

Nov. 29, 1955

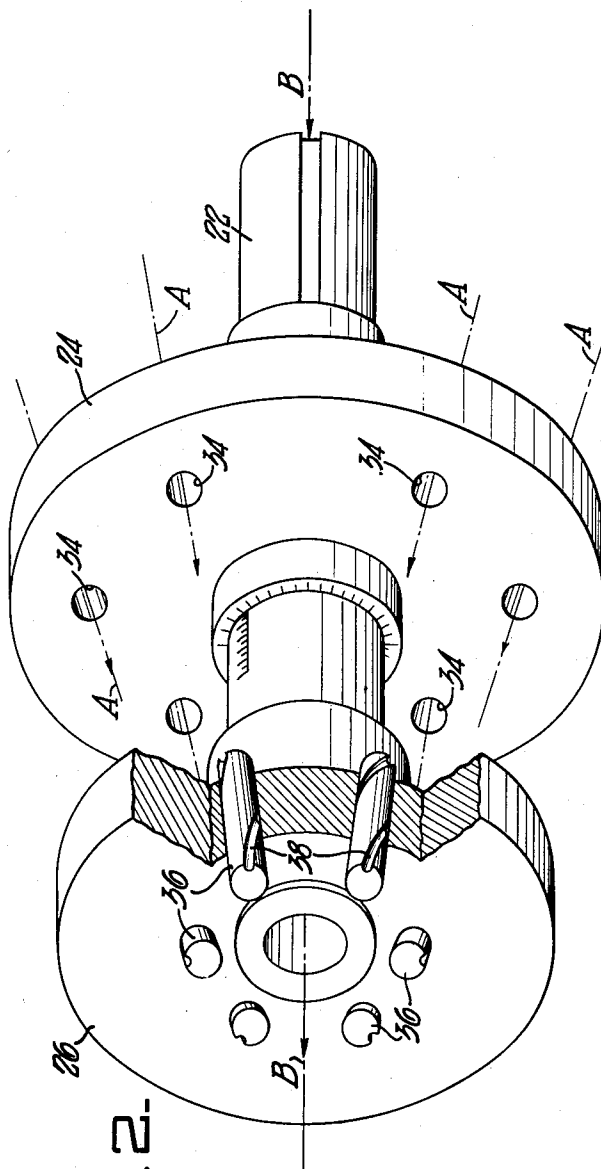
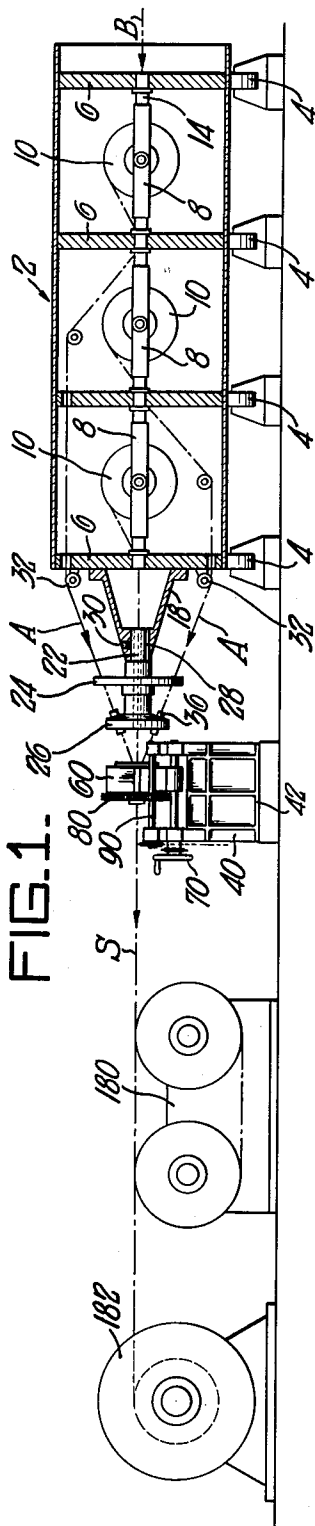
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2,724,944

APPARATUS FOR MAKING STRANDED WIRE STRUCTURES

Filed Dec. 3, 1952

4 Sheets-Sheet 1



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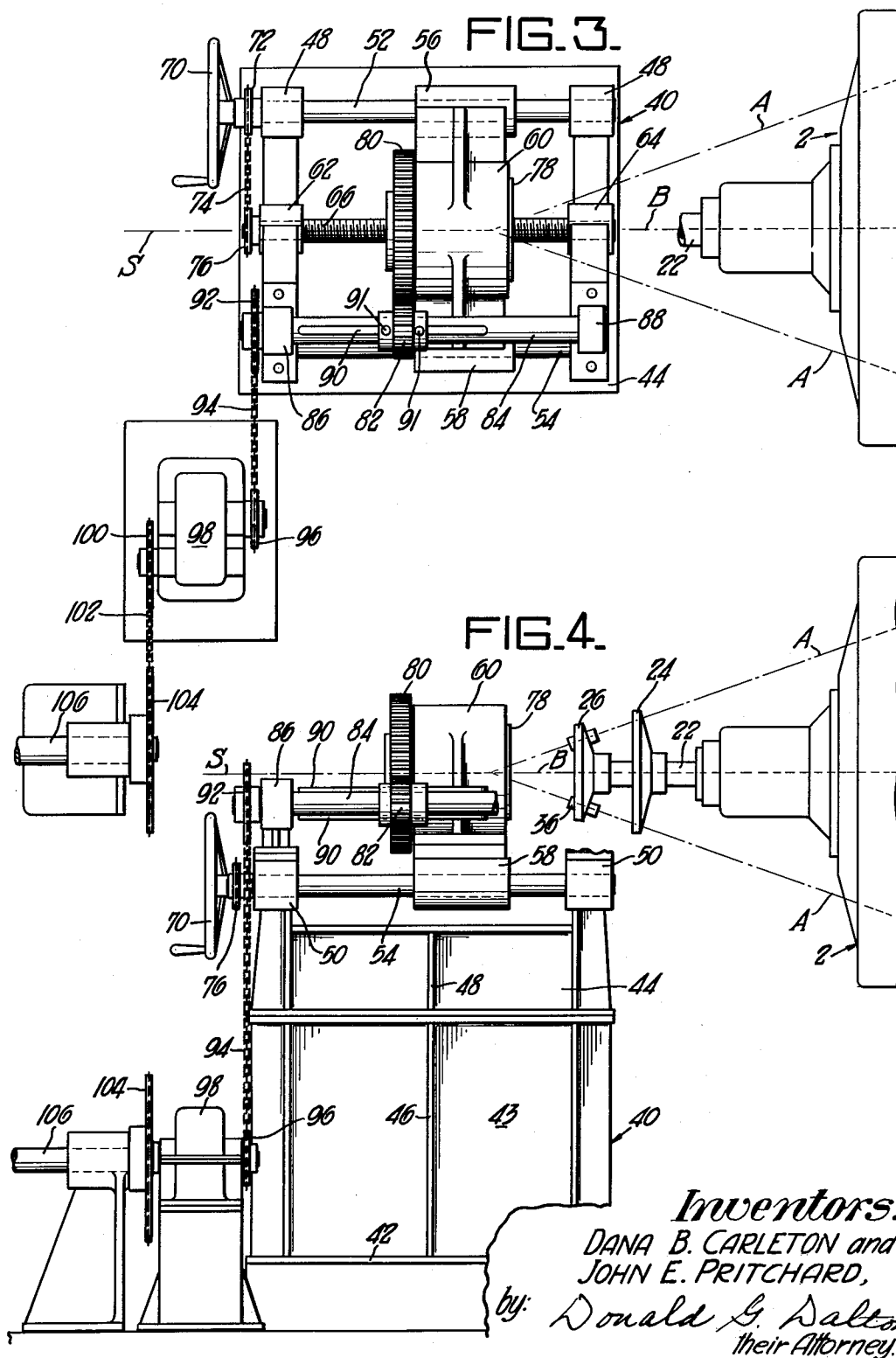
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FIG. 6.

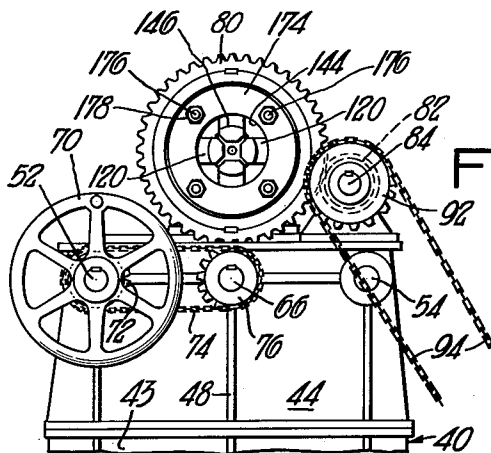
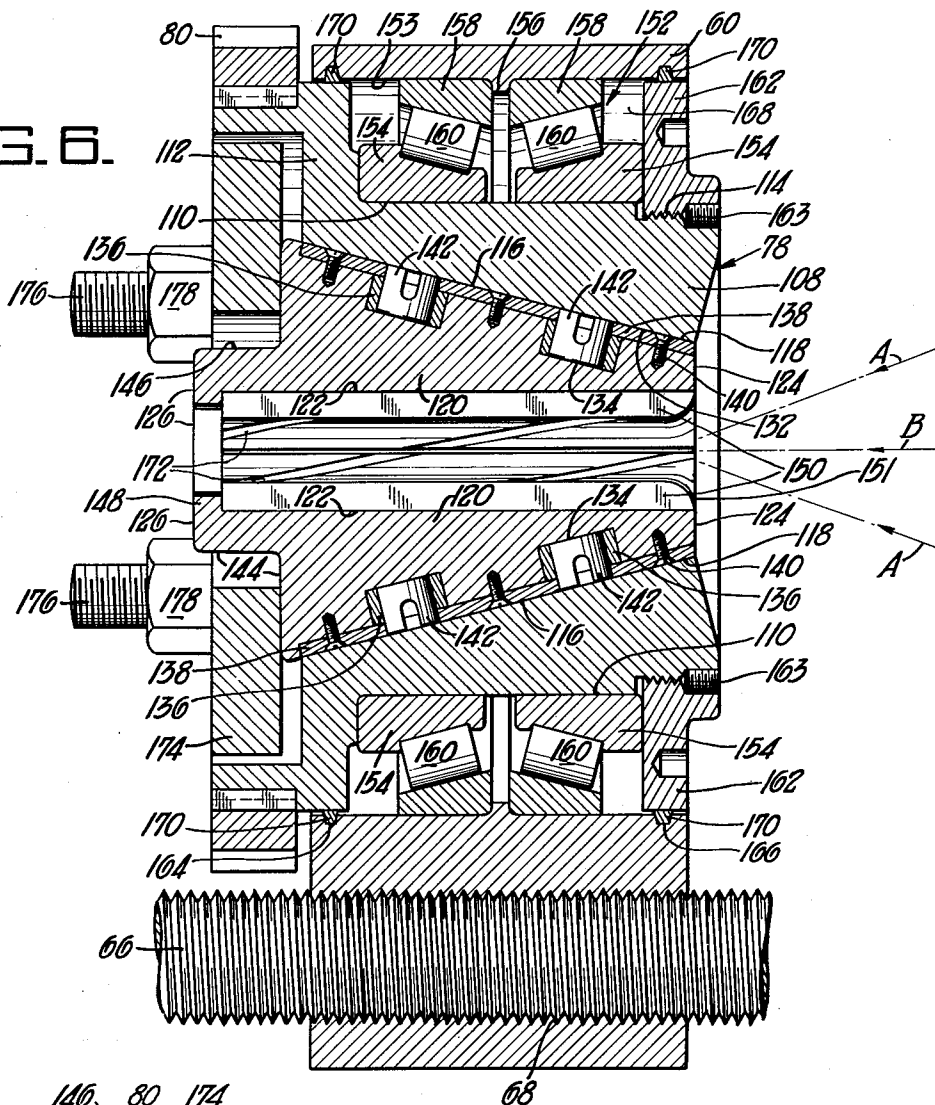


FIG. 5.

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FIG. 7.

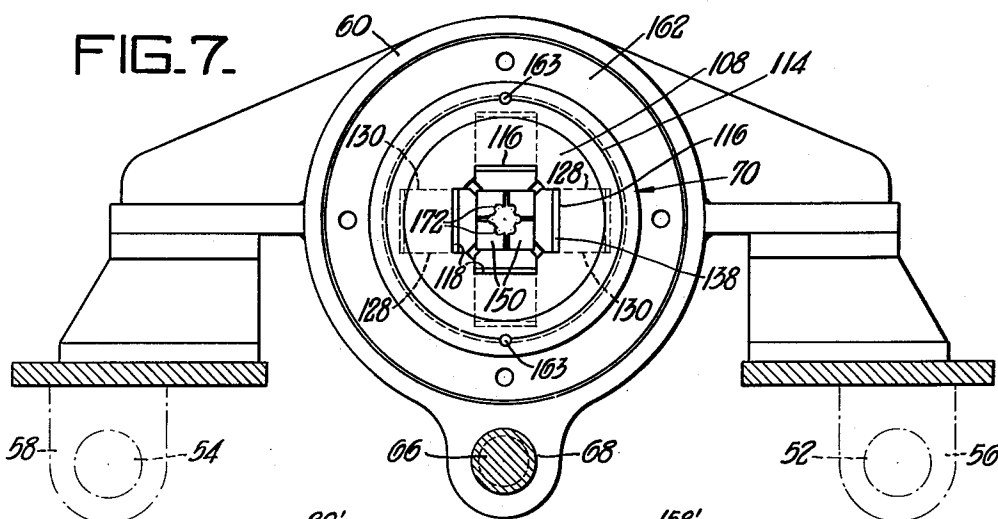
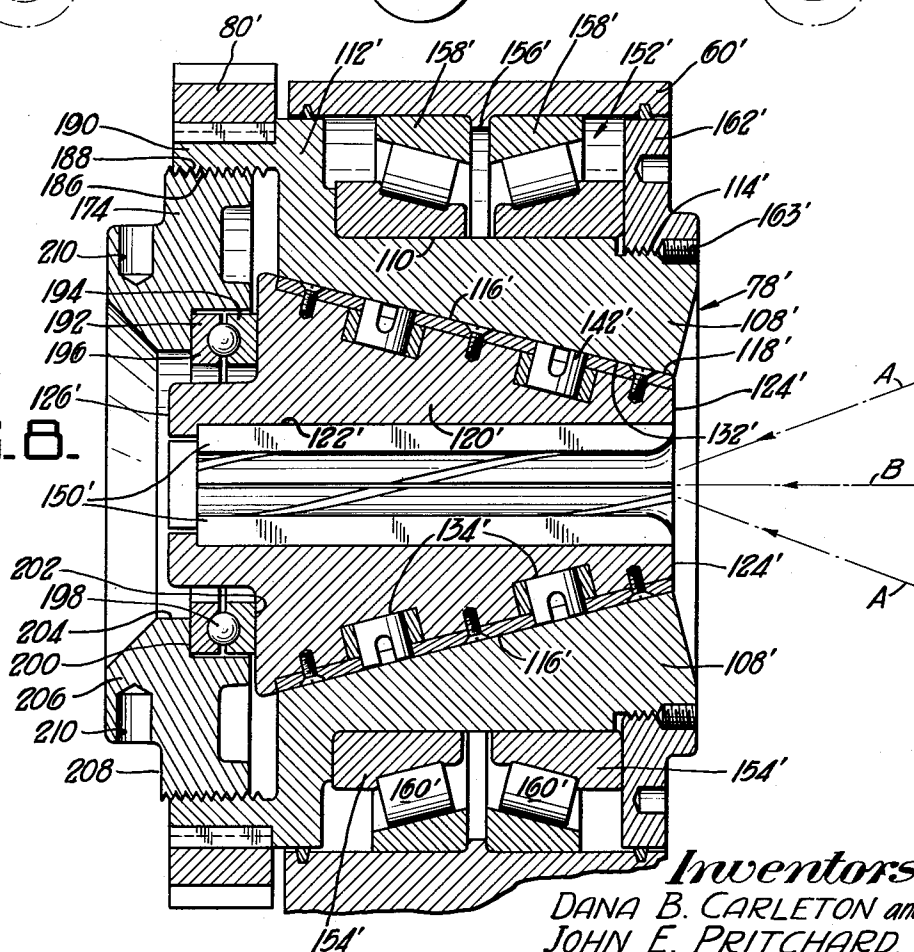


FIG. 8.



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2,724,944

## APPARATUS FOR MAKING STRANDED WIRE STRUCTURES

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Application December 3, 1952, Serial No. 323,823

18 Claims. (Cl. 57—55)

The present invention relates generally to the art of manufacturing preformed stranded wire structures and more particularly to apparatus for manufacturing strand wire structures such as preformed rope and the like from wire or filaments of metal, hemp, sisal, plastic, or other similar material.

The term rope, when used in connection with stranded wire structures, and as used throughout this specification and attached claims, refers to a structure made up of a plurality of strands laid together, with each strand comprising a plurality of component wires or filaments stranded together, the strands being laid or stranded in longitudinal helical elements in an assembled radial relation about a wire core element. In preformed rope, the stranded elements are preset or preformed in the form which they are to occupy in the completed structure. Such preforming causes the stranded elements to be inert in the sense that they are in a condition substantially free from internal stresses and thereby different from ordinary or nonpreformed rope elements which, after laying, are in a condition of such internal stress or tension that, unless served with a binding, will spread apart or "explode."

Prior to our invention, apparatus for making a preformed rope ordinarily included a twisting machine, including a rotatable tubular frame having supply spools for the strand elements, a perforated guide plate and a preforming head, a rotary or stationary closing die, a haul-off mechanism, and take-up reel. The preforming head of the twisting machine was either the quill type as disclosed by Carleton et al. in Patent No. 2,556,164 or any other suitable type. In practice, the twisting machine, the closing die, the haul-off mechanisms and take-up reel were operatively associated together arranged in longitudinal alignment with the axes of the tubular frame, the guide plate, the preforming head, and the closing die extending in a common longitudinal plane. The various components of the assembly were arranged so that the strand components passed through the guide plate, which was positioned between the tubular frame and the preforming head, in such a manner as to enter the preforming head tangentially to the core element which progressed axially through the apparatus. The guide plate was adjustable longitudinally and radially to obtain the proper angle of tangency between the several strand components and the core element. The several strand components continued tangentially to the core element as they passed through the preforming head. The preforming head was adjustable radially so as to cause the strand components to form the desired pitch line diameter and helix angle. The apparatus was adjusted so that the several strand components twisted about or converged upon the core element at the point of entrance into the closing die.

In order to produce a stranded rope having a plurality of elements stranded or laid in longitudinal helices about a core element in balanced spaced relation with each other and in an inert condition, it is essential that the distance from the point of emergence of the components

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from the preforming head to the point of twist or convergence with the core member be carefully adjusted so that the convergence will take place at the point of entrance of the component strands and the core into the closing die. This distance varies according to the diameter of the component wires or strands.

Although apparatus has been developed for manufacturing stranded products which include a fixed closing die and means for readily adjusting the distance between the fixed die and the outlet end of the preforming head, we are not aware of any stranding apparatus using a rotary closing die, prior to our invention, that included rapid and simple means for adjusting this distance. For example, in apparatus having a quill type preforming head and rotary closing die as disclosed in the above mentioned patent, it was necessary to disassemble the preforming head element and change the spacer tube between the preforming head and the die in order to adjust this distance for each change in size of product being made.

The lack of flexibility or ease of adjustment inherent in apparatus for making preformed stranded wire structures with a rotary closing die, prior to our invention, increased considerably the time and cost required for producing preformed stranded wire structures of varying sizes and lay in production quantities.

It is, accordingly, an object of our invention to provide an apparatus for making preformed stranded wire structures which are capable of high speed production and which can easily and quickly be adjusted to produce stranded products of varying sizes and lay.

Another object of our invention is to provide an apparatus which includes a twisting machine, a rotary closing die, haul-off mechanism, and take-up reel disposed in longitudinal alignment wherein the rotary closing die is readily adjustable longitudinally relative to the outlet end of the preforming head of the twisting machine.

A further object of the invention is to provide a readily adjustable rotary closing die assembly for making a preformed stranded wire structure of the type whose stranded elements are preset in the form which they are to occupy in the completed structure and which are thus in a condition substantially free from internal stresses.

These and other objects will become more apparent after referring to the following specification and attached drawings, in which:

Figure 1 is an elevational view partly in section showing a preformed stranded wire structure making machine having the apparatus included therein;

Figure 2 is a perspective view with parts broken showing a preforming head and guide plate;

Figure 3 is a plan view of the die assembly support stand and die assembly of our invention;

Figure 4 is a side elevational view of Figure 3;

Figure 5 is an elevational view of the exit end of the stand and die assembly of our invention;

Figure 6 is a vertical sectional view through the die assembly of our invention;

Figure 7 is an elevational view of Figure 6 showing the entry end of the die assembly; and

Figure 8 is a vertical sectional view of a modification of the die assembly of our invention.

Referring more particularly to the drawings, reference numeral 2 indicates a rotatable tubular frame which is supported in any suitable manner such as by sets of rollers 4 equally positioned along its length. Equally spaced along the length of the tubular frame 2 are a plurality of transverse spiders 6, between which are supported axially pivoted cradles 8. Supply spools 10, on which the component strands A are reeled, are rotatively mounted in the cradles 8. A hollow spindle 14 extends axially through the tubular frame 2 for passage of a core ele-

ment or wire B. A hollow mast 18, through which the core element B passes out of the tubular frame 2, is mounted on the forward end of the frame. The mast 18 is provided with a hole in its end for receiving a hollow shaft 22 on which is mounted a circular guide plate 24 and a quill type preforming head 26. The shaft 22 is secured in the mast 18 by means of a key 28 and a set screw 30. Although we have chosen to show a quill type preforming head in the exemplary form of our invention, it will be understood that any other suitable type may be used if desired.

A series of lead sheaves 32 are radially disposed about the mast 18 to guide the component strands A as they emerge from the tubular frame 2. After passing over the sheaves 32, the component strands A pass through equally spaced guide holes 34 in the guide plate 24. The holes 34 are arranged with their axes converging toward the axis of the shaft 22. After passing through the guide plate 24, the component strands A pass through the quills 36 of the preforming head 26. The axes of the quills are tangentially directed similarly to the holes 34. The quills 36 are provided with helical grooves 38 along which the component strands travel as they pass through the quills. The operation and function of the preforming head 26 is described in detail in the patent to Carleton et al., No. 2,556,164, referred to hereinbefore, and it is not thought necessary to repeat this description for a clear understanding of the present invention.

Reference numeral 40 indicates a die assembly frame support stand. The stand 40 is disposed adjacent the preforming head 26 in longitudinal alignment therewith but mounted separately therefrom on a stationary bed 42. The stand 40 may be made up of a lower base portion 43 and an upper standard 44 as best shown in Figures 3 and 4. The base 43 and standard 44 may be formed of castings having strengthening ribs 46 and 48 respectively. The standard 44 is provided with pairs of outer bearings 48 and 50 which respectively support a rotatable shaft 52 and a stationary shaft 54 on which are slidably mounted bearings 56 and 58, respectively, of a die assembly housing 60. Standard 44 is provided with intermediate bearings 62 and 64 for accommodating a screw shaft 66 which is threaded into a central threaded bore 68 on the lower portion of the housing 60. A handwheel 70 may be rigidly secured on the end of the shaft 52 so that the shaft may be manually turned in the bearings 48. A sprocket 72 is secured on the shaft 52 adjacent the handwheel 70 by means of a conventional key (not shown). Sprocket 72 is drivingly connected by means of a chain 74 with a sprocket 76 which is secured to the end of the screw shaft 66. Thus as handwheel 70 is turned, the screw shaft 66 will move the die assembly housing 60 either away or toward the preforming head, depending on the direction of rotation of the shaft, along the shafts 52 and 54. A die assembly 78, which will be described in detail hereinafter, is rotatably mounted in the die assembly housing 60. At one end, the die assembly 78 contained in the housing 60 is provided with a ring gear 80 which is adapted to mesh with a drive pinion 82 slidably mounted for axial movement on a shaft 84. The shaft 84 is journaled in bearings 86 and 88 which are supported on the standard 44 above the shaft 54. The drive pinion 82 is slidably secured to shaft 84 by a pair of keys 90. The drive pinion may be rigidly fixed in adjusted position by means of a pair of set screws 91.

A sprocket wheel 92 is rigidly secured on one end of the shaft 84 and is drivingly connected by means of a chain 94 with a sprocket 96 of a reduction gear unit 98. The reduction gear unit 98 is provided with another sprocket wheel 100 which is drivingly connected by means of a chain 102 with a sprocket 104 on a main drive shaft 106.

As shown in Figure 6, the rotary die assembly 78 comprises a chuck body 108 having an intermediate journal portion 110, a flange portion 112 at one end and a cir-

cumferentially threaded portion 114 at its other end. The ring gear 80 is disposed around the flange portion 112 exteriorly of the housing 60. A plurality of slots or ways 116 extend longitudinally along the tapered bottom surface 118 of the chuck body 108. A die chuck wedge plate 120 is slidably positioned in each of the slots or ways 116. Each of the chuck plates 120 may have a flat bottom face 122, front end face 124, rear end face 126, side walls 128 and 130, and a flat tapered upper face 132. The taper of the upper face 132 of each of the chuck plates coincides with the tapered bottom of the slot 116 in which it is inserted so as to permit ready longitudinal movement in the slot 116. A plurality of bottomed holes 134 having sleeves 136 therein are provided in the upper tapered surface of each of the chuck plates 120. A jaw plate 138, preferably made of phosphor-bronze, is secured on the tapered upper face of each of the chuck plates 120 by means of flat headed screws 140. Each of the jaw plates is constructed to overlap the edges of the holes 134 so as to retain the sleeves 136 therein.

Within the bronze sleeves 136 are mounted, by a drive fit, plugs 142 which may be formed of any suitable magnetic material, such as aluminum-nickel alloy, for the purpose of holding each of the chuck plates 120 against the surface of its slot 116. A portion of the rear end of each chuck plate 120 may be cut away, as at 144, so as to provide a radial surface 146 the purpose of which will become apparent. A depending flange 148 is also provided at the rear end of each of the chuck plates to provide an abutment heel for a die segment 150.

A radial-and-thrust bearing 152 is disposed on the journal portion of the chuck body 108. The bearing unit includes inner roller bearing races 154, spacer flange 156, outer roller bearing races 158, and roller bearing rolls 160. The bearing unit 152 is rigidly mounted by a press fit in the inner circular bore 153 and on the journal 110 and retained against the flange portion 112 by a chuck ring 162 which is mounted on the threaded portion 114 of the chuck body and secured in place by set screws 163. Grooves 164 and 166 may be provided near the edges of the bore 153 of the housing 60 to accommodate felt washers 170 which retain lubricant in the bearing unit and exclude foreign material therefrom.

The rotary closing die assembly of our invention includes a plurality of die blocks 150, each die block being disposed against the inner face of a chuck plate 120 with one end thereof abutting the heel 148. Each block is provided with helical grooves 172 having a size and lay substantially the same as the stranded wire structure or rope S being laid or stranded. Although we have shown a closing die having four die blocks, any suitable number of blocks may be used as desired. The blocks 150 are positioned against the chuck plates with their ends abutting against the abutment heel 148 so that the axial force exerted against the die blocks by the rope S being stranded will be resisted by the abutment heel. The inner ends 151 of the blocks are shaped to form a bell mouth at the entrance of the opening defined by the die blocks.

The chuck plates are held in position against the tapered surfaces of the slots 116 by means of a chuck pressure plate 174, chuck studs 176 threaded at one end into the chuck body 108, and chuck stud nuts 178. Radial pressure is applied to the die segments 150 by tightening the nuts on the chuck studs 176. The pressure plate 174 distributes pressure equally along the tapered surfaces of the slots 116 which causes a radial pressure to be exerted by the die blocks 150 against the rope S. The chuck body 108 together with the die blocks 150 is caused to rotate concentrically in the rotary die housing 60 about the central axis of the rope S being formed by means of the drive pinion 82 meshing with the integral ring gear 80.

A hauling mechanism or haul-off block 180 and take-up reel 182 of conventional design are disposed adjacent

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and in longitudinal alignment with the die assembly stand 40.

In operation, the apparatus of our invention is set up for a given size rope by removing the die blocks 150 from the chuck body 108, loosening each of the chuck bolt nuts 178 by threading them to the extreme end of the studs 176, and moving the pressure plate 174 and chuck plates 120 out towards the stud nuts as far as possible. In order to permit such a movement, holes are provided in the pressure plate 174 for the studs 176 which are slightly larger in diameter than the diameter of the studs so as to permit the pressure plate to slide readily along the studs. The various component strands A to be stranded or laid and the core element B are then pulled through the guide plate 24, the preforming head 26 and the opening defined by the chuck plates 120, and fastened to a starting rope as in conventional starting operations for stranded rope manufacturing apparatus. The apparatus is then set in motion, i. e., the twisting machine, closing die and haul-off block are rotated, without the die blocks 150 and run until the loosely laid stranded structure extends a few feet beyond the rotary die housing 60. If preferred, a sufficient length of loosely laid rope may be formed so as to extend around the haul-off mechanism 180 to the take-up reel 182. The die blocks 150, of proper size for the particular lay and rope diameter desired, are then placed around the loosely formed stranded structure and within the chuck plates 120 with the ends of the die blocks abutting against the heels 148. This may be done by inserting the die blocks 150 around the loosely stranded rope from the entrance end of the die assembly 78 adjacent the preforming head 26. The die blocks 150 at this stage are lying in their approximate positions against the loosely formed rope. The nuts 178 are now turned on the studs 176 which causes the pressure plate 174 to push against the ends of the chuck plates 120 and slides them down along the tapered surfaces of the slots 116. Thus radial pressure is transmitted by the chuck plates 120 toward the axial center line of the rotary die assembly 78 and the rope positioned therein by means of the die blocks 150.

With the tightening of the nuts 178, three adjustments must be made:

1. A correct equal positioning of the die blocks around the center line of the rope.
2. Rotary adjustment of the chuck body 108 and the chuck plates 120 and die blocks held therein to such a position that the grooves 172 in the die blocks 150 will fit over the helically laid strands of the structure and will be positioned exactly in line with the helically preformed strands delivered from the preforming head 26.
3. Longitudinal adjustment or positioning of the die blocks along the axis of the rope being formed so that the bell mouth of the opening formed by the die blocks 150 will be positioned at the natural twisting point of the helically preformed strands delivered by the preforming head 26.

The rotary die blocks are converged about the rope being formed so that the helical groove openings at the entrance end of the closing die assembly will be positioned in exact helical alignment with the helically preformed strand components 12 emerging from the quills 36 of the preforming head 26. This is accomplished by the simultaneous three-direction movement of the die blocks, the first two being the axial and the radial converging movement of each of the die blocks toward the central axis of the rope to be formed and the third being the rotational movement of the die blocks in unison about the central axis of the rope. The radial adjustment of the die blocks is effected by the tightening of the nuts 178 on the studs 176. The rotary adjustment of the die assembly is effected by loosening the set screws 91 and sliding the drive pinion 82 along the shaft 84 out of mesh with the ring gear 80, then after the die assembly and the integral ring gear 80 have been rotated to the proper position, i. e., the posi-

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tion wherein the helical grooves of the die blocks coincide with the preformed component strands 12, the drive pinion is again moved along the shaft 84 so as to mesh with the ring gear 80 and clamped into position.

The longitudinal adjustment of the die blocks 150 along the axis of the stranded rope is effected by moving the die assembly 78 as a unit with the rotary die housing 60 by turning the handwheel 70.

When the nuts 178 have been tightened enough to develop proper pressure on the die blocks 150, friction between the contacting surfaces of the pressure plate 174 and chuck plates 120 will be sufficient to prevent relative motion therebetween. The pressure plate 174 remains in place throughout the laying operation to insure that no longitudinal movement of the die blocks 150 occurs. While not absolutely necessary, it is preferable that the nuts 178 be tightened almost to the desired point, and a few feet of stranded rope formed before final adjustment of the nuts is made. This completes the preparatory adjustments of the apparatus and thereafter the laying operation is carried on in normal manner until the stranded rope is completed.

The foregoing operations are repeated whenever changing the size or lay of the stranded rope or when changing or replacing the die blocks 150.

In practice, the rotatable frame member 2 may be driven from the back shaft 106, and the back shaft may be driven from any suitable power driven main shaft (not shown) through spur gears, chain, or belt drive (not shown).

In order to produce an inert stranded product having the helical outer strands and the core component all in balanced stress relation with each other, the bell mouth entrance of the opening defined by the assembled helically grooved die blocks must be placed at the point of natural twist of the converging helical strand elements delivered by the rotary twisting machine. The improved apparatus of our invention permits this adjustment to be made more quickly and more easily than has heretofore been possible with conventional apparatus. In addition, a wide variety of sizes of stranded products can be produced on the same machine than has been possible on conventional apparatus in use prior to our invention.

Figure 8 discloses a modified form of rotary die assembly similar in all respects to the die assembly disclosed in Figures 6 and 7, except that a somewhat different means for adjusting the chuck plates is provided. As disclosed in Figure 8, the pressure plate 174' is provided with threads 186 on its outer edge adapted to engage corresponding threads 188 provided on the inner surface of a flange 190 of the chuck body 108'. A thrust bearing 192 is provided between the pressure plate 174' and the chuck plates 120'. The thrust bearing is provided with an inner ball bearing race 194, outer race 196 and ball bearings 198. The outer ball bearing race is adapted to fit into an inner recess 200 of the pressure plate 174' and the inner race 194 is adapted to bear against the rear faces 202 of the chuck plates 120'. Although four chuck plates 120' are disclosed, any suitable number may be used.

The pressure plate 174' is provided with a bore 204 and a hub portion 206 extending from its outer face 208. In the hub portion are provided bottomed holes 210 for receiving the plugs or pins of a spanner wrench for turning the pressure plate to screw it in or out of the chuck body 108' when it is desired to adjust the axial and radial positions of the die blocks 150' of the die assembly.

While two embodiments of our invention have been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

We claim:

1. Apparatus for making a stranded wire structure which comprises a rotary twisting machine, a die housing having a cylindrical bore therethrough disposed ad-

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jacent the outlet end of said machine, a haul-off mechanism adjacent said die housing for pulling the stranded wire structure through the rotary twisting machine and the die housing, means mounting said housing for adjustable coaxial movement relative to said machine, a rotary closing die assembly in said housing disposed coaxially relative to said machine, means connected with said die assembly for driving the same at an angular velocity substantially equal to that of said machine, and means for disengaging said die assembly from said driving means.

2. Apparatus for making a stranded wire structure which comprises a rotary twisting machine, a die housing having a cylindrical bore therethrough disposed adjacent the outlet end of said machine, a haul-off mechanism adjacent the outlet end of said die housing for pulling the stranded wire structure through the rotary twisting machine and the die housing, a frame support member adjacent the outlet end of said machine, a first and second shaft mounted on said frame support in spaced parallel relation extending longitudinally of said machine, said first shaft being rotatably mounted, said housing being slidably supported on said first and second shafts, a screw shaft mounted on said frame support in parallel relation to and between said first and second shafts and threadingly engaging a nut in said housing, means connected with said first shaft for rotating the same, means connecting said first shaft and said screw shaft whereby said screw shaft is rotated and said housing is adjustably moved coaxially relative to said machine when said first shaft is rotated, a rotary closing die assembly in said housing disposed coaxially relative to said machine, means connected with said die assembly for driving the same at an angular velocity substantially equal to that of said machine, and means for disengaging said die assembly from said driving means.

3. Apparatus for making a stranded wire structure which comprises a rotary twisting machine, a die housing having a cylindrical bore therethrough disposed adjacent the outlet end of said machine, a haul-off mechanism adjacent the outlet end of said die housing for pulling the stranded wire structure through the rotary twisting machine and the die housing, means mounting said housing for adjustable coaxial movement relative to said machine, a rotary closing die assembly in said housing disposed coaxially relative to said machine, a ring on said assembly having gear teeth exposed on the exterior of said housing, means connected with said die assembly for driving the same at an angular velocity substantially equal to that of said machine, said driving means including a drive shaft rotatably journaled on said frame support adjacent said housing and extending parallel to the axis thereof, and a pinion on said drive shaft meshing with the teeth on said ring, and means for disengaging said die assembly from said driving means while said die housing is adjusted coaxially relative to said machine.

4. Apparatus for making a stranded wire structure which comprises a rotary twisting machine, a die housing having a cylindrical bore therethrough disposed adjacent the outlet end of said machine, a haul-off mechanism adjacent the outlet end of said die housing for pulling the stranded wire structure through the rotary twisting machine and the die housing, means mounting said housing for adjustable coaxial movement relative to said machine, a rotary closing die assembly in said housing disposed coaxially relative to said machine, a ring on said assembly having gear teeth exposed on the exterior of said housing, a drive shaft rotatably journaled on said frame support adjacent said housing and extending parallel to the axis thereof, a pinion slidably mounted for adjustable axial movement on said shaft, said pinion being adapted to mesh with the teeth on said ring, and locking means on said pinion for securing the same in adjusted position to mesh with the teeth

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on said ring after said die assembly is coaxially adjusted relative to said machine.

5. Apparatus for making a stranded wire structure which comprises a rotary twisting machine, a die housing having a cylindrical bore therethrough disposed adjacent the outlet end of said machine, a haul-off mechanism adjacent the outlet end of said die housing for pulling the stranded wire structure through the rotary twisting machine and the die housing, a frame support member adjacent the outlet end of said machine, a first and second shaft mounted on said frame support in spaced parallel relation extending longitudinally of said machine, said first shaft being rotatably mounted, said housing being slidably supported on said first and second shafts, a screw shaft mounted on said frame support in parallel relation to and between said first and second shafts and threadingly engaging a nut in said housing, means connected with said first shaft for rotating the same, means connecting said first shaft and said screw shaft whereby said screw shaft is rotated and said housing is adjustably moved coaxially relative to said machine when said first shaft is rotated, a rotary closing die assembly in said housing disposed coaxially relative to said machine, a ring on said assembly having gear teeth exposed on the exterior of said housing, means connected with said die assembly for driving the same at an angular velocity substantially equal to that of said machine, said driving means including a drive shaft rotatably journaled on said frame support adjacent said housing and extending parallel to the axis thereof, and a pinion on said drive shaft meshing with the teeth on said ring, and means for disengaging said die assembly from said driving means while said die housing is adjusted coaxially relative to said machine.

6. Apparatus for making a stranded wire structure which comprises a rotary twisting machine, a die housing having a cylindrical bore therethrough disposed adjacent the outlet end of said machine, a haul-off mechanism adjacent the outlet end of said die housing for pulling the stranded wire structure through the rotary twisting machine and the die housing, means mounting said housing for adjustable coaxial movement relative to said machine, a rotary closing die assembly in said housing disposed coaxially relative to said machine, a ring on said assembly having gear teeth exposed on the exterior of said housing, means connected with said die assembly for driving the same at an angular velocity substantially equal to that of said machine, said last named means including a drive shaft rotatably journaled on said frame support adjacent said housing and extending parallel to the axis thereof, a pinion slidably mounted for adjustable axial movement on said shaft, said pinion being adapted to mesh with the teeth on said ring, and locking means on said pinion for securing the same in adjusted position to mesh with the teeth on said ring after said die assembly is coaxially adjusted relative to said machine.

7. Apparatus for making a stranded wire structure which comprises a rotary twisting machine, a die housing having a cylindrical bore therethrough disposed adjacent the outlet end of said machine, a haul-off mechanism adjacent the outlet end of said die housing for pulling the stranded wire structure through the rotary twisting machine and the die housing, a frame support member adjacent the outlet end of said machine, a first and second shaft mounted on said frame support in spaced parallel relation extending longitudinally of said machine, said first shaft being rotatably mounted, said housing being slidably supported on said first and second shafts, a screw shaft mounted on said frame support in parallel relation to and between said first and second shafts and threadingly engaging a nut in said housing, means connected with said first shaft for rotating the same, means connecting said first shaft and said screw shaft whereby said screw shaft is rotated and said housing is adjustably

5 moved coaxially relative to said machine when said first shaft is rotated, a rotary closing die assembly in said housing disposed coaxially relative to said machine, a ring on said assembly having gear teeth exposed on the exterior of said housing, means connected with said die assembly for driving the same at an angularly velocity substantially equal to that of said machine, a drive shaft rotatably journaled on said frame support adjacent said housing and extending parallel to the axis thereof, a pinion slidably mounted for adjustable axial movement on said shaft, said pinion being adapted to mesh with the teeth on said ring, and locking means on said pinion for securing the same in adjusted position to mesh with the teeth on said ring after said die assembly is coaxially adjusted relative to said machine.

8. Apparatus for making a stranded wire structure as defined by claim 1 characterized by said rotary closing die assembly including a cylindrical chuck disposed coaxially in said bore for rotation therein about the common axis of the bore and chuck, said chuck having a central bore, said chuck bore having circumferentially spaced longitudinal slots therein with their bottoms inclined to said axis, a wedging jaw having an inclined outer surface fitting snugly in each slot, a helically grooved die surface on each jaw adapted to engage the strand wire structure progressively, and means common to said jaws effective to move the jaws in said slots in such direction as to cause inward movement of said jaws.

9. Apparatus for making a stranded wire structure as defined by claim 8 characterized by said means including a pressure ring, and means for moving said pressure ring toward said chuck.

10. Apparatus for making a stranded wire structure as defined by claim 8 characterized by said chuck being composed of magnetic metal, and at least one magnet fixed in the outer surface of each jaw effective to hold the jaw in contact with the bottom of its slot.

11. Apparatus for making a stranded wire structure as defined by claim 8 characterized by spaced radial-and-thrust bearings in said housing, said chuck being carried in said bearings.

12. Apparatus for making a stranded wire structure as defined by claim 8 characterized by a die block disposed inwardly of each jaw, said helically grooved die surfaces being formed in said blocks.

13. A rotary closing die for working on a stranded wire structure comprising a housing having a cylindrical bore therethrough, a cylindrical chuck disposed coaxially in said bore for rotation therein about the common axis of the bore and chuck, said chuck having a central bore, said chuck bore having circumferentially spaced longitudinal slots therein with their bottoms inclined to said axis, a wedging jaw having an inclined outer surface

fitting snugly in each slot, a helically grooved die surface on each jaw adapted to engage the stranded wire structure progressively, and means common to said jaws effective to move the jaws in said slots in such direction as to cause inward movement of said jaws.

14. A rotary closing die as defined by claim 13 characterized by said means including a pressure ring, and means for moving said pressure ring toward said chuck.

15. A rotary closing die as defined by claim 13 characterized by said chuck being composed of magnetic metal, and at least one magnet fixed in the outer surface of each jaw effective to hold the jaw in contact with the bottom of its slot.

16. A rotary closing die as defined by claim 13 characterized by a die block disposed inwardly of each jaw, said helically grooved die surfaces being formed in said blocks.

17. A rotary closing die for working on a stranded wire structure comprising a housing having a cylindrical bore therethrough, means mounting said housing for movement along its axis, a die assembly in said housing mounted co-axially therewith, and means for driving said assembly at a desired angular velocity, said driving means including a ring on said assembly having gear teeth exposed on the exterior of said housing, a drive shaft parallel to said axis and a pinion on said shaft meshing with the teeth on said ring.

18. A rotary closing die for working on a stranded wire structure comprising a housing having a cylindrical bore therethrough, means mounting said housing for movement along its axis, a die assembly in said housing mounted co-axially therewith, means for driving said assembly at a desired angular velocity, said driving means including a ring on said assembly having gear teeth exposed on the exterior of said housing, a drive shaft parallel to said axis and a pinion on said shaft meshing with the teeth on said ring, a nut mounted in said housing, and a screw shaft parallel to said axis engaging said nut to move said housing axially.

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