

Feb. 5, 1952

J. W. BARNETT  
PUNCH AND DIE SET

2,584,415

Filed Jan. 15, 1947

3 Sheets-Sheet 1

FIG. 1

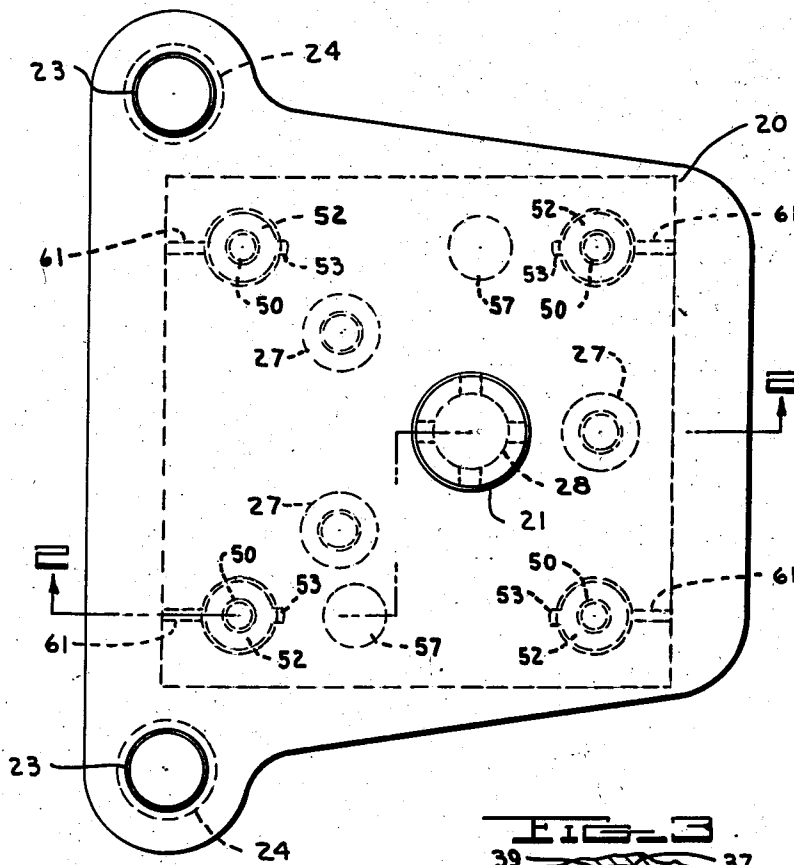


FIG. 3

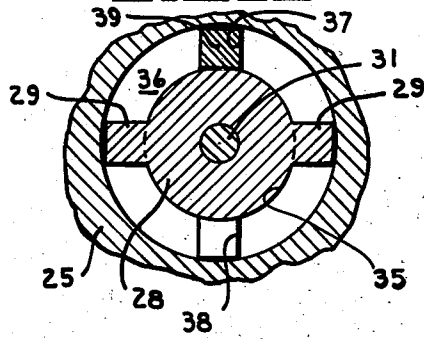
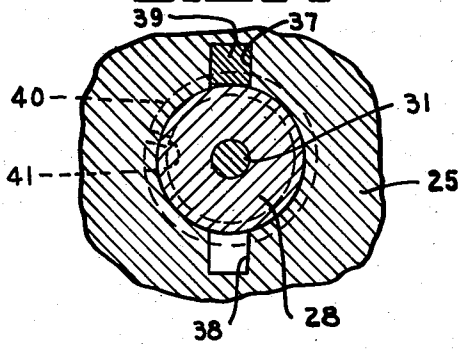


FIG. 4



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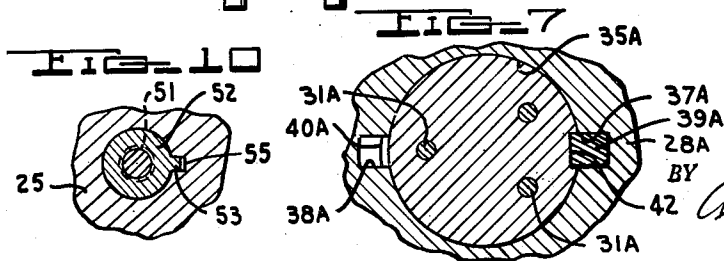
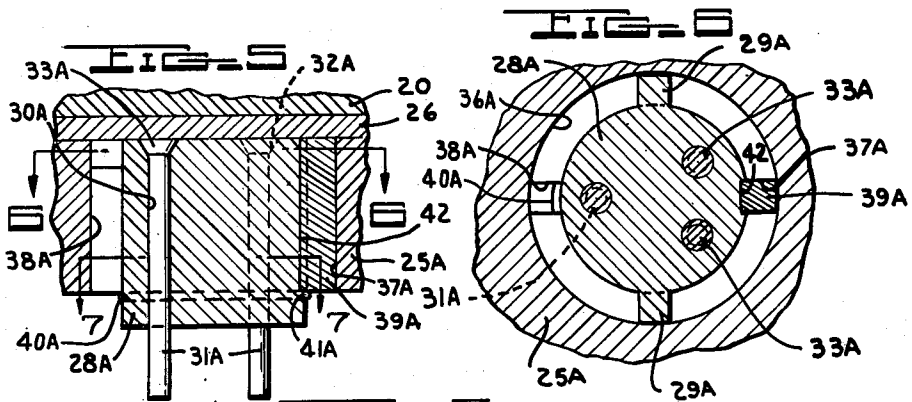
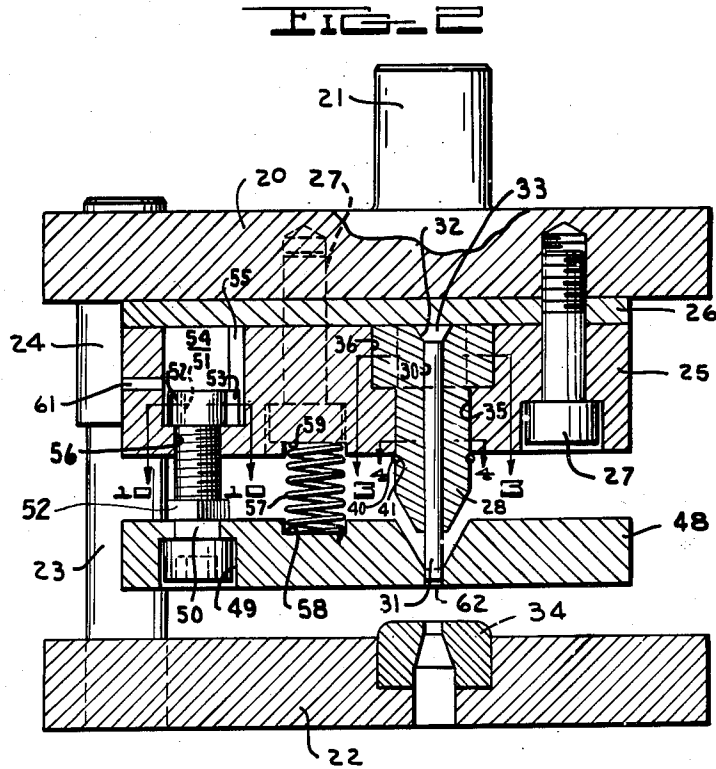
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

FIG. 11

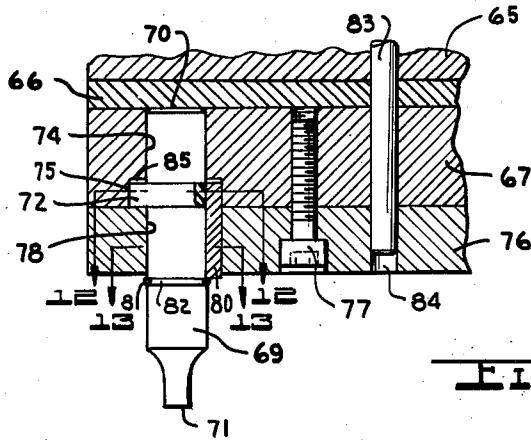


FIG. 9

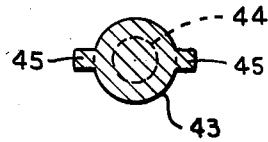


FIG. 12

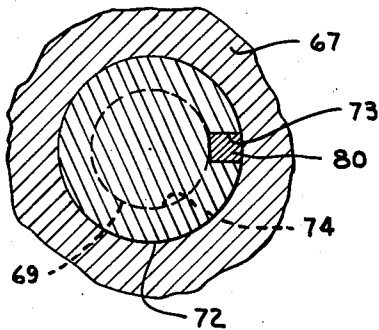


FIG. 13

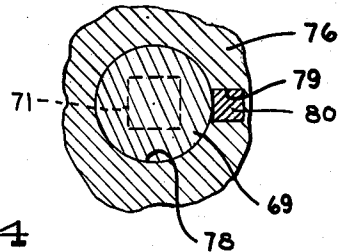


FIG. 10

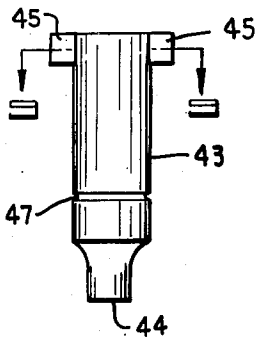
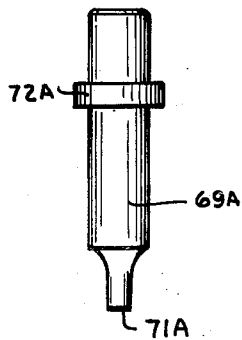


FIG. 14



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# UNITED STATES PATENT OFFICE

2,584,415

## PUNCH AND DIE SET

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16 Claims. (Cl. 164—124)

1

The present invention relates to a punch and die set including a removable and replaceable punch construction and a quick-change stripper plate.

It is conventional practice in sheet metal stamping to mount a stripper plate and punch to a punch retaining plate and then to rigidly bolt the latter to an upper die shoe member in accurate alignment with respect to the die. Whenever it is necessary to remove or replace the punch, the entire punch retaining plate assembly must be disassembled and the accurate alignment thereof is impaired. Not only is considerable time consumed in removing the punch retaining plate from the die shoe and in realigning it whenever a punch is replaced, but each succeeding realignment becomes increasingly difficult as a result of wear between the parts involved during each dismantling. Similarly, conventional practice frequently requires the removal of the punch and die from the press in order to remove the stripper plate. This operation is costly in itself and further shortens the life of both the die and the punches.

Accordingly, one of the principal objects of the present invention is to provide an improved punch and die set having a simplified and economically manufactured mounting between the punch retaining plate and both the stripper and punch, permitting attachment or removal of these for repair or replacement without necessitating the removal of the punch retaining plate or disturbing its accurate alignment with respect to the die, and further permitting removal of the stripper plate without necessitating the removal of the punch and die from the press.

In order to hold the punch holder in proper alignment within the punch retaining plate, it is also conventional to utilize spring pressed ball bearings partially set within a recess in both the punch holder and punch retaining plate, or to utilize tapered wedges pressed against corresponding tapered portions of the punch holder and held in position by screws or resilient means. Such devices are frequently intricate and complicated by a complexity of parts which are expensive to manufacture, are time-consuming in their assembly, and require special tools for their operation. Furthermore, where steel ball bearings are keyed partially in both the punch or punch holder and punch retaining plate, the relatively

2

soft metal of the punch holder and punch retaining plate as compared to the hard metal of the bearing soon results in excessively worn fittings, especially during heavy stamping, permitting misalignment of the punch and requiring its early replacement. Such practices also frequently fail to provide the adequate support required to hold the punch during heavy stamping operations.

Accordingly, other important objects of the present invention are to provide an improved punch and supporting means therefor having a simplified, economical and readily applied means for detachably securing the punch and its supporting means to the punch retaining plate without removing the latter or disturbing its alignment with the die, which may be suitably but not exclusively adapted for use with the aforementioned punch and die set, which may be adapted to provide adequate positive support for multiple or intricate punches to assure proper alignment thereof during stamping operations, and which may be particularly adapted to withstand the forces of heavy punching and stripping.

In certain preferred embodiments of the present invention, it is desirable to utilize punch holders having flanges or extending lugs to hold the punch holder within the punch retaining plate, especially during the stripping operation. During heavy stamping, there is frequently a tendency for the flanges or extending lugs to weaken and shear from the punch holder as a result of repeated impacts against the body of the punch retaining plate.

Accordingly, another important object of the present invention is to provide, in a punch holder having flanges or extending lugs which hold the punch holder within the punch retaining plate, an improved means for mounting said punch holder within the punch retaining plate so as to avoid shearing of said flanges or extending lugs under the impact of heavy stamping.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawings:

Fig. 1 is a plan elevation of a sheet metal punch and die set embodying the present invention.

3

Fig. 2 is a vertical section through the die set and punch holder of Fig. 1, taken in the direction of the arrows essentially along the line 2-2 of Fig. 1 and showing the stripper plate retaining screw and lug nut.

Fig. 3 is a fragmentary enlarged horizontal section through the punch holder, taken in the direction of the arrows essentially along the line 3-3 of Fig. 2.

Fig. 4 is a fragmentary enlarged horizontal section through the punch holder, taken in the direction of the arrows essentially along the line 4-4 of Fig. 2.

Fig. 5 is a fragmentary vertical section through a punch retaining plate and punch holder assembly, showing a modified form of punch holder, similar to that of Fig. 2, but being adapted for multiple punches.

Fig. 6 is a fragmentary horizontal section through the punch holder of Fig. 5, taken in the direction of the arrows essentially along the line 6-6 of Fig. 5.

Fig. 7 is a fragmentary horizontal section through the punch holder of Fig. 5, taken in the direction of the arrows essentially along the line 7-7 of Fig. 5.

Fig. 8 is a side elevation of a modified form of punch particularly adapted for heavy punching and also adapted for use interchangeably with the type of punch and punch holder shown in Figs. 2, 3 and 4.

Fig. 9 is a horizontal section through the punch of Fig. 8, taken in the direction of the arrows essentially along the line 9-9 of Fig. 8.

Fig. 10 is a fragmentary horizontal section through the lug nut and stripper plate retaining screw of Fig. 1, taken in the direction of the arrows essentially along the line 10-10 of Fig. 2.

Fig. 11 is a fragmentary vertical section through the upper portion of another embodiment of a die set, showing a modified punch and punch retaining plate particularly adapted for heavy punching.

Fig. 12 is a fragmentary enlarged horizontal section through the punch of Fig. 11, taken in the direction of the arrows essentially along the line 12-12 of Fig. 11.

Fig. 13 is a fragmentary enlarged horizontal section through the punch of Fig. 11, taken in the direction of the arrows essentially along the line 13-13 of Fig. 11.

Fig. 14 is a side elevation of a modification of the punch shown in Fig. 11.

Before explaining the present invention in detail it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring to the drawings, Figs. 1 and 2 show a plan elevation and vertical section, respectively, of a die set adapted for sheet metal stamping and embodying the present invention. The upper die shoe member 20 is secured to the vertical shaft 21 which may be raised or lowered relative to the lower die shoe member 22 by the mechanism of the punch press, not shown. The alignment between the upper and lower die shoe members 20 and 22 is maintained by the plurality of vertical guide pins 23, secured in the lower die shoe member 22 to serve as guides for the

4

corresponding plurality of sleeves 24 provided by the upper die shoe member 20. The punch retaining plate 25 is spaced from the upper die shoe member 20 by the hardened abutment plate 26, and both are secured to the upper die shoe member 20 by the plurality of cap screws 27. Where desirable dowel pins may be utilized to join and to facilitate the alignment between the upper die shoe member 20 and punch retaining plate 25.

A particular punch holder embodying the present invention is shown by way of example in Figs. 1 through 4. A cylindrical punch holder 28 provides the pair of diametrically opposed radially extending retaining lugs 29 at its butt end, Fig. 3, the coaxially extending punch opening 30 for the punch shank 31, and a tapered countersunk recess 32 for the tapered head 33 of the punch shank 31.

In the course of normal sheet metal stamping or punching, it is frequently necessary to remove the punch from its mounting within the die set for repair or replacement. In conventional mountings, removal of the punch 31 necessitates the dismantling of a considerable portion of the die assembly, including the removal of the punch retaining plate 25 from the upper die shoe member 20. Thus upon replacement of the punch 31, considerable time is required to realign the plate 25 with the other members of the die set, particularly the button die 34 which is shown mounted within the lower die shoe member 22 by way of example of a specific application of the present invention.

In order to permit replacement of the punch 31 without disturbing the alignment of the punch retaining plate 25, a counterbored punch holder opening 35 is provided in the plate 25 for the punch holder 28. The counterbored upper portion of the opening 35 adjacent the hardened abutment plate 26 comprises the coaxial annular recess 36 for the retaining lugs 29. Also opening into the opening 35 and the annular recess 36 are the two axially extending diametrically opposed lug receiving passageways 37 and 38 within the punch retaining plate 25 and mating with the lugs 29 to permit passage thereof to the recess 36.

When the lugs 29 enter the annular recess 36, they may be moved out of alignment with the passageways 37 and 38 by rotation of the punch holder 28. Key 39 may then be inserted into the passage 37 and the annular recess 36, Figs. 3 and 4. Realignment of the lugs 29 with the passageways 37 and 38 is prevented and the punch holder 28 is locked within the punch retaining plate 25.

It is apparent that the lugs 29 must withstand the force of stripping, i. e., of withdrawing the punch 31 from the sheet metal workpiece, not shown, on the retraction stroke of a stamping operation. One or a plurality of lugs 29 may be utilized, but I have preferred to use two diametrically opposed lugs so as to balance the forces on the punch holder 28 during stripping. A single large lug will obviously provide the same resistance to shearing as is provided by two smaller lugs, but in the use of a single large lug, the relatively wide passageway for the wide lug, corresponding in function to the passageways 37 and 38, presents a relatively large break in the supporting wall of the punch holder opening 35 and results in a tendency for the punch holder 28 to cock slightly to one side during relatively heavy stripping. By utilizing two lugs 29 as described, each of half the width required by a single lug to

provide the same shear strength, the break at any one location in the supporting wall of the punch holder opening 35 will be correspondingly reduced by one-half, and the shearing forces of stripping will also be balanced on opposite sides of the punch holder 28.

Various convenient devices may be employed to hold the key 39 in its proper place within the passage 37 and the annular recess 36. In the preferred embodiment of the invention shown, the key 39 is held in position by the C-shaped snap spring 40 which seats within the annular groove or seat 41, provided by the punch holder 28, Figs. 2 and 4, and underlies a portion of the key 39.

It is apparent from the foregoing that the punch 31 may be readily removed from its mounting upon spreading the C-shaped spring 40 and removing it from its seat 41. The key 39 may then be moved from the passageway 37, permitting alignment of the lugs 29 with their respective passageways 37 and 38. In this position the punch holder 28 may be readily removed from the lower portion of the punch retaining plate 25 without in any way disturbing the alignment of the plate 25, permitting the punch 31 to be simply removed from the opening 30. Means, as for example a recess in the end of the key 39, may be provided where desired or required to facilitate removal of the key 39 from the passageway 37. By reversing the above procedure, the punch 31 may be readily remounted within the die assembly. The alignment of the punch 31 with the die 34 will be assured because the alignment of the punch retaining plate is not disturbed.

One problem in sheet metal stamping involving intricate or multiple punches has been to provide means for holding the punch in positive alignment with respect to the punch retaining plate during heavy punching or throughout long periods of repeated punching operations. By means of a simple adaptation of the present invention, Figs. 5, 6 and 7, a punch holder similar to the punch holder 28 of Fig. 2 may be used to hold intricate or multiple punches in positive alignment.

Fig. 5 is a fragmentary vertical section through portions of the upper die shoe member 20 and hardened abutment plate 26 to which a punch retaining plate 25A is secured, as in Fig. 2, by bolts, not shown. The essential function and arrangement of the parts shown are similar to those discussed above, but with modifications which are noted below. The punch holder 28A provides the lugs 29A and the plurality of countersunk openings 30A for the plurality of punches 31A, each of which has a tapered head 33A. The counterbored punch holder opening 35A is provided for the punch holder 28A. The counterbored portion of the opening 35A comprises the recess 36A which provides a runway for the lugs 29A. Lug passageways 37A and 38A are provided in the punch retaining plate 25A to receive the lugs 29A and to permit axial movement of the punch holder 28A. In addition, an axially extending keyway 42 is provided in the periphery of the punch holder 28A and is so positioned that when the punches 31A are properly aligned with respect to the other die members, the keyway 42 will be aligned with one of the said axially extending passageways, 37A for example, to provide a keyway for the key 39A which is adapted to jointly fill both the keyway 42 and passageway 37A. The key 39A is held in position by the C-

shaped spring 40A seated within the annular groove 41A and underlying the key 39A. It is apparent that operation of the embodiment of the present invention shown in Figs. 5, 6 and 7, and the removal or replacement of the punches 31A from their mountings, may be accomplished essentially as described in connection with the application of the punch 31 and punch holder 28 of Figs. 1 through 4.

In the discussion above, both the single punch holder 28 and multiple punch holder 28A have been separable from their punches. For certain purposes, particularly for heavy punching, it is feasible for the punch and punch holder to comprise a unitary structure as shown by the punch 43 of Figs. 8 and 9. In this instance, the punch 43 provides the diametrically opposed radially extending retaining lugs 45 at the butt end thereof, the annular groove 47 for a C-shaped key retaining spring, and the round punching surface 48. In application, the punch 43 is utilized similarly to the punch and punch holder combinations of Figs. 1 through 7. The chief distinction is that the punch 43 and its punching element 44 are not separable. If for any reason it is desirable to utilize this type of punch with a punching surface that is not round, proper alignment of the punch 43 within its punch retaining plate may be maintained by keying the punch 43 to its punch retaining plate in the manner similar to that disclosed in Figs. 5, 6 and 7.

In many sheet metal stamping processes, it is necessary to employ a spring pressed stripper plate mounted for vertical movement relative to the sheet metal workpiece so as to engage and press the workpiece against portions of the die during the punching and stripping operations. It is commonly most feasible to space the stripper plate from the underside of the punch retaining plate by a resilient mounting thereto so as to permit vertical movement between the stripper plate and the punch retaining plate. Accordingly, removal of the punch retaining plate for replacement of a punch also necessitates removal of the stripper plate.

In order to realize the optimum advantage of the quick-change replaceable punches and punch holders of the present invention, it is important to provide means for easily and quickly removing the stripper plate assembly from the punch retaining plate without disturbing the alignment of the latter with the die or without removing the die from the press. This is accomplished by the present invention with the stripper plate 48, Figs. 2 and 10, which provides the plurality of counterbored openings 49 for the corresponding plurality of socket-headed screws 50. Each screw 50 provides a threaded portion 51 for screw-threaded engagement with a lug nut 52 and the lock nut 52A. The lug nut 52 carries the radially extending lug 53 and is vertically movable with the screw 50 within the grooved well 54 provided therefor in the punch retaining plate 25 and having the radially extending groove 55 for the lug 53. The lock nut 52A is screwed tightly against the upper surface of the stripper plate 48 to prevent screw 50 from falling completely out of the stripper plate 48 in the event that screw 50 should accidentally become loosened from lug nut 52.

Each well 54 and groove 55 opens through the top of the punch retaining plate 25 to permit insertion of the corresponding lug nut 52 therein before the plate 25 is initially aligned in position and secured to the upper die shoe member 20.

7

Each stripper screw 50 may then enter the corresponding well 54 from below through the opening 56 provided therefor in the punch retaining plate 25 at the base of each well 54. With the lug 53 within its groove 55, the lug nut 52 is prevented from turning when the screw 50 is screwed thereto.

As in conventional practice, the stripper plate 48 is spaced from the punch retaining plate 25 by the plurality of compressed springs 57, each of which seats at opposite ends in seats 58 and 59 provided by the stripper plate 48 and punch retaining plate 25, respectively. The stripper plate 48 may move vertically with respect to the plate 25 by means of the sliding screws 50 which move within the wells 54 during the stamping operation.

In application, the quick-change stripper plate 48 may be detachably secured to the punch retaining plate 25 without disturbing the alignment of the latter with respect to the die 34, merely by inserting the springs 57 within their respective seats 58 and 59 and by screwing the socket-headed screws 50 into their respective lug nuts 52. The operation is facilitated by the plurality of horizontal pinholes 61, one of each leading from the exterior of the punch retaining plate 25 to the interior of one of each of the wells 54 just above the top of the lug nut 52 therein when the latter is in a lowered position. A pin may thus be inserted into the pinhole 61 above the lug nut 52 to prevent the latter from moving upward when the socket-headed screw 50 is screwed thereto. A pin may also be inserted into the pinhole 61 under the lug 52, when the latter is raised above the pinhole 61, so as to hold the stripper plate 48 against the compression of the springs 57 and to project the end of the punch 31 through punch hole 62 provided therefor in the stripper plate 48. Thus proper alignment of the punch 31 with the die 34 is also facilitated.

Other means within the spirit of my invention for detachably coupling the screws 50 to the quick-change stripper plate 48 will suggest themselves to the skilled mechanic. The lug nut 52 may be provided as the head of the screw 50, for example, which in that case would be threaded at its lower end and detachably secured to the stripper 48 by a nut which would replace the socket head of the screw presently employed. Also, for particular requirements, the grooved well 54 may be adapted for modified lug nuts having a plurality of lugs rather than the single lug 53 shown. Where desirable or necessary for particular requirements, alignment studs may be projected downward from the plate 25 and slidably passed through bushings within the stripper 48 to afford additional support and to assure proper alignment between the stripper 48 and punch retaining plate 25.

Figs. 11, 12 and 13 show another embodiment of the present invention which provides a readily replaceable punch particularly adapted for use with heavy punching or stripping. Fig. 11 is a fragmentary vertical section, similar to Fig. 5, through a portion of the upper die shoe member 65, the hardened abutment plate 66, and punch retaining plate 67, all of which correspond in structure and function to the upper die shoe member 20, hardened abutment plate 26, and the punch retaining plate 25A, respectively, of Fig. 5. The punch retaining plate 67 is suitably bolted to the abutment plate 66 and the upper die shoe member 65 by means not shown.

8

The punch comprises the cylindrical body 69, the butt end 70, punching end 71, the annular retaining projection 72 spaced between the punching end 71 and abutment end 70 so that the distance between the butt end 70 and the lower face of the projection 72 is equal to the thickness of the punch retaining plate 67, and the axially extending keyway 73 within the annular projection 72, Figs. 12 and 13. The punch retaining plate 67 provides the counterbored punch receiving opening 74 for the butt end of the punch 69 and has the counterbored portion 75 for the annular projection 72.

In application, the punch 69 is inserted into the counterbored opening 74 with its butt end 70 resting against the hardened abutment plate 66 and with the lower surface of the annular projection 72 flush with the lower face of the punch retaining plate 67. In this position, the capping plate 76 may be rigidly secured to the punch retaining plate 67 by the plurality of screws 77, with the punching end 71 penetrating the punch opening 78 provided therefor in the capping plate 76. By aligning the axially extending keyway 73, which is adjacent the punch opening 78 in the capping plate 76, Fig. 13, with the keyway 73, the key 30 may be inserted jointly within both keyways 73 and 79 to positively lock the punch body 69 in proper alignment within the punch retaining plate 67.

Similarly to the manner in which the aforementioned keys 30 and 30A are detachably secured in position, the C-shaped key retaining spring 64 snaps in place around the punch body 69 within the annular groove 82 and partially underlies the key 30. Alignment of the capping plate 76 with the punch retaining plate 67 is achieved by means of a plurality of alignment dowel pins 83 imbedded within the upper die shoe member 65 and projected downward through the abutment plate 66 and the punch retaining plate 67 to fit into the corresponding plurality of alignment holes 84 provided therefor in the capping plate 76.

Obviously, the provision for holding the punch body 69 in proper alignment is only required for multiple or intricate punches, as in the case of the square punching surface 71, Fig. 13. Referring to Fig. 14, wherein the punch 69A has the circular punching surface 71A, the annular retaining projection 72A need not be provided with a keyway corresponding to the keyway 73. However in both the punch of Figs. 11, 12 and 13 and the punch of Fig. 14, the annular retaining projections 72 and 72A, respectively, provide optimum support to prevent the punch 69 or 69A as the case may be, from pulling through the punch opening, such as 78, Fig. 11, during heavy stripping. The projections 72 and 72A serve the same function as the aforementioned lugs 25 and 29A, but in the case of the projections 72 and 72A, the force of stripping is distributed over a larger area than the area afforded by the lugs 25 and 29A. Thus shearing of the annular projections 72 and 72A during heavy stripping is avoided.

The projections 72 and 72A are further protected from shearing during the impact of heavy punching by the provision of the spacing 85 between the upper portions of the projections 72 or 72A and the axially adjacent portions of the punch retaining plate 67. By virtue of the spacing 85, the impact of heavy punching is transmitted directly from the punching end 71 to the hardened abutment plate 66 which is in direct contact with the butt 70. No impact can

be transmitted from the projections 72 or 72A to the axially adjacent portions of the punch retainer plate 67.

By the above description and disclosures, I have provided improvements in die punching apparatus whereby a simplified and economical method of mounting punches and the stripper plate to the punch retaining plate is provided, permitting these parts to be readily removed or replaced without removing the die from press or disturbing the alignment of the punch retaining plate with respect to other portions of the die; and whereby improved, quick-change punches and punch holders are provided which are particularly adaptable for use in heavy punching or stripping and which may be adequately supported in positive and accurate alignment within the punch retaining plate.

I claim:

1. In a die punching assembly, the combination of a punch having a plurality of radially projecting retaining lugs, a punch retaining plate having a punch opening therein for the body of said punch, an annular lug receiving recess opening from said punch opening above the lower portion thereof, a plurality of axially extending lug receiving passageways within said punch opening and leading to said annular recess to permit separation of said punch from said punch retaining plate, means to prevent alignment of said lugs with said lug receiving passageways when said lugs are within said annular recess and including a key adapted to fit within one of said passageways and to project into said annular recess, and means to detachably secure said key within said axially extending passageway therefor.

2. The combination in a die punching assembly as claimed in claim 1 and being further characterized in that said means to detachably secure said key within said axially extending passageway therefor includes an annular groove in the periphery of said punch body at the base of said key and a C-shaped key retaining spring adapted to snap into position within said annular groove and to project beyond the periphery of said punch body to underlie said key.

3. In a die punching assembly, the combination of a punch holder having a body, a punch opening in said body for a punch shank, a countersunk recess at one end of said punch opening for the head of a punch shank, a plurality of radially projected retaining lugs provided by said body, a punch retaining plate including a punch holder opening therein for said punch holder, a concentric annular lug receiving recess opening from said punch holder opening above the lower portion thereof, and a means to permit entry of said lugs into said annular recess and to permit separation of said punch holder from said punch retaining plate and comprising a plurality of axially extending lug receiving passageways in said punch holder and leading to said annular recess, means to prevent alignment of said lugs with said passageways when said lugs are within said annular recess and including a key adapted to fit within one of said passageways and to project into said annular recess, and means to detachably secure said key within the axially extending passageway therefor.

4. The combination in a die punching assembly as claimed in claim 3 and being further characterized in that said means to detachably secure said key within the axially extending

passageway therefor includes an annular groove in the periphery of said punch holder body at the base of said key and a C-shaped key retaining spring adapted to snap into position within said annular groove and to project beyond the periphery of said punch holder body to underlie said key.

5. In a die punching assembly, the combination of a punch having a plurality of radially projecting retaining lugs, an axially extending peripheral keyway within said punch, a punch retaining plate having a punch opening therein for said punch, a concentric annular lug receiving recess opening from said punch opening above the lower portion thereof, a plurality of axially extending lug receiving passageways opening from said punch opening and leading to said annular recess to permit said punch to be detachably mounted with said punch retaining plate, means to hold said punch in positive alignment with respect to said punch retaining plate when said lugs are within said annular recess and including a key adapted to fit jointly within said keyway and in one of said axially extending passageways, and means to detachably secure said key within said keyway and the axially extending passageway therefor.

6. In a die punching assembly, the combination of a punch holder, a punch opening in said punch holder for a punch shank, a countersunk recess at one end of said punch opening for the head of a punch shank, a plurality of retaining lugs projected radially from said punch holder, an axially extending keyway within said punch holder, a punch retaining plate having a punch holder opening therein for said punch holder, a concentric annular lug receiving recess opening from said punch holder opening above the lower portion thereof, a plurality of axially extending lug receiving passageways opening from said punch holder opening and leading to said annular recess to permit said punch holder to be detachably mounted with said punch retaining plate, means to hold said punch holder in positive alignment with respect to said punch retaining plate when said lugs are within said annular recess and including a key adapted to fit jointly within said keyway and in one of said axially extending passageways, and means to detachably secure said key within said keyway and the axially extending passageway therefor.

7. In a punch adapted for use with a punch retaining plate having a punch receiving opening, a concentric annular lug receiving recess opening from said punch receiving opening, and a plurality of axially extending lug receiving passageways opening from said punch holder opening and leading to said annular recess, the combination of a punch body, a punching end of said body, a plurality of radially extending retaining lugs provided by said body, and an annular groove in the periphery of said body and axially spaced from said lugs to receive a C-shaped key retaining spring.

8. The combination in a punch as claimed in claim 7 and being further characterized in that means are provided to hold said punch in positive alignment with its punch retaining plate and including an axially extending keyway within said punch body.

9. In a punch retaining plate, rigidly alignable with the die, and a punch adapted for heavy punching and replaceably mountable with said punch retaining plate without disturbing the alignment thereof with respect to said die, the



11

combination of a punch body for said punch, a butt end and a punching end of said body, an annular retaining projection provided by said body, a counterbored opening in said punch retaining plate and adapted to receive the butt end and annular retaining projection of said punch, a capping plate detachably secured to said punch retaining plate and having an opening penetrated by the punching end of said punch body, said punch being prevented from pulling out of said punch retaining plate during stripping by contact between said annular retaining projection and said capping plate.

10. The combination as claimed in claim 9 and being further characterized in that means are provided to securely hold said punch in positive alignment with respect to said punch retaining plate and including a keyway in said capping plate, a keyway within said punch, a key adapted for insertion jointly within both of said keyways, and means to detachably secure said key in position jointly within both of said keyways.

11. A combination as claimed in claim 9 and being further characterized in that means are provided to prevent shearing of said annular retaining projection by impact thereof against said punch retaining plate during heavy punching and including a spacing maintained between said annular retaining projection and the axially adjacent portion of said punch retaining plate.

12. In a punch for heavy die stamping and adapted to be detachably mounted with a punch retaining plate having a counterbored punch receiving opening and to be detachably secured in an operative position by means of a capping plate which is detachably secured to said punch retaining plate and which also provides a punch receiving opening, the combination of a punch body having a punching end adapted to penetrate the punch receiving opening of said capping plate when the latter is operatively secured to said punch retaining plate, and an annular retaining projection of said body and adapted for insertion into the counterbored punch receiving opening of said punch retaining plate so as to prevent removal of said punch therefrom when said capping plate is operatively secured to said punch retaining plate.

13. In a punch for heavy die stamping and adapted to be detachably mounted with a punch retaining plate having a counterbored punch receiving opening and to be detachably secured in an operative position by means of a capping plate which is detachably secured to said punch retaining plate and which also provides a punch receiving opening, the combination of a punch body having a punching end adapted to penetrate the punch receiving opening of said capping plate when the latter is operatively secured to said punch retaining plate, an annular retaining projection of said body and adapted for insertion into the punch receiving opening of said punch retaining plate, and an axially extending keyway in said punch, said punch being thereby adapted for detachably mounting with said punch retaining plate without disturbing the alignment thereof with its die shoe upon removal of said capping plate.

14. In a die stamping assembly adapted to permit ready replacement of the punching element and having a stripper plate depended from a punch retaining plate in variable spaced relationship therewith, the combination of a well having an opening in the upper surface of said punch re-

12

taining plate, a shaft opening leading to the base of said well from the underside of said punch retaining plate, a stripper plate supporting shaft slidable within said shaft opening, an enlarged head of said stripper plate supporting shaft slidable within said well, means to detachably secure said stripper plate to the depending portion of said stripper plate supporting shaft, a punch holder, a punch opening in said punch holder for a punch shank, a countersunk recess at one end of said punch opening for the head of a punch shank, a plurality of radially projected retaining lugs provided by said punch holder, a punch holder opening in said punch retaining plate for said punch holder, a concentric annular lug receiving recess opening from said punch holder opening above the lower portion thereof, a means to permit said punch holder to be detachably mounted with said punch retaining plate and comprising a plurality of axially extending lug receiving passageways in said punch holder opening and leading to said annular recess, means to prevent alignment of said lugs with said passageways when said lugs are within said annular recess and including a key adapted to fit within one of said passageways and to project into said annular recess, and means to detachably secure said key within the axially extending passageway therefor.

15. In a die stamping assembly adapted to permit ready replacement of the punching element and having a stripper plate depended from a punch retaining plate in variable spaced relationship therewith, the combination of a punch holder, a punch opening in said punch holder for a punch shank, a countersunk recess at one end of said punch opening for the head of a punch shank, a plurality of radially projected retaining lugs provided by said punch holder, a punch holder opening in said punch retaining plate for said punch holder, a concentric annular lug receiving recess opening from said punch holder opening above the lower portion thereof, a means to permit entry of said lugs into said annular recess and to permit separation of said punch holder from said punch retaining plate and comprising a plurality of axially extending lug receiving passageways in said punch holder and leading to said annular recess, means to prevent alignment of said lugs with said passageways when said lugs are within said annular recess and including a key adapted to fit within one of said passageways and to project into said annular recess, means to detachably secure said key within the axially extending passageway therefor, a well having an opening in the upper surface of said punch retaining plate, a shaft opening leading to the base of said well from the underside of said punch retaining plate, a stripper plate supporting shaft slidable within said shaft opening, an enlarged head of said stripper plate supporting shaft slidable within said well, and means to detachably secure said stripper plate to the depending portion of said stripper plate supporting shaft.

16. In a die stamping assembly having a stripper plate dependent from a punch retaining plate in a variable spaced relationship therewith and replaceably mountable thereto without disturbing the alignment thereof with respect to the die, the combination of a vertical well having an opening in the upper surface of said punch retaining plate, a shaft opening leading to the base of said well from the underside of said punch retaining plate, a stripper plate supporting shaft

**13**

slidable within said shaft opening, an enlarged head of said stripper plate supporting shaft slidable within said well, said punch retaining plate having a pin hole extending from the outer surface thereof to the interior of said well above the enlarged head of said stripper plate supporting shaft when said head is in a lowered position within said well, and means to detachably secure said stripper plate to the depending portion of said stripper plate supporting shaft.

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15

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