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PUNCH AND DIE ASSEMBLY

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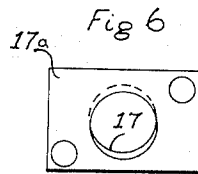
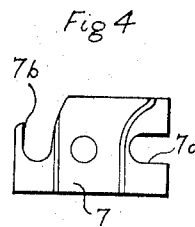
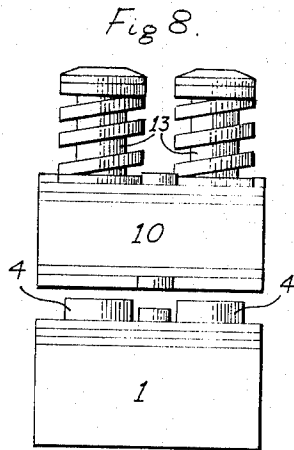
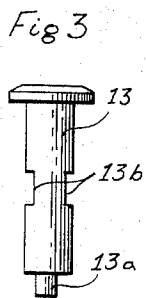
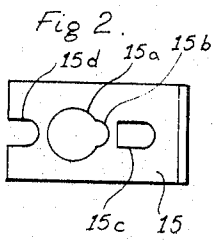
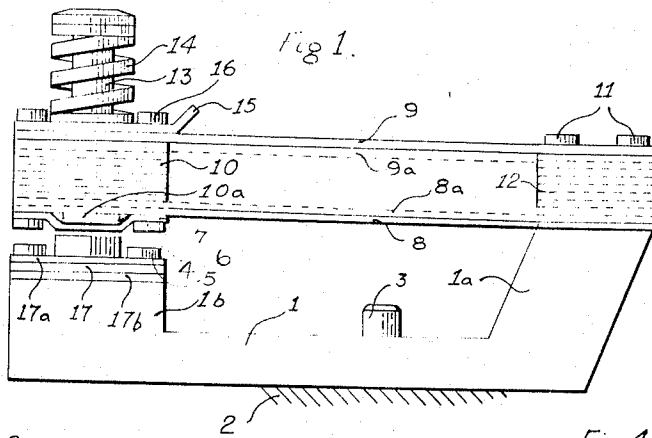


Fig. 7.

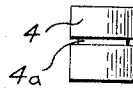
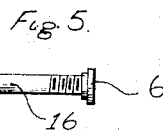
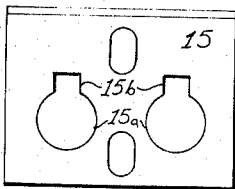


Fig. 9.



1

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PUNCH AND DIE ASSEMBLY

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My invention relates to punch presses and more particularly to a punch and die assembly having features which render it suitable for use in metal stamping production where it may be desirable to make numerous changes in the punching arrangement without the usual extremely long "down-time."

Punch and die assembly units, in present use, comprise a rigid frame assembly which supports both the punch guide and the die and is secured to the press bed so that the press ram may contact a punch in the guide and provide a punching operation. The rigid frame assembly of the unit is usually cast of metal, is costly to manufacture and must be accurately machined to provide the proper punch and die alignment.

It is, therefore, an object of my invention to provide a punch and die assembly unit in which the punch and die are pre-aligned.

It is a further object of my invention to provide a punch and die assembly unit which is economical to manufacture in that a number of its parts are readily stamped from sheet metal.

It is a further object of my invention to provide a punch and die assembly unit which facilitate accurate alignment of the punch and die and wherein accurate machining is, for the most part, eliminated.

It is a still further object of my invention to provide quick release means facilitating a rapid change of punches and dies thus greatly reducing "down-time."

It is also an object of my invention to provide a stripping mechanism readily changeable to accommodate different punch sizes.

A further object of my invention is to provide a punch and die assembly unit, a number of which may be closely spaced in operation, facilitating the punching of closely spaced holes and reducing the number of re-runs normally necessary to provide such closely spaced holes.

In carrying out my invention the punch and die assembly unit comprises a main body member rigidly supporting the die member and adapted to be readily secured to a punch press bed, for instance, by a single stud bolt. The main body member is further provided with a pair of parallel-overlying, flexible members secured at one of their ends to the body member and together supporting, by means of apertures provided therefor, in their other ends the punch, punch guide and stripper mechanisms. By means of loosening of one or two screws, associated with the punch or die units, these units can readily be removed and replaced by other such units. The stripper plate is similarly readily replaceable and the punch accommodating aperture in this plate is made by the punch itself and the alignment problem is thereby eliminated.

My invention will now be more fully described with reference to the figures of the drawing in which,

FIGURE 1 is a side view of a complete punch and die assembly unit.

FIGURE 2 shows the holding and quick release mechanism for removal of the punch.

FIGURE 3 is a view of the punch member.

FIGURE 4 shows the replaceable stripping member.

FIGURE 5 shows one of the bolts which secures the releasable members.

2

FIGURE 6 is the holding and quick release mechanism for the die unit and,

FIGURE 7 shows the releasable die member.

FIGURE 8 shows the close punch spacing provided by use of two assembly units according to the invention.

FIGURE 9 shows a punch release plate for a composite unit.

Referring now to FIGURE 1, the punch and die assembly unit comprises a main body or support member 1 secured to a press bed 2 by means of a stud 3. The member 1 is preferably provided with a slot accommodating bolt 3 thus providing a wide range of adjustment of the location of the assembly unit on bed 2. At the left hand end of member 1 as shown in FIGURE 1 a raised portion 16 supports a die member 4, shown more clearly in FIGURE 7, by means of a quick release mechanism 17, 17a, 17b to be described subsequently.

At the right hand end of member 1, a pair of elongated flexible members 8, 9 are supported in spaced overlying relationship by means of a spacer 12, preferably of punched plate sections, and bolts 11 which secure members 8, 9 and spacer 12 to the raised portion 1a. At the other ends of members 8 and 9 a punch guide 10a is secured therebetween and can be provided with shoulder portions and necks of reduced size which are accommodated in apertures provided in each of members 8, 9 thus providing greater rigidity. A punch guide holder and spacer 10, preferably formed from a number of stampings as shown by the dotted lines of FIGURE 1 thus rendering the manufacture more economical, is held in position between members 8 and 9 by means of two bolts 16, having shouldered nuts 6, as shown in FIGURE 5. The punch member 13, see FIGURE 3, is provided with a reduced end portion 13a, which performs the actual punch operation and determines the punched hole size, and a slotted portion 13b by means of which the punch is held in the desired position in the guide. A punch release plate 15, shown in FIGURES 1 and 2, is secured in position by means of bolts 16 and slotted holes 15c and 15d. Slot 15d is open ended to provide for replacement of plate 15 by removal of only one bolt 16 passing through slot 15c and loosening of the other bolt passing through 15d. The head of one bolt 16, the right hand one of FIGURE 1, may be provided with a shoulder so that plate 15 is held snugly thereby but can be moved with respect thereto when the left hand bolt 16 is loosened. Release plate 15 is provided with a punch accommodating aperture 15a including a reduced diameter extension 15d. When release plate 15 is in position with aperture 15a aligned with the guide aperture, not shown, and punch 13 in position movement of plate 15 to the left in FIGURE 1 provides that the slotted portion 13b is accommodated in extension 15b and the punch is thereby secured against removal, bolts 16 being tightened to ensure this. For non-symmetrical punch operation, the reduced diameter portion of punch 13 may be provided with, for instance, four flat sides providing a choice of two or more orientations of the non-symmetrical punch. Extension 15b would, of course, be contoured to facilitate the punch orientation.

A stripper spring 14 is held in place encircling punch 13 by means of the flanged head thereof. A readily removable closed stripper plate 7, see FIGURES 1 and 4, is held in position by bolts 16 as shown in FIGURE 1. Slots 7a and 7b accommodate shouldered nuts 6 and the stripper plate is readily replaceable by loosening at least one of the bolts 16 as will be readily seen. The central portion of plate 7 is raised away from member 8 as shown in FIGURE 1 to accommodate the end of the punch guide 10a which in this instance protrudes through member 8. The aperture in plate 7 for punch 13 is provided by the

punch itself when a blank stripper plate is installed thus accurate alignment of punch and stripper is automatically achieved.

Referring now to the die assembly, die member 4 is provided with a circumferential slot 4a. The securing and quick release means for the die is provided by three plates 17, 17a, 17b which are provided with mounting holes to accommodate bolts 5 and a central die accommodating aperture in which the die 4 fits snugly. Plate 17 is provided in two sections as shown by dotted lines in FIGURE 6. The left hand section acting only as a spacer and the right hand end acting as a die locking and release means. When die 4 is in the position as shown in FIGURE 1, slot 4 thereof is in vertical alignment with locking plate 17. A horizontal displacement of the apertured portion of plate 17 is effective to lock the die in position when the aperture thereof is not in alignment with the apertures of plates 17a, 17b and to provide for ready removal of the die when the apertures of all three plates are in alignment. FIGURE 6 shows a misalignment of the apertures of plates 17 and 17a and illustrates the manner in which die 4 is locked in position. Plates 17a and 17b provide for the maintenance of alignment between die 4 and punch 13 and the whole die assembly is secured to main body member 1 by means of stud bolts 5.

It will be evident that the alignment of the punch and die will be maintained during punching operations by flexible members 8, 9 cooperating with punch guide holder 10 in so long as the punch stroke is of reasonable length as would be the case in punching sheet metal. Since pre-alignment of the punch and die is provided by each assembly unit without respect to the press proper, then the tedious set-up and alignment procedure normally encountered is avoided. Only the position of the hole with respect to the usual guide pins of the press is of concern. In the event that flexible members 8, 9 must be long, then it is preferable that further members 8a, 9a, shown in dashed line in FIGURE 1, be added to provide further rigidity. It is within the scope of my invention to provide more than one punch and die member pair per assembly unit and such an arrangement is shown in end view in FIGURE 8. Additionally, it will be obvious that the punch and die member pairs may be displaced longitudinally of members 8, 9 as well as transversely as shown in FIGURE 8.

The punch and die quick release plates for use in the composite unit of FIGURE 8 may be similar to those of FIGURES 2 and 6. However, a linear motion of the die release plate is preferred. The plates are preferably common to each of two or more punches or dies thus providing that, for instance, all punches are released simultaneously and similarly all dies are released simultaneously. FIGURE 9 shows a punch release plate for a dual unit wherein the extension of apertures 15a are contoured to provide punch orientation. A similar locking plate for securing two or more dies may be provided. The die may be provided with a key cooperating with notches in aperture 17 to provide for a number of different orientations of the die.

Although a preferred embodiment has been shown, it will be obvious, to those skilled in the art, that various modifications may be made which do not depart from the spirit and scope of my invention as set forth in the appended claims.

What is claimed is:

1. A punch and die assembly comprising a main body member adapted to be secured to the bed of a machine press, releasable means to secure a die at one end of said body member, means at the other end of said body securing, by their ends, a pair of elongated, flexible members in spaced overlying relationship, wherein said flexible members are provided with aligned punch guide accommodating apertures at their unsecured ends, and a punch guide member fitted into said accommodating apertures

and secured between said flexible members with the axis of said punch guide in alignment with the axis of a die secured to said main body member.

2. A punch and die assembly comprising a main body member adapted to be secured to the bed of a machine press, releasable means to secure a die at one end of said body member, means at the other end of said body securing, by their ends, a pair of elongated, flexible members in spaced overlying relationship, wherein said flexible members are provided with aligned punch guide accommodating apertures at their unsecured ends, a punch guide provided with reduced end sections secured between said flexible members with said reduced sections tight fitted into said apertures with, the axis of said punch guide in alignment with the axis of a die secured to said main body member, and means securing said guide between said flexible members.

3. An elongated, flexible, flat punch guide holder adapted to be secured at one end to a main body member to allow flexing of the other end at right angles to the flat surface thereof and having a punch guide accommodating aperture located in said other end, and means maintaining parallel orientation of the axis of said aperture, during flexing movement of said member, comprising a further similar elongated punch holder in parallel spaced overlying relationship and means to secure a punch guide between said flexible members with its punch guide axis in alignment with the axes of the apertures of said flexible holders.

4. The assembly as claimed in claim 1 wherein said means securing said guide between said flexible members includes further releasable means for securing a punch member in said guide, said further releasable means comprising an apertured plate through which the punch member is inserted, said plate being adjustable in the plane of the plate to a locking position and provided with a notch in the edge of the aperture which cooperates, in locking position, with a reduced diameter section of said punch to secure said punch against removal from said guide.

5. The assembly as claimed in claim 1 wherein said releasable means comprises a movable locking plate between two clamping plates all apertured to receive a die, said die including a circumferential groove into which the boundary material defining the aperture of said movable plate may be moved by misalignment of the aperture of said locking plate with respect to the apertures of said clamping plates.

6. The assembly as claimed in claim 1 wherein said releasable means comprises a movable locking plate between two clamping plates all apertured to receive a die, said die including a circumferential groove into which the boundary material defining the aperture of said movable plate may be moved by misalignment of the aperture of said locking plate with respect to the apertures of said clamping plates, and wherein said means securing said guide between said flexible members includes further releasable means for securing a punch member in said guide, said further releasable means comprising an apertured plate through which the punch member is inserted, said plate having notch in the edge of the aperture which cooperates, in locking position, with a reduced diameter section of said punch to secure said punch against removal from said guide.

7. The assembly as claimed in claim 2 wherein said means securing said guide between said flexible members includes further releasable means for securing a punch member in said guide, said further releasable means comprising an apertured plate through which the punch member is inserted, said plate having a notch in the edge of the aperture which cooperates, in locking position, with a reduced diameter section of said punch to secure said punch against removal from said guide.

8. The assembly as claimed in claim 2 wherein said releasable means comprises a movable locking plate be-

5

tween two clamping plates all apertured to receive said die, said die including a circumferential groove into which said movable plate may be moved by misalignment of the aperture of said locking plate with respect to the apertures of said clamping plates.

9. The assembly as claimed in claim 2 wherein said releasable means comprises a movable locking plate between two clamping plates all apertured to receive said die, said die including a circumferential groove into which said movable plate may be moved by misalignment of the aperture of said locking plate with respect to the apertures of said clamping plates, and wherein said means securing said guide between said flexible members includes further releasable means for securing a punch member in said guide, said further releasable means comprising an apertured plate through which the punch member is inserted, said plate having notch in the edge of the aperture which cooperates, in locking position, with a reduced diameter section of said punch to secure said punch against removal from said guide.

10. A punch and die assembly as claimed in claim 3 wherein at least one of said apertured plates is provided with a notch cooperating with a circumferential portion of the tool being locked to provide circumferential orientation.

6

11. The quick release means as claimed in claim 9 wherein the aperture in the locking plate is provided with a notch extension contoured to cooperate with a complementary contoured body portion of the tool providing for circumferential orientation of the tool in its locked position.

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