United States Patent

Donche-Gay

[15] **3,690,349**

[45] **Sept. 12, 1972**

[54] **REINFORCING ROD MACHINE**

[72] Inventor: **Pierre Donche-Gay,** Buenos Aires, Argentina

[73] Assignee: **American Engineering Company Limited**

[22] Filed: **March 15, 1971**

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[52] **U.S. Cl.** **140/63,** 140/65

[51] **Int. Cl.** **B21f 25/00**

[58] **Field of Search** 140/58, 62, 63, 65

[56] **References Cited**

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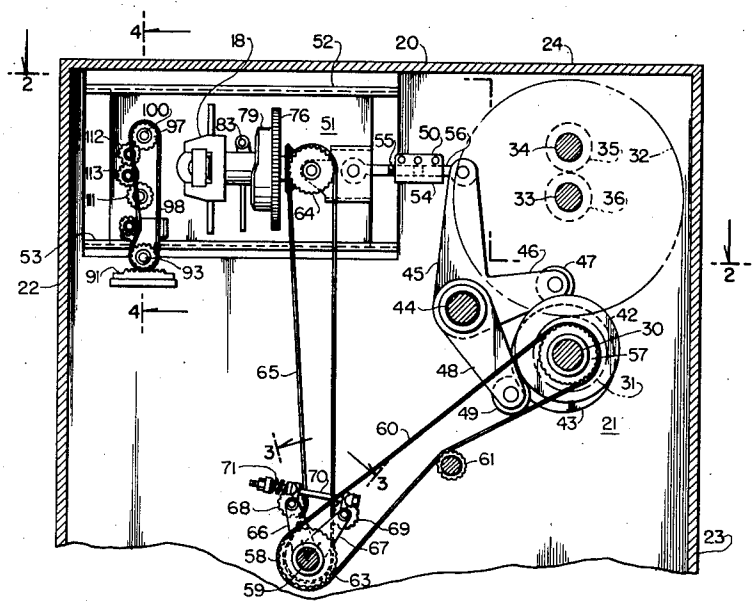
Primary Examiner—Lowell A. Larson

Attorney—Peter L. Tailer

[57] **ABSTRACT**

A machine for the manufacture of reinforcing rod having spaced apart flattened portions wound with turns of smaller diameter rod has a pair of constantly turning forming rollers which feed the rod between them and form the spaced apart flattened portions and the machine has a reciprocating winding head which winds turns about the flattened portions of the rod while advancing with the rod. A drive for the forming rollers rotates cams which oscillate a yoke which reciprocates the winding head. The drive for the forming rollers also, through sprockets and a chain, rotates the winding head arbor. The chain driving the winding head arbor incorporates a spring chain tightener to compensate for the oscillation of the winding head. The reciprocation of the winding head causes a sector gear on the winding head engaging a fixed rack to drive rod metering rollers which extend smaller diameter rods to be wound about the flattened portions of the reinforcing rod.

3 Claims, 13 Drawing Figures



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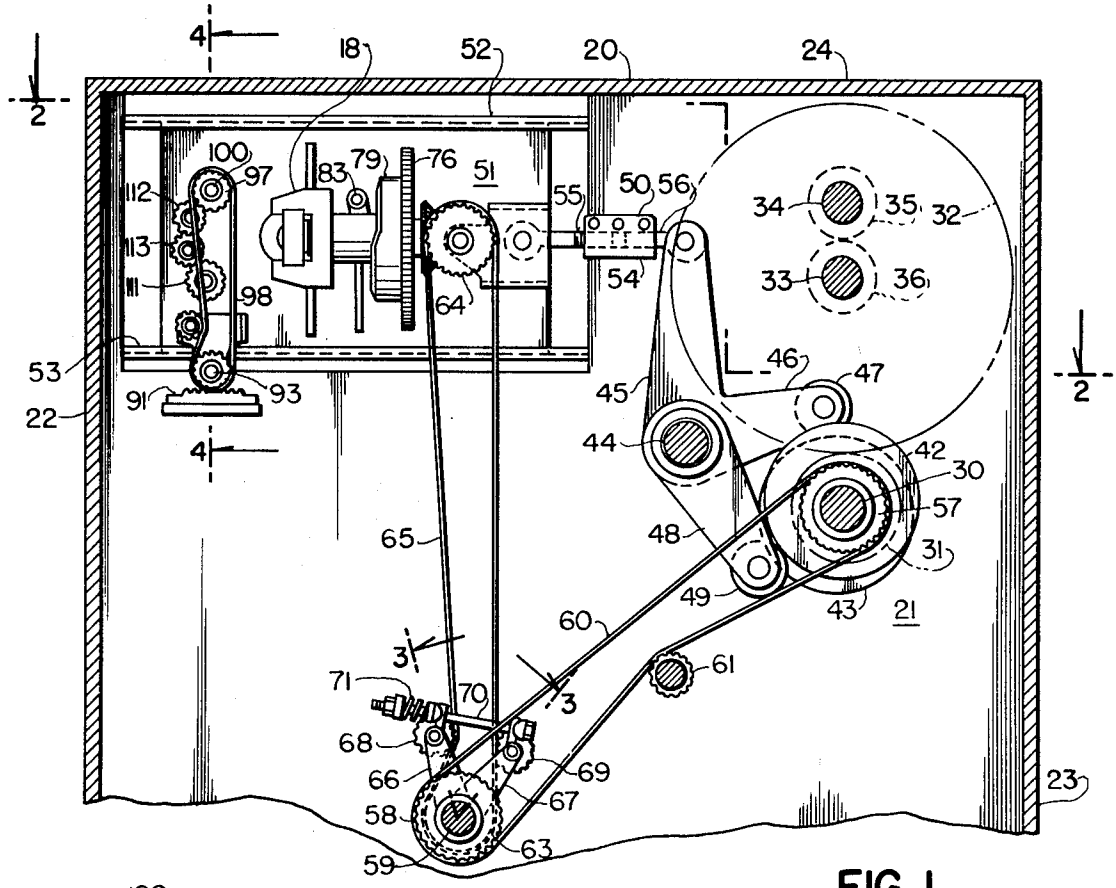

FIG. 1

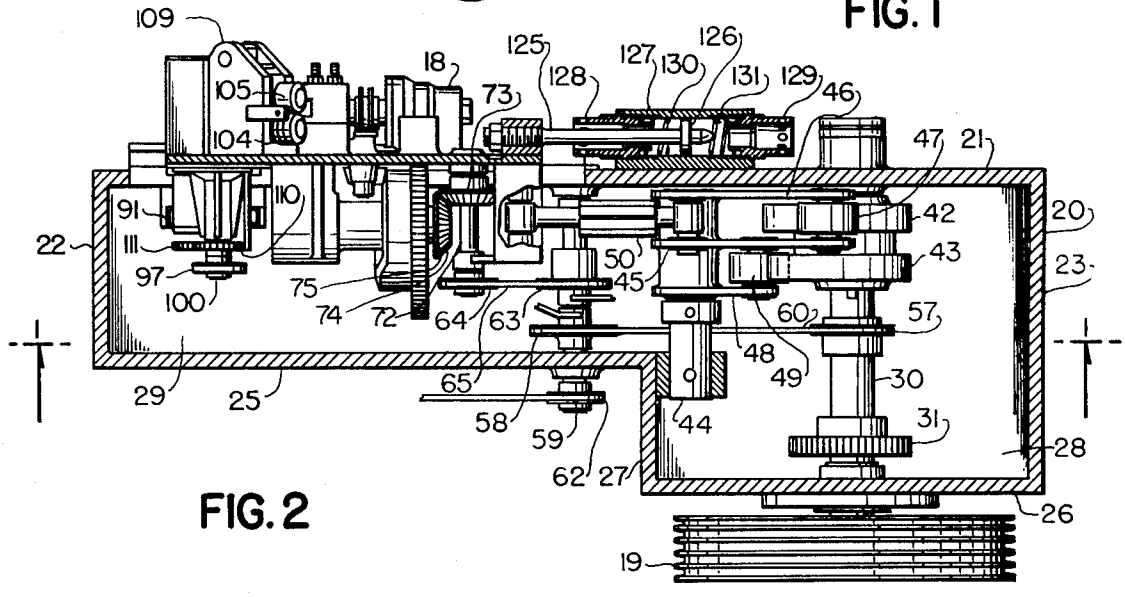

FIG. 2

INVENTOR:
PIERRE DONCHE-GAY
BY Peter L. Tailer
ATTORNEY

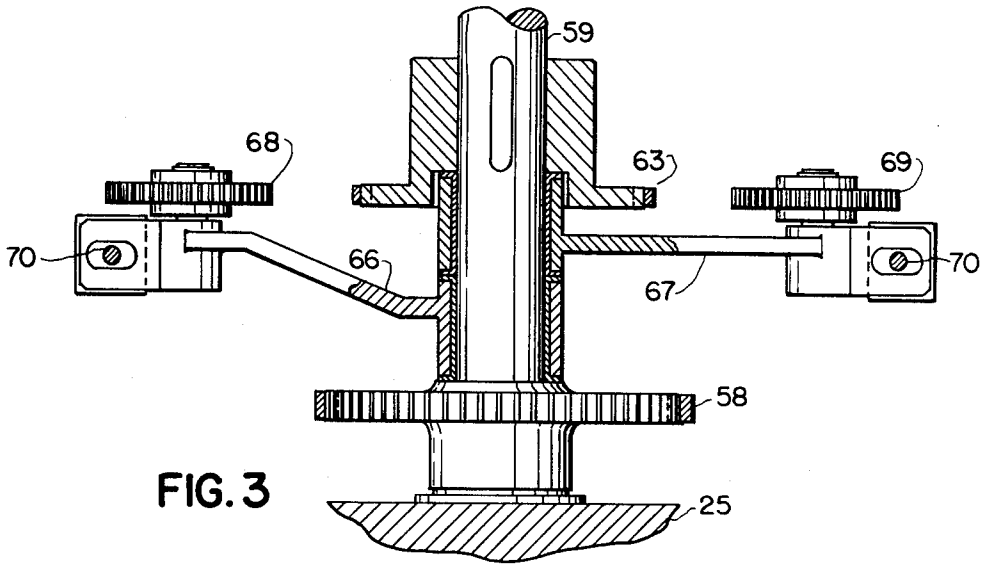

FIG. 3

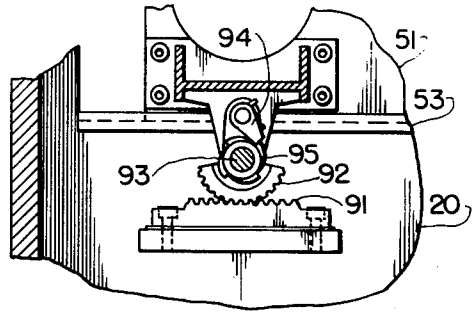

FIG. 5

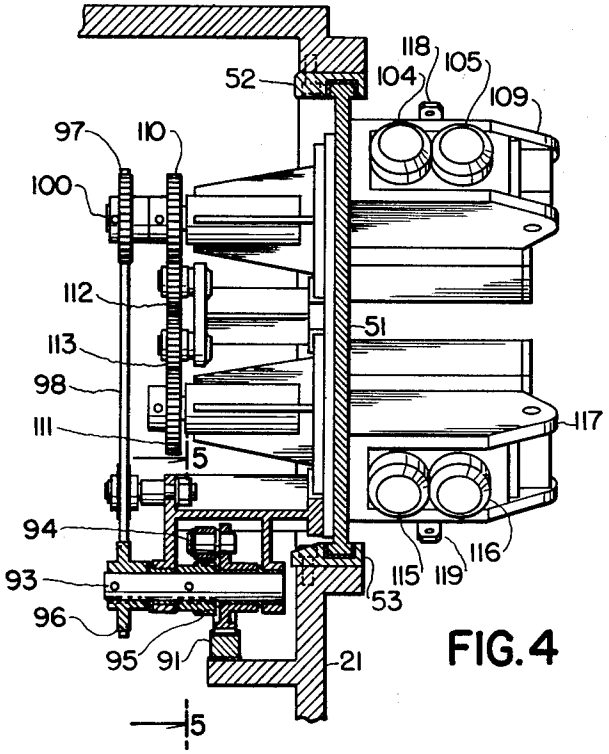

FIG. 4

INVENTOR:
PIERRE DONCHE-GAY
BY Peter L. Tailer
ATTORNEY

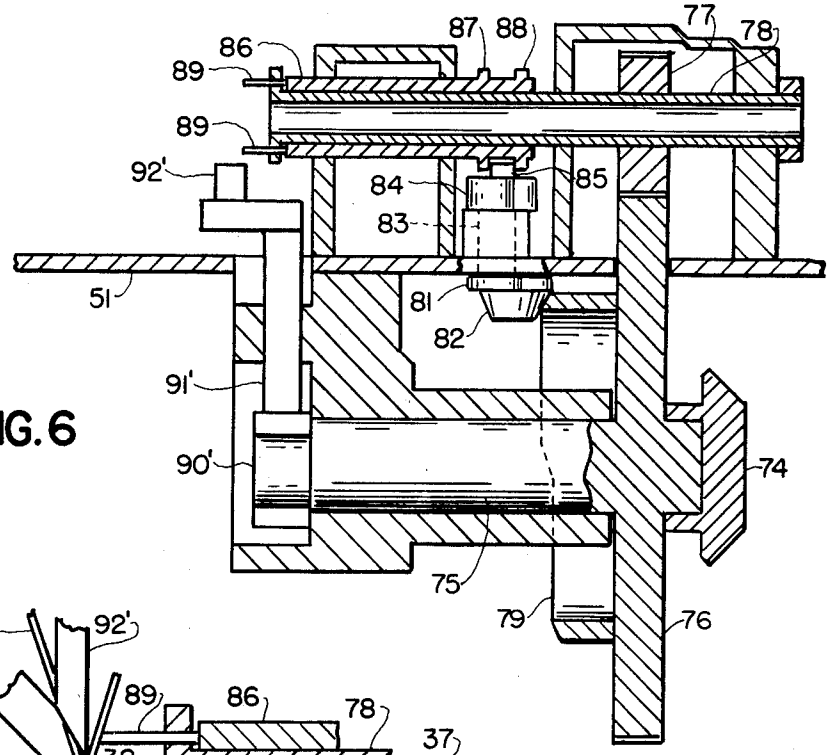

FIG. 6

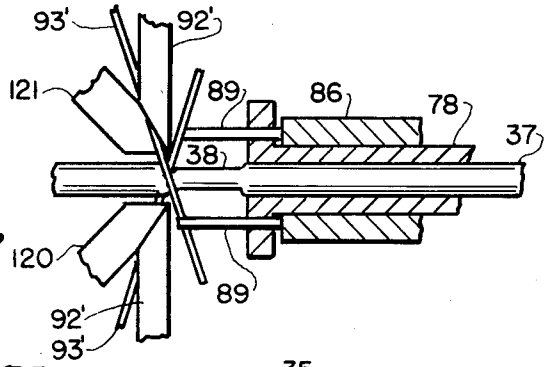

FIG. 7

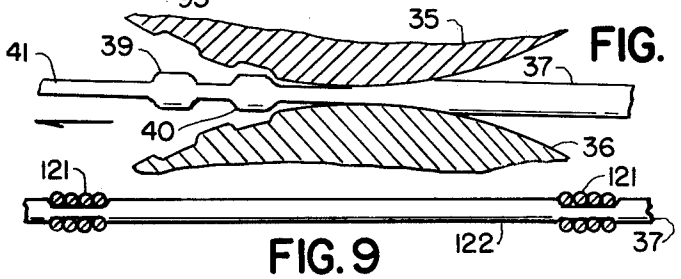

FIG. 9

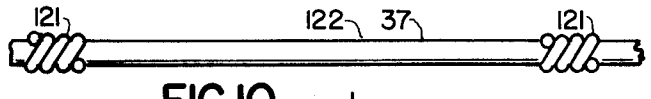

FIG. 10

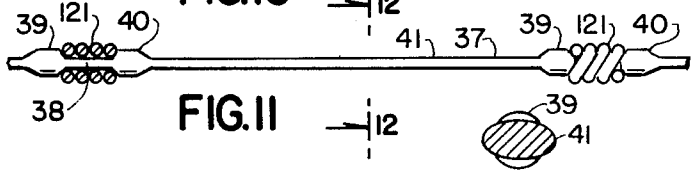

FIG. 11

FIG. 12

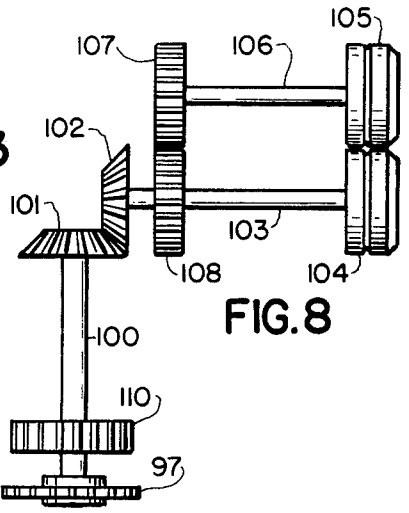

FIG. 13

FIG. 8

INVENTOR:
PIERRE DONCHE-GAY
BY Peter L. Tailer
ATTORNEY

REINFORCING ROD MACHINE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application relates to a machine for the manufacture of the reinforcing rod shown and described in U.S. Pat. application Ser. No. 34,064 of Pierre Donche-Gay filed May 4, 1970, now abandoned.

BACKGROUND OF THE INVENTION

To manufacture the reinforcing rod of the above identified patent application, a particularly strong and rugged machine is required that is easily adjusted and set up to deform and wind turns about relatively heavy rod. This invention supplies such a machine.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a longitudinal, vertical section through the reinforcing rod machine of this invention with a lower portion broken away;

FIG. 2 is a horizontal section taken on line 2—2 of FIG. 1;

FIG. 3 is a section taken on line 3—3 of FIG. 1;

FIG. 4 is a section taken on line 4—4 of FIG. 1;

FIG. 5 is a section taken on line 5—5 of FIG. 4 showing the drive mechanism for feed rollers of the winding head;

FIG. 6 is a horizontal section through elements of the winding head showing details of its construction;

FIG. 7 is a longitudinal, vertical section through a broken away end of the winding head arbor showing extended fingers winding smaller diameter rods about a flattened portion of a reinforcing rod;

FIG. 8 shows drive elements for the upper set of feed rollers of the winding head;

FIG. 9 is a side view of a length of reinforcing rod with windings thereon shown in section;

FIG. 10 is a side view of a length of reinforcing rod with windings thereon;

FIG. 11 is a side view of a modified length of reinforcing rod with one winding thereon shown in section;

FIG. 12 is a section taken on line 12—12 of FIG. 11; and,

FIG. 13 is a longitudinal, vertical section through fragments of forming rollers passing a reinforcing rod therethrough.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIGS. 1 and 2, the machine of this invention has a rectangular frame 20 with a front wall 21, end walls 22 and 23, and a top wall 24. Rear walls 25 and 26 and intermediate wall 27 form a wider drive housing 28 of the machine and a narrower winding head portion 29.

Main drive shaft 30 is journalled in front and rear walls 21 and 26 and has the drive pulley 19 for multiple V-belts mounted on it outside frame 20. Spur gear 31 mounted on shaft 30 drives a larger spur gear 32, shown in phantom lines in FIG. 1, which is mounted on shaft 33. Shafts 33 and 34, which are linked by meshing spur gears of the same size (not shown) have the forming rollers 35 and 36 mounted on them. As may be seen in FIG. 13, the forming rollers 35 and 36 deform the cylindrical rod 37 as shown in FIGS. 11 and 12 by flattening short lengths 38 between short unflattened portions 39 and 40. The longer lengths 41 between portions 39 and 40 are also preferably flattened to provide easier handling of the finished rod.

Referring further to FIGS. 1 and 2, a pair of cams 42 and 43 are mounted on shaft 30. Shaft 44 mounts a cam follower shaft yoke 45 which has one arm 46 mounting follower 47 riding on cam 42 and another arm 48 mounting follower 49 riding on cam 43. The cams 42 and 43 impart a controlled oscillating motion to yoke 45 which, by means of the link 50, oscillates winding head 18. Winding head 18 is mounted on and formed about the winding head plate 51 which is slidably mounted in the guides 52 and 53 which are most clearly shown in FIG. 4. The link 50 is adjusted as to length by rotating its central portion 54 about the oppositely threaded ends 55 and 56. This adjustment enables the winding head 18 to have its oscillations positioned in relation to deformed portions 38 of the constantly moving rod 37 to wind turns 121 thereon as will be described.

A sprocket 57 on shaft 30 drives sprocket 58 on shaft 59 by means of a chain 60 and a chain tension idler sprocket 61. Shaft 59, as shown in FIG. 2, mounts a sprocket 62 which may be used to drive a large diameter rod take-up reel (not shown). It also mounts sprocket 63 which drives sprocket 64 by means of chain 65. Since sprocket 64 is mounted on the oscillating winding head plate 51, the distance between the sprockets 63 and 64 will constantly vary to some extent.

A chain tension device is shown in FIGS. 1 and 3 to keep a constant tension on chain 65 as the winding head plate 51 reciprocates. Two arms 66 and 67 are rotatably mounted on shaft 59 and carry the idler sprockets 68 and 69 at their ends. A connecting rod 70 and a compression spring 71 urges the ends of the arms 66 and 67 together to maintain a constant and even tension on chain 65.

As shown in FIG. 2, sprocket 64 is mounted on shaft 72 which carries bevel gear 73 driving bevel gear 74 of winding head shaft 75. As may be seen in detail in FIG. 6, shaft 75 mounts a large spur gear 76 which extends through winding head plate 51 to drive spur gear 77 of winding head arbor 78. A barrel cam 79 mounted on the back of spur gear 80 oscillates link 81 which has follower 82 mounted thereon. By means of shaft 83 which mounts both link 81 and link 84, projection 85 of link 84 longitudinally reciprocates winding finger shaft 86 once for each rotation of shaft 75. Projection 85 extends between the annular flanges 87 and 88 of the hollow winding finger shaft 86 which is slidably mounted on arbor 78 so that teach reciprocation of shaft 86 extends and retracts the winding fingers 89.

The end of shaft 75 carries an eccentric 90' from which a follower 91' slidably extends to mount the smaller diameter winding rod cut-off knives 92'. As shown in FIG. 7, the rod forming rollers 35 and 36 feed rod 37 through arbor 78 until a flattened portion 38 extends past the arbor 78. As reciprocation of winding head plate 51 matches the speed of rod 37, fingers 89 extend to wind projected ends of the smaller diameter rods 93 about the flattened portion 38.

As shown in FIGS. 1, 4 and 5, a rack gear 91 is mounted on the machine frame 20. A sector gear 92

rotatably disposed about shaft **93** carries a rachet **94** which drives ratchet wheel **95** with each motion of winding head plate **51** in one direction. Shaft **93** carries sprocket **96** which drives sprocket **97** by means of chain **98**. As may be seen in FIG. **8**, sprocket on shaft **100** turns bevel gear **101** meshing with bevel gear **102** on shaft **103** carrying gear **108** and the smaller diameter rod feeding roller **104**. Gear **107** on shaft **106** meshes with gear **108** on shaft **103** to drive feeding roller **105**. The shafts **103** and **106** are journalled in a housing **109**.

As shown in FIGS. **1** and **4**, gear **110** on shaft **100** drives gear **111** by means of idler gears **112** and **113**. Gear **111** drives the feeding rollers **115** and **116** which are mounted on shafts (not shown) journalled in housing **117**. The rollers **115** and **116** are driven by means of a gear train similar to that shown by FIG. **8**. Guides **118** and **119** direct smaller diameter rod to the sets of feed rollers **104** and **105** and **115** and **116**.

As shown in FIG. **7**, the smaller diameter rods **93'** are fed through guides **120** and **121** to be wound and then cut off by the laterally moving knives **92'** moved by eccentric **90'**. The smaller diameter rods **93'** of FIG. **7** form the windings **121** shown in FIGS. **9–11**. As shown in FIGS. **9** and **10**, rod **37** may be left unflattened between windings **121**; however, the flattening of the portions **41** as shown in FIGS. **11** and **12** enables the rod to be coiled and handled more easily.

It is to be noted that with each turn of shaft **30** winding head **18** oscillates once, winding fingers **89** extend andretract as arbor **78** rotates several times to wind the turns **121**, feed rollers **104** and **105** and **115** and **116** feed out smaller diameter rod for the next winding **121**, and eccentric **90'** cuts off the completed winding **121**. The speed of winding head **18** to the left as shown in FIGS. **1** and **2** matches the speed forming rollers **35** and **36** pass rod **37** therebetween. Link **50** is adjusted so that each winding **121** is made about a flattened portion **38**.

Referring to FIG. **2**, a rod **125** is fixed to winding head plate **51** to reciprocate with it. Rod **125** terminates in a piston **126** within a cylinder **127**. The ends **128** and **129** of cylinder **127** may be turned in or out to position the compression springs **130** and **131** to help overcome inertia of winding head **18** at each end of its oscillations.

The combined elements and mechanisms of this reinforcing rod machine provide a rugged apparatus for the rapid production of relatively heavy reinforcing rod.

What is claimed is:

1. A machine to make reinforcing rod having spaced apart flattened portions and windings of smaller diameter rod about the flattened portions, said machine comprising, in combination, a machine frame, first and second shafts journalled in said frame, forming rollers mounted on said first and second shafts, said forming rollers having circumferential portions forming spaced apart flattened portions on a reinforcing rod passing therebetween, a third driven shaft mounted on said frame, first transmission means on said third and said second shafts so that said third shaft drives said second shaft, gear means on said first and second shafts so that said second shaft drives said first shaft, first and second cams on said third shaft, a yoke pivotally mounted on said frame said yoke having two arms and followers thereon engaged by said first and second cams so that rotation of said first and second cams with said third shaft oscillates said yoke, a fourth shaft mounted on said frame, second transmission means on said third and fourth shafts so that said third shaft drives said fourth shaft, a slidably mounted winding head on said frame above said fourth shaft, a link of adjustable length connecting said yoke to said winding head oscillating said winding head on said frame, a fifth shaft on said winding head parallel to said fourth shaft, third transmission means on said fourth and fifth shafts so that said fourth shaft drives said fifth shaft, a longitudinal sixth winding head shaft, bevel gears on said fifth and sixth shafts so that said fifth shaft drives said sixth shaft, feed rollers on said winding head for smaller diameter rod passing smaller diameter rod therebetween, guides and cutoff knives on said winding head for smaller diameter rod, a third cam on said sixth shaft, means moved by rotation of said third cam moving said knives cutting off said smaller diameter rod, a hollow seventh winding head shaft through which reinforcing rod passes after being intermittently deformed by said forming rollers, a large drive gear on said sixth shaft, a smaller driven gear on said seventh hollow winding head shaft driven by said large drive gear, winding fingers slidably mounted on said winding head shaft, a fourth cam on said large drive gear on said sixth shaft, means moved by said fourth cam extending and retracting said winding fingers to wind smaller diameter rod about flattened portions of said reinforcing rod, and means driving said smaller diameter rod feed rollers during oscillation of said winding head to feed lengths of smaller diameter rod through said guides to be wound, said winding head oscillating to move with said reinforcing rod at the same speed as said reinforcing rod.

2. The combination according to claim **1** wherein said means driving said smaller diameter rod feed rollers comprises a rack gear on said frame, at least a sector gear on said winding head engaging said rack gear, a rachet and a rachet wheel on said winding head one of which oscillates with said sector gear driving the other intermittently in one direction, and fourth transmission means connecting said smaller diameter rod feed rollers to said rachet and rachet wheel intermittently driving said smaller diameter rod feed rollers.

3. The combination according to claim **2** wherein said third transmission means on said fourth and fifth shafts comprises chain sprockets on said fourth and fifth shafts, a chain connecting said sprockets, two arms pivotally mounted on said fourth shaft, idler sprockets on said arms riding on said chain on each side thereof, and spring means urging said arms together maintaining even tension on said chain as said winding head reciprocates.

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