Feb. 6, 1934. R. BLAMIRE 1,945,799

ADJUSTABLE PREFORMING HEAD

Filed April 23, 1931 2 Sheets-Sheet 1

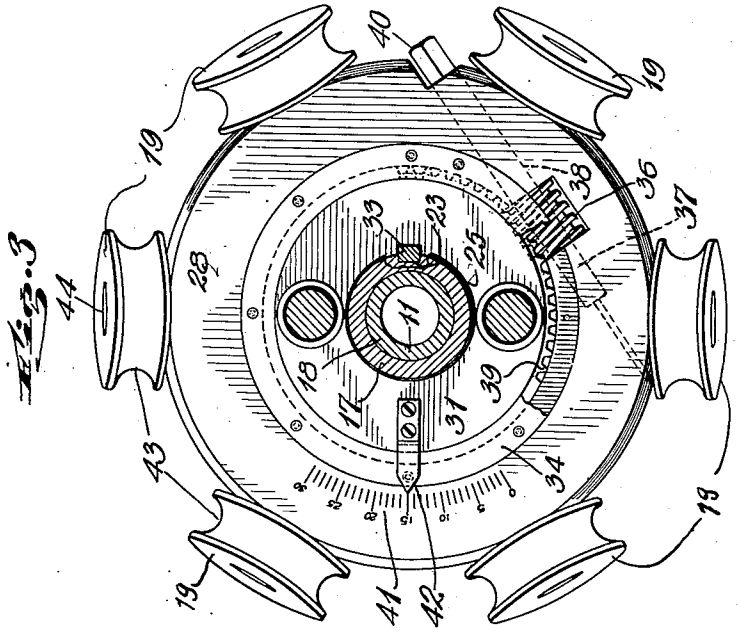


Fig. 3.

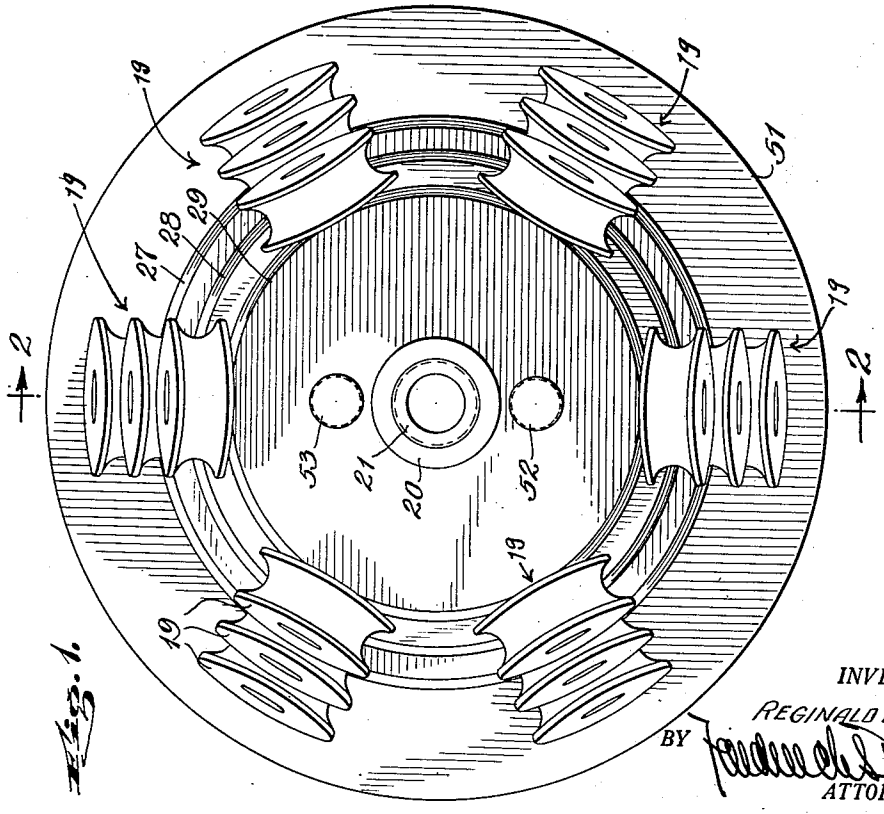


Fig. 1.

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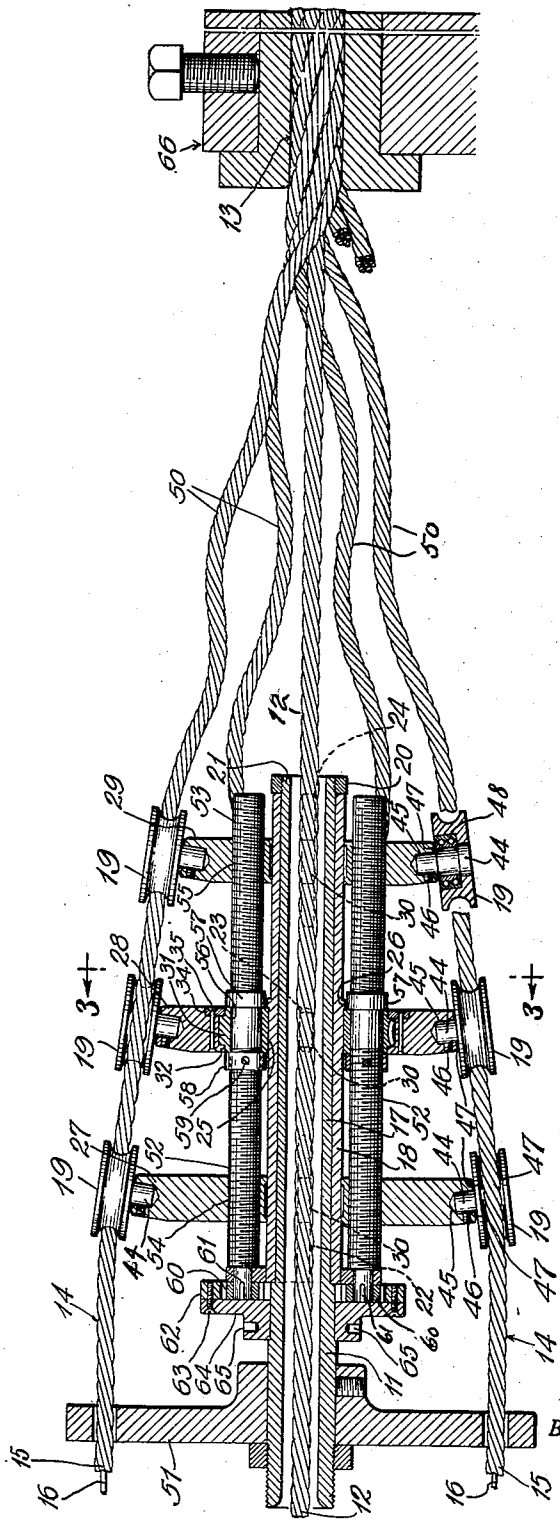


Fig. 2.

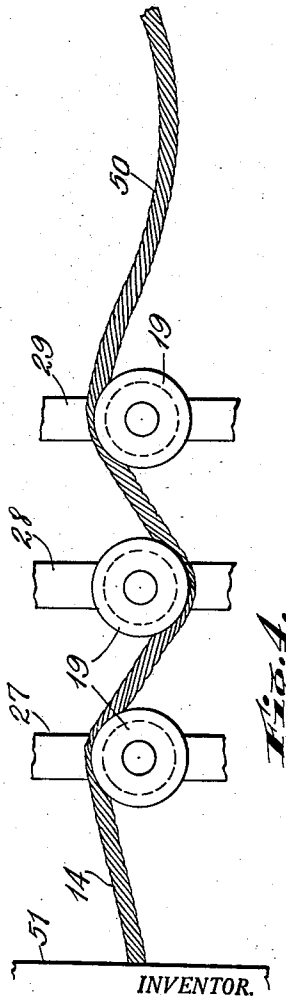


Fig. 4.

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UNITED STATES PATENT OFFICE

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ADJUSTABLE PREFORMING HEAD

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Application April 23, 1931. Serial No. 532,235

5 Claims. (Cl. 117—50)

This invention relates to the fabrication of stranded wire structures, such as a strand formed of a plurality of resilient wire components, or a rope formed of a plurality of such strands, or a cable formed of a plurality of such ropes, and is of particular utility when embodied in a preforming head adapted to bend each of the components of such a stranded wire structure beyond the elastic limit of the wire and thereby to set the said component in the form which each such component is to occupy in the stranded structure, the purpose of such preformation of the components being in general to produce a structure having the characteristic of inert lay, so that the components will not tend to unravel when the strand, wire rope, cable or the like is severed.

An object of the invention is to provide an appliance for the above purpose in the form of a preforming head comprising a support provided with several sets of preforming devices, and adapted to be mounted upon a shaft which is arranged to rotate about the axis of the stranded wire structure under formation, the forming devices acting to form the several components into helices as each wire or other component is drawn or otherwise forced through one of the sets of forming devices, while simultaneously by means of revolution of the several sets of forming devices around the axis of the stranded wire structure, a planetary motion is imparted to the helically formed components and the latter are laid consecutively in assembled relation about a core or other suitable underlying structure as the latter is moved along the axis of the completed product at a rate properly co-ordinated with the rate of rotation of the head to produce a lay of the desired pitch.

Another object of the invention is to provide forming devices so grouped and supported upon the rotatable head that corresponding devices in order of operation in each of two of the sets are mounted in a group constituting a movable unit upon the head, and to provide means by which each such unit or group of forming devices can be moved readily, by sliding the carriers for these two selected groups of forming devices along the axis of the head, to change the co-axially spaced relation of the devices in the group or groups thus shifted relatively to the intermediate group of devices, so as to change uniformly and simultaneously the pitch of the lay.

A cognate object is to provide a forming head with means for supporting the above described groups or units of forming devices in such a manner, and with adjusting means so arranged, that at least one of the groups may be readily rotated around the axis of the head to vary the angular relation of the preforming devices on that unit relatively to the devices on adjacent units so as to change uniformly and simultaneously the diameter of the helices which are to be formed in the several components.

The above and other features of the invention are illustrated and described fully in the accompanying drawings and specification and are pointed out in the claims.

In the drawings:

Fig. 1 is a view in front elevation of a forming head in the construction of which this invention has been embodied.

Fig. 2 is a view in vertical longitudinal section on the line 2—2 of Fig. 1, this figure showing also a closing die, with strand components in course of formation to form a wire-rope.

Fig. 3 is a view in vertical section on the line 3—3 of Fig. 2, showing in elevation the means for rotative adjustment of the middle group of preforming devices, parts thereof being broken away to reveal details of construction.

Fig. 4 is a fragmentary, detail view in side elevation of one set of helix forming devices with a portion of the strand being preformed thereby.

In the now preferred form of embodiment of the invention selected for illustration and description, the part designated by the reference character 11 is a shaft, preferably hollow to permit the passage therethrough of a core 12 or other underlying part of the eventual stranded wire structure, which structure is designated by the reference character 13, the same taking the form, in the instance illustrated, of a wire rope, composed of several strands 14, laid in helical relation around the core 12, each strand being formed of several wires 15 laid in helical relation about a core wire 16, preferably by means of a similar appliance, it being understood that the appliance illustrated, or others like it, can be utilized for the production of a stranded wire structure consisting of a strand having several wires, or a wire rope having several strands each composed of several wires, or wire cable composed of several ropes, or in general any kind of stranded wire structure of the type whose components it is desirable to set in the form which they are to occupy in the completed structure.

The shaft 11 is shown as having a reduced portion 17 at its forward end, and upon this reduced portion is shown at 18 a support for the preforming devices 19, this support preferably comprising a steel sleeve which is held

fast upon the shaft by means of a threaded collar 20 screwed at 21 upon the forward end of the shaft, the sleeve having key-ways 22, 23 and 24 at spaced intervals, and also being provided near its mid-portion with an enlargement 25 and a shoulder 26, for a purpose to be described.

Upon this sleeve 18 are mounted, in adjusted position relatively to the axis, carriers 27, 28 and 29 for the units or groups of preforming devices, these carriers preferably taking the form of collars, the carriers 27 and 29 being capable of co-axial adjustment along the sleeve 18, while they are fixed in position to rotate with the sleeve by means of keys 30 which extend into the keyways 22 and 24 and into keyways (not shown) in the hubs of the collars 27 and 29.

The middle carrier 28 is adapted to be adjusted rotatively around the sleeve, being mounted rotatably upon an inner collar 31 which is seated upon the sleeve 18 at the enlargement 25 above referred to, being fixed to rotate with the sleeve by means of the key 30 extending into the keyway 23 of the sleeve. The shoulder 26 on the sleeve prevents movement of the collar 31 lengthwise of the sleeve. The inner collar 31 has a peripheral rib upon which is seated rotatably the outer collar 28, the latter having an inwardly extending annular flange 32, at one side, and a retaining ring 34 at the other side, between which is embraced the peripheral rib, and rivets or bolts 35 are provided to hold the above mentioned parts in assembled relation.

The outer collar or carrier 28 may be adjusted rotatively upon the inner collar 31 by means of a worm 36 (see Fig. 3) on a shaft 37 mounted in bearings 38 carried by the collar 28, the worm engaging with teeth 39 upon the collar 31. The end of the shaft 37 is squared at 40 for convenience in operation. A scale 41 is preferably provided on the collar 28, and a cooperating pointer 42 on the collar 31, to give indications for adjustment.

The forming devices 19 may be of any suitable character, and as a now preferred form of forming device I have shown each of the forming devices as constituted by a roll having a peripheral groove 43, the rolls being secured to the periphery of their respective supporting flanges by pivot studs 44 (see Fig. 2), which enter sockets or recesses 45 in the carriers and are there secured by set-screws 46. The supporting flanges are preferably bevelled peripherally as at 47, to afford seats for the rolls, the latter being preferably provided with ball-bearings, and the size of the carriers and the inclination of the bevelled seat portions is preferably such that the rolls will be supported with the grooves substantially in alignment, so that the axis of each stud is perpendicular to an imaginary cone, the apex of which lies in the axis of the rotary head at a point spaced by the distance of approximately one pitch of the lay from the region of emergence of the components from the forming devices. By this arrangement the helically formed portions of the components, which are respectively designated by the reference characters 50, are delivered in proper converging relation to be laid consecutively in helical relation upon the core 12.

In pursuance of the invention, provision is made for varying readily and accurately the distance between the groups of preforming devices in order to change uniformly and simultaneously the pitch of the lay, and as a now preferred form of structure for this purpose the carriers 27 and 29 are adapted to be moved coaxially along the sleeve 18 into any desired position relatively to each other, and the axial position of the flanges or collars may be adjusted and maintained conveniently by suitable means, such as the lead-screws or threaded shafts 52 and 53, of which two are shown, although any suitable number may be used.

The shafts 52 and 53 pass through threaded apertures 54 and 55 in the collars 27 and 29 respectively and the opposite ends of each of the shafts are oppositely threaded, so that when the shafts are turned in one direction the carriers 27 and 29 are simultaneously moved toward the middle carrier 28, and when the shafts are rotated in the other direction the carriers 27 and 29 are moved simultaneously away from the carrier 28. The shafts may, and preferably are, formed without threads at their middle portions, as illustrated in Fig. 2, this being the region at which the shafts pass through apertures 56 in the inner collar 31. Each shaft preferably has an integral collar 57 formed thereon in position to bear against one side of the inner collar 31, and each shaft is likewise provided with an adjustable collar 58 which may be secured by a set-screw 59 in position to bear against the other side of the inner collar 28. Thus each of the shafts is held against displacement lengthwise, relatively to the middle carrier, while it is free to rotate in the bearing 56.

As a suitable form of means to operate the lead-screws 52 and 53 simultaneously, each lead-screw is provided with a pinion 60 secured to its inner end by a key 61, and these pinions are arranged to engage with an interior ring gear 62, the latter being secured by screws 63 around the margin of a collar 64 which is seated rotatably upon the shaft 11. This collar has recesses 65 in which a spanner or other suitable tool may be inserted when it is desired to adjust the lead-screws. By turning the collar 64, the ring gear 62 acts upon the pinions 60 to cause rotation of the shafts 52 and 53, in one direction or the other, as desired, and by this operation the collars 27 and 29 with their preforming rolls 19 are adjusted either toward, or away from the collar 28 and its preforming rolls 19.

In preparing for production of a stranded wire structure the unformed strand components 14, which may be derived from any suitable source of supply, such for example as reels or supply carriers (not shown) mounted suitably to receive a planetary motion around the core member 12, are led through a suitable guide flange 51 fixed upon the shaft 11, and thence the components are respectively threaded each through a set of rolls 19 preferably in the manner illustrated in the drawings.

In the instance illustrated, each strand component passes over a roll 19 on carrier 27, then under a roll 19 onto carrier 28 and then over a roll 19 on carrier 29, the carrier 28 being set in the desired position to secure the proper diameter of helix by turning the collar 28 by means of the shaft 37 and worm 36 to rotate the collar 28 so that its rolls 19 occupy the desired angular position relatively to the radial positions of the other rolls of its set, i. e., the rolls 19 on the carriers 27 and 29, it being understood that these latter carriers have first been adjusted to their proper relative position lengthwise of the preforming head by operating the lead-screws 52 and 53 by turning the collar 64

in the manner above-described. In Fig. 4 is illustrated approximately the relative position of the rolls 19 of a set acting upon one strand component 14 to produce the helical deformation of the same indicated at 50. As already indicated, the emergent portion of each component so designated by the reference characters 50 is then laid around the core 12, and the core, with the helical components thus assembled, is preferably threaded through a closing head 66 as indicated by the reference character 13. The closing head 66 may be of any suitable character, being shown as of conventional form, and thence the stranded wire structure 13 is drawn off and stored for use. Any suitable drawing-off mechanism may be utilized for this purpose and it is not illustrated for the reason that such mechanism is well-known to those skilled in the art. It is to be noted that in instances where the preforming head rotates, as above-described, the drawing-off mechanism should operate to haul off the wire rope or other stranded wire structure non-rotatively at a rate properly proportional to the rate of rotation of the forming head, for the purpose of securing any given pitch of lay.

It will be understood, however, that the adjusting means and other improvements which characterize the preforming head according to the present invention, can be embodied advantageously in a preforming head for stranding machines of the type in which the preforming head is stationary, while the haul-off mechanism is adapted to draw off the completed product rotatively. In that event it will also be understood by those skilled in the art that the supply reels from which the strand components 14 are delivered to the preforming head will be mounted to turn relatively to the preforming head, thus permitting relative rotation between the unformed portions 14 and helically formed portions 50 of the strand components on the one hand, and the preforming devices 19 on the other hand, such relative rotation being essential to accomplish the laying of the helically formed components into the completed product without twisting the components.

It will be understood readily from the above description that the preforming head forming the subject of this invention acts in conjunction with the closing die and haul-off mechanism to bend each component and set the same permanently in approximately the exact helical shape which it possesses in the completed structure, and that the improved preforming head is intended to be utilized for the fabrication of wire strand, wire rope or wire cable, with adjustments or substitutions of parts suitable to operate upon different types of material and to produce the desired form of stranded wire structure; also that these adjustments can be readily effected with ordinary tools and by workmen of average skill; also that the working parts are readily accessible for such alterations and substitutions, and that the structure as a whole is of a sturdy character, easy to construct, and involving but little expense for maintenance.

I claim:

1. A preforming head of the type characterized by a set of three annular carriers mounted upon a shaft and each provided with a group of wire-bending devices arranged around the periphery of the carrier, the two outer carriers being adapted for adjustment along the axis of said shaft, and the intermediate carrier being adapted for adjustment rotatively with respect to said axis; said preforming head being further characterized by means to effect said coaxial adjustment of said outer carriers positively and symmetrically at the same time, by moving said outer carriers simultaneously in opposite directions toward or away from said intermediate carrier; said adjusting means comprising a plurality of rotatable lead-screws in threaded engagement with said carriers to be so adjusted, and means common to all of said lead-screws for operating them in unison to effect simultaneous adjustment longitudinally of the two outer carriers along the shaft.

2. A preforming head of the type characterized by a set of carriers mounted upon a shaft and each provided with a group of wire-bending devices arranged around the periphery of the carrier, certain of said carriers being adapted for adjustment, relatively to other carriers, along the axis of said shaft, and one of said carriers being adapted for adjustment rotatively with respect to said axis; said preforming head being further characterized by means to effect said co-axial adjustment of a plurality of said carriers positively and symmetrically at the same time, by moving two of said carriers simultaneously in opposite directions toward or away from an intermediate carrier; said adjusting means comprising a rotatable lead-screw in threaded engagement with said carriers to be so adjusted, and means to rotate said lead-screw, said means comprising a pinion upon said lead-screw, and a gear mounted rotatably upon said shaft, and meshing with said pinion, to cause rotation of said pinion and lead-screw when said gear is rotated.

3. A preforming head of the type characterized by a set of carriers mounted upon a shaft and each provided with a group of wire-bending devices arranged around the periphery of the carrier, certain of said carriers being adapted for adjustment, relatively to other carriers, along the axis of said shaft, and one of said carriers being adapted for adjustment rotatively with respect to said axis; said preforming head being further characterized by means to effect said co-axial adjustment of a plurality of said carriers positively and symmetrically at the same time, by moving two of said carriers simultaneously in opposite directions toward or away from an intermediate carrier; said adjusting means comprising a plurality of rotatable lead-screws in threaded engagement with said carriers to be so adjusted, and means to rotate said lead-screws, said means comprising a pinion upon each lead-screw, and a ring gear mounted rotatably upon said shaft, and meshing with said pinions, to cause rotation of each pinion and its lead-screw when said ring gear is rotated.

4. A preforming head characterized as in claim 2, and in which said adjusting means comprises a lead-screw having its ends threaded oppositely and engaged respectively with correspondingly threaded portions of said co-axially adjustable carriers, said lead-screw having a portion intermediate said threaded ends mounted for free rotation in bearings in said intermediate carrier, and provided with a plurality of collars adapted to hold said lead-screw in fixed longitudinal position, one of said collars being removable.

5. A preforming head of the type characterized by a set of three annular carriers mounted in axial alignment upon a shaft and each provided with a group of wire-bending devices arranged around the periphery of the carrier, the two

outer carriers being adapted for adjustment along the axis of said shaft, and the intermediate carrier being adapted for adjustment rotatively with respect to said axis; said preforming head being further characterized by means to effect said co-axial adjustment of said outer carriers positively and symmetrically at the same time, by moving said outer carriers simultaneously in opposite directions toward or away from said intermediate carrier, while the latter remains in fixed axial position upon said shaft and in which said intermediate carrier comprises an inner collar fixed upon said shaft, and an outer collar provided with preforming devices and adjustable rotatively upon said inner collar, one of said collars being provided with teeth and the other collar having a rotatable shaft provided with a worm meshing with said teeth and adapted to cause rotative adjustment of said outer collar upon said inner collar, and a scale and pointer mounted upon said collars respectively to afford indications for said rotative adjustment.

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