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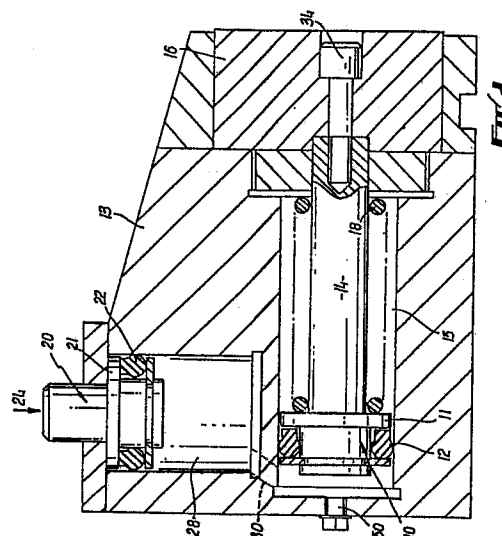
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54 Improvements in or relating to punches and presses.

57 A punch assembly for a press tool comprises a cylinder block (13) fixable to the fixed member of the press and defining first and second interconnected cylinders (15, 28) each provided with a piston arrangement (10, 20), the axes of the cylinders being arranged at an angle with the second piston arrangement (20) in the path of travel of the movable member of the press tool whereby when the tool closes the second piston arrangement is moved into its cylinder causing corresponding outwards movement of the first piston arrangement to operate, for example, a punch piercing the workpiece in the tool in a direction which is angularly disposed with respect to the direction of movement of the movable member.



Description

Improvements in or Relating to Punches and Presses

The present invention relates to punches and presses and especially but not exclusively to punches for piercing, forming or trimming apertures in sheet metal or other material. The invention is concerned also with auxiliary presses where a moving tool, normally shaped, is moved towards a fixed tool to shape a sheet metal member therebetween. Effectively the difference between punches and auxiliary presses is that the punch pierces the workpiece while the press does not. For simplicity, in this specification, punches and presses will be referred to as punches.

A known system comprises one or more punches which are fixed to a lower non-movable member of a press or press tool and are operated by lowering an upper member of the press or press tool, the sheet material to be punched being placed on the bed of the press. A problem with this system is that the holes may only be punched at a defined angle (normally at right angles) with respect to the workpiece. Where the workpiece is non-planar it often has to be subjected to several operations to achieve apertures in desired positions.

It is an object of the present invention to obviate or mitigate the above and other problems.

According to the present invention there is provided a punch assembly adapted for mounting on a press tool including a first piston arrangement adapted to carry a punch for forming a workpiece on said tool and mounted in a first cylinder, a second piston arrangement mounted in a second cylinder, fluid connection means between said first and second cylinders and mounting means for said second cylinder adapted for mounting said second cylinder on the press tool with its piston arrangement in the path of travel of a movable member of the press tool whereby on movement of said member said second piston arrangement is moved into its cylinder to compress fluid therein and said first piston arrangement is moved out of its cylinder by said fluid.

Further according to the present invention there is provided a press tool for shaping sheet metal having a profiled fixed member on which the workpiece to be shaped is supportable and a correspondingly shaped member movable towards said fixed member to shape the workpiece and including also a punch assembly for further forming the workpiece by deforming it in a direction angularly displaced from the direction of movement of said movable member in which said punch assembly included a first piston arrangement mounted in a first cylinder, a second piston arrangement mounted in a second cylinder and fluid connection means between said first and second cylinders, said cylinder being mounted on said fixed member of the press tool with the second piston arrangement in the path of travel of the movable member whereby movement of the movable member causes movement of said second piston arrangement into its cylinder and corresponding movement of the first piston out of its cylinder to

cause said further forming of the workpiece.

Embodiments of the present invention will now be described by way of example only with reference to the accompanying drawings, in which:-

Fig. 1 shows a cross-sectional view of a punch assembly;

Fig. 2 shows a first angled punch assembly;

Fig. 3 shows a second angled punch assembly; and

Fig. 4 shows, diagrammatically, a plurality of punch assemblies illustrating the punching of holes in a complex shaped workpiece.

A punch assembly is illustrated in Fig. 1 and comprises a first piston arrangement 10 and a second piston arrangement 20.

The first piston arrangement comprises a piston 11 and seal 12 and a piston rod 14 attached to a punch mounting member 16. The piston is spring urged by a return spring 18 into the position as shown.

The second piston arrangement 20 comprises an operating plunger or piston 21 with a seal 22 which is operated by a force applied in the direction of arrow 24. The piston 21 is movable in a cylinder 28 arranged substantially at right angles in the same block 13 as the cylinder 15 in which piston 11 is movable. The piston arrangement 20 is driven in operation into the cylinder 28 by a member (not shown) of a press on which the punch assembly is mounted and therefore the speed at which the piston travels is determined by the operating speed of the press.

In operation downward movement of the piston 21 into cylinder 28 increases the pressure of hydraulic fluid in the cylinder 28 which flows through a passage 30 to cylinder 15. This flow of fluid causes piston arrangement 14 to move forward in a horizontal direction out of cylinder 15 at a force which depends upon the ratio areas of the pistons 11 and 21.

The punch mounting member 16 attached to the end of piston rod 14 by a screw 34 is adapted to mount any commercial headed or ball lock punch retainer (not shown).

As an alternative to using piston 21 to cause movement of piston 11 a hydraulic line may be connected to an inlet 50 (shown blocked off in the embodiment of Fig. 1). The line is connected to a cylinder 28 in a block (not shown) mounted on the press remote from the block housing piston arrangement 10. It will be realised therefore that one piston arrangement 20 can drive several piston arrangement 10.

In Fig. 1 the piston arrangements 10, 20 are at right angles to each other thereby allowing a vertical operating press to punch holes in a horizontal direction.

Figs. 2 and 3 show punch assemblies 102 and 103 in which the first and second piston arrangements 10, 20 may be set at different angles. In Fig. 2 the angle A between the direction of applied force 24

and punch movement 25 is acute ($< 90^\circ$) and in Fig. 3 angle A is obtuse ($> 90^\circ$).

The punch assembly of the invention is therefore extremely versatile being adjustable both in speed, in the angle of punching and in the travel of the punch per unit travelled by the press.

With reference now to Fig. 4 a complex shaped channel section 60 is shown with two major front faces 62, 64. Face 62 is inclined at an angle forward of the vertical and face 64 rearward of the vertical. By using a plurality of punch assemblies as shown in Figs. 2 and 3 both faces can be punched perpendicularly to the face. The punch assemblies 102, 103 etc may be operated directly by the upper movable member 66 of a press or may as illustrated, be connected by hydraulic lines 102', 103' to a separate block 52 carrying a piston arrangement 20.

In a modification the spring 18 is replaced by an air or gas spring.

Claims

1. A punch assembly adapted for mounting on a press tool characterised in that it includes a first piston arrangement (10) adapted to carry a punch for forming a workpiece on said tool and mounted in a first cylinder (15), a second piston arrangement (20) mounted in a second cylinder (28), fluid connection means (30) between said first and second cylinders (15, 28) and mounting means (13) for said second cylinder adapted for mounting said second cylinder on the press tool with its piston arrangement (20) in the path of travel of a movable member of the press tool whereby on movement of said member said second piston arrangement is moved into its cylinder to compress fluid therein and said first piston arrangement is moved out of its cylinder by said fluid.

2. A punch assembly as claimed in claim 1, characterised in that a return spring (18) is provided in said first cylinder (15) to urge the first piston arrangement (10) into said cylinder.

3. A punch assembly as claimed in claim 1 or claim 2, characterised in that said first and second cylinders (15, 28) are formed in the same cylinder block (13).

4. A punch assembly as claimed in any one of the preceding claims, characterised in that the axes of said first and second cylinders (15, 28) are mutually perpendicular.

5. A punch assembly as claimed in any one of the preceding claims, characterised in that the diameters of said first and second cylinders (15, 28) are unequal.

6. A press tool for shaping sheet metal having a profiled fixed member on which the workpiece to be shaped is supportable and a correspondingly shaped member movable towards said fixed member to shape the workpiece and including also a punch assembly for further forming the workpiece by deforming it in a

direction angularly displaced from the direction of movement of said movable member characterised in that said punch assembly included a first piston arrangement (10) mounted in a first cylinder (15), a second piston arrangement (20) mounted in a second cylinder (28) and fluid connection means (30) between said first and second cylinders (15, 28), said cylinder (15, 28) being mounted on said fixed member of the press tool with the second piston arrangement (20) in the path of travel of the movable member whereby movement of the movable member causes movement of said second piston arrangement into its cylinder and corresponding movement of the first piston out of its cylinder to cause said further forming of the workpiece.

7. A press tool as claimed in claim 6, characterised in that the longitudinal axis of said first cylinder (15) is perpendicular to the longitudinal axis of said second cylinder (28).

8. A press tool as claimed in claim 6 or claim 7, characterised in that said first and second cylinders (15, 28) are formed in the same block (13).

9. A press tool as claimed in claim 6, characterised in that a plurality of first piston arrangements (15) and cylinders (10) are provided connected to a single second piston and cylinder assembly by hydraulic lines.

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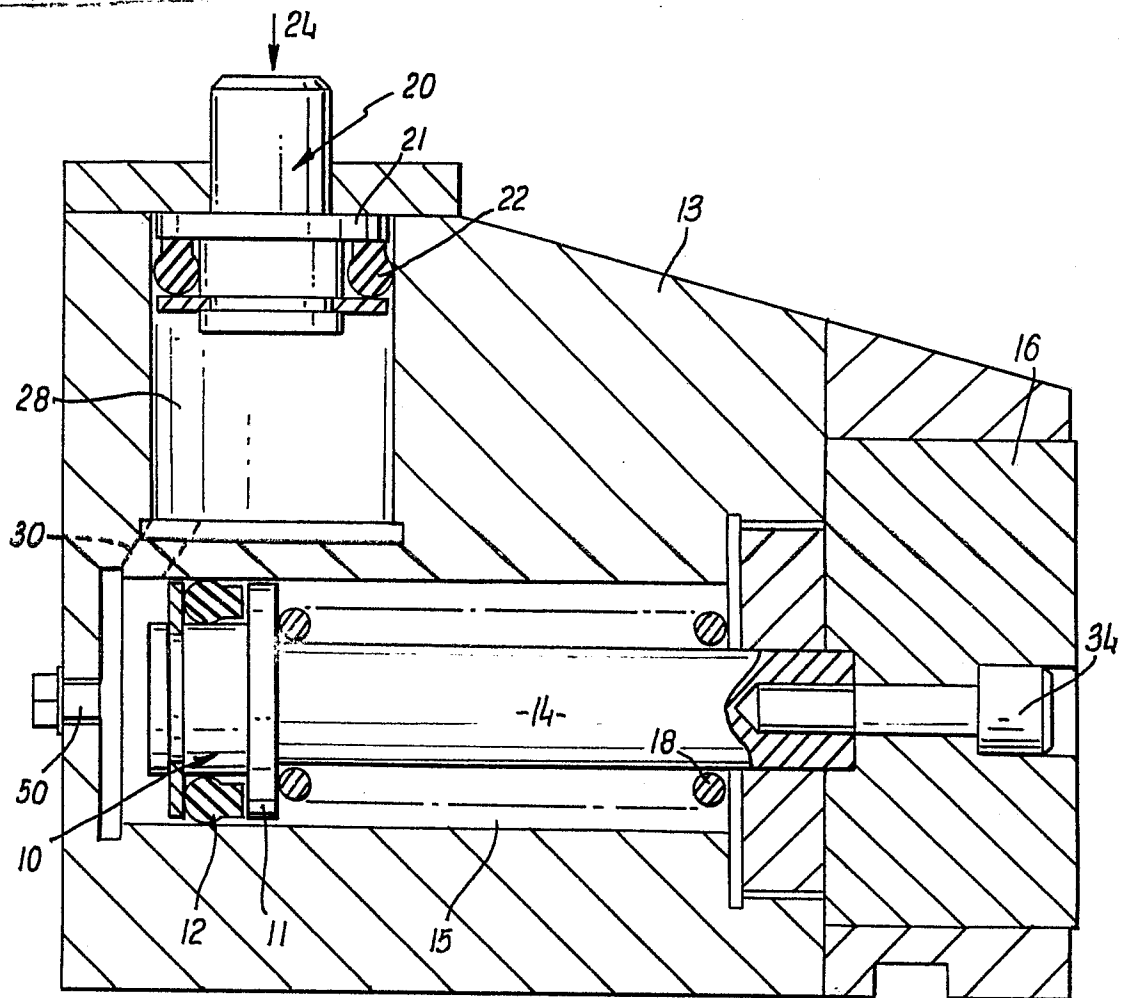


FIG. 1

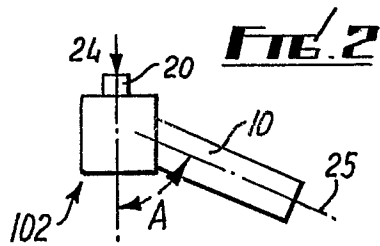


FIG. 2

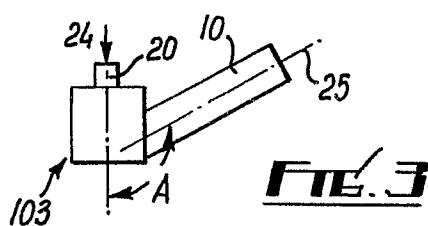


FIG. 3

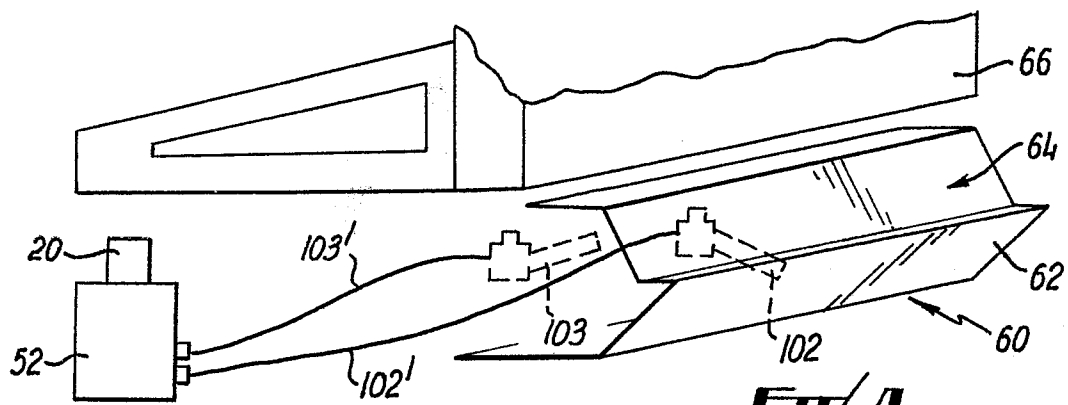


FIG. 4