Aug. 8, 1961 D. J. DONATO 2,995,170

FLANGING OR SPINNING MACHINE

Filed Nov. 12, 1957 4 Sheets-Sheet 1

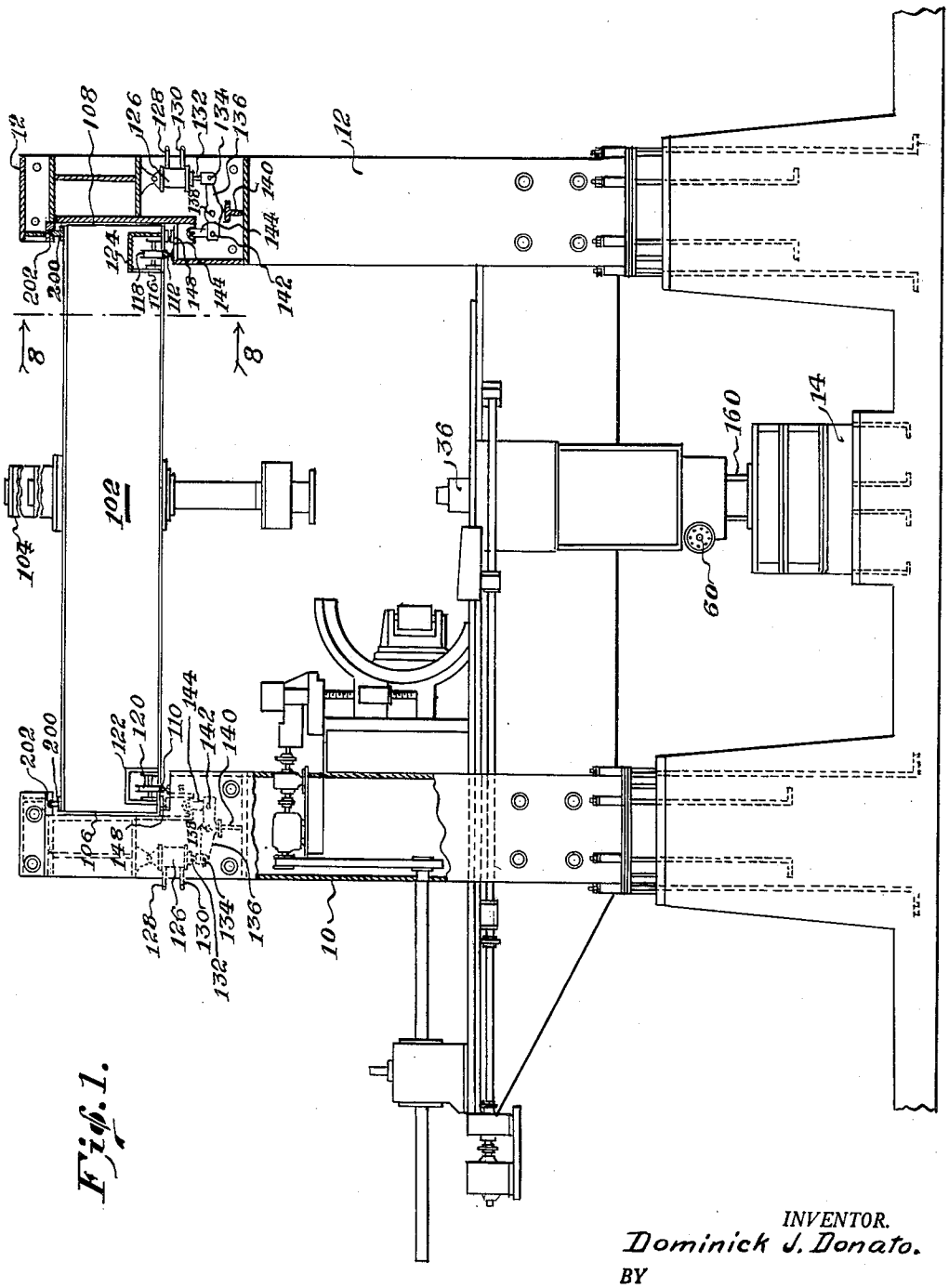

Fig. 1.

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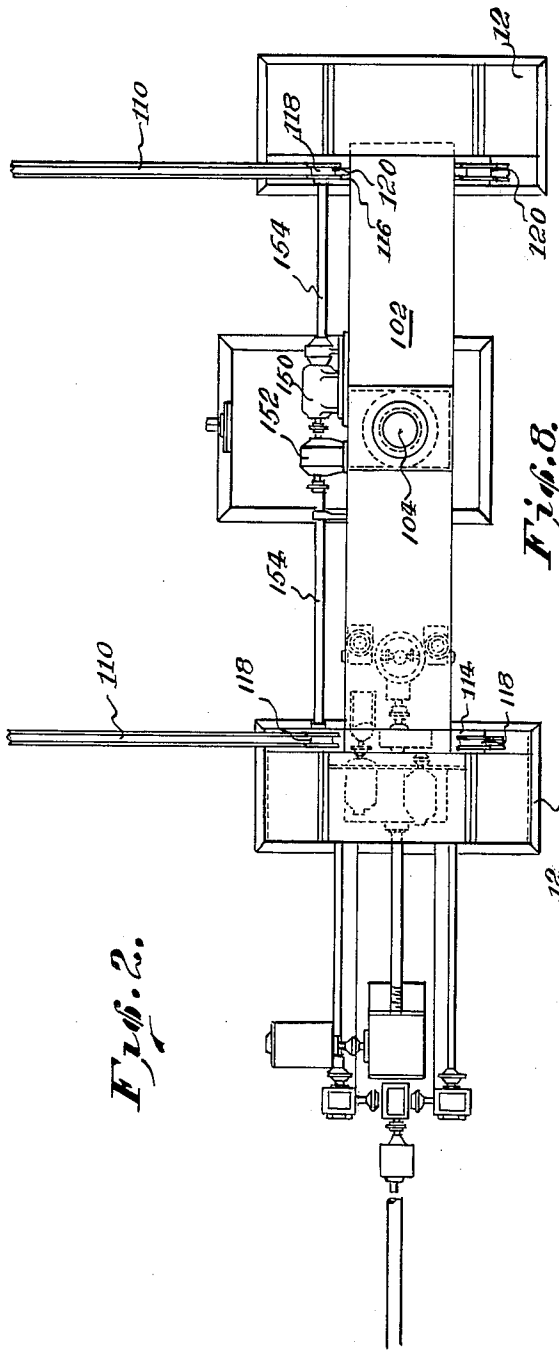

Fig. 2.

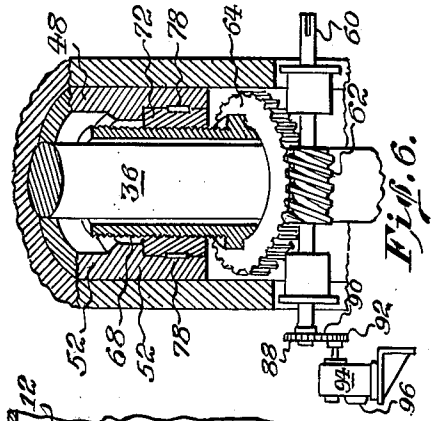

Fig. 6.

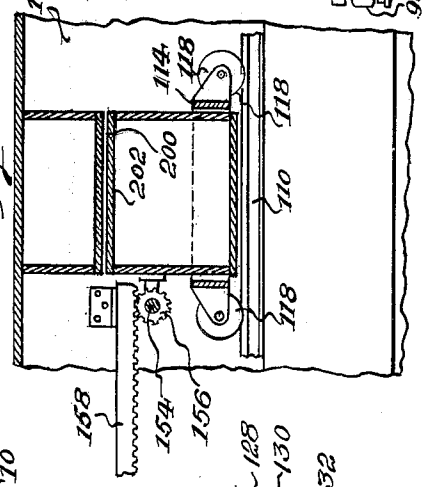

Fig. 8.

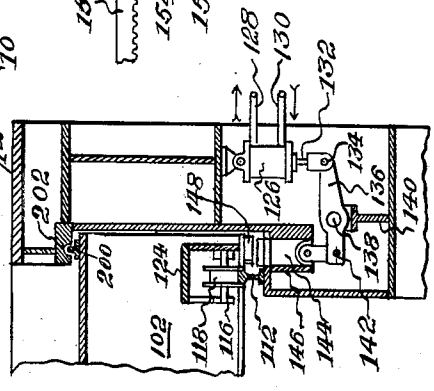

Fig. 7.

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FLANGING OR SPINNING MACHINE

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Fig. 3.

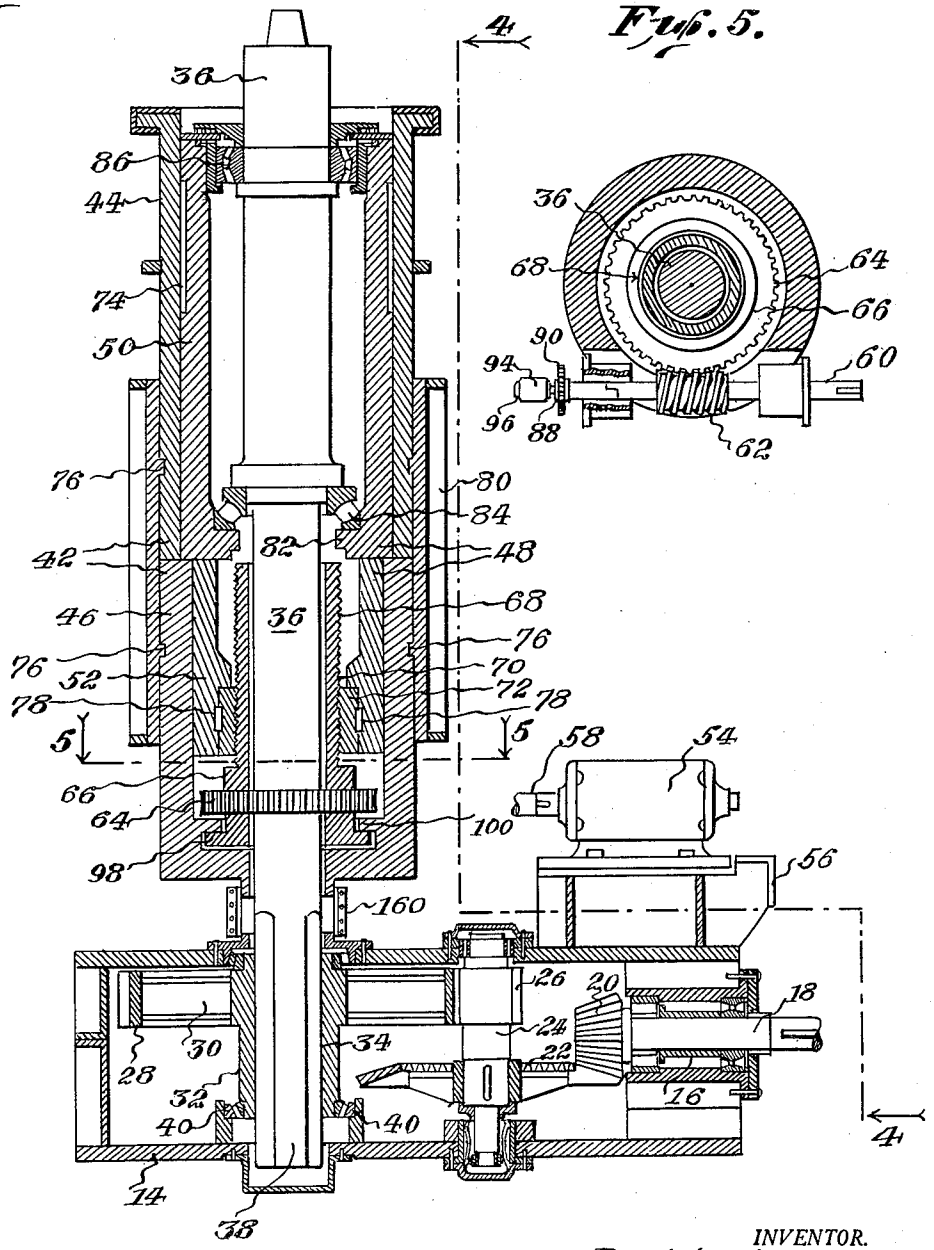

Fig. 5.

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FLANGING OR SPINNING MACHINE

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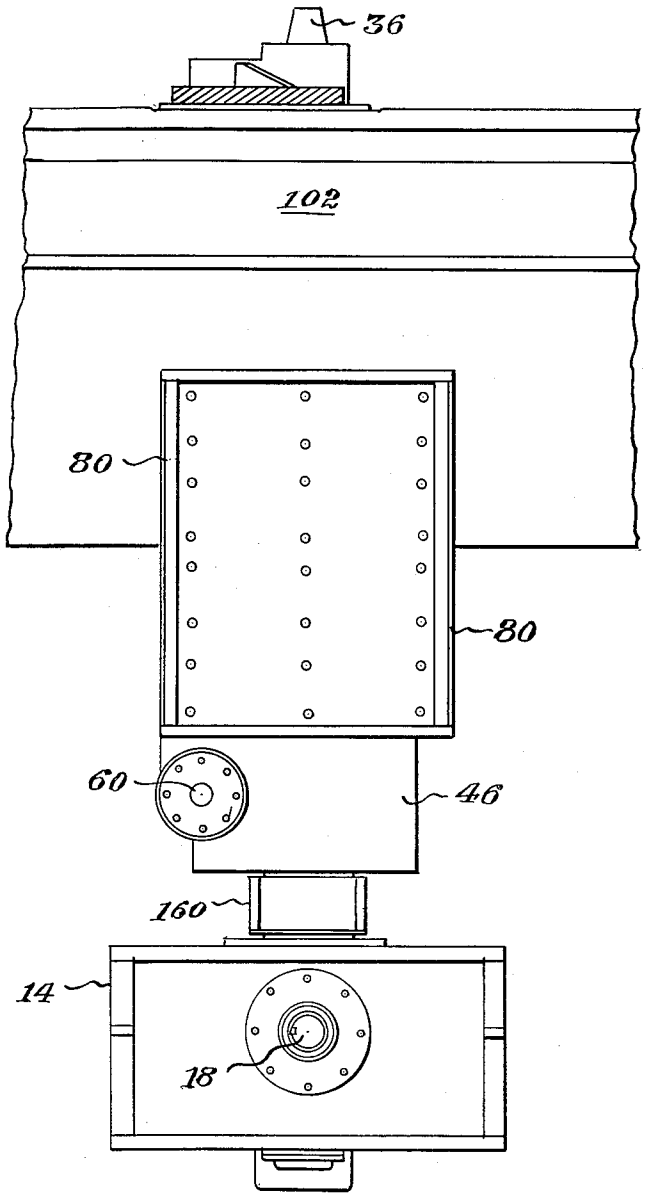

Fig. 4.

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United States Patent Office 2,995,170 Patented Aug. 8, 1961

2,995,170

FLANGING OR SPINNING MACHINE

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Filed Nov. 12, 1957, Ser. No. 695,572
5 Claims. (Cl. 153—26)

The present invention relates to a novel flanging or spinning machine.

An object of the invention is the provision of a machine for rapidly and accurately flanging or spinning metal articles such as sheet metal containers, cylinders, dished articles, etc. that are made by spinning or flanging operations.

Another object is the provision of means for quickly adjusting the main bottom spindle of the flanging or spinning machine in a vertical direction.

A further object is to provide an improved construction for substantially instantly raising or lowering the main bottom spindle and retaining the spindle in its adjusted position whereby to perform different operations and to form differently shaped articles hereinafter termed work pieces.

Yet another object is to provide in a spinning machine having a top beam provided with means for moving the same in a substantially horizontal direction, means for clamping the beam in its operating position above the main bottom spindle.

Other objects will appear hereinafter throughout the specification.

In the drawings:

FIGURE 1 is a front elevation view of the entire structure;

FIGURE 2 is a top plan view partly broken away of the structure shown in FIGURE 1, with the racks and pinions omitted for the sake of clarity;

FIGURE 3 is a vertical section, partly broken away and with parts shown in full lines, of the main bottom spindle and the mechanism for adjusting the same;

FIGURE 4 is a view taken on the line 4—4 of FIG. 3;

FIGURE 5 is a horizontal section taken on the line 5—5 of FIG. 3;

FIGURE 6 is an enlarged detail view partly in vertical section and partly in full lines of the auxiliary motor drive mechanism;

FIGURE 7 is an enlarged vertical sectional view of the vertical support at the right of FIGURE 1; and

FIGURE 8 is a view looking in the direction of the arrow 8—8 of FIG. 1.

The flanging and spinning machines of standard design have provided for vertical adjustment of the main bottom spindle by installing spacers between the bottom former and the bottom spindle. Much time is lost in adjusting the spindle by this method and means. Moreover, no positive holding or clamping means has been devised for machines of this type for maintaining the top clamping beam in proper position of horizontal adjustment. These deficiencies are overcome by the provision of the mechanism of this invention, now to be described.

Referring to FIGURES 1 to 5 inclusive, the numerals 10 and 12 indicate a pair of vertical columns forming supports for the top clamping beam and its tracks, and housings for some of the mechanism to be described. Supported at ground level midway between the columns, as shown in FIGURE 1, is a gear housing 14, and extending through and supported by one of the side walls thereof is a roller bearing assembly 16 that rotatably supports the drive shaft 18 which is driven by the main driving motor, not shown.

Splined to the opposite end of shaft 18 from the drive motor is the pinion gear 20 which meshes with the ring

gear 22 splined to vertical shaft 24. The upper end of this shaft is provided with the reduction gear mechanism, including gears 26 and 28, the latter being connected by spokes 30 to the hub or sleeve 32. This hub has an opening 34 of non-circular shape which slidably supports main bottom spindle 36, whose lower end is shaped to conform with the configuration of the sleeve opening 34. The spindle 36 is provided with the usual block or die which may be in accordance with that shown in the British Patent No. 516,287 of December 29, 1939, or may be of any other suitable shape for supporting the workpiece. As indicated in FIG. 3, sleeve opening 34 and shaft end 38 are octagonal in cross section. However, any other multi-sided or other shape may be provided for the opening and lower shaft end which will permit sliding movement of the shaft in the opening while still permitting driving engagement between hub 32 and spindle 36 during the various adjusted positions of the said spindle.

The hub 32 and gear 28 are rotatably supported by bearings 40 in housing 14.

As particularly illustrated in FIGURES 3 and 6, there is an upper outer housing for the main bottom spindle 36, said housing being indicated by the numeral 42 as seen in FIGURE 3. This stationary housing which is fixed to housing 14 by collar 160 comprises an upper portion 44 and a lower portion 46. This two-part outer housing 42 supports and guides the slidable inner two-part housing 48, which also consists of an upper portion 50 and a lower portion 52.

The mechanism for raising and lowering the inner housing and the main bottom spindle which is supported thereby comprises an auxiliary motor, such as the electric motor shown at 54. This motor is mounted upon a base 56 which rests upon and is rigidly attached to the upper surface of the gear housing 14. Auxiliary, reversible-type electric motor 54 is drivingly connected to drive shaft 58, the latter being connected to driven shaft 60. Splined on shaft 60 between the ends thereof is worm 62 which drives worm gear 64, the latter being splined to sleeve 66 adjacent the lower end thereof. This sleeve, which is free of spindle 36, is provided with threads 68 that engage threads 70 of a nut 72. This nut is held non-rotatably within the lower portion 52 of the housing 48.

It will be understood that the parts 44, 46, 50, 52 and 72 are prevented from rotating by splines 74, 76 and 78. Upper and lower inner housing portions and nut 72 are permitted to move in an upward or downward direction in accordance with the direction of rotation of the worm gear 64. It will be understood that the supporting means supporting outer sleeve 80 will be maintained in a stationary position by means of the connecting collar 160 which connects lower portion 46 to stationary housing 14. The lower portion 52 and upper portion 50 are moved upwardly and downwardly and slide vertically in the upper portion 44 and lower portion 46 in accordance with the rotation of the worm wheel 64, and it is the upward or downward movement of these spindle supporting portions which causes vertical adjustment of main bottom spindle 36.

The lower end of the upper inner housing portion 50 is provided with a circular shoulder or pillow for the support of anti-friction thrust bearings 84. These bearings and the combined thrust and radial bearings 86 support and maintain the main bottom spindle 36 in proper alignment in its various positions of adjustment.

By reference to FIGURE 6 it will be noted that the driven shaft 60 is provided with a sprocket 88 having a sprocket chain 90 which drives a driven sprocket 92 which drives a conventional speed reducer 94. Connected to the speed reducer 94 is a limit switch 96. The function

of the limit switch is to disconnect current to the motor **54** at either the uppermost or lowermost positions of adjustment of the main bottom spindle **36**. It will be understood that the motor **54** can be provided with any conventional manually controlled switching means for causing the motor to rotate in either direction, and it will be further understood that the direction of rotation of the motor through the worm gearing illustrated in FIGURE 5 will force the main bottom spindle to move upwardly or downwardly, or to remain in its vertical position of adjustment when current has been disconnected from the motor **54**. Should the shaft reach either an extreme upward or downward position, the motor will automatically be shut off by activation of limit switch **96** at either extremity of movement of the spindle **36**.

It will be appreciated that in any position of vertical adjustment to which the main spindle has been moved, or during its vertical movement, it may be continuously rotated through the gear train which is driven by main drive shaft **18**. The purpose of the speed reducer **94** is to prevent a too rapid movement in a vertical direction of the main spindle **36**, and to permit small increments of upward or downward movement of this spindle in accordance with the opening and closing of the manually controlled switch of motor **54**.

In order to prevent vertical movement of sleeve **66**, the lower end of this sleeve is provided with a shoulder **98**, which is adapted to engage shoulder **100**. As shown in FIGURES 1, 2, 7 and 8, the top clamping beam **102** is provided with hydraulic cylinder **104** for supporting the usual forming tool.

The vertical columns **10** and **12** are provided with inner recessed portions **106** and **108**, forming a base for the support of the tracks **110** and **112**, and the top clamping beam is provided at opposite ends with carriages **114** and **116**, each carriage supporting a pair of wheels **118** and **120**. It will be noted that the carriages are mounted in boxings **122** and **124**.

Mounted within the housing portions of the vertical columns **10** and **12**, as shown in FIGURES 1 and 7, are the clamping mechanisms for retaining the top clamping beam in fixed position. FIGURE 7 shows the rightmost clamping mechanism of FIGURE 1 on an enlarged scale. Each clamping mechanism comprises a fluid cylinder **126**. Fluid lines **128** and **130** lead to opposite ends of the pistons (not shown) located in each of these cylinders. It will be understood that fluid may be led through fluid line **128** to the top of the cylinder and led through fluid line **130** to exit below the said cylinders by the manipulation of any well-known hydraulic system, which would include a tank, pump, and manually or automatically controlled valve. The operation of the valve in one direction would cause fluid to flow to the top of the cylinders through conduits **128** and above the pistons located therein and exhaust fluid through fluid lines **130** which connect with the space beneath the said pistons. The operation of the fluid control valve in the opposite direction would cause fluid to flow into fluid lines **130** below the pistons within cylinders **126** and out of fluid lines **128** which communicate with the upper portions of the cylinders **126** so that fluid above the pistons located in said cylinders may be exhausted therefrom.

Each piston is connected to a piston rod **132** the lower end of which is pivoted at **134** to rocking lever **136** whose intermediate portion is pivoted at **138** to a fixed support **140** which is mounted within one or the other of supports **10** and **12**, as particularly shown in FIGURE 7. The opposite end of the rocking lever is pivoted at **142** to the vertically moving plunger **144** which is guided in its upward and downward movements by sleeve **146** which is rigidly attached to beams **10** and **12**.

As shown in FIGURES 1 and 7, the top clamping beam **102** is provided on its underside adjacent each side edge thereof with a seat which is adapted to be engaged by plunger **144** when the piston in cylinder **126** is moved downwardly by exit fluid line **130** and the forcing in of fluid through line **128** above the piston in said cylinder.

It will be further understood that fluid is forced through each line **128**, and each line **130**, in the same direction. When the fluid is simultaneously forced through each line **128** above the piston in the cylinder **126**, the fluid below each piston exits through line **130**, and the plungers **144** are moved upwardly to engage each seat **148**. The fluid within these fluid lines is preferably actuated by a valve, as indicated above, and preferably the said valve is operated by a motor switch which is automatically tripped when the top clamping beam reaches its work-engaging position over spindle **36**.

When the switch is reversed to cause fluid to move in the opposite direction through said lines, each seat is disengaged by its plunger **144**. The top clamping beam may then be moved on tracks **110** and **112** to its non-working position on said tracks. This movement results from the hereinafter described mechanism. Mounted on the top clamping beam, as shown particularly in FIGURE 2, is an electric motor **150** which is connected to a speed reducing mechanism **152**, both of which are mounted on line shaft **154**. On the ends of this shaft are mounted pinions **156**, as shown in FIGURES 7 and 8. Each pinion **156** engages a rack mounted on the other side of the recessed portions **106** or **108**. The pinion does not closely engage the rack **158** in its driving position, but is forced upwardly slightly, possibly a quarter of an inch, by the upward movement of the top clamping beam **102** when each plunger **144** engages its seat **148**. It will be understood, therefore, that the beam is tightly clamped in stationary position by the plungers **144** when they engage the seats **148** and there is a slight upward movement of the clamping beam **102**. Nevertheless, when these plungers are moved downwardly by forcing fluid into the lower ends of cylinders **126**, the pinions **156** are still in driving engagement with the rack **158**. Any suitable electric switching mechanism may be used to drive the reversible electric motor **150** in opposite directions.

As shown in the drawings, the top clamping beam is provided with a tongue member **200**, and the supporting means, such as the column **12**, is provided with a groove member **202**. This tongue and groove construction may be provided on either side or preferably both sides adjacent the top portion of the top clamping beams and the under portions of the supporting means **10** and **12**. When the pistons or plungers **144** are moved upwardly by the hydraulic means, including the pistons located in cylinders **126**, the plungers engage the seats **148** and raise the top clamping beam so that the tongues **200** will engage the grooves **202**.

It will be understood from the foregoing description and drawings that I have provided a very efficient mechanism for quickly and easily raising or lowering the main bottom spindle **36** and holding the same in any adjusted position whereby to compensate for different types of work pieces and different kinds of work being performed thereon, and that the top clamping beam may be quickly brought to its work-engaging position, wherein the tool which is operated by hydraulic cylinder **104** will be moved to its operative or non-operative positions, and clamped in position for ready engagement of the work by the tool which by the usual spindle and ram is supported on the top clamping beam **102**.

The term "motor means" in the claims includes a single reversible motor, or more than one motor, whereby to rotate shaft **58** in either direction of rotation.

The above description and drawings disclose a single embodiment of the invention, and specific language has been employed in describing the several figures. It will, nevertheless, be understood that no limitations of the scope of the invention are thereby contemplated, and that various alterations and modifications may be made such as would occur to one skilled in the art to which the invention relates.

I claim:

1. In a spinning machine structure for use in spinning and flanging operations comprising a main vertical spindle having work-supporting means on the upper portion of said spindle adapted for supporting and rotating a workpiece, means for rotating said spindle including a drive shaft, means for adjustably raising and lowering said spindle and for retaining said spindle in its adjusted position whereby to form differently shaped articles from workpieces, said last named means including a reversible motor, a non-rotatable spindle supporting means for preventing sidewise oscillation of said spindle including spaced bearings, said means for adjustably raising and lowering said spindle further comprising a screw-threaded drive connection including threaded means, said spindle and a threaded nut engaging said threaded means, said nut being rigidly connected to said supporting means, the said nut being located between said reversible motor and said non-rotatable spindle supporting means.

2. The structure of claim 1 wherein said means for rotating said spindle including said drive shaft includes a non-circular lower end for said main vertical spindle and gear means for driving said spindle, said gear means having a hub of non-circular configuration whereby to permit vertical sliding movements between said main spindle end and said gear means but preventing relative rotative movements therebetween.

3. The structure of claim 2 wherein said means for adjustably raising and lowering said spindle further includes a limit switching means for limiting the upward and downward movements of said main spindle.

4. The structure of claim 1 wherein said non-rotatable spindle supporting means comprises inner housing means mounting said spaced bearings, said inner housing means and bearings being longitudinally adjustable with said main spindle.

5. The structure of claim 4 wherein said spinning structure is provided with an outer sationary housing means which supports said inner housing means, both said inner and outer housing means comprising said non-rotatable spindle supporting means.

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