

- [54] **SHUT HEIGHT COUNTER DRIVE FOR PRESSES**
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- [51] Int. Cl.**B30b 5/00**
- [58] Field of Search ..100/99, 214, 257, 282; 74/586; 83/522, 527; 72/32, 35, 446

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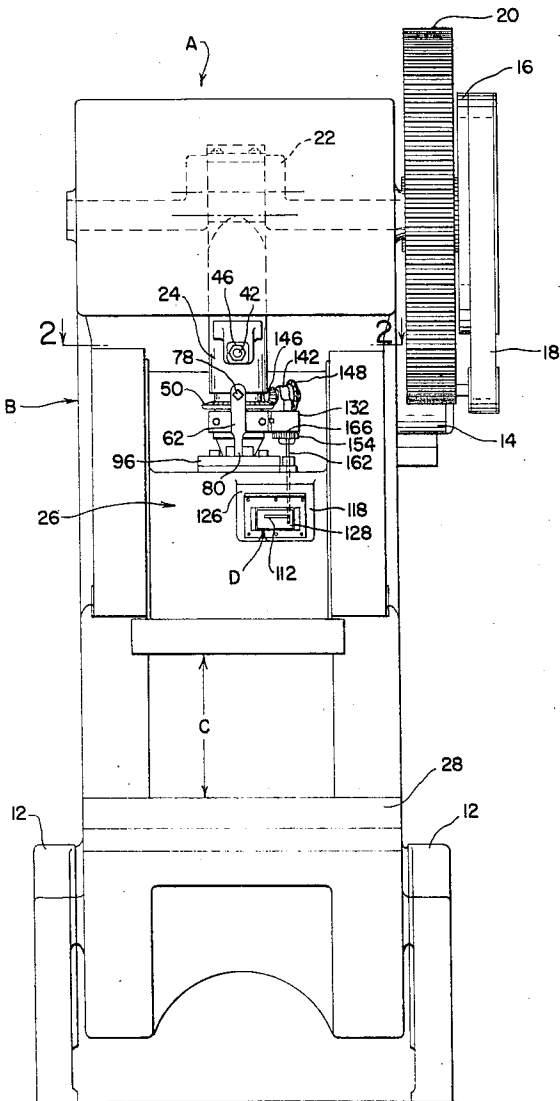
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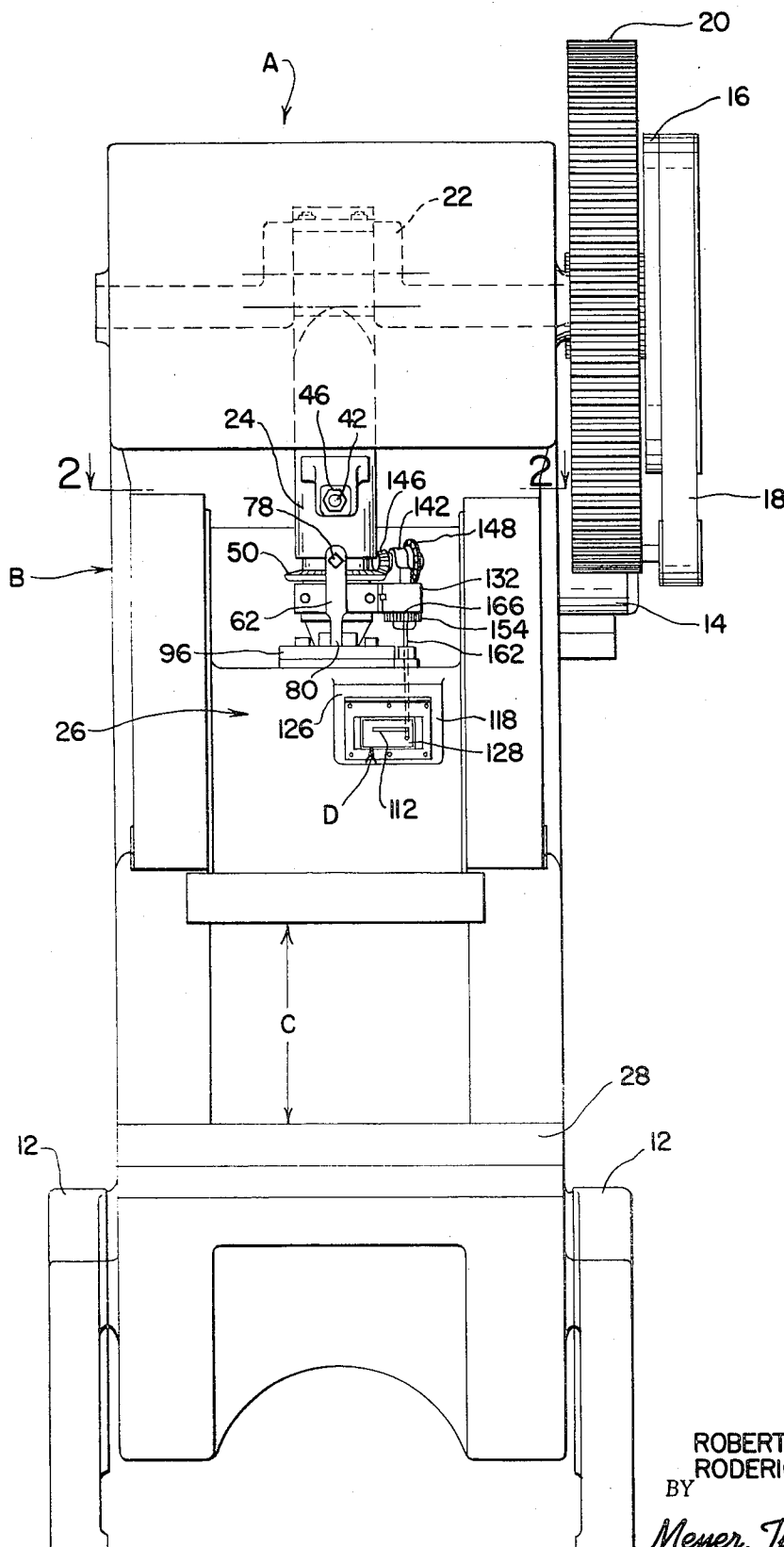
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[57] **ABSTRACT**

A press having a frame includes a slide reciprocatingly mounted on the frame for cooperation with the bed to perform work on workpieces. A drive means for reciprocating the slide is connected thereto by adjustable connection means for adjustable movement of the slide toward and away from the bed to vary the shut height. A variable indicating means is mounted on the slide for indicating the adjusted shut height position of the slide. An indicating drive mechanism is mounted on the adjustable connection for driving the indicator to vary the indication thereon and show the adjusted shut height position of the slide when the adjustable connection is adjusted. A flexible drive shaft drivingly connects the indicating drive mechanism with the indicator.

8 Claims, 4 Drawing Figures





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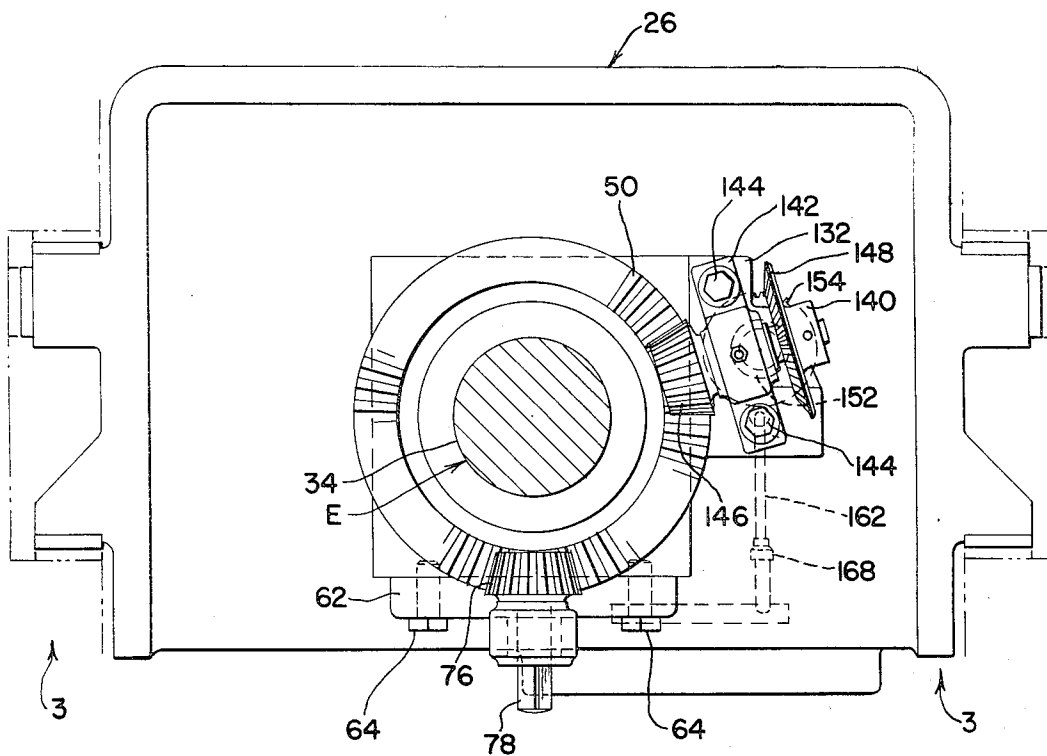


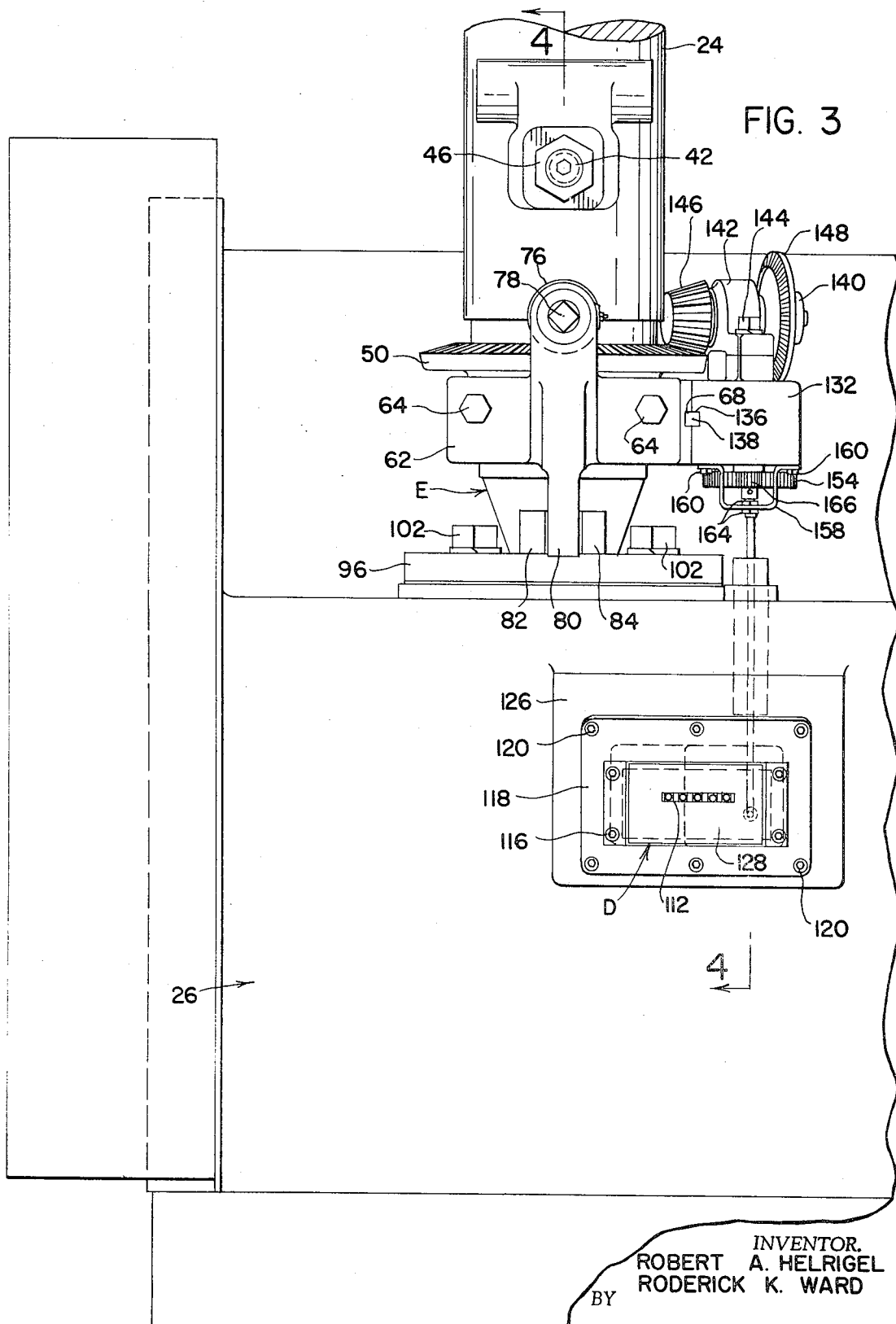
FIG. 2

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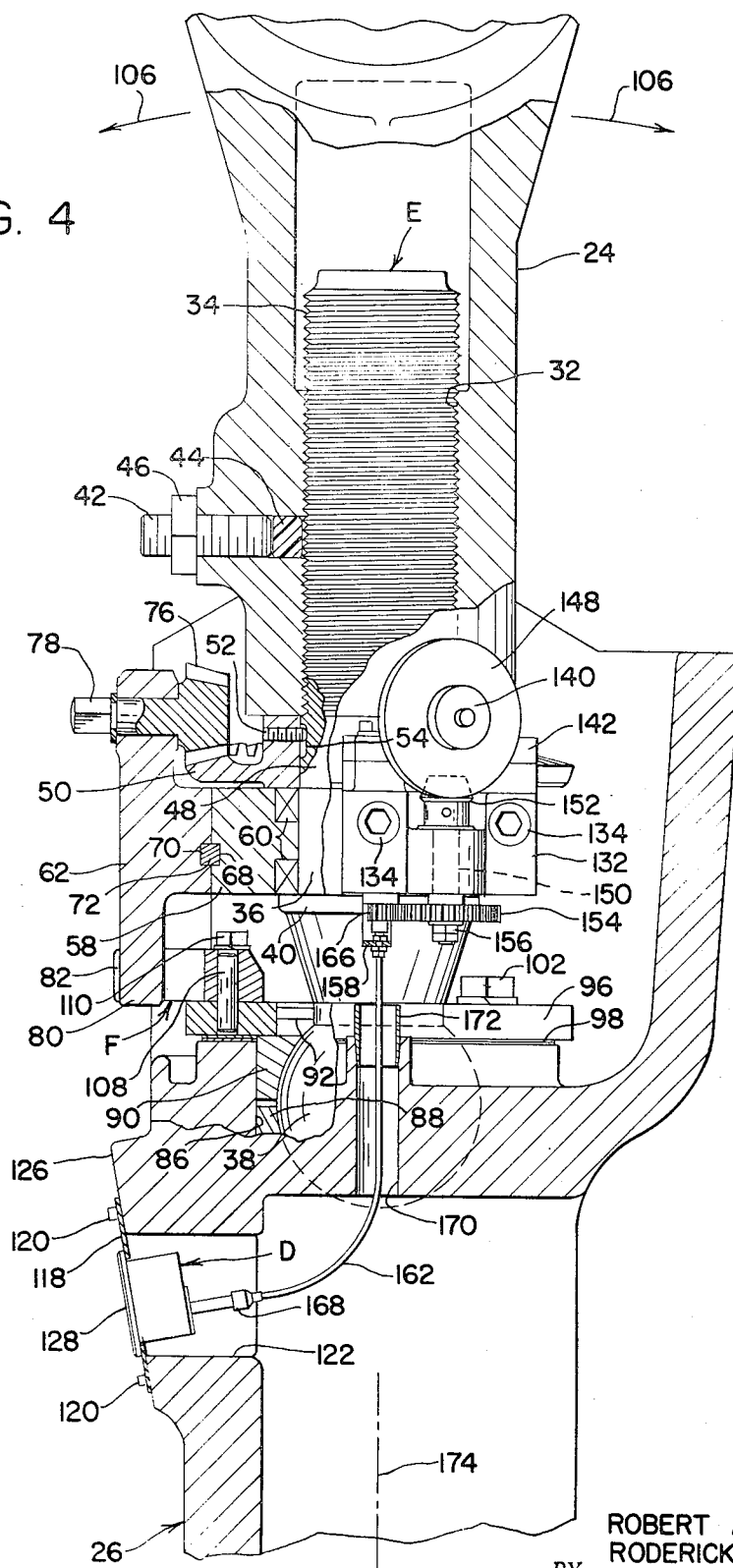
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FIG. 4



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an inner surface to match the outer surface of collar 58. Collar 58 and bracket 62 are provided with horizontal grooves 68 and 70 for receiving a key 72 to aid in holding bracket 62 to collar 58 in cooperation with bolt 64. A bevel gear 76 is rotatably journaled in the upper portion of bracket 62 and meshed with bevel gear 50. Bevel drive gear 76 has a coupling end portion 78 which is adapted to be connected with a suitable power source for providing torque, such as an air motor or the like. Bracket 62 has a downwardly projecting leg 80 extending between spaced-apart arms 82 and 84 of bifurcated dog member F which is fixed to slide 26.

The upper portion of slide 26 is provided with a recess 86 receiving a ball seat bushing 88 and a ball cap bushing 90 which in turn receive ball portion 38 of screw E for rotatable and swiveling movement. A ball seat ring 92 is positioned slightly above ball portion 38. Ball bushings 88 and 90, and ball cap ring 92, are held in position on slide 26 by a circular ball cap member 96. Shims as at 98 may be positioned between ball cap member 96 and the upper portion of slide 26 for adjusting the clamping force supplied to bushings 88 and 90. Ball cap member 96 is provided with suitable circumferentially spaced holes through which bolts as at 102 extend into threaded engagement with axial threaded bores in the upper portion of slide 26. Bolts 102 clamp ball cap member 96 to the upper portion of slide 26 for holding ball cap ring 92 in position along with bushings 88 and 90. Ball portion 38 of screw E may rotate and swivel relative to bushings 88 and 90, and ball cap ring 92. Connecting rod 24 will oscillate back and forth in the direction of arrows 106 when crankshaft 22 is rotated during operation of press A. Bifurcated dog member F is provided with a pair of spaced-apart bores for attaching dog member F to ball cap member 96. Ball cap member 96 is provided with a pair of spaced-apart holes alignable with the pair of holes in dog member F. One pair of aligned holes may receive a pin 108 while the other hole in cap member 96 may be threaded for receiving bolt 110. This securely locks bifurcated dog member F to slide 26 through ball cap member 96 to prevent movement of dog member F relative to slide 26. Reception of leg 80 on bracket 62 between arms 82 and 84 of dog member F also holds bracket 62 and collar 58 against rotation relative to screw E.

In order to adjust shut height C, lock bolt 42 is loosened and the drive motor connected with drive bevel gear 76 is operated. Drive bevel gear 76 then rotates adjusting bevel gear 50 to cause rotation of screw E so that it will thread into or out of threaded bore 32. Depending upon the driving direction of the drive motor for drive bevel gear 76, slide 26 will then selectively move toward or away from bed 28 to vary shut height C.

Shut height indicator D is of a known type and includes a plurality of rotatable wheels having numbers thereon which are visible through a front window 112. Indicator D is attached to a mounting plate 118 as by screws 116. A recess 122 is formed in the front portion of slide 26 for receiving indicating counter D. Mounting plate 118 is secured to the front face of slide 26 as by bolts 120 extending through holes in mounting plate 118 and threaded into threaded bores in the front face of the slide. In a preferred arrangement, upper front

face portion 126 of slide 26 slopes forwardly from the vertical so that front face 128 of counter D also slopes forwardly from the vertical. This forward sloping of the front face of counter D makes it easier for an operator to view the numbers visible through window 112 from the front of press A. Indicating counter D is drivingly connected with the adjusting mechanism between rod 24 and slide 26 so that the indication on the wheels visible through window 112 varies when the adjustable connection is connected to vary shut height C. In accordance with conventional practice, each number on counter D represents 0.001 inch of movement of the slide. Shut height C must usually be adjusted for each die which is mounted on slide 26 and bed 28. Once an operator has adjusted shut height C to accommodate a certain die, the numbers on indicating counter D may be etched into the die. During subsequent operations, other dies will be used on press A. When a die which has already been used is again attached to press A, an operator can simply operate the adjusting mechanism until the numbers on indicating counter D correspond with those etched on the die in order to obtain proper shut height C for that particular die. This eliminates all the set up time required after the first time a die is used.

In accordance with the preferred arrangement, the indicating drive mechanism for driving indicating counter D is mounted on the adjustable connection between rod 24 and slide 26. The indicating drive mechanism includes a bracket 132 having an arcuate inner surface to correspond with the circular shape of collar 58. Bracket 132 is provided with suitable holes through which bolts 134 extend and thread into suitable threaded bores formed in the outer surface of collar 58 for securely bolting bracket 132 is provided with a horizontal recess or groove 136 which cooperates with groove 68 in collar 58 to receive a key 138 which aids in holding bracket 132 to collar 58 along with bolts 134. Bracket 132 and collar 58 are held against rotation with screw E by bracket 62 whose leg 80 is received between arms 82 and 84 of bifurcated dog member F. Positioning of collar 58 between shoulder 40 and bevel adjusting screw 50 also prevents longitudinal or axial movement of collar 58 relative to adjusting screw E. During adjustment of shut height C, bevel gear 50, collar 58, and brackets 62 and 132 move axially with slide 26 and adjusting screw E. A substantially horizontal shaft 140 is rotatably mounted on bracket 132 and rotatably held thereto as by bearing shaft retained 142 and bolts 144. Shaft 140 has first and second bevel gears 146 and 148 mounted on opposite end portions thereof. First bevel gear 146 is in mesh with adjusting bevel gear 50 so that rotation of adjusting bevel gear 50 by drive bevel gear 76 also rotates bevel gears 146 and 148 along with shaft 140. A substantially vertical shaft 150 is rotatably journaled on bracket 132. A third bevel gear 152 is mounted on the upper end portion of vertical shaft 150 and meshes with second bevel gear 148. A first spur gear 154 is mounted on the lower end portion of vertical shaft 150 and retained thereon as by bolts 156. A substantially U-shaped member 158 is attached to the bottom of bracket 132 as by bolts 160. One end portion of a flexible drive shaft 162 is attached to member 158 as by bolts 164. The end portion of flexible drive shaft 162 attached to member 158 has a second spur gear 166

SHUT HEIGHT COUNTER DRIVE FOR PRESSES

BACKGROUND OF THE INVENTION

This application pertains to the art of presses and more particularly to shut height indicators for presses. The invention is particularly applicable to presses and will be described with particular reference thereto although it will be appreciated that the invention has broader applications and can be used in other machinery having a reciprocating member whose stroke can be adjusted.

Presses of the type having adjustable slides for varying the shut height often include an indicator for showing the adjusted position of the slide. The indicator is connected with the adjusting mechanism so that the indication changes when the slide is adjusted. Previous arrangements of this type have been very complicated.

SUMMARY OF THE INVENTION

A device of the type described includes an indicating counter mounted in a recess on the front face of the slide. An indicating drive mechanism for the indicating counter is mounted on an adjustable connection between the slide and the reciprocating connecting rod which connects the slide to a reciprocating drive mechanism. The indicating drive mechanism is connected with the indicating counter through a flexible drive shaft.

In accordance with a preferred arrangement, the front face of the indicating counter is sloped forwardly from the vertical on the front face of the slide so that it can be easily viewed from the front of the press. In accordance with another aspect of the invention, the indicating drive mechanism includes a bevel gear rotatably mounted on a bracket attached to a collar on an adjusting screw. The adjustable connection between the slide and the connecting rod includes a bevel gear drivingly engaged with the bevel gear on the bracket for the indicating drive mechanism. The bevel gear for the indicating drive mechanism is drivingly connected through a gear train with a spur gear attached to one end portion of the flexible drive shaft. The spur gear is mounted on a vertical axis lying in a plane which passes through the center of the slide from side-to-side thereof. Rocking of the spur gear and the indicating drive mechanism with the adjustable connection and connecting rod during operation of the press is thereby minimized.

It is a principal object of the present invention to provide a press with an indicating drive mechanism which is very economical and simple to manufacture and assemble.

It is also an object of the present invention to provide such an indicating drive mechanism which is very compact.

It is also an object of the present invention to provide such an indicating drive mechanism which is very reliable in operation.

It is an additional object of the present invention to provide such an indicating drive mechanism wherein the indicator itself is mounted on the slide so it is not subject to rocking motion during operation of the press and is more easily viewed by an operator.

BRIEF DESCRIPTION OF THE DRAWING

The invention may take physical form in certain parts and arrangements of parts, a preferred embodiment of which will be described in detail in this specification and illustrated in the accompanying drawings which form a part hereof.

FIG. 1 is a front elevational view of a press having the improvements of the present invention incorporated therein;

FIG. 2 is a partial cross-sectional plan view looking in the direction of arrows 2—2 of FIG. 1;

FIG. 3 is an enlarged front elevational view looking in the direction of arrows 3—3 of FIG. 2; and

FIG. 4 is a cross-sectional view looking in the direction of arrows 4—4 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein the showings are for purposes of illustrating a preferred embodiment of the invention only and not for purposes of limiting same, FIG. 1 shows a press A having a frame B on which the various elements of the press are mounted. A pair of spaced-apart legs 12 are connected with frame B for supporting frame B in an upright position. Press A includes a drive motor 14 drivingly connected through a brake-clutch unit 16 through belt 18. Brake-clutch unit 16 is connected with flywheel 20 which rotates eccentric crankshaft 22. A connecting rod 24 is connected with crankshaft 22 and with slide 26. Rotation of crankshaft 22 reciprocates connecting rod 24 which in turn reciprocates slide 26 relative to frame B for cooperation with press bed 28 to perform work on workpieces. Press A includes an adjustment mechanism for varying shut height distance C between slide 26 and bed 28. An indicating counter D is mounted in a recess on the front face of slide 26 for indicating the adjusted position of slide 26 relative to bed 28 when shut height C is adjusted.

Press A includes a mechanism for adjusting shut height C as shown in FIG. 4. Connecting rod 24 is provided with a central internally threaded bore 32 threadably receiving adjustment screw E. Adjustment screw E includes a threaded portion 34 and a non-threaded portion 36. A ball 38 on the lower end of screw E is separated from non-threaded portion 36 by an outwardly projecting shoulder 40. A suitable bore is provided in connecting rod 24 for receiving a locking screw 42 which bears against shim 44 and is locked in place by nut 46. Non-threaded portion 48 of screw E has a diameter slightly less than non-threaded portion 36 and receives an adjusting bevel gear 50. Adjusting bevel gear 50 is locked in position on non-threaded portion 48 as by set screws 52 threaded through suitable threaded bores in the hub portion of adjusting bevel gear 50 and entering axial slots 54 in the outer periphery of non-threaded portion 48. A collar 58 is received around non-threaded portion 36 and is provided with suitable bearings 60 so that non-threaded portion 36 may rotate relative to collar 58.

An adjusting drive bracket 62 is connected with cylindrical collar 58 by suitable bolts which pass through bores in bracket 62 and thread into suitable threaded bores in cylindrical collar 58. Bracket 62 has

secured thereto and meshing with first spur gear 154. Flexible drive shaft 162 is suitably coupled to the drive mechanism of indicating counter D as at 168. The upper portion of slide 26 is provided with a hole 170 around flexible drive shaft 162 extends. A tubular nipple 172 is received in the upper portion of the hole 170 around flexible drive 162.

Line 174 at the bottom of FIG. 4 represents the side center line of connecting rod 24 and slide 26. It will be recognized that line 174 represents a vertical plane passing through connecting rod 24 and slide 26 from side-to-side of press A. In the vertical position of connecting rod 24, plane 174 extends through the center line of connecting rod 24. During operation of the press, connecting rod 24 oscillates in the direction of arrows 106 so that the center line of connecting rod 24 moves back and forth on opposite sides of plane 174 and pivots about ball portion 38. In accordance with the preferred arrangement, second spur gear 166 is mounted on a substantially vertical axis lying in plane 174 and closely adjacent ball portion 38 so that the rocking motion imparted to spur gear 166 during operation of the press is minimized. The oscillating movement imparted to flexible drive shaft 162 is thereby very minimal and the little rocking motion of flexible drive shaft 162 which does occur has no effect on operation of indicating counter D.

In operation of the indicating counter drive mechanism, drive bevel gear 76 is rotated by the adjusting air motor. This causes rotation of adjusting bevel gear 50 and screw E. Rotation of adjusting bevel gear 50 also rotates first and second bevel gears 146 and 148 along with shaft 140. Rotation of second bevel gear 148 rotatably drives third bevel gear 152 and vertical shaft 150 to rotate first spur gear 154. Rotation of first spur gear 154 rotates second spur gear 166 which rotates flexible drive shaft 162 to drive the drive mechanism for indicating counter D and vary the numbers visible through window 112. Indicating counter D adds or subtracts numbers according to whether slide 26 is moving downward or upward. The arrangement described provides a highly simplified, compact and economical mechanism which is also very reliable in operation.

While the invention has been described with reference to a preferred embodiment, it is obvious that modifications and alterations will occur to others skilled in the art upon the reading and understanding of this specification. The present invention includes all such equivalent alterations and modifications, and is limited only by the scope of the claims.

Having thus described our invention, we claim:

1. In a press having a frame, slide means reciprocatingly mounted on said frame for cooperation with a bed on said frame to perform work on workpieces, drive means for reciprocating said slide means, adjustable connection means connecting said drive means to said slide means for adjustable movement of said slide means toward and away from said bed, variable indicating means mounted on said slide for indicating the adjusted position of said slide, indicating drive means mounted on said adjustable connection means

for driving said indicating means to vary the indication thereon and show the adjusted position of said slide means when said adjustable connecting means is adjusted, and flexible shaft means drivingly connecting said indicating drive means with said indicating means.

2. The device of claim 1 wherein said slide means has a front surface, an opening in said front surface of said slide means, said indicating means being mounted in said opening, said indicating means having an indicating face, said indicating face being tilted forwardly from the vertical relative to said front surface of said slide means.

3. The device of claim 1 wherein said adjustable connection means includes a rotatable adjusting gear, said indicating drive means including a rotatable driven gear drivingly engaged with said adjusting gear and with said flexible shaft means.

4. The device of claim 1 wherein said drive means for reciprocating said slide means includes a connecting rod, said adjustable connecting means including a rotatable screw connecting said connecting rod to said slide means, said screw having a threaded portion threadedly connected with said rod and an unthreaded portion between said rod and said slide means, a collar on said unthreaded portion, said collar being fixed against rotation and against axial movement relative to said screw, said indicating drive means being mounted on said collar.

5. The device of claim 4 wherein said adjustable connecting means includes a bevel adjusting gear fixed to said screw above said collar, said indicating drive means including bracket means mounted on said collar, and a rotatable driven bevel gear rotatably mounted on said bracket means in mesh with said adjusting gear.

6. The device of claim 5 and further including attachment means on said bracket for attaching said flexible shaft thereto in driving engagement with said driven bevel gear through a gear train.

7. The device of claim 1 wherein said slide means has a vertical centerline plane from side-to-side thereof, said indicating drive means including spur gear means drivingly connected with said flexible shaft, said spur gear means being rotatably mounted on an axis lying in said plane.

8. The device of claim 1 wherein said indicating drive means includes a bracket, a substantially horizontal shaft rotatably mounted on said bracket and having first and second bevel gears on opposite end portions thereof, said first bevel gear being rotatably driven by operation of said adjustable connection means to rotate said horizontal shaft and said second bevel gear, a substantially vertical shaft rotatably mounted on said bracket, said vertical shaft having a third bevel gear mounted on the upper end thereof and meshing with said second bevel gear, a first spur gear mounted on the lower end of said vertical shaft, a second spur gear rotatably mounted on said bracket on a substantially vertical axis and meshing with said first spur gear, and said second spur gear being drivingly connected with said flexible drive shaft.

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