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TWISTING MACHINE

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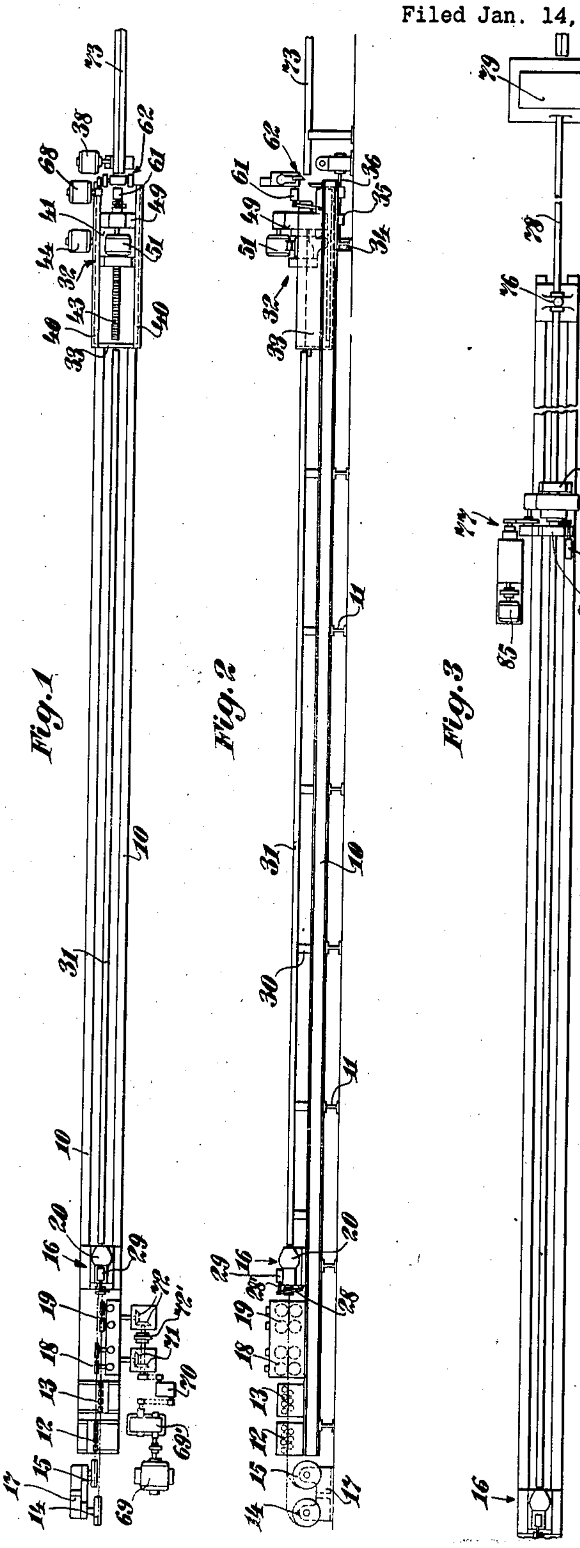

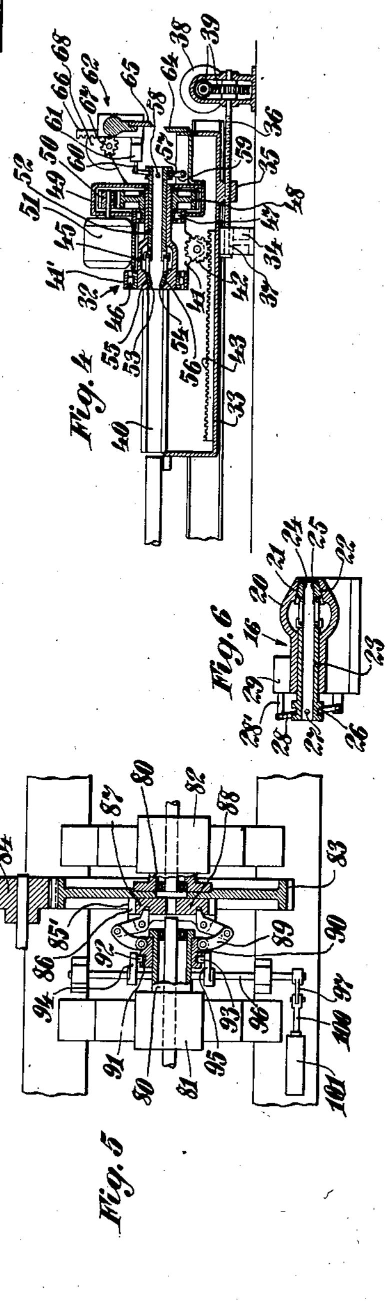

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TWISTING MACHINE

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2 Claims. (Cl. 153—2)

The present invention relates to apparatus for manufacturing concrete reinforcing bars, and more particularly to an improved machine for manufacturing twisted concrete reinforcing bars in a semi-continuous manner.

Twisted concrete reinforcing bars of this character are known commercially as "Isteg" bars, and are disclosed in prior United States Patent No. 1,692,505. These bars are usually formed by twisting together along a common generatrix, a pair of rods having the same length and cross-section.

The rods used in the manufacture of reinforcing bars of this type are available commercially in coil form, and therefore must be straightened before being twisted together. Heretofore it has been the usual practice to straighten the rods and cut them off into desired lengths in one operation, and to twist them together in pairs in a separate operation. It has been found, however, that the ends of the rods tend to pull out of the clamping heads during the twisting operation. Moreover, considerable time is consumed in conveying the cut and straightened rods from the straightening machine to the twisting machine. Hence, the method is slow and the manufactured product relatively expensive.

An object of the present invention accordingly is to provide an improved apparatus for manufacturing twisted concrete reinforcing bars in which the bars may be made rapidly and inexpensively in a semi-continuous manner.

A further object of the invention is to provide an improved apparatus of the above character in which the rods are straightened and twisted into bars before being cut off into sections of the desired length.

In a preferred embodiment of the invention, rod stock is unwound from several coils and straightened to form a pair of parallel adjacent rods, substantially equal in length to the desired length of the twisted bar. The ends of the parallel rods are then clamped in a rotatable head, and the rods are also clamped in a stationary head spaced from the rotatable head by a distance equal to the desired length of the twisted bar. By operating the rotatable head, the rods are twisted together between the two heads to form a continuous bar. The clamping heads are then opened and the unwinding of the rod stock continued until the twisted bar has been entirely moved past the rotatable head, and another pair of parallel adjacent rods are in position between the heads, at which time the twisted bar is cut off and the clamping and twisting operations are repeated.

Additional objects will become apparent from the following detailed description taken in conjunction with the accompanying drawing in which:

Figure 1 is a plan view showing diagrammatically apparatus for manufacturing twisted reinforcing rods, constructed in accordance with the present invention;

Figure 2 is a view in elevation of the apparatus shown in Fig. 1;

Figure 3 is a plan view of a modification of the apparatus in which the twisting head is disposed midway between the ends of the rods;

Figure 4 is an enlarged view in vertical section of the right hand end of the machine shown in Figs. 1 and 2;

Figure 5 is an enlarged view, partly in section, of the twisting head used in the modification shown in Fig. 3; and

Figure 6 is an enlarged view in vertical section of a stationary head for clamping the rods during the twisting operation.

Referring to Figs. 1 and 2, a frame is shown at 10 which may be supported a predetermined distance above the floor on suitable I beams 11. Mounted on the frame 10 at the left hand end thereof are the straightening rolls 12 and 13 in which rod stock from the rod reels 15 and 14, respectively, may be straightened prior to the twisting operation. The rod reels 14 and 15 are rotatably mounted upon a suitable frame 17 and are offset with respect to one another, as shown in Fig. 1 in order that rod stock may be fed from them in the form of a pair of parallel adjacent rods.

Secured to the frame 10 adjacent the straightening rolls 13 are feed rolls 18 and 19 of a well known type, by means of which rod stock is adapted to be fed from the reels 14 and 15, respectively. The rolls 18 and 19 may be driven by means of an electric motor 69 through a suitable speed reduction mechanism 69' and the variable speed drive 70, the output of which is supplied to the gearing 71 and 72, respectively. A speed regulator 72' may be provided between the gearing 71 and 72 which may be adjusted to drive the rolls 18 and 19 at the same speed, so that the rods will be fed at the same rate.

Adjacent the feed rolls 19 is secured a stationary gripping head 16, shown in greater detail in Fig. 6, which comprises a hollow casing 20 having inclined surfaces 21 and 22 formed therein.

Slidably mounted within the casing 20 is a sleeve 23, at one end of which a pair of jaws 24 and 25 are secured. At the other end of the sleeve 23, an annular groove 26 is formed within which a pin 27 on a lever arm 28 is adapted to be received. The lever arm 28 is pivoted at one end on the casing 20, and its other end is connected to a suitable actuating member, such as a plunger 28' operating in a hydraulic cylinder 29. By the operation of the hydraulic cylinder 29, the sleeve 23 may be moved within the casing 20, and the jaws 24 and 25 may be opened or closed by sliding them forwards or backwards, respectively, upon the inclined surfaces 21 and 22 formed within the casing 20.

Supported on suitable spacing members 30 secured to the frame 10 is a guide member 31, which may be a tube of relatively small diameter, for directing the straightened pair of rods to the twisting apparatus 32, located at the right hand end of the frame 10. The twisting apparatus 32 comprises a casing 33 movably mounted upon a suitable support 34. A lock nut 35 is formed on the bottom of the casing 33 within which a lead screw 36 is adapted to be threaded. The lead screw 36 is provided with the unthreaded portion 37 which is journalled within the support 34, and it is adapted to be rotated in either direction by means of a motor 38 through the gearing 39 for stretching the twisted bars, as described in greater detail below.

A pair of longitudinally extending guides 40 are formed in the sides of the casing 33 within which the frame 41 of the twisting head 41' is adapted to be slidably received. At the bottom of the frame 41 a pinion 42 is rotatably mounted which may be driven by an electric motor 44 and which is adapted to engage a rack 43 formed in the bottom of the casing 33, for moving the twisting head longitudinally within the casing 33.

The twisting head 41' comprises a hollow shaft 45 journalled within the bearings 46 and 47, secured to the frame 41, on which a gear 48 is mounted. The gear 48 is enclosed within a housing 49 and is adapted to engage a pinion 50 driven by a motor 51 mounted on the frame 41 of the twisting head. Within the hollow shaft 45 a sleeve 52 is slidably mounted, at one end of which are secured a pair of jaws 53 and 54, which are adapted to slide upon inclined surfaces 55 and 56 formed within the shaft 45. At the other extremity of the sleeve 52 an annular groove 57 is formed, within which a pin 58 on a lever arm 59 is adapted to be received. The lever arm 59 is secured to the frame 41 at one end, and its other end is connected to an actuating member which may be the plunger 60 operating in the hydraulic cylinder 61.

Secured at the rear of the frame 41 is a shear 62 of a well known type which may comprise a lower stationary member 64 secured to the frame 41 and an upper movable blade 65 which is adapted to be operated by means of a rack 66 and a cooperating pinion 67 driven by an electric motor 68.

In operation, the ends of the adjacent parallel coils on the reels 14 and 15 are passed through their straightening and feed rolls 13 and 19 and 12 and 18, respectively. By adjusting the variable speed motor 69, the reduction mechanism 69' and variable speed drive 70, varying speeds may be obtained to accommodate various sizes of rods. The straightened rods are fed through the sleeve 23 within the casing 16 and through the tubular guide member 31 to the twisting machine 32. When the two adjacent ends of the parallel rods have been inserted within the sleeve 52, the motor 69 is stopped, and the hydraulic cylinders 29 and 61 at the stationary head 16 and the twisting machine 32, respectively, are operated, causing the jaws 24 and 25 to grip the rods at the stationary head 16, and the jaws 53 and 54 to grip the rods at the twisting machine 32. The motor 51 is then operated, thus rotating the hollow shaft 45 and twisting the rods into a continuous bar between the stationary head 16 and the twisting machine 32.

It has been found that the tensile strength of the twisted bar is increased if it is stretched after twisting. This may be accomplished by energizing the motor 38. The operation of the motor 38 rotates the lead screw 36, causing the lock nut 35 together with the casing 33 to be moved to the right to stretch the twisted bar. After the bar has been stretched, the motor 38 may be stopped, and the clamping jaws 24 and 25, and 53 and 54 of the stationary head 16 and the twisting machine 32 respectively, may be opened. The motor 69 is then actuated, causing the feed rolls 18 and 19 to move the twisted section of the rod through the tubular guide 31 and through the twisting machine 32 to a run out table 73.

The feeding operation is continued until the entire twisted section has moved past the jaws 53 and 54 of the twisting machine 32, at which time the motor 69 is stopped. The motor 44 is then energized to rotate the pinion 42 on the rack 43, moving the entire frame 41 of the twisting machine 32 in the guides 40 to the left a distance equal to the distance between the jaws 53 and 54, and the stationary shear member 64, so that the shear 62 is moved approximately to the position formerly occupied by the jaws 53 and 54. The motor 44 is then stopped and the motor 68 is energized, causing the movable shear member 65 to cut off the twisted bar. The shear 62 is maintained closed while the motor 44 is energized to move the frame 41 back to its normal position, so that the twisted section may be moved away from the twisting machine 32. The sequence of operations is then repeated substantially as described above.

It is possible to obtain two twisted rods with one single twisting operation by means of the apparatus shown in Figure 3. Here the parallel rods are run out to a length equal to twice the desired length of the bar. They are then gripped in the stationary heads 16 and 76, and a twisting machine 77 located midway between the heads 16 and 76 is operated. The operation of the twisting machine 77 produces a right hand spiral on its one side, and a left hand spiral on its other side. The double section of the twisted rod is then fed through a second tubular guide 78 to a shearing mechanism 79 of a well known type, which may be spaced from the stationary head 76 by a distance equal to the desired length of the finished bar. The twisted bar may then be cut into sections of the desired length by operating the shearing mechanism 79.

The twisting machine 77, as shown in Figure 5, comprises a shaft 80 rotatably journalled in the bearings 81 and 82 and to which is secured a gear 83 meshed with a pinion 84 driven by an electric motor 85. Formed within the hub 85' of the gear 83 is a transverse passage 86, within which a pair of clamping members 87 and 88 are adapted to be slidably received. The members 87 and 88 are adapted to be moved radially

in opposite directions by a suitable toggle mechanism 89 secured to a collar 90 slidably mounted on the hollow shaft 80. A circular groove 91 is formed in the collar 90 within which the pins 92 and 93 on the arms 94 and 95, respectively, are adapted to be received. The arms 94 and 95 are secured to a shaft 96 connected to an arm 97 actuated by the plunger 100 of a hydraulic cylinder 101. It will be evident that as the plunger 100 is moved inwardly and outwardly of the cylinder 101, the clamping members 87 and 88 will be moved radially in opposite directions within the transverse passage 86.

From the foregoing, it will be evident that the invention provides an improved apparatus for making twisted reinforcing concrete bars rapidly and effectively in a semi-continuous manner. By reason of the fact that the rods are straightened and twisted into bars before being cut into the required length, the number of operations required in their manufacture has been substantially reduced. Accordingly, the invention enables twisted rods of this character to be manufactured more rapidly and inexpensively than has been possible heretofore.

Although several preferred embodiments have been described in detail above, the invention is not intended to be in any way limited thereby, but is susceptible of numerous changes in form and detail within the scope of the appended claims.

I claim:

1. In apparatus for making twisted bars semi-continuously from a plurality of sources of rod stock, the combination of a first stationary hollow clamping head, a second stationary hollow clamping head spaced from said first head and aligned therewith, a rotatable hollow clamping head disposed between said two stationary heads and in alignment therewith, tubular guide members disposed between said respective stationary heads and the rotatable head, a plurality of feed mechanisms aligned with said clamping heads for feeding a plurality of adjacent lengths of rod stock from said sources through said first stationary head, the rotatable head and tubular guiding members to said second stationary head, a plurality of straightening mechanisms aligned with said clamping heads and feeding mechanisms for straightening said lengths of rod stock during the feeding thereof, both said feeding mechanisms and straightening mechanisms being located in advance of said stationary and rotatable clamping heads and in close proximity to one of said stationary clamping heads, and variable speed power means for operating both said feed mechanisms at the same speed, whereby portions of said lengths of rod stock may be clamped by said two stationary heads and rotatable head and twisted together, which twisted portions may be cut off to provide twisted bars.

2. In apparatus for making twisted bars from a plurality of sources of rod stock, the combination of a first stationary clamping head, a second stationary clamping head spaced from, and aligned with said first clamping head, a rotatable clamping head disposed between said first and second stationary clamping heads and in alignment therewith, tubular guides disposed between said respective stationary heads and the rotatable clamping head, rod stock feeding and straightening means disposed in advance of said stationary and rotatable clamping heads and in close proximity to said first stationary clamping head, and a shear disposed beyond said second stationary clamping head, whereby portions of said lengths of rod stock may be clamped by said stationary and rotatable clamping heads and twisted together and cut off by said shear to provide twisted bars.

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