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E. D. BENNETT

3,334,406

METHOD FOR ALIGNMENT AND MOUNTING OF A PIERCING PUNCH

Filed April 5, 1965

2 Sheets-Sheet 1

FIG. 1A

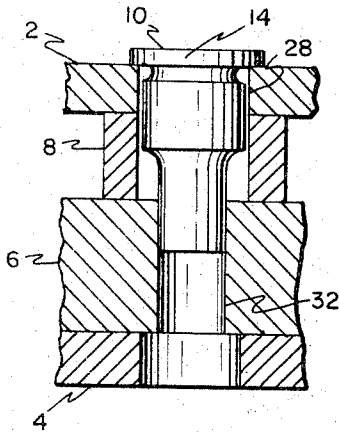


FIG. 1B

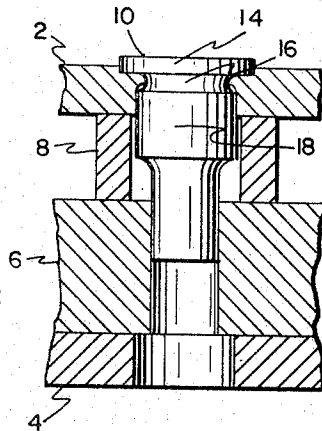


FIG. 1C

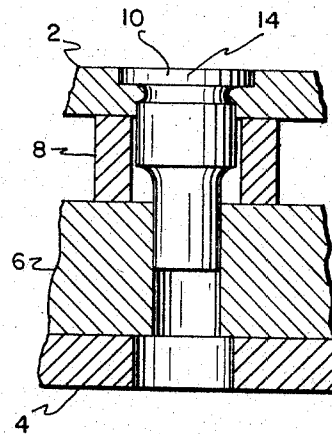


FIG. 2A

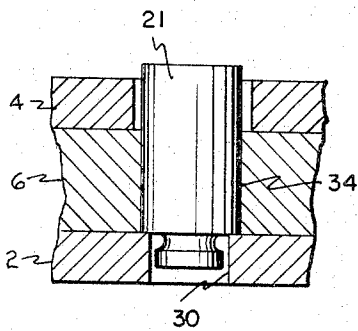


FIG. 2B

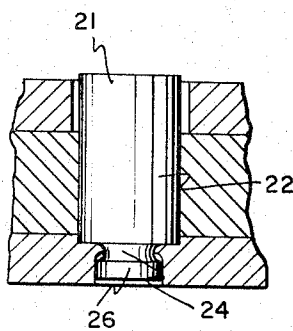
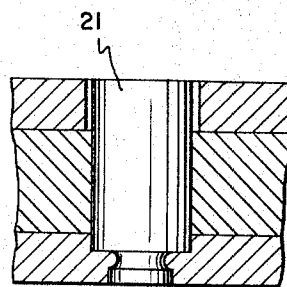


FIG. 2C



INVENTOR.
EDWARD D. BENNETT

BY

Charles L. Johnson
ATTORNEY

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E. D. BENNETT

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FIG. 4

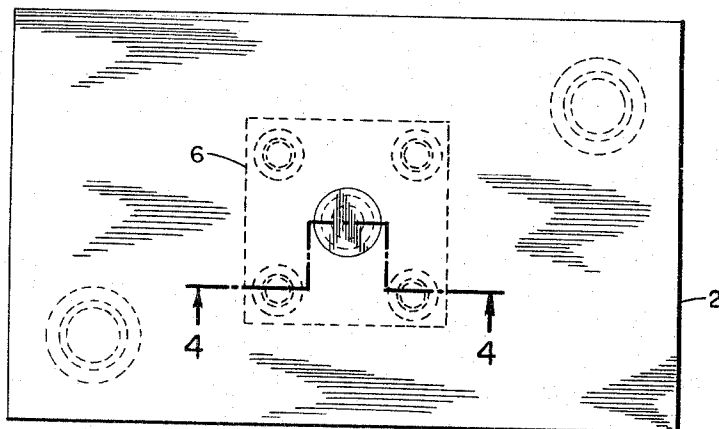
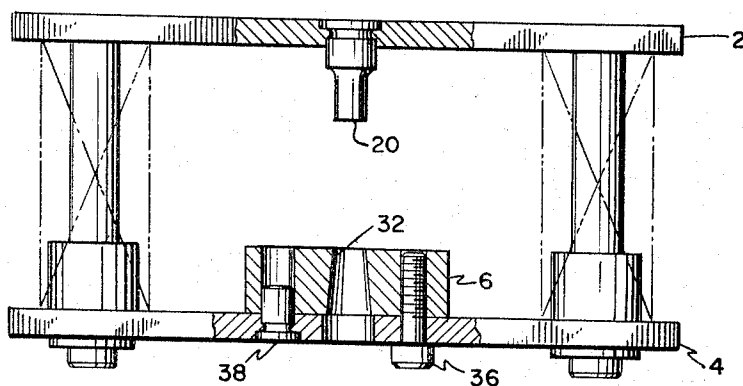


FIG. 3



INVENTOR.
EDWARD D. BENNETT

BY
Charles J. Simon, Jr.
ATTORNEY

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METHOD FOR ALIGNMENT AND MOUNTING OF A PIERCING PUNCH

Edward D. Bennett, Union County, N.J., assignor to Minnie Punch & Die Company, Inc., Union County, N.J.

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ABSTRACT OF THE DISCLOSURE

In a parallel plate punching die set, a method of aligning a punch while mounting it is described in which a bushing helps to transfer the punch position and align the punch while pressure is applied to force the punch into the mounting plate so that plate material is distorted into a groove in the punch head.

This invention relates to piercing dies and more particularly is concerned with improvements in the dies employed in cooperation with punch presses.

In order to insure proper cooperation between the die elements of a die of the type referred to, it is necessary, and also the practice, to so design the said elements that there will be a predetermined clearance between their cooperating cutting edges. Such clearance serves three purposes. It reduces the power required to operate the press; it promotes a smooth shearing action; and it prevents actual contact between the cooperating edges of the die elements and hence avoids nicking and breaking such edges. The amount of clearance is dependent principally upon the gauge of the stock and its composition.

In the art of metalworking, extensive work is continuously being expended in an attempt to improve the accuracy, reliability, and reduce the cost of devices for making the parts from which products are assembled. Piercing dies, for punching holes in piece parts have long been used. The conventional die is a highly machined, large, heavy, expensive, relatively accurate and reliable device capable of producing a large number of pierced piece parts.

In the development of less expensive punching dies, the problem of accurately aligning and mounting piercing punches has been a significant and expensive problem.

The employment of perforating dies has had the objection that their manufacture has necessitated the exercise of a high degree of skill in order to obtain proper alignment of the cooperating die elements.

One object of the present invention, therefore, is to overcome the above objections, this object contemplating a punch element which is so formed that it will enable the production of dies, comparable in action to steel dies, from inexpensive materials and without the exercise of a high degree of skill.

A further object is to provide a die element which is so designed that its alignment with a companion element may be effected rapidly, accurately and without the aid of special tools.

Another object of the invention is to provide an improved method and apparatus for aligning and mounting piercing punches.

To accomplish the above objects, one feature of the invention is the use of a self-locking punch aligned between a punch plate and a die prior to locking.

Another feature of the invention is the use of a self locking punch in which a support bushing interspaced between a punch plate and a die so that the punch passes through the punch plate, the support bushing and into the die so as to properly align the punch between the punch plate and die prior to exerting a force, so as to

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secure the punch to the punch plate by means of the self-locking feature.

These and other objects and features of the invention will appear from the description and the drawings in which:

FIG. 1(a), (b), and (c) illustrates the invention in which one form of a self locking punch is aligned and mounted in a parallel plate punching die set.

FIG. 2(a), (b), and (c) illustrates the invention in which a different form of piercing punch is mounted.

FIG. 3 is a partial cross sectional elevation of a parallel plate punching die set shown in the open position.

FIG. 4 is a plan view representation of the die plate with the die attached thereto.

The essence of the invention is the method and apparatus for the alignment and mounting of a punch in a die set. More specifically a self-locking punch is preliminarily aligned between a punch plate and a die and then locked in position.

A plate for mounting and securing the punch is provided and is designated as the punch plate 2. Punch 10 has a head 14, an undercut portion 16, a body portion 18, and a punch point 20. A die plate 4 is provided for the mounting of the die 6 by means of the dowels 38 and screws 36 as shown in FIG. 3. Returning to FIG. 1, a support bushing 8 is provided to separate the punch plate 2 from the die 6 and to support the punch plate during mounting so that no punch plate material is distorted below the bottom level of the punch plate.

In the practice of the invention the following steps are outlined. A punch 10 of the general configuration shown is selected for its proper punch point diameter in accordance with the size of the hole it is wished to pierce. The die 6, which is mounted on the die plate 4, is machined so the hole 32 is the same size as the punch point diameter. The hole 32 in the die 6 is transferred to the punch plate 2 and drilled so that hole 28 in the punch plate 2 is larger than the body 18 of the punch 10. This allows the self-locking punch 10 to distort punch plate material into the undercut collar and align itself perfectly with the hole or aperture 32 in the die 6.

A support bushing 8 is placed between the punch plate 2 and the die 6. The punch 10 is then inserted through the punch plate hole 28 and the support bushing 8 so that its punch point 20 is the same dimension as the die hole 32.

As may be seen from FIG. 1(a), (b) and (c), as force is applied to the head 14 of the punch 10 the punch plate material flows in and around the undercut portion 16 of the punch 10 to thereby accurately align the punch with the die while mounting the punch in the punch plate. The self-locking feature of the punch allows accurate alignment and mounting to be accomplished with a single stroke applied to the head of the die set. The support bushing assures that punch plate material is not distorted on the under side of the punch plate.

It should be noted that the bushing 8 supports the punch plate 2 as the punch point 20 is being guided in the die hole 32. FIG. 1(c) illustrates the position of the punch 10 at the end of the pressure or mounting stroke. The position of the die is thereby transferred to the punch.

The die plate 4 is then separated from the punch plate 2, the support bushing 8 removed and the die hole 32 enlarged by machining to the proper clearance. The amount of clearance is dependent principally upon the gauge of the stock and its composition. The die set is then assembled as illustrated in FIG. 3. FIG. 4 shows the die plate 4 with the die 6 positioned thereon and secured thereto.

From the above it may be seen that a self-locking punch has been accurately aligned and mounted with one stroke of a force applying device.

FIGS. 2(a), (b) and (c) illustrates a variation of the method and apparatus of FIG. 1 in that the punch point and body are of the same diameter which is larger than the head. The punch 21 comprises a point and body portion 22, an undercut portion 24, and a head 26 having a smaller diameter than the body 22. The punch plate hole 30, in FIG. 2 is larger than the head diameter 26. The die 6 is again secured to the die plate 4 but in this embodiment, pressure is exerted against the point of the punch to force the punch plate material 2 into the undercut portion 24 of the punch 22 as the die hole 34 acts to align and guide the punch. FIG. 2(c) illustrates the position of the self locking punch as aligned to the die and secured to the punch plate.

In both FIG. 1 and FIG. 2 the displacement of punch plate material into the undercut portion is necessarily accomplished only if the punch plate material is softer than the punch material. In the preferred embodiment, the punch material comprises a steel alloy while the punch plate material is aluminum or magnesium.

By the invention as described above a light weight parallel plate punching die set has been assembled in which a self locking punch has been aligned to a die and secured to a punch plate by one strike of a force applying device, such as an arbor press.

To review briefly, the above has been accomplished by one or more of the following steps which include; forming a die having an opening equal to the punch point diameter, mounting the die to a die plate; transferring the die opening to the punch plate by drilling or otherwise; placing a support bushing between the punch plate and die to support the punch plate when force is applied; placing a self locking punch through the punch plate, bushing and into the die opening so as to accurately align the punch, the punch plate opening being slightly larger than the punch body; applying force to the punch so as to distort some of the punch plate material so as to lock the punch into the punch plate in a position of accurate alignment position with the die; removing the bushing; enlarging the die opening by machining to provide the proper clearance; and assembling the die set for operation.

From the above description it is seen that the objects and features of the invention have been realized and it should be understood that variations may be made without departing from the scope of the invention which is described below.

What is claimed is:

1. The method of aligning and mounting a piercing punch in a parallel plate punching die set comprising the steps of forming a die having an opening equal to the piercing punch point diameter, mounting the die on a plate of the die set designated as the die plate, transferring the die opening to another plate designated as the punch

plate, placing a support bushing between the punch plate and die, placing a self-locking punch through the punch plate, support bushing and into the die opening so as to accurately align the punch point with the die opening, the punch plate opening being slightly larger than the punch body but smaller than the punch head, applying a force to the punch so as to distort the punch plate material while guiding the punch point in the die and supporting the punch plate material under the piercing punch head with the support bushing thus locking the piercing punch into the punch plate in a position of accurate alignment with the die, removing the support bushing, machining the die to enlarge the die opening to provide proper punching clearance; and assembling the parallel plate die set.

2. The method of claim 1 in which the self-locking punch includes an undercut collar into which punch plate material flows, upon the application of forces, to thereby lock the punch in the punch plate.

3. The method of aligning and mounting a piercing punch in a parallel plate punching die set comprising the steps of forming a die having an opening equal to the piercing punch point diameter, mounting the die in a plate of the die set designated as the die plate, transferring the die opening to another plate designated as the punch plate, the transferred opening being larger than the head of the piercing punch but smaller than the shoulder of the piercing punch, placing a self-locking punch through the die plate, and die opening, and into the punch plate so as to accurately align the punch point and body with the die opening, the punch plate opening being slightly larger than the punch head but smaller than the punch body, applying a force to the piercing punch point so as to distort the punch plate material while guiding the punch point in the die, thus locking the piercing punch into the punch plate in a position of accurate alignment with the die, removing the punch plate with the piercing punch affixed and machining the die to enlarge the die opening to provide proper punch clearance; and assembling the parallel plate die set.

4. The method of claim 3 in which the self-locking punch includes an undercut collar into which punch plate material flows, upon the application of force, to thereby lock the punch in the punch plate.

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ANDREW R. JUHASZ, *Primary Examiner.*