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(54) TURRET PRESS

(71) We, YOSHIDA KOGYO K.K., a corporation duly organized under the laws of Japan and existing at No. 1, Kanda Izumi-cho, Chiyoda-ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a turret press.

It is known to provide a turret press with various types of tools. A known type of tool, apart from the turret press field, comprises a pair of relatively pivotable cutting blades which can be used to cut off or punch structural bars. Heretofore, it has been known to actuate such blades with a manually movable lever, but because of the inherent nature of such tooling, precision cutting is difficult to achieve. Furthermore, a relatively large inventory of blades is needed to accommodate different classes of work. The use of such types of tooling is tedious, time consuming, and expensive.

A form of turret press that has been suggested for use on structural bars is shown in U.S. patent 3,921,486, issued November 25, 1975. With this type of arrangement, the actuator is carried in a large C-frame disposed at one side of the turret, and thus access to the point where cutting is to take place is obstructed, making it difficult to visually check the position of the workpiece with respect to the tooling. The tooling at only one station can be used at a time, and the punching of axially hollow structural bars or members cannot be effected. Further, a relatively large amount of floor space is required with such structure.

The present invention seeks to provide an improved turret press.

According to the invention, there is provided a turret press comprising a bed; a table movably supported on said bed; a plurality of pairs of coactive tools supported on said table, each of said pairs of tools being receptive of a workpiece therebetween and including a movable punch and a die, said

movable punch extending in a direction away from its cutting edge to the central portion of said table and being pivotally secured at an intermediate portion; and a power actuator carried on the centre of the table and operable simultaneously on said movable punch, at an inner end thereof, of each of said pairs of tools.

The invention will now be described in greater detail, by way of example, with reference to the drawings, in which:—

Figure 1 is a top plan view, with parts broken away, of a turret press provided in accordance with the present invention;

Figure 2 is a vertical cross-sectional view taken along line II—II of Figure 1;

Figure 3 is a fragmentary portion of Figure 2 at the end of a power stroke; and

Figures 4 to 8 are fragmentary perspective views showing the steps by which the end of a structural bar is progressively notched and punched by the turret press.

The principles of the present invention are particularly useful when embodied in a turret press such as shown in Figures 1 and 2, generally indicated by the numeral 10.

The press 10 includes a bed 11, a table 12, a series of pairs of coactive tools 13, 13a, 13b etc., arranged to be simultaneously actuated by a linear power actuator 32, for acting on the end of a workpiece 53.

The bed 11 has a bore 22 which is internally stepped to provide a downwardly facing shoulder 26, and has a flat upper surface 30 on which an annular bearing assembly 29 is supported.

The table 12 has a central bore 31 which extends downwardly into a tubular portion 21 which is rotatable within the bore 22 of the bed 11. The table 12 has a downwardly facing shoulder 27 which engages the bearing assembly 29 and which, with the bearing 29, encircles the tubular portion 21 of the table. A retaining means 23 in the form of a disc is held by a number of screws 25 against the bottom surface 24 of the table 12. The periphery of the retaining means 23 extends radially beyond the lower end of the tubular portion 21 in overlapping relation to the shoulder 26 in the bed 11. The

upper surface of the disc 23 also is a support and reaction surface described below.

Each of the pairs of tools 13 has a cutting edge shaped to provide a desired notch or hole, the shape of which is not here pertinent. The pair of tools 13 is typical and is shown in Figure 2 in the normal workpiece-receiving position and in Figure 3 in the operated position. The pair of tools 13 constitutes a punch 15 and a die 14, each of which has an outer end that overhangs the periphery of the table 12 whereby the outer ends of the tools 14, 15, or either one of them, can be received within a hollow structural bar. Thus a cutting edge 17 on the movable punch 15 can coact with the die 14 on the workpiece as shown in Figure 3. The movable punch 15 extends in a direction away from its cutting edge 17 to the central portion of the table 12. Between the cutting edge 17 and a pivot 16 for the punch 15, there is provided a spring 18, one for each of the pairs of tools. The spring 18 performs three functions. First, it acts to raise the outer end of the tool 15 after the cutting is completed and to bias it in an open direction. The second and third purposes are described below.

Most of the tooling illustrated constitutes notching punches. However, other forms of punch tooling can be used in the press 10. For example, as shown in Figure 2, the pair of tools 13a is provided with a punch 19 and a die 20 for making a circular aperture. The various tools 13 etc. are thus supported on the upper portion 28 of the table 12.

The power actuator 32 includes a cylinder 33 that can be pressurized with a pressure fluid, the cylinder 33 being slidable in the table bore 31 from the position shown in Figure 2 to a raised position such as shown in Figure 3. The cylinder 33 has a bore 35 within which there is a piston 34 including a portion 38 having a groove 46 in which there is an O-ring 45 forming a pressure seal with the wall of bore 35. The bore 35 has an enlarged portion 36 defining a shoulder 37 against which an enlarged flange 39 normally engages. From the flange 39, there extends a piston rod 40 which extends slidably through an annular externally threaded member 41 screwed into the end of the cylinder 33, for engagement with the upper surface of the retaining means 23 which functions as a reaction surface for the end of the piston rod 40. Preferably, a spring 44 acts between the flange 39 and the lower end of the cylinder provided by the annular part 41. The upper surface of the annular member 41 can thus also provide vertical support for the power actuator assembly 32. If desired, the rod 40, the flange 39 and the piston portion 38 can be constructed as a unit. The element 41, threaded to the lower end 42 of the cylinder 32 and having the

opening 43 for the rod 40 thus constitutes the rod-end of the cylinder.

At its other end, the cylinder 33 has a passage-way 47 extending through the end 52 of the bore 35 for conducting pressurized fluid into and out of the pressure chamber at the upper side of the piston 34. The passage-way 47 is connected to a fluid conduit 48 for conducting pressure fluid. The shoulder 37 and the flange 39 thus ensure a positive space for fluid pressure at the top of the piston 34.

The cylinder 33 at its upper end has an annular head 49 which can assist in the vertical support of the cylinder 33 and has an upper surface on which a bearing ring 49a is carried. The ring 49a is suitably recessed, as are the inner ends 50, 50a of the tools 15, 15a to receive the second pivot 51 of circular cross-section, here comprising balls. The springs 18 have a second function of holding the inner ends 50, 50a etc., the balls 51, and the bearing ring 49a in snug relation. The springs 18 further act, when compressed as shown in Figure 3, to assist in the return of the cylinder 33 from its raised position as shown to that of Figure 2.

Figures 4-8 illustrate the way in which the end of a workpiece 53 is sequentially notched and punched to conform the end thereof for use as a rail in a window or door assembly. The workpiece 53 is first cut to selected length as shown in Figure 4. A first notch 54 is then provided on one side after which the workpiece is inverted as shown in Figure 6. The table 12 is rotated to bring a different pair of notching tools to the user, by which the second notch 55 is formed on the other side as shown in Figure 7. After further table rotation, a third notch 56 and an aperture 57 (shown in Figure 8) are formed by a third pair of tools, thereby completing the machining of that end of the rail.

With the disclosed construction, the turret press 10 is of minimum size, and where the tools 13 are relatively small, the press can be considered to be portable and can be rotated to any position desired. Since the lower dies 14, 14a etc. are fixed to the table 12, the positioning of the workpieces relative to the tools 13 is easy to perform accurately and maximum precision can be obtained without the use of further tooling or assistance. The portable turret press 10 is particularly advantageous where relatively heavy or long structural bars are to be machined, especially those of hollow configuration.

WHAT WE CLAIM IS:—

1. A turret press, comprising
 - (a) a bed;
 - (b) a table movably supported on said bed;



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1. A turret press, comprising
 - (a) a bed;
 - (b) a table movably supported on said bed;



(11)

- (c) a plurality of pairs of coactive tools supported on said table, each of said pairs of tools being receptive of a workpiece therebetween and including a movable punch and a die, said movable punch extending in a direction away from its cutting edge to the central portion of the said table and being pivotally secured at an intermediate portion, and
- (d) a power actuator carried on the centre of the table and operable simultaneously on said movable punch, at an inner end thereof, of each of said pairs of tools.
2. A turret press according to claim 1, in which each of the tools overhangs the periphery of the table.
3. A turret press according to claim 1 or claim 2, and including a plurality of springs respectively acting between the tools of each of the pairs to bias the workpiece-engaging portions of the tools apart.
4. A turret press according to any preceding claim, in which the movement of the power actuator is linear and a second pivot is provided between the actuator and the punch.
5. A turret press according to claim 4, in which the second pivot has a circular cross-section.
6. A turret press according to claim 5, in which the second pivot is a ball.
7. A turret press according to any one of claims 4 to 6, and including a plurality of springs respectively biasing the punch, the second pivot and the actuator together.
8. A turret press according to any preceding claim, in which the table has a central bore into which the power actuator extends and which extends into a tubular portion of the table, the bed having a bore in which the tubular portion is rotatably disposed, and in which the bore of the bed has a downwardly facing shoulder, means secured to the tubular portion being engageable with the shoulder for retaining the tubular portion in the bore of the bed.
9. A turret press according to any preceding claim, in which the power actuator comprises a fluid-pressurizable cylinder slidably disposed in a bore in the table and acting on the punches, and a piston in a bore of the cylinder, the piston having a rod extending from the cylinder and engageable with a reaction surface on the table.
10. A turret press according to claim 9, in which the piston has an enlarged flange secured to a non-pressurizable side thereof and engageable with a shoulder in the cylinder for spacing the pressurizable side of the piston from the end of the bore in the cylinder.
11. A turret press according to claim 10 and including a spring acting between the cylinder and the flange and normally biasing the flange and the shoulder in the cylinder together.
12. A turret press according to any one of claims 8 to 11 and including annular bearing means disposed on the upper surface of the bed, encircling the tubular portion, and engaging a downwardly directed annular shoulder on the table.
13. A turret press substantially as described herein with reference to the drawings.

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