

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number:

0 251 796 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **29.04.92** (51) Int. Cl.⁵: **B21D 28/32**

(21) Application number: **87305861.4**

(22) Date of filing: **02.07.87**

(54) **Improvements in or relating to punches and presses.**

(30) Priority: **27.06.86 GB 8615709**

(43) Date of publication of application:
07.01.88 Bulletin 88/01

(45) Publication of the grant of the patent:
29.04.92 Bulletin 92/18

(84) Designated Contracting States:
BE DE ES FR GB IT NL SE

(56) References cited:
DE-A- 1 919 095
FR-A- 2 348 051
US-A- 2 112 153

PATENT ABSTRACTS OF JAPAN, vol. 9, no.
168 (M-396)[1891], 13th July 1985; & JP-A-60
40 621 (NISSAN JIDOSHA K.K.) 04-03-1985

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Description

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.

A system described in Japanese Patent Application JP-A-60 40 621 and according to the pre-characterising parts of claims 1 and 6 respectively uses a piston and cylinder arrangement to drive the punch. Seal members around the pistons are required to provide a seal and also to guide the piston in the cylinder. It is found to be extremely difficult in practice to satisfactorily achieve both aims.

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 assembly adapted for mounting said assembly on the press tool with the second 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, characterised in that the said first piston is attached to a guiding member external of the cylinder and received in a guide bore in the mounting means, the punch being mounted, in use, on the guiding member.

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, said punch assembly including a first piston arrangement 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 adapted for mounting said assembly on said fixed member of the pressing 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, characterised in that the said first piston is attached to a guiding member external of the cylinder and received in a guide bore in the mounting means, the punch being mounted, in use, on the guiding member.

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 including 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 assembly adapted for mounting said assembly on the press tool with the second 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 (20) is moved into its cylinder to compress fluid therein and said first piston arrangement (10) is moved out of its cylinder (15) by said fluid, characterised in that the said first piston (10) is attached to a guiding member external of the cylinder (15) and received in a guide bore in the mounting means (13), the punch being mounted, in use, on the guiding member.

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, said punch assembly including a first piston arrangement (10) 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) adapted for mounting said assembly on said fixed member of the pressing 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 (20) into its

cylinder (28) and corresponding movement of the first piston (10) out of its cylinder (15) to cause said further forming of the workpiece, characterised in that the said first piston (10) is attached to a guiding member external of the cylinder and received in a guide bore in the mounting mean (13), the punch being mounted, in use, on the guiding member.

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.

Revendications

1. Ensemble de montage de poinçon prévu pour être monté sur un outillage de presse, comprenant un premier dispositif à piston (10) prévu pour supporter un poinçon de formage d'une pièce sur ledit outillage et monté dans un premier cylindre (15), un second dispositif à piston (20) monté dans un second cylindre (28), des moyens de raccordement pour le passage d'un fluide (30) entre le premier et le second cylindres (15,28) et des moyens de montage (13) pour ledit ensemble, prévus pour le montage de cet ensemble sur l'outillage de presse avec le second dispositif à piston (20) situé sur la trajectoire d'une partie mobile de l'outillage de presse, grâce à quoi lors d'un mouvement de ladite partie le second dispositif à piston (20) est déplacé vers l'intérieur de son cylindre de manière à comprimer le fluide qui s'y trouve et le premier dispositif à piston (10) est déplacé vers l'extérieur de son cylindre (15) par ledit fluide, caractérisé en ce que le premier piston (10) est fixé à un organe de guidage situé à l'extérieur du cylindre (15) et logé dans un alésage de guidage ménagé dans les moyens de montage (13), le poinçon étant, en cours d'utilisation, monté sur l'organe de guidage.

2. Ensemble de montage de poinçon selon la revendication 1, caractérisé en ce qu'un ressort de rappel (18) est prévu à l'intérieur du

premier cylindre (15) pour pousser le premier dispositif à piston (10) vers l'intérieur de ce cylindre.

3. Ensemble de montage de poinçon selon la revendication 1 ou 2, caractérisé en ce que les premier et second cylindres (15,28) sont formés dans le même bloc de cylindres (13).

4. Ensemble de montage de poinçon selon l'une quelconque des revendications précédentes, caractérisé en ce que les axes des premier et second cylindres (15,28) sont perpendiculaires l'un à l'autre.

5. Ensemble de montage de poinçon selon l'une quelconque des revendications précédentes, caractérisé en ce que les diamètres des premier et second cylindres (15,28) sont inégaux.

6. Outillage de presse pour le formage de tôles métalliques, comportant une partie fixe sur laquelle la pièce à former peut être supportée et une partie mobile de conformation correspondante, déplaçable en direction de ladite partie fixe pour le formage de la pièce et comprenant aussi un ensemble de montage de poinçon prévu pour un formage supplémentaire de la pièce pour déformation de celle-ci dans une direction décalée angulairement par rapport à la direction de déplacement de ladite partie mobile, l'ensemble de montage de poinçon comprenant un premier dispositif à piston (10) monté dans un premier cylindre (15), un second dispositif à piston (20) monté dans un second cylindre (28), des moyens de raccordement pour le passage d'un fluide (30) entre le premier et le second cylindres (15,28) et des moyens de montage (13) prévus pour le montage dudit ensemble sur la partie fixe de l'outillage de presse, le second dispositif à piston (20) étant situé sur la trajectoire de la partie mobile, grâce à quoi un mouvement de cette partie mobile provoque un mouvement du second dispositif à piston (20) vers l'intérieur de son cylindre (28) et un mouvement correspondant du premier piston (10) vers l'extérieur de son cylindre (15) pour provoquer le formage supplémentaire de la pièce, caractérisé en ce que le premier piston (10) est fixé à un organe de guidage situé à l'extérieur du cylindre et logé dans un alésage de guidage ménagé dans les moyens de montage (13), le poinçon étant, en cours d'utilisation, monté sur l'organe de guidage.

7. Outillage de presse selon la revendication 6, caractérise en ce que l'axe longitudinal du premier cylindre (15) est perpendiculaire à l'axe longitudinal du second cylindre (28).
8. Outillage de presse selon la revendication 6 ou 7, caractérisé en ce que les premier et second cylindres (15,28) sont formés dans le même bloc (13).
9. Outillage de presse selon la revendication 6, caractérisé en ce qu'est prévue une pluralité de premiers dispositifs à piston (15) et de premiers cylindres (10), reliés par des lignes hydrauliques à un seul ensemble formé du second piston et du second cylindre.

Patentansprüche

1. An einem Pressenwerkzeug befestigbare Stanzvorrichtung, mit einer ersten Kolbenanordnung (10), die zum Halten eines Stanzstempels zum Formen eines Werkstücks auf dem Werkzeug ausgebildet und in einem ersten Zylinder (15) angeordnet ist, einer zweiten Kolbenanordnung (20), die in einem zweiten Zylinder (28) angeordnet ist, Fluidverbindungsmitteln (30) zwischen dem ersten und dem zweiten Zylinder (15,28) und Befestigungsmitteln (13) zum Befestigen der Vorrichtung an dem Pressenwerkzeug, wobei die zweite Kolbenanordnung im Bewegungsweg eines beweglichen Gliedes des Pressenwerkzeugs angeordnet ist, bei dessen Bewegung die zweite Kolbenanordnung (20) in ihren Zylinder zum Komprimieren von Fluid in ihm hineinbewegt wird und die erste Kolbenanordnung (10) durch das Fluid aus ihrem Zylinder (15) herausbewegt wird, dadurch gekennzeichnet, daß der erste Kolben (10) an einem Führungsglied befestigt ist, das sich außerhalb des Zylinders (15) befindet und in einer Führungsbohrung in den Befestigungsmitteln (13) aufgenommen ist, wobei der Stanzstempel beim Gebrauch an dem Führungsglied befestigt ist.
2. Stanzvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß in dem ersten Zylinder (15) eine die ersten Kolbenanordnung (10) in den Zylinder hinein beaufschlagende Rückholfeder (18) angeordnet ist.
3. Stanzvorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der erste und der zweite Zylinder (15,28) in dem gleichen Zylinderblock (13) ausgebildet sind.
4. Stanzvorrichtung nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß der erste und der zweite Zylinder (15,28) senkrecht zueinander sind.
5. Stanzvorrichtung nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß der erste und der zweite Zylinder (15,28) ungleiche Durchmesser aufweisen.
6. Pressenwerkzeug zum Bearbeiten von Metallblechen, mit einem profilierten feststehenden Glied, an dem das zu formende Werkstück gehalten werden kann, und einem entsprechend geformten Glied, das zum Formen eines Werkstücks auf das feststehende Glied hin bewegbar ist, und ferner mit einer Stanzvorrichtung zum weiteren Formen des Werkstücks, indem das Werkstück in einer aus der Bewegungsrichtung des beweglichen Gliedes winkelmäßig verlagerten Richtung verformt wird, wobei die Stanzvorrichtung eine in einem ersten Zylinder (15) angeordnete erste Kolbenanordnung (10), ein in einem zweiten Zylinder (28) angeordnete zweite Kolbenanordnung (20), Fluidverbindungsmittel (30) zwischen dem ersten und dem zweiten Zylinder (15,28) und Befestigungsmittel (13) zum Befestigen der Vorrichtung an dem feststehenden Glied des Pressenwerkzeugs enthält, wobei die zweite Kolbenanordnung (20) im Bewegungsweg des beweglichen Glieds angeordnet ist, dessen Bewegung eine Bewegung der zweiten Kolbenanordnung (20) in ihren Zylinder (28) hinein und eine entsprechende Bewegung des ersten Kolbens (10) aus seinem Zylinder (15) heraus hervorruft, um das weitere Verformen des Werkstücks zu bewirken, dadurch gekennzeichnet, daß der erste Kolben (10) an einem Führungsglied befestigt ist, das sich außerhalb des Zylinders befindet und in einer Führungsbohrung in den Befestigungsmitteln (13) aufgenommen ist, wobei der Stanzstempel beim Gebrauch an dem Führungsglied befestigt ist.
7. Pressenwerkzeug nach Anspruch 6, dadurch gekennzeichnet, daß die Längsachse des ersten Zylinders (15) senkrecht zur Längsachse des zweiten Zylinders (28) ist.
8. Pressenwerkzeug nach Anspruch 6 oder 7, dadurch gekennzeichnet, daß der erste und der zweite Zylinder (15,28) in dem gleichen Block (13) ausgebildet sind.
9. Pressenwerkzeug nach Anspruch 6, dadurch gekennzeichnet, daß eine Mehrzahl von ersten Kolbenanordnungen (15) und Zylindern (10)

durch hydraulische Leitungen mit einer einzigen zweiten Kolben- und Zylinderanordnung verbunden ist.

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