PRESS ADAPTER SYSTEM FOR STANDARDIZING DIE USE

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ABSTRACT
Apparatus equipping a press for a standardized use of die sets and having the following distinctive characteristics. Adapter elements simplify installation and setting up of die sets in a press and include an interchangeable platen replaceable in the press in lieu of replacing bolsters or a variety of rail spacers. Preferred embodiments of the invention feature the use of a single thrust plate which is capable of receiving all standard die sizes for a press. Novel centering structure effects a precision location of the die and precludes relative movement thereof, including rotary or angular turning motion. Preassembled dies are contemplated, substituted as a unit in a press. Handler devices associated with the die set have an alternative use as a means to aid maneuvering of the die set and as a means to lock it against opening and closing movements during storage and handling.

32 Claims, 12 Drawing Figures
PRESS ADAPTER SYSTEM FOR STANDARDIZING DIE USE

BACKGROUND OF THE INVENTION

This invention relates to press apparatus and particularly to press systems in which a die constructed and adapted for one forming, punching or like operation may be substituted in a press for another die constructed and adapted for another operation in a simple manner.

The term "die" as used herein designates a die assembly tooled up to produce a specific work piece.

In the prior art, the changeover of a press to equip it for the performance of a different forming, punching or like operation is tedious and time consuming, and unless done with care can result in damaged or misformed parts. Heavy bolster elements must sometimes be replaced on the press bed to accept a lower or fixed half of the die while the press ram or slide must be made to accept the upper or actuating half of the die. Devices to positively position the die in the press centerline either do not exist or are incapable of controlling relative angular turning movements. A concept of standardized use of dies, according to which similarly constructed but different preassembled dies can quickly and easily be substituted in a press, is largely unknown in the prior art. Heretofore each die has been custom built, along with bolster and other adapter elements by which it is to be fitted to the press, with the installation of a new die in a press being a major undertaking of disassembly and reassembly.

SUMMARY OF THE INVENTION

The present invention has in view use of a "standard" die, that is a die which lends itself to varied tooling while retaining basic structural characteristics. Die classes and die groups of varying complexity, according to the requirements of the work, are established and appropriate selection made to utilize pre-made standard die components in a standard size of die. These are installed and substituted as required in a press. According to a feature of the invention "Pressizer" elements mount as adapters to the press with a broad common application to groups and classes of die sets, such application being extended by an easily replaceable platen of special reference to certain series of dies. A feature of the invention is a means of slip fitting the platen to a common bolster, the slip fit motion being used substantially automatically to locate the platen and to fix it in a condition of parallelism with opposing support elements.

One such opposing support element is another adapter element in the form of a thrust plate mounted to the press ram or slide and universal with respect to each of the variously substituted dies. According to a further feature of the invention the thrust plate and a cooperating element of each die have interfitting portions which locate the die properly in the press, insure parallelism thereof and obviate undesired relative angular turning movements. In the illustrative embodiments of the invention the interfitting portions in the preferred embodiment include provision for a specially designed pin-socket arrangement for interrelating the die set to the thrust plate. The interfitting portions may also advantageously include a centerizing plate on the die set, positionable thereon either in accordance with the geometric center or the dynamic load center for certain applications.

In another aspect, the invention provides handler devices in connection with preassembled die sets. These serve, alternately, as handles to maneuver and position a die and as tie means locking acting and fixed halves of the die against opening and closing movements for damage-free storage and handling. Embodiments also feature coordinated openings for cut material drop-through in lower elements of the apparatus, in a manner to effect sufficient surface area support and safety in mounting of dies.

Invention embodiments are so structured as to preclude bending movement of dies during load application, as is specifically apparent where dies of varying heights are mounted on rails to adjust for press opening.

Further, the invention press apparatus is adaptable to press systems commonly identified as O.B.I., gap and straight side.

In a broad sense the invention provides an ability to standardize and control the sizes of all elements within the press mounting apparatus and the working dies whereby to eliminate confusion of assembly and reduce the scope of inventory and maintenance procedures.

A primary object of the invention is to provide a press system which is more economical to employ, more efficient and satisfactory in use, adaptable to a wide variety of application and unlikely to malfunction.

A further object of the invention is to provide a press system enabling and facilitating a standardized use of dies in equipping a press for operation and in changing over from one operation to another.

Another object of the invention is to provide a "Pressizer" system in accordance with which a press is adapted for the quick and accurate set up of dies therein.

A further object of the invention is to provide for accurate, quick firm positioning of a die by structure featuring a special universal pin-socket arrangement for interrelating dies to a thrust or like plate.

A further object of the invention is to provide for accurate positioning of a die in accordance with which a die holder is positively located on the press centerline or in conformance with the dynamic loading of the die set, and is prevented from angular misalignment.

Still another object of the invention is to provide a replaceable platen cooperating with a supporting bolster so as to be substantially automatic in its assuming of an accurately located position in the press and additionally to further provide a predetermined opening within each platen to furnish adequate clear area for drop-through of cut materials while still affording sufficient surface for die set support in operation.

A still further object of the invention is to introduce a use of handler devices in connection with preassembled dies whereby a die may be readily maneuvered and positioned, and, may be locked in an open or a closed position to avoid damage in storage or in handling.

With the above and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the system, the parts and extensions thereof and the mode of their application as hereinafter described or
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illustrated in the accompanying drawings, or their equivalents.

**BRIEF DESCRIPTION OF DRAWINGS**

In the Drawings:

FIG. 1 is a fragmentary view in perspective of press equipped according to an illustrative embodiment of the invention;

FIG. 2 is an exploded perspective view of press and system components as shown in FIG. 1;

FIG. 3 is a fragmentary view in perspective of the bed portion of the press, showing the bolster and platen elements thereon;

FIG. 4 is a detail fragmentary view of the underside of the thrust plate showing the “Centerizer” slot therein as illustrated in FIG. 1;

FIG. 5 is a detail fragmentary view of a punch holder element of the die, showing the “Centerizer” plate thereon;

FIG. 6 is a fragmentary view in cross section showing detent means for the platen;

FIG. 7 is a view of a die, shown suspended in a sling and showing handlers thereon in a position to lock the die and to define sling anchor locations;

FIG. 8 is a fragmentary perspective view illustrating a preferred embodiment of the invention as provided by a modification of the structure shown in FIGS. 1-7.

FIG. 9 is a fragmentary plan view illustrating details of the thrust plate shown in FIG. 8;

FIG. 10 is a perspective view of the bottom of the thrust plate shown in FIG. 8; and

FIG. 11 is a fragmentary view of the punch holder embodied in the showing of FIG. 8.

**DESCRIPTION OF A PREFERRED EMBODIMENT**

Referring to the drawings, a punch press comprises a stationary bed 10, and, in opposing relation to the bed, a slide or ram member 11 reciprocable through approaching and retracting strokes toward and away from the bed. In equipping a press for work there is interposed between the press slide and the press bed a die comprised of acting and fixed die halves suitably structured to perform punching, cutting, forming and like operations upon work material fed across the fixed die half. In addition to the die, however, it is conventionally required that bolsters and other adapter devices be mounted to either or both the press slide and the press bed, in an effort to provide mountings for the fixed and acting halves of the die, absorb wear, complement the die in achieving correct extents of opening and closing movements and provide a selected clear area for drop-through of cut slugs. The latter feature is of importance in that it is desirable to provide the largest possible amount of reaction area on the press bed while still retaining adequate clear area for drop-through of cut materials.

According to the prior art, therefore, the equipping of a press to stamp a particular work piece, and the changeover of a press to stamping some other work piece, is a relatively expensive and time consuming operation. There is, moreover, a tendency to avoid wasting time and expense by using makeshift, jerry-built assemblies resulting often in damage or costly misoperation.

The present invention provides a “Pressizer” by which basic press apparatus is adapted to materially improve the speed and facility with which a press can be equipped for stamping one work piece and changed over to stamping an entirely different work piece by simply changing the die. A bolster 12 constitutes one adapter element of the “Pressizer” and includes a base plate 13 bolted in place on the press bed 10. At its ends the base plate 13 has raised parallel shoulders 14 and 15 defining an intermediate recessed area 16. Generally centrally located in the plate 13 within the recess 16 is a plate drop-through opening 17 overlying and in line with a cavity 20 in the press bed 10. The recessed plate portion 16 together with the shoulders 14 and 15 forms an effective sidewall for slip fit of a platen 18. The latter is appropriately positioned to align a drop-through opening 19 therein with the base plate drop-through opening 17 and is then suitably and releasably anchored in position between the shoulders 14 and 15.

Together the bolster 12 and platen 18 form a bolster plate assembly having considerable advantage. It will be understood in this connection, that various slip fit platens 18 having different clear areas for drop-through may be substituted in a single bolster as desired. The platen 18 in any case provides a pattern of tapped attachment holes 21 by which the fixed half of the die set is installed thereon, as will be seen. Different platens 18 may be substituted to agree with particular dies. By means of the simple slip fit platen 18 of required depth, the bolster plate assembly may be given a height to mount a die set in a position whereby a uniform stroke of the press slide 11 may be utilized for proper opening and closing movements of the die. The entire construction of the “Pressizer” bolster 12 is such that its use is very economical and eliminates the problem of wear usually encountered due to frequent interchange of dies.

Further comprised in the adapter elements forming the invention “Pressizer” is a thrust plate 22 bolted to the underside of the press slide to dispose in an opposed, parallel relation to the platen 18. The thrust plate has a pattern of tapped attachment holes 23 by which the acting half of the die is secured thereto, as will be seen. The under surface of the thrust plate, or that surface facing platen 18, is planar and cut by a slot or recess 24 which at its one end opens through what may be considered a front edge of the thrust plate, at a location centered between the ends of the plate. The plate wall surfaces which form the sides of this recess are parallel. At its other end the recess 24 extends to the mid point of the thrust plate, such other or inner end being defined by an arcuate wall surface providing a seat 25. The radial center from which curved seat 25 is described coincides with the point of intersection of imaginary center lines taken from side to side and from front to back of the thrust plate. Recess 24 has a centering and control function to be considered more particularly hereinafter.

Platens 18 having varying patterns of attachment holes 21 may be substituted in the press as may be found desirable to adapt to use of particular die or series of dies.

The platen 18 and the thrust plate 22 form the jaws of the press between which a die is installed to perform the actual cutting, punching or like operations upon an intervening work piece as the press jaws are alternately opened and closed. Except for modifications of the
The present invention to be hereinafter particularly discussed, dies of known construction may be used in conjunction with the "Pressizer" adapter elements, for example a die as shown in Gargrave et al., U.S. Pat. No. 3,554,060 issued Jan. 13, 1971. A die similar to that shown in the patent is illustrated in the instant press, with reference being made to the patent for a disclosure of structural details not here specifically dealt with. The illustrated die includes a die holder 26 and a punch holder 27. The former seats flushly upon the platen 18 superposing over drop-through opening 19. The die holder in turn has drop-through openings (not shown) within the die space corresponding in size as is required to clear cut-through material (slugs or blanks), which openings overlie opening 19. Properly oriented on the platen 18, the die holder 26 has attachment holes to align with holes of the pattern 21 in the platen and the die holder is secured to the platen by the installation of screws 28. The punch holder 27 mounts to the under side of thrust plate 22, screws 29 being used in conjunction with the pattern of attachment holes 23. A series of guide posts 31 is set in the die holder 26 to project upwardly thereof. Guide post bushings 32 dependent from punch holder 27 receive the guide posts with a sliding fit. The interacting guide posts and guide post bushings guide the die holder and the punch holder in relative approaching and retracting movements which take place in conjunction with and as a result of reciprocation of the press slide 11. Superimposing on the die holder 26 is a die plate 33 variously containing recessed and through openings with which tool elements cooperate in cutting, punching or forming a work piece. The through openings provide for initial drop-through of slugs and cut material which is allowed to continue on through communicating drop-through openings including the opening 19 in platen 18. The die plate 33 is precision mounted to the die holder 26 and screwed and dowelled in place.

Punch holder 27 has secured to it what may be considered the under side thereof a punch plate 34. It likewise is precision oriented to the punch holder and is fixed in place by appropriately installed screws and dowels. The punch plate aligns with the die plate and mounts tool elements complementary to the recesses and openings in the die plate. The tools on the punch plate and the recesses and die openings on the die plate occupy die spaces which are areas within the die set between the guide posts available for the mounting of punch and die elements and other tooling. The die space defines the nominal size of a die set.

The punch holder 27 and punch plate 34 form principal elements of the acting half of the die. Die holder 26 and die plate 33 form principal elements of the fixed half of the die. In the operation of the press a work piece is fed between the acting and fixed die halves so that when the press jaws close thereon complementary portions on the punch plate assembly and the die plate assembly effect appropriate, indicated punching, cutting, forming and like operations. The operation of the press normally is cycled or continuous, with repeated closing and opening movements of the press jaws being effected as work pieces or a continuous work strip is fed into and out of position between the acting and fixed halves of the die.

As disclosed in the above identified patent, a die may include a stripper plate 30 interposing between the punch plate and the die plate and suspended from the punch plate with freedom of relative bodily motion. Tool elements on the punch plate extend toward the die plate through openings in the stripper plate which is urged outwardly or away from the punch plate by appropriate resilient means. The stripper plate holds the work piece to the die plate and prevents its retracting away from the die plate when an opening movement of the press jaws draws the tool elements out of or away from the work.

Dies are installed in and substituted in the press in a relatively simple manner by virtue of the adapter elements of the "Pressizer." Assisting in the simplified installation and substitution, as well as performing new and important functions in the mounting of the die, per one embodiment of the invention, a "Centerizer" plate 35 fastened to the outer or upwardly facing surface of the punch holder 27. The plate 35 is configured substantially in correspondence with the configuration of thrust plate recess 24. At least one end thereof is rounded to conform to arcuate recess 25 and the plate is oriented on the punch holder to cause the rounded end to face inward or toward the seat 26. As received in the recess 24, "Centerizer" plate 35 positively precludes both side and rotary turning movements of the die set relatively to the thrust plate 22. It will be understood in this connection, that although the punch holder 27 has been described as being screwed or bolted to the thrust plate a press operation may produce relatively powerful torsional and like forces attempting to misalign the acting die half. The "Centerizer" plate serves also a useful function in facilitating accurate positioning of the punch holder relatively to the thrust plate for installation of attachment connectors.

The "Centerizer" plate may be considered to be mounted in the front to back center line of the punch holder with the radial center of its rounded end coinciding with the point of intersection of imaginary center lines drawn from side to side and from front to back of the punch holder. It may, however, be otherwise positioned if it is desirable to locate the "Centerizer" plate with respect to the dynamic load center of the die set rather than with respect to the geometric center. A screw 36 and dowel pins 37 secure the "Centerizer" plate to the punch holder.

A press user, having his press equipped with "Pressizer" elements places a preassembled die on the platen 18, locating it in an approximately correct position thereon. The press slide 11 is then lowered until thrust plate 22 approaches contact with the punch holder 27. The die set is then finely maneuvered until the "Centerizer" plate 35 thereon is in position to engage in thrust plate recess 24. Further lowering of the slide brings the thrust plate 22 into contact with the punch holder and causes the "Centerizer" plate 35 to enter recess 24. Edges of the "Centerizer" plate may be chamfered to facilitate entrance of the plate into the thrust plate slot or recess. In the process, the die is moved into a positive position of alignment with the thrust plate. The die is then pushed toward the back of the press, to seat the rounded end of the "Centerizer" plate in the arcuate recess configuration 25. As a result of these adjustments, the die is positively locked against lateral motion and against rotary turning movements to the thrust plate. Attachment screws or molts are then installed, connecting the die holder 26 to the platen 18 and connecting the punch holder 27 to the thrust plate 22.
the assembly process the "Centerizer" plate aligns the die correctly in a side to side direction or on what may be termed the X—X axis, aligns the die correctly in a front to back sense, along what may be termed the Y—Y axis (the attachment of connectors in the pattern of holes 23 completing this function), aligns the die correctly in a radial or rotary sense and positions the die in the press for correct continuing feed of the work piece or stock material.

The "Centerizer" plate 35 constitutes one modification of a known die contemplated in embodiment of the present invention. This has proven to function as above described and to provide considerable advantage in use. However, the preferred and more universally applicable alternative to the use of the plate 35 and the recess 24 is illustrated in FIGS. 8 through 11 of the drawings. In this case the thrust plate, here identified as 22', is modified to eliminate the recess 24. In lieu thereof, the plate 22' is provided in its bottom surface with transversely spaced key-ways or channels 55 and 57 the sides of which are parallel.

The channels 55 and 57 are respectively located adjacent and spaced inwardly of the respective lateral extremities of the plate 22'. They extend in a sense perpendicular to and open at one end from the front edge of the plate. At their innermost ends, the channels 55 and 57 are respectively extended by an enlargement defined by a circular recess in the bottom of the plate, the depth of which recess is greater than that of the related channel. The recess at the innermost end of channel 55 is identified in the drawings by the numeral 59 while the recess at the innermost end of channel 57 is identified by the numeral 61.

The recess 59 receives a disc shaped insert 63 the lowermost or outer surface portion 62 of which positions flush with the bottom surface of plate 22'. The disc 63 is cut by a wedge-like notch 65 which opens from its bottom surface 62 and a portion of its peripheral edge. The depth of the notch 65 is such that its base positions co-planar with the base of the channel 55 on the insertion of the disc in the recess 59. The wall which defines the periphery of the notch 65 has an innermost central portion the inner end of the channel 57. The 64 formed as a uniform arc, the circumferential extent of which is slightly less than 180° and the center of radius of which is coincident with the center of the disc 63, and thereby coincident with the center of the recess 59. The side walls 66 of the notch 65 are divergent from and extend tangentially to the lateral extremities of the arcuate wall portion 64. An entrance to the notch 65 is thus defined which is relatively enlarged and wider than the opening from the inner end of the related channel 55. On insertion in the plate 22', the disc 63 is fixed in a position to center the mouth of the notch 65 in reference to the channel or key-way 55 and to provide an extension thereof at its inner end. Once positioned, disc 63 is secured in place within recess 59 by socket head screws 67 applied thereto through suitable openings in the top portion of the thrust plate 22', to threadedly engage in holes 65 tapped in the base or seating portion of the disc. The holes 69 are so positioned as to fall on a diametral line of the disc including its center, which line is parallel to the front edge of the plate 22'.

The recess 61 is filled by a somewhat similar disc 71. The surface of disc 71 which positions lowermost is provided with a generally wedge-shaped notch 73 the base of which positions co-planar with the base of the related channel 57. The side walls 74 of notch 73 diverge, similarly to the side walls 66, to provide the notch with an enlarged mouth which is positioned in line with and wider than the opening therefrom to the inner end of the channel 57. The innermost central wall portion 77 of notch 73 is generally arcuate but it is not formed on a uniform radius. It is made slightly wider than the wall portion 64 and flattened at its central or apex portion 79 to expand the inner wall portion of this notch for reasons to be further described. Positioned so that the notch 73 provides an extension of the channel 57, the disc 71 is fixed in position by socket head screws 81. The latter are similar to the screws 67 but in this instance the two screws employed are not on a diametral line but offset, as seen in FIGS. 8, 9 and 10 of the drawings.

Attention is directed to the fact that the channels 55 and 57 are abruptly expanded by the notches which form their extensions. Moreover, the divergent side walls of the notches provide guide surfaces which lead gently into the innermost central wall portions thereof. In accordance with the invention, the discs 63 and 71 are formed of materials to provide that the wall surfaces of the notches are significantly harder than the material of which the plate 22' is formed.

As seen in FIG. 8 of the drawings, the dies applied to the system of the invention as here modified do not utilize the plate 35. In this instance, the punch holder 27 thereof is provided in its upper surface with a pair of transversely spaced hardened pins 75. The pins 75 are arranged to position in a line adjacent, spaced from, and parallel to that which is defined by the forward edge of the thrust plate. The respective positions of the pins are such as to respectively align them with the channels 55 and 57. Note that the heads of the pins 75 are of a cylindrical form and are enlarged relative their body portions, the latter of which are cylindrically formed and sized to be fixed by a press fit in complementary holes in the punch holder 27. Moreover, the heads of the pins 75 seat to and project from the upper surface of the punch holder 27 and are of a shape and width to be complementary to that of the channels 55 and 57. This enables that the heads of the pins may be slid in and be positively and accurately guided by the channel walls in movement thereof into the respective notches in the discs 63 and 71, as will be further described.

It will be observed in FIG. 8 of the drawings that the discs 63 and 71, by virtue of their notches or recesses 65 and 73, provide sockets for positioning the pins 75. In assembling a die to the adapter apparatus of the invention including the pin-socket arrangement just described, a user, having his press equipped with the "PRESSIZER" elements of the invention, places a pre-assembled die on the platen 18, sliding the same inwardly on the platen until it is supported thereby. This initial positioning of the die is made such that the pins 75 will be located immediately forward of the front edge of the thrust plate 22'. The press slide 11 is then lowered until the thrust plate 22' approaches contact with the punch holder 27. The plate 22' is lowered sufficiently that a sliding adjustment of the die set will bring the pins 75 to bear within the confines of the channels 55 and 57. The die is then simply maneuvered to slide the same inwardly on the platen 18 so as to have the heads of the pins 75 enter the channels 55 and
and be guided by the side walls thereof into the notches in the discs 63 and 71. As the pins move into the discs, the relatively wider, expanded, mouths of their notches assure that the pin movement is free and unrestricted. The one pin 75 which enters the disc 63 will be brought into a seated engagement in the socket provided by its notch 65 and centered in its abutment with its arcuate back wall portion 64. The other pin 75 is similarly caused to enter the notch 73 in the disc 71 and abut its rearmost wall portion 77. Attention is directed to the fact that the notch in the disc 63 provides a datum control socket. This means that the abutment of the pin to its innermost wall portion 64 provides location therefor. By reason of the flat 79, provided in the expansion of the rear wall portion of the notch 73 in disc 71 the right hand pin 75, as shown in the drawings, is accommodated, irrespective of a tolerable discrepancy as to its spacing or position, so as to permit the die to be precisely positioned referenced to both the platen 18 and the thrust plate. With the die thus accurately and quickly set as to its “X” and “Y” axes, the punch holder 27 is fixed to the thrust plate 22 by use of suitable means, with the pins 75 positioned in their sockets as required for a precise positioning of the die. Of course, the die holder 26 is similarly fixed to the platen 18.

In this last described assembly process, by a slip fit of the pins 75 into their respective sockets the die set is aligned correctly, in a side to side direction as well as from front to rear of the thrust plate and the platen. Moreover, the die is easily and quickly aligned in a radial or rotary sense as referenced to the pin in the datum socket.

As may be seen, a simple and effective means is provided whereby a die may, by a simple sliding action to fixed stops, be precisely oriented and the parts thereof fixed to receive and act upon the materials to be worked. Basically, the pins 75 are arranged for a positive location and squaring of the die with the press and in reference to its feed provision. The ease with which the pin socket arrangement provides for guiding the die set into correct position, centered and square with the press, without any force or requirements for measurement is most significant as far as providing advantages in the application and interchange as well as a standardization of dies. This modification of the invention which is preferred enables the use of one thrust or adapter plate to receive all standard die sizes for a press. This adaptability of a press as provided by the invention adds to its ability to provide a simple and quick change of the platen required to give a support appropriate for the size of die employed. In total the noted features contribute to substantial advance in the art, eliminating the need for much custom adaptation in the manufacture and application and interchange of dies in a press. Attention is directed to the fact that the system avoids the need for removal of a thrust or adapter plate in the interchange of dies. Moreover, the application of the improvements just described produce no conflict or interference with the maximum toothing area which is provided in a die set in accordance with the invention.

FIG. 12 shows a modification of the head of the right hand pin 75 associated with the disc 71. This modification can contribute to accommodating a fine rotary adjustment of a die set referenced to the datum control socket 65. The head of this modified pin is identified by the numeral 75 and its periphery includes portion 83 and 84 which are formed on the same radius, a relatively flat portion 82 and a portion 85 formed on a larger radius. It will be seen that, by rotating the head of the pin 75', a selective portion of its periphery will in seating of the pin abut the rear wall portions 77, 79 of the socket 73 and selectively change the position of the die referenced to the datum socket pin 75. This will provide for limited correction of the position of the die in a rotary sense, if such proves to be required.

It is of importance to note that the pin-socket arrangement for mounting a die removes the requirement for highly critical dimensioning in the means for fitting the die in place.

Another modification of embodiments of the invention involves a use of die handlers, useful in positioning the die, as sling anchors and as spacer devices. The die handlers are in the illustrated instance mounted on three sides of the die. Each includes a handle 38 anchored at one end to the side of the die holder 26 by a screw 39. The other end carries a screw 40 engageable alternatively in a tapped hole 41 in the holder 26 and in a hole 42 in the holder 27. Engagement of the handle screw 40 in hole 41 or hole 42 is a releasable one. It may at will be disengaged from one hole position and reengaged in another, the handle 38 being in the process swung some 90° between alternate positions of adjustment. Engaged in hole position 41, the devices 38 are in stored position against the fixed die half 26 during operation, the die having been previously aligned and locked to the thrust plate 22 and platen 18 by devices 38. Engaged in hole position 42, the devices 38 serve as handles to assist in the maneuvering and positioning of the die set. Also engaged in hole position 42, the devices 38 act as spacers, holding the die set in an open position with tooling elements out of engagement with die components, obviating damage. Also, as attached in hole position 42 the devices 38 provide anchor locations simplifying the formation of a sling whereby flexible cables 50 or the like may be attached to the die set and in turn connected with power lift mechanism for moving a die into and out of storage and into and out of position in a press. The handle devices 38 are rigid members which when interconnecting the holder elements form positive links maintaining a spaced relationship of the punch and die holders. Through use of the devices 38 a die may be preassembled, stored and in unitary fashion installed in or substituted in a press. In the illustrated instance handlers 38 are adapted to hold the die in an open position. The length of the handle devices could, if desired, be made such as to maintain in the alternative a closed position of the die.

The die may have a temporary attachment to skid members 43 and 44 which protect the die in storage and permit its more facile handling by forklift or like material handling devices. The skid members may conveniently be attached to the die holder 26, using handler holes 41.

The die is attached on the one hand to the thrust plate 22 or 22' and on the other hand to the platen 18 by screws. The pattern of screw holes is standardized and coordinated with die sizes to permit dies to be mounted in presses of compatible size and capacity and to discourage their use in presses which are outside the acceptable range, for example, small dies used in overly large presses. In the case of the platen 18, die size and
platen size are coordinated to assure proper support for the die holder and to assure that sufficient drop-through opening for slug disposal will be provided without likelihood of misoperation from improper disposal.

While in one aspect of the invention the "Pressizer" components equip a press for use with any conventional die, the invention also contemplates a use of standardized dies and accessories. A platen 18 will have particular reference to a certain one or to a certain series of dies and its pattern of holes 21 will be in compatible or conforming relation to an attachment hole pattern in the die holder of the certain die or series of dies.

The preferred pin-socket arrangement, or "Centerizer" plate 35 in certain applications, will provide initial guidance in fitting the die to the thrust plate and then positively positions the die in the press. As far as the pin-socket arrangement, this will universally produce a precise positioning and enables a precise lock of a die in place. In use of plate 35, lateral bearing areas of the plate prevent turning of the die during operation and thereby maintain a positive position thereof parallel with the feed line direction of the stock or work piece. In any case, dies can be interchanged within the press without readjustment of feed line height or direction.

The principle of parallelism exists also in the base portion of the "Pressizer" equipped press where the platen 18 has a closely controlled slip fit mounting between parallel bolster shoulders 14 and 15. Dimensions throughout the die and adapter assembly are taken from appropriate centers. Shoulders 14 and 15 provide, as noted, a sliding means for introduction and removal of the platen and control the platen in a lateral sense for installation of the screws 45 into appropriate tapped holes 46 which fix it in position onto plate 13. Automatically positioning the platen in a fore and aft or front to rear sense is a locating mechanism which may take the form of a ball 47 accommodated in a recess 48 in plate 13 and spring urged outwardly to engage in a detenting recess 49 in the platen 18. Proper positioning of a platen 18 accordingly is a simple, substantially automatic operation. As it is slip fit mounted, the shoulders 14 and 15 align it correctly in lateral and angular senses while engagement of the ball 47 in detent 49 signals arrival of the platen in a correct position in a fore and aft sense. So accurately located, the platen is in a directly opposing relation to the thrust plate 22, insuring precision alignment of the fixed and acting halves of the die. The screw connections of the die to the platen 18 and to the thrust plate 22 may exhibit a slight tolerance as may be required for conformance to the positively located platen and the positively engaged pins 75 or plate 35 as the embodiment may provide.

The plate 35 has been disclosed as mounted on the die and the mating slot 24 as formed in the thrust plate 22. As also pins 75 have been illustrated on the punch holder and sockets in the thrust or adapter plate. It will be evident that this relationship could, if desired, be reversed.

Note the invention simply allows adjustments to bolster thickness which adapt a press or like apparatus to attain a standard open area between the press slide and bed in a closed position, thereby gaining the advantage (economics) and benefit of standardized working height of all dies as contemplated in the system.

As contemplated by the invention, patterns of attachment holes in thrust plate are inclusive of all die sizes coordinated to the series for that press size and match with attachment holes in the replaceable platen; i.e., each platen coordinates to one standard die size but the thrust plate will accept the punch holder of all dies in series.

Having thus described our invention, we claim:

1. For use in a press or like apparatus providing a press slide and a press bed, elements adapting the press to a facile installation and exchange of dies, including a thrust plate for removable mounting to the press slide and a bolster plate assembly for removable mounting to the press bed, said thrust plate providing means for the mounting of a tool holder element of a die thereto, said bolster plate assembly including a bolster for removable mounting to the press bed and a platen removably mounted to the bolster, said removable platen having means for the releasable mounting of a die holder element of the die thereto, and means positioning said platen upon said bolster to provide a proper basis for the accurately aligned mounting of the die holder element opposite the tool holder element.

2. Apparatus according to claim 1, wherein said platen provides a drop-through opening to accept cut material from the die space of the die, the die holder mounting means of said platen and the size of its drop-through opening being specific to a certain die or a series of dies, and said platen being exchangeable with others specific to another die or other series of dies without changing said bolster.

3. Apparatus according to claim 1, characterized by means for positively positioning the tool holder element in an angular sense relatively to said thrust plate on relative contact therebetween.

4. Apparatus according to claim 1, wherein said platen has a slip fit mounting to said bolster, characterized by means responsive substantially automatically upon slip fitting of said platen to said bolster accurately to locate said platen for a correct mounting of the die holder element opposite the tool holder element.

5. Apparatus according to claim 1 wherein the means provided by said thrust plate for mounting a tool holder element thereto said means provided by said platen for mounting a die holder element thereto include patterns of attachment holes respectively in said thrust plate and in said platen, said holder elements having matching connector passing holes, at least said platen being replaceable in the press with the pattern of attachment holes therein being specific to a certain die holder element or series of die holder elements.

6. For use in combination with a press or like apparatus providing a press bed and a press slide, and a die including a tool holder and a die holder interposing between the press slide and press bed, interfitting means for mounting in respective connection with said press slide and said tool holder including slide means connecting with one thereof and slide guide means connecting with the other, said slide guide means being formed to open laterally from a seat therein for said slide means and the laterally open formation thereof providing for an interfit therewith and a seating therein of said slide means by a lateral sliding motion, to align the tool holder in side to side and front to rear directions.

7. Apparatus according to claim 6, wherein said interfitting means are formed to provide for relative sliding motion between said adapter and said tool holder
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and to limit such sliding motion in one sense to accomplish a correct positioning of the tool holder relative to the adapter and the press slide.

8. Apparatus according to claim 6, wherein said slide means and said slide guide means includes a positioning plate and means defining a mating recess, said plate and recess being in part formed with parallel sides.

9. For use in combination with a press or like apparatus providing a press bed and a press slide, and a die including a die holder and a tool holder interposing between the press slide and press bed, an adapter mounting to said press slide and interfitting means for positioning the tool holder of the die set relatively to said adapter to preclude side to side and relative angular movement therebetween said adapter comprising a thrust plate for removable mounting to the press slide and having a slip connection means on an outwardly facing surface thereof providing one portion of said interfitting means, and a mating slip connection means forming a second portion of said interfitting means and attaching to the related tool holder, and a bolster assembly for removable mounting to the press bed, said bolster assembly including a bolster and a removable platen interfits the bolster, said platen and bolster having interfitting portions positively limiting relative lateral and angular movements of the platen, a die holder of the die mounting to said platen in opposing relation to the tool holder.

10. For use in a press or like apparatus providing a press slide and a press bed, elements adapting the press to a facile installation and exchange of dies, including a thrust plate for movable mounting to the press slide and a bolster plate assembly for removable mounting to the press bed, said thrust plate providing means for the mounting of a tool holder element of a die thereto, said bolster plate assembly including a bolster for removable mounting to the press bed and a platen removably mounted to the bolster, said removable platen having means for the releasable mounting of a die holder element of the die thereto, said platen having a slip fit to said bolster and detent means yieldingly positioning said platen on said bolster in a fore and aft sense.

11. Apparatus according to claim 9, wherein one of said slip connection means is a positioning plate located in accordance with the dynamic loading of the die set.

12. For use in a press or like apparatus, a die set including preassembled superposed tool and die holder elements mounted for relative approaching and separating motions, and means adjustable for alternative use as handle means for the maneuvering and positioning of the die set and as tie means fixing relative position of said holder elements for damage free storage and handling of the die set or assembled die.

13. Apparatus according to claim 12, wherein said handle means is adjustable to alternate positions in which said holder elements are maintained in a separated position in a manner to preclude relative approaching motion thereof.

14. Apparatus according to claim 12 wherein said handle means comprises at least one handle device including means which in one alternate position attaches at one end to one of said holder elements and at the other end attaches to the other holder element, said device in an other alternate position attaching at both ends to said one holder element.

15. Apparatus according to claim 14 wherein said handle means comprises a plurality of handle devices selectively located about the die to provide in said one alternate position a plurality of slip anchor locations.

16. For use in a press or like apparatus providing a press slide and a press bed, elements adapting the press to a ready installation and exchange of dies, including an adapter plate for removable mounting to the press slide and a bolster plate assembly for removable mounting to the press bed, said adapter plate providing means for mounting of a tool holder element of a die thereto, said bolster plate assembly providing in association therewith a platen and means for slip fit of said tool holder element to said adapter plate including a plurality of cooperating spaced means respectively on said tool holder element and said adapter plate arranged for a sliding interfit thereof, said interfitting means including portions formed to function on contact to provide a precise datum control in positioning said tool holder element, and other portions of said interfitting means providing means to accommodate discrepancies in the relative positions of said plurality of interfitting means so as to provide for a simple and automatic positioning of said tool holder element on said adapter plate by said interfitting means.

17. Apparatus as set forth in claim 16 characterized by said interfitting means including means defining guide channels and pin-like projections which are slidably received in said guide channels to position the tool holder element by a seating of one referenced to the other.

18. Apparatus as set forth in claim 17 characterized by said guide channels providing socket means for receiving the pin-like projections.

19. Apparatus as set forth in claim 17 characterized by said means defining guide channels including means defining interrelated sockets which form extensions of said guide channels.

20. Apparatus as set forth in claim 19 characterized by said sockets being provided by releasable inserts in one of said adapter plate or said tool holder elements.

21. Apparatus as set forth in claim 20 characterized by the sockets forming extensions of said guide channels having a wedge-like shape and the means defining the minimum transverse dimension thereof positioning remote from the inner end of said guide channels.

22. Apparatus as set forth in claim 21 characterized by said wedge-shaped sockets providing sockets forming extensions of said guide channels the mouths of which are wider than said guide channels and centered in reference thereto.

23. Apparatus as set forth in claim 19 characterized by said sockets being differentially shaped, one thereof having its periphery defined by divergent walls the convergent extremities of which are connected by a wall having an arc radius, the arc of which is formed on a uniform radius, and other of said sockets having the periphery thereof defined by divergent walls connected at their convergent extremities by a generally arcuate wall segment a central portion of which is flattened and the lateral extent of which is greater than the lateral extent of the arc formed wall portion of the first mentioned socket.

24. Apparatus as set forth in claim 16 characterized by said tool holder upon installation being embodied in
an initially connected relation with the other components of a die which are placed on said platen as a unit to provide that a sliding movement between said unit and said adapter plate will appropriately position said interfitting means to accurately position said die thereby.

25. Apparatus as set forth in claim 17 characterized by a portion of said pin-like projections providing for a rotary adjustment of said tool holder element for accurate positioning thereof.

26. Apparatus for simple and precise positioning of a tool holder or like plate assembly relative to a surface providing therefor a base support characterized by said plate assembly and its base support having in connection therewith means for a slip fit of one to the other, said means including a plurality of cooperating spaced means respectively on said plate assembly and said base support arranged for a sliding interfitt, said interfitting means including portions providing on contact a precise datum control for the location of said plate assembly and other portions of said interfitting means providing means to accommodate discrepancies in the relative positions thereof in reference to said datum control so as to provide for a simple and automatic positioning of said plate assembly on said base support on slip fit of said interfitting means.

27. Apparatus as set forth in claim 26 characterized by said interfitting means including means defining guide channels terminating in socket means opening laterally to the associated die channels and pin-like projections which are slidably received in said guide channels to position the plate assembly relative to said base support on seating of said pin-like projections in said socket means by a sliding interfitt.

28. Apparatus as set forth in claim 27 characterized by said socket means being provided by releasable and replaceable inserts.

29. Apparatus as set forth in claim 28 characterized by said socket means providing notches therein which are wedge-like in configuration and the maximum dimension of each of which being positioned to open to the related guide channel.

30. Apparatus as in claim 29 characterized by said notches being differentially shaped at the convergent ends thereof which form abutments for the pin-like projections on sliding interfitt of said plate assembly to its base support.

31. For use in a press or like apparatus providing a press slide and a press bed, elements adapting the press to a facile installation and exchange of dies, including a thrust plate for removable mounting to the press slide and a bolster for removable mounting to the press bed, said thrust plate providing means for the mounting of tool holder means thereto and said bolster providing means for the mounting of die holder means thereto, and means individually related to each of said thrust plate and said bolster including slide means and slide guide means providing a seat for said slide means, said slide guide means being formed to open laterally from a seat therein for said slide means and the laterally open formation thereof providing for an interfitt thereof and a seating therein of said slide means by a lateral sliding movement, to position the tool holder means relative to said thrust plate and positively to position the die holder means relative to said bolster for the accurately aligned mounting of the tool holder and die holder means.

32. Apparatus according to claim 31, wherein each of said individually related means has a form to be properly positioned substantially automatically upon application respectively of the tool holder means to said thrust plate and of said die holder means to said bolster.

* * * * *
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,848,494 Dated November 19, 1974

Inventor(s) Robert J. Gargrave; Ludomil A. Holiga

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 21, "actuating" is amended to read -- acting --.
Column 6, line 65, "molts" is amended to read -- bolts --.
Column 7, lines 43-44, delete "the inner end of the channel 57. The".
Column 9, line 13 -- a precise -- is inserted to follow "provides".
Column 10, line 1, "portion" is amended to read -- portions --; line 30, "due" is amended to read -- die --.
Column 11, line 58, "also" is amended to read -- also --.
Claims 7, 26-30 and 32 are deleted from this application.

Signed and Sealed this

Seventeenth Day of August 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks