated with said movable guiding means for displacing same in dependence on the building up of the winding on the warp beam whereby a substantial change in the angle between the warp and the guiding means is eliminated.

15. A warping or beaming machine comprising: a drive for rotating a warp beam, a reed arranged for the passage of warp to be wound on said warp beam, guiding means arranged for guiding said warp onto said warp beam, said guiding means being movable relative to said warp beam, a pressure roll, and a loaded swingable support carrying said pressure roll for urging same against the winding on the warp beam, said loaded swingable support being associated with said movable guiding means for displacing same in dependence on the building up of the winding on the warp beam whereby a substantial change in the angle between the warp and the guiding means is eliminated.

16. A warping or beaming machine comprising: a drive for rotating a warp beam, a reed arranged for the passage of warp to be wound on said warp beam, said reed being movable relative to said warp beam, guiding means arranged for guiding said warp onto said warp beam, said guiding means being movable relative to said warp beam, and automatic control means associated with said movable reed and said movable guiding means for displacing same simultaneously in dependence on the building up of the winding on the warp beam.

17. A warping or beaming machine comprising: a drive for rotating a warp beam, a reed arranged for the passage of warp to be wound on said warp beam, said reed being movable relative to said warp beam, guiding means arranged for guiding said warp onto said warp beam, said guiding means being movable relative to said warp beam, and a movable member arranged for contacting engagement with the winding on the warp beam, said movable member being associated with said movable reed and said movable guiding means for displacing same simultaneously in dependence on the building up of the winding on the warp beam.

18. A warping or beaming machine comprising: a drive for rotating a warp beam, a reed arranged for the passage of warp to be wound on said warp beam, said reed being movable relative to said warp beam, guiding means arranged for guiding said warp onto said warp beam, said guiding means being movable relative to said warp beam, a pressure roll, and a loaded swingable support carrying said pressure roll for urging same against the winding on the warp beam, said loaded swingable support being associated with said movable reed and said movable guiding means for displacing same simultaneously in dependence on the building up of the winding on the warp beam.

19. A warping or beaming machine comprising: a drive for rotating a warp beam, a divergent reed arranged for the passage of warp to be wound on said warp beam, said divergent reed being movable relative to said warp beam, guiding means arranged for guiding said warp onto said warp beam, said guiding means being movable relative to said warp beam, and automatic

control means associated with said movable divergent reed and said movable guiding means for displacing same simultaneously in dependence on the building up of the winding on the warp beam.

20. A warping or beaming machine comprising: a drive for rotating a warp beam, a movable carriage, a reed arranged for the passage of warp to be wound on said warp beam, guiding means arranged for guiding said warp onto said warp beam, said reed and said guiding means being mounted on said movable carriage, and automatic control means associated with said movable carriage for displacing same with said reed and said guiding means in dependence on the building up of the winding on the warp beam.

21. A warping or beaming machine comprising: a drive for rotating a warp beam, a movable carriage, a reed arranged for the passage of warp to be wound on said warp beam, said reed being adjustably mounted on said movable carriage, means for holding said reed in an adjusted position, guiding means arranged for guiding said warp onto said warp beam, said guiding means being mounted on said movable carriage, and automatic control means associated with said movable carriage for displacing same with said reed and said guiding means in dependence on the building up of the winding on the warp beam.

22. A warping or beaming machine comprising: a drive for rotating a warp beam, a movable carriage, a divergent reed arranged for the passage of warp to be wound on said warp beam, said divergent reed being adjustably mounted on said movable carriage, means for holding said divergent reed in an adjusted position, guiding means arranged for guiding said warp onto said warp beam, said guiding means being mounted on said movable carriage, and automatic control means associated with said movable carriage for displacing same with said divergent reed and said guiding means in dependence on the building up of the winding on the warp beam.

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