July 20, 1943. L. F. BARNUM 2,324,668

MACHINE FOR MAKING TWISTED PAPER

Filed Jan. 23, 1942 2 Sheets-Sheet 1

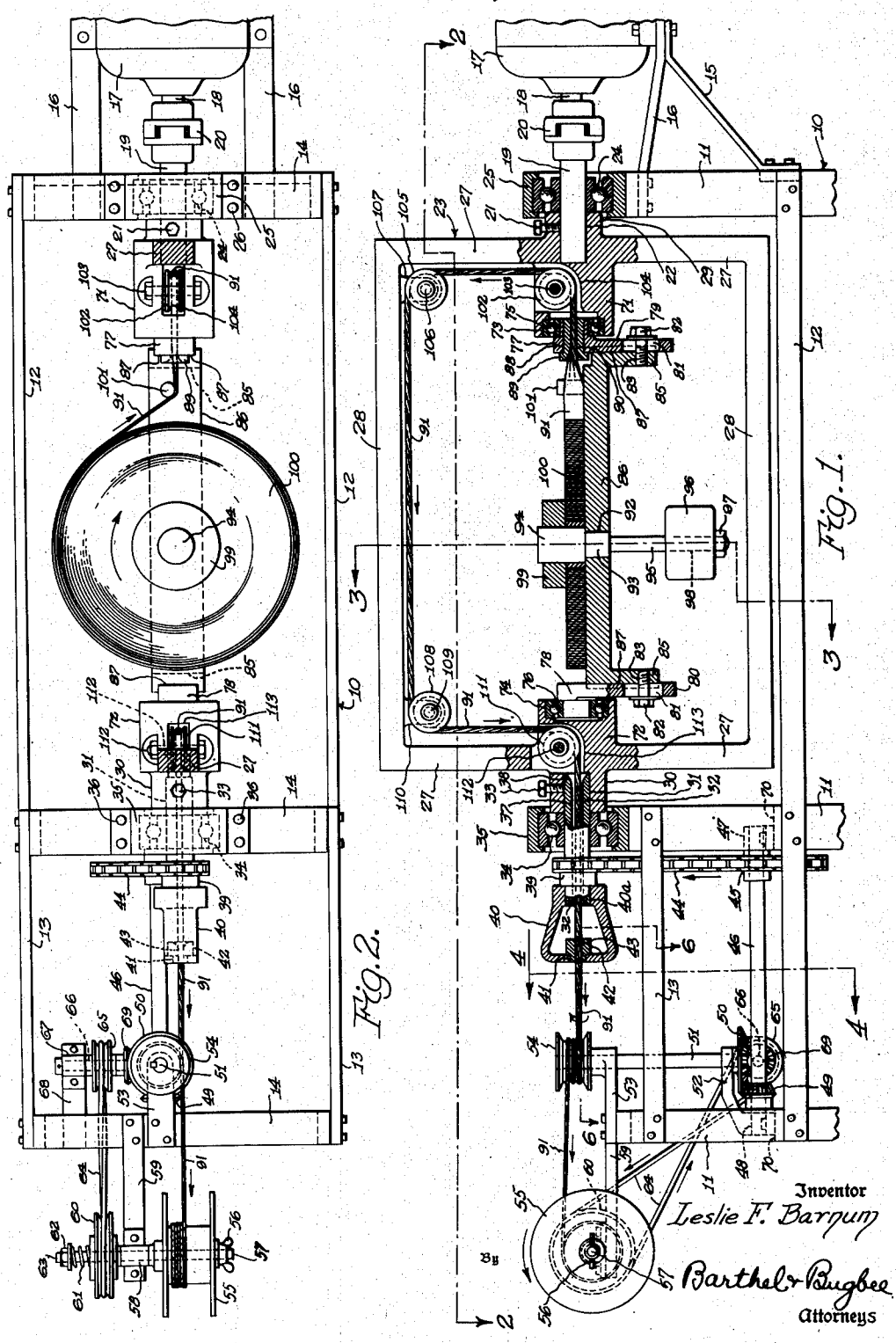


Fig. 2.

Fig. 1.

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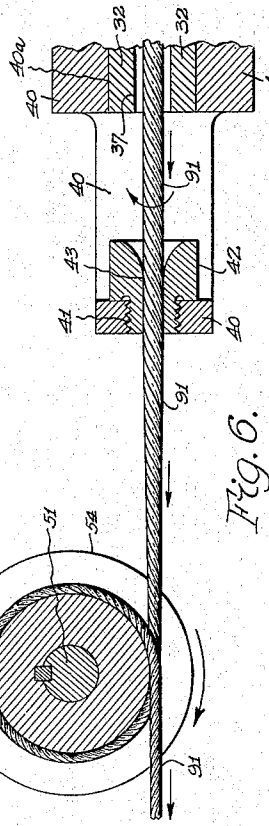


Fig. 6.

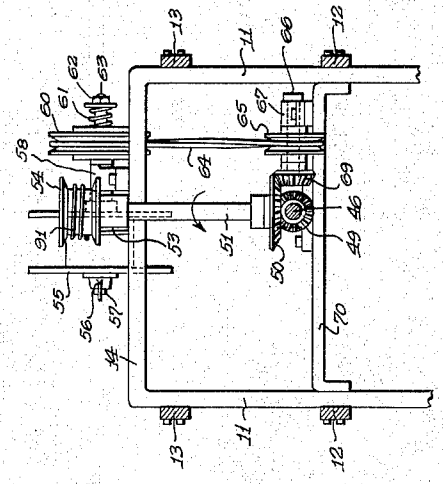


Fig. 4.

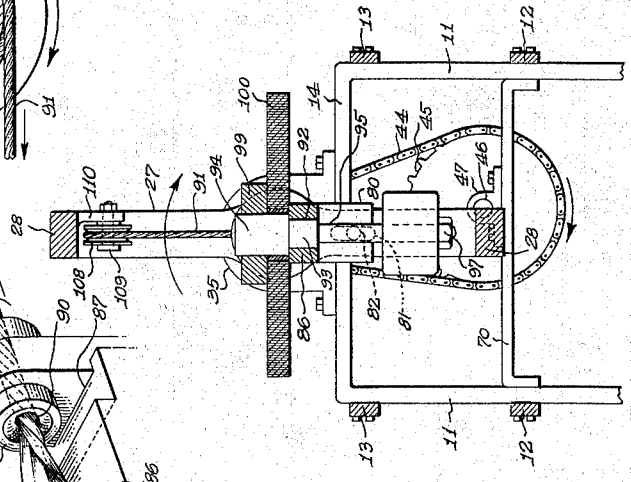


Fig. 3.

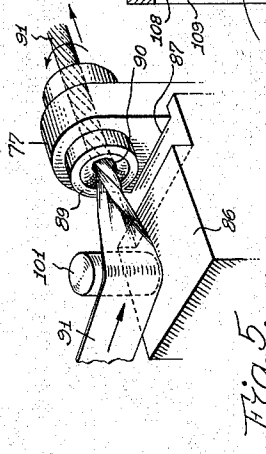


Fig. 5.

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MACHINE FOR MAKING TWISTED PAPER

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Application January 23, 1942, Serial No. 427,852

11 Claims. (Cl. 57—31)

This invention relates to machines and methods of making cordage and in particular to such machines and methods for making twisted paper cordage or the like.

One object of this invention is to provide a machine for making twisted cordage wherein the material receives two twists for every rotation of the apparatus.

Another object is to provide a machine and method for making twisted cordage wherein material in tape or ribbon form is arranged in a loop extending around the supply of material, the latter being kept substantially stationary while the former is rotated.

Another object is to provide a machine and method for making twisted cordage as set forth in the preceding object wherein the supply of tape or ribbon material is stationarily mounted on the axis of rotation and the loop follows a path from the supply first along the axis of rotation, then follows a path to one side of the supply and returns to the axis of rotation in a path extending in the opposite direction from the first portion of its path along the axis of rotation, thereby imparting two twists to the material for a single rotation of the loop around the supply.

In the drawings:

Figure 1 is a side elevation, partly in section, of a preferred embodiment of the cordage making machine of this invention and of one form of apparatus by which the method of the invention may be performed.

Figure 2 is a horizontal section taken along the line 2—2 in Figure 1.

Figure 3 is a vertical cross-section taken along the line 3—3 in Figure 1.

Figure 4 is a vertical cross-section taken along the line 4—4 in Figure 1.

Figure 5 is an enlarged perspective view of the first twister of the machine.

Figure 6 is a horizontal section taken along the line 6—6 of Figure 1, showing the second twister.

In general, the cordage making machine of this invention consists of a rotatable frame having a supply of material stationarily supported at its axis of rotation. The material is preferably paper in the form of a roll of ribbon or tape. This tape is led from the roll through a die forming a twister point and over pulleys to form a loop passing beside the roll and returning to the axis of rotation around another pulley. The twisted tape passes from this last pulley along the axis of rotation in the opposite direction from its first path, proceeding through a forming and smoothing die member at another twisting point and around a power-driven winch and on to a take-up reel. In this manner the paper tape is given two twists for a single rotation of the frame as well as smoothing the convolutions thereof upon emergence from the frame, thereby providing a superior cordage at a low cost.

The method of making cordage consists broadly of leading the tape from a supply along the axis of rotation, then rearwardly in a loop around the supply and again along the axis of rotation in the opposite direction, and rotating the loop around the supply. This causes two twists to be imparted to the tape for every rotation of the loop.

Referring to the drawings in detail, Figures 1 and 2 show a preferred embodiment of the machine of this invention as including a frame 10 having uprights 11 interconnected by lower horizontal members 12, upper horizontal members 13 and cross members 14. Mounted upon bracket members 15 and 16 secured to one end of the frame 10 is an electric motor 17 having a motor shaft 18 connected to a drive shaft 19 through a coupling 20. The drive shaft 19 in turn is secured as at 21 within a bore 22 in a rotatable frame 23. The shaft 19 is rotatably supported in anti-friction bearings 24 mounted upon one of the cross members 14 and held by the bearing bracket 25 secured thereto as at 26. The frame 23 consists of end portions 27 and side portions 28 forming a rectangle. It will be evident, however, that any type of open frame may be used, such as a circular or oval frame.

The bore 22 is formed in a boss 29 which projects axially toward the motor 17, the boss 29 being integral with the frame 23. The opposite end of the frame 23 is similarly provided with an integral boss 30 extending in the opposite direction and having a bore 31 with a tubular shaft 32 secured therein as at 33. The tubular shaft 32 is rotatably supported upon anti-friction bearings 34 mounted in the bearing bracket 35 secured as at 36 to the middle cross-member 14.

The tubular shaft 32 is provided with a longitudinal bore 37 having a bell-mouthed entrance 38. Mounted on the tubular shaft 32 is a drive sprocket 39 and adjacent the sprocket 39 is mounted a rotatable frame 40 having a longitudinal bore 40a for receiving the end of the tubular shaft 32. Coaxial with the bore 40a in the frame 40 is a second longitudinal bore 41 which is threaded to receive the threaded end of the die forming and smoothing member 42 having a bell-mouthed bore 43 (Figure 6). The sprocket 39 drives a sprocket chain 44 which in turn drives

a sprocket 45 mounted upon the shaft 46 (Fig. 1). The latter is supported in brackets 47 and 48 at its opposite ends. Mounted on the shaft 46 is a bevel gear 49 meshing with a bevel gear 50 mounted upon a vertical shaft 51 supported at its opposite ends in brackets 52 and 53. The upper end of the shaft 51 carries a winch 54 around which the cordage is passed on its way to a take-up reel 55.

The take-up reel 55 is secured as at 56 to a shaft 57 mounted in a bracket 58 on an arm 59 secured to one of the cross-members 14. The shaft 57 on its opposite end carries a pulley 60 engaged by a coil spring 61 seated against a nut 62 threaded upon one end 63 of the shaft 57. The pulley 60 is driven by a belt 64 from a pulley 65 mounted upon a shaft 66. The latter is rotatably mounted in a bracket 67 on an arm 68 secured to the frame 10 (Fig. 2) and at its opposite end carries a bevel gear 69 meshing with the bevel gear 50. (Fig. 4.) The brackets 47, 48 and 67 are mounted upon lower cross-members 70 (Figs. 3 and 4).

The frame 23 is also provided with a pair of inwardly projecting integral bosses 71 and 72 (Figs. 1 and 2) having sockets 73 and 74 respectively accommodating anti-friction bearings 75 and 76 (Fig. 1). The anti-friction bearings 75 and 76 support the hubs 77 and 78 of depending arms 79 and 80. The arms 79 and 80 are provided with slots 81 which accommodate cap screws 82 entering threaded bores 83 in the downwardly projecting portions 85 of the material holder 86. The portions 85 are provided with guide grooves 87 within which the arms 79 and 80 are slidable relatively to the material holder portions 85 for adjustment purposes.

The hub 77 of the arm 79 is further provided with an axial bore 88 which accommodates the die member 89 having a bell-mouthed bore 90 to facilitate passage of the tape or strand of cord 91.

The material holder 86 is provided with a central transverse bore 92 within which is mounted a shaft 93 having an upwardly extending enlarged portion 94 on one side thereof and a downwardly extending reduced portion 95. The latter carries a counter-weight 96 secured thereto by the nut 97 threaded upon the lower end of the shaft portion 95 which passes through a bore 98 therein. The enlarged shaft portion 94 serves as a spindle to receive a collar 99 for retaining the roll of material 100 in position upon the material holder 86. The material holder 86 is also provided with a guide pin 101 for directing the tape 91 into the first twister 90.

Beyond the first twister 90 the now twisted strand 91 passes over a pulley 102 mounted upon a shaft 103 in a recess 104 within the boss 71. The strand or cord 91 continues parallel to the frame end 23 and then passes over a pulley 105 mounted upon a shaft 106 held by the ear 107, after which it continues parallel to and along one of the sides 28 over a third pulley 108 similarly mounted upon a shaft 109 supported by an ear 110 extending inwardly from the frame 23. Beyond the third pulley 108 the cord 91 passes around a fourth pulley 111 mounted upon a shaft 112 mounted within a recess 113 in the boss 72 of the frame 23. Beyond the fourth pulley 111 the cord 91 passes through the bore 37 in the tubular member 32 and thence through the second twister 42, around the winch 54 and onto the take-up reel 55.

In the preparation of the machine for operation, a roll 100 of paper or other suitable material preferably in tape or ribbon form is mounted upon the shaft 94 of the material holder 86 and secured in place by means of the collar 99. The holder 86 is adjusted up or down until the center line of the material strip or cord 91 coincides approximately with the axis of the bore 90. The strand or cord 91 is then twisted and threaded through the bore 90 of the die member 89 by hand, passed around the pulleys 102, 105, 108 and 111, thence through the bore 37 in the tubular shaft 32 and finally through the bore 43 of the forming and smoothing die member 42, passing several times around the winch 54 and onto the supply reel 55. With the machine thus adjusted, it is ready for operation.

In the operation of the machine and in the practice of the method the motor 17 is caused to rotate the frame 23 while the counter-weight 96 maintains the material holder 86 in a substantially horizontal and stationary position, although permitting swing to impart flexibility of movement. As the cord 91 passes through the die member 89 and around the first pulley 102 it receives a first twist for every revolution of the frame 23. After it has passed around the pulleys 105, 108 and 111 and through the second twister 43 it receives a second twist for every revolution of the frame 23. The bell-mouthed portions of the die members 89 and 42 facilitate passage of the cord 91 through the bores thereof. In this manner there has been provided a machine and method for making cordage from ribbons or tapes of paper or other suitable material wherein the cordage is twisted twice for every revolution of its loop. By this double twisting the cord is packed more tightly and given a greater strength at a lower cost of production.

While a specific embodiment of the invention has been described and illustrated, it will be understood that various modifications may be made within the scope of the appended claims without departing from the spirit of the invention.

What I claim is:

1. In a machine for making twisted cordage, a rotatable frame, a holder for a supply of material in flat strip form, means for guiding the strip from said supply in a path forming a loop within the confines of said frame and including the axis of rotation of said frame, means for rotating said frame at one end thereof, means for feeding said material from said supply through said loop and die forming means at the other end of the frame for frictionally engaging the strand and for smoothing the convolutions thereof to impart a further twist thereto between the frame and feeding means.

2. In a machine for making twisted cordage, a rotatable frame, a holder for a supply of material in a path forming a loop within the confines of said frame and including the axis of rotation of said frame, means for rotating said frame at one end thereof, means for feeding said material from said supply through said loop in a path emerging from said frame along said axis of rotation and die forming means at the other end of the frame for frictionally engaging the strand for smoothing and forming the convolutions thereof and to impart a further twist thereto between the frame and feeding means.

3. In a machine for making twisted cordage, a rotatable frame, a holder for a supply of material in strip form, means for guiding the strip from said supply in a path forming a loop within the confines of said frame and including the

axis of rotation of said frame, means for rotating said frame at one end thereof, means for feeding said material from said supply through said loop, and die forming means at the opposite end of the frame for grasping said strand to facilitate smoothing of the twisted convolutions of said strand and for twisting at a location along said axis of rotation between said die forming means and feeding means.

4. In a machine for making twisted cordage, a rotatable frame, a holder for a supply of material in relatively flat strip form, means for guiding the strip from said supply in a path forming a loop within the confines of said frame and including the axis of rotation of said frame, means for rotating said frame at one end thereof, means for feeding said material from said supply through said loop in a path emerging from said frame along said axis of rotation, and die forming means at the opposite end of the frame for frictionally gripping said strand to facilitate smoothing and forming the twisted convolutions of said strip and twisting the same between a pair of spaced locations along said axis of rotation.

5. In a machine for making twisted cordage, a rotatable frame, a holder for a supply of material in relatively flat strip form, means for guiding the strip from said supply in a path forming a loop about and within the confines of said frame and including the axis of rotation of said frame, means for rotating said frame at one end thereof, means for feeding said material from said supply through said loop in a path emerging from said frame along said axis of rotation, and means for frictionally gripping said strip at a location along said axis of rotation adjacent said supply and also along said axis of rotation between the feeding means and frame in said emerging path at the opposite end of the frame whereby to facilitate twisting at two separate locations near the beginning and end of said path.

6. In a machine for making twisted cordage, a rotatable frame, a holder for a supply of material in relatively flat strip form, means for guiding the strip from said supply in a path forming a loop about and within the confines of said frame and including the axis of rotation of said frame, means for rotating said frame at one end thereof, means for feeding and tensioning said material from said supply through said loop at the point where the supply enters the loop adjacent the rotating means, means for maintaining said supply substantially stationary during the rotation of said frame and an annular forming die between the feeding means and frame for smoothing and pressing the convolutions of said strip by drawing the strip therethrough.

7. In a machine for making twisted cordage, a rotatable frame, a holder for a supply of material in strip form, means for guiding the strip from said supply in a path forming a loop about and within the confines of said frame and including the axis of rotation of said frame, means for rotating said frame at one end thereof, means for feeding said material from said supply through said loop, die forming means for gripping the strand as it emerges from said loop said feeding means including a rotatable drum around which said strand is wound, means for driving said drum and said die forming gripping means including a rotatable head through which the strand passes before being wound on said drum whereby the convolutions of said strip will be tightly pressed together.

8. In a machine for making twisted cordage, a rotatable rectangular frame, a holder for a supply of material in relatively flat strip form in alignment with the axis of the frame, means for guiding the flat strip from said supply in a path forming a loop about and within the confines of said frame and including the axis of rotation of said frame, means for rotating said frame at one end thereof to impart a twist thereto, means for feeding said material from said supply through said loop in timed relation with the rotation of the frame, said feeding means including a rotatable drum around which said strand is wound, a rotatable twisted strand receiving forming die member located at the end of the frame in opposed relation with the frame rotating means and means for connecting the strand receiving member for rotating the feeding means whereby said twisted strand will be formed and pressed with its convolutions in closely compact relation.

9. In a machine for making stranded cordage from tape material, a rectangular frame rotatable about an axis, a material holder supported within said frame in alignment with said axis, means for impeding rotation of said holder, means for guiding said tape material from said holder in a loop about and within the confines of one side of said frame, and a forming die member arranged to press and smooth said tape material as it emerges from said frame said forming die member being rotated in unison with the frame.

10. In a machine for making stranded cordage from tape material, a rectangular frame rotatable about an axis, a material holder supported within said frame in alignment with said axis, means for impeding rotation of said holder, means for guiding said tape material from said holder along said axis in a loop about and within the confines of one side of said frame and outward along the same axis but in the opposite direction and a die member positioned at the emergence end of the frame along the axis of rotation thereof for tightly pressing the convolutions of said tape upon one another after the tape is twisted.

11. In a machine for making stranded cordage from tape material, a rectangular frame rotatable about an axis, a strip material holder supported within said frame in alignment with the axis thereof, means for impeding rotation of said holder, means for guiding said tape material from said holder along said axis in a loop about and within the confines of one side of said frame and outward along the same axis but in the opposite direction to impart a twist thereto and a die member positioned at the emergence end of the frame along the axis of rotation thereof for tightly pressing the convolutions of said tape upon one another after the tape is twisted.

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