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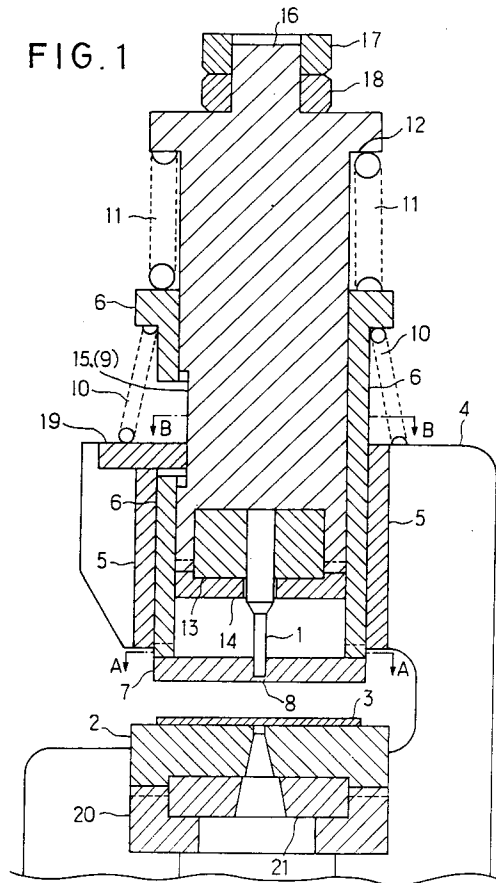
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W-6000 Frankfurt am Main 1(DE)(54) **PUNCH DIE SET.**

(57) A punch die set capable of easily making changes of a punch, a die and the like and improving a working precision. In this punch die set, a stripper inserted so as to be vertically slidable on the inner peripheral surface of a hollow sleeve (5) solidly secured to a set holder (4) through a bonding agent includes a hollow stripper body (6) and a stripper plate (7) provided with a punch through hole (8) and

detachably mounted to the bottom open end of the stripper body (6). A die (2) is detachably mounted onto a die holder (20) solidly secured to the set holder (4) through a bonding agent. Positioning means are provided between the stripper body (6) and the stripper plate (7) and between the die (2) and the die holder (20), respectively.

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FIG. 1



TECHNICAL FIELD OF THE INVENTION

This invention relates generally to a punch-die set used for the piercing and blanking of sheet metal by mounting on a punching press, etc., and more particularly to a punch-die set that has been improved to facilitate the changing of punches and dies and to improve machining accuracy.

BACKGROUND OF THE INVENTION

A punch-die set for piercing and blanking sheet metal (hereinafter referred to as a workpiece), such as sheet steel, as shown in Fig. 5 is well known.

Fig. 5 is a longitudinal sectional view illustrating the essential part of a punch-die set of a conventional type. Reference numeral 41 in the figure refers to a punch; 42 to a die; 43 to a die fixing screw; 44 to a die locking pin; 45 to a workpiece; 46 to a set holder; 47 to a sleeve; 48 to a stripper; 49 to a punch passing hole; 50 to a stripper spring; 51 to a punch proper; 52 to a punch holder; 53 to a parallelism reference plane; 54 to a punch-proper threaded portion; 55 to a parallelism reference jig plate; 56 to a punch pusher; 57 to a punch-pusher threaded portion; 58 to a punch head; 59 to a punch pad; and 60 to a punch-proper spring, respectively.

In Fig. 5, the stripper 48 is formed into a bottomed hollow cylindrical shape, and supported on the set holder 46 via the stripper spring 50 in such a manner as to be vertically slidable in the sleeve 47 fixedly fitted to the set holder 46 via adhesive. On the bottom of the stripper 48 formed is a punch passing hole 49 through which the punch 41 is passed.

The punch proper 51 is formed into a bottomed hollow cylindrical shape, and constructed so as to be vertically slidably inserted into the stripper 48. On the bottom of the punch proper 51 formed is the punch holder 52 to which the punch 41 is fixedly fitted by bonding, crimping or other means. The punch proper 51 has the parallelism reference plane 53 formed by machining part of the outer circumferential surface thereof so as to ensure that the parallelism reference plane 53 slidably comes in contact with the end face of the parallelism reference jig plate 55 provided on the set holder 46. With this arrangement, the rotation of the punch proper 51, that is, the punch 41 is controlled. Furthermore, the punch-proper threaded portion 54 is provided in the form of female threads on the inner circumferential surface at the upper end of the punch proper 51, and engaged with the punch-pusher threaded portion 57, which is provided in the form of male threads on the punch pusher 56. Thus, the punch pusher 56 is integrally connected to the punch proper 51 by screwing the punch

pusher threaded portion 57 to the punch-proper threaded portion 54. The punch pusher 56 is connected to the punch proper 51 in such a manner as to push the punch pad 59. The punch pad 59 prevents the punch 41 from coming off upwards, and adjusts the punching stroke by adjusting the thickness thereof properly. In addition, the punch-proper spring 60 is provided between the punch pusher 56 and the stripper 48.

The die 42 is installed at a location facing the punch 41 of the set holder 46. The die 42 is fixedly fitted to the set holder 46 by the die fixing screw 43, and is prevented from being rotated by the die locking pin 44.

In the foregoing, the construction of the conventional type of punch-die set as shown in Fig. 5 has been described. In the following, the operation of the punch-die set of the conventional type will be described. The punch-die set is set on a press table, for example, and the punch head 58 is pushed downwards by a press or cylinder ram (not shown). As the punch head 58 is pushed downwards, the stripper spring 50 is first deflected and the stripper 48 is pushed down until the bottom surface of the stripper 48 comes in contact with the workpiece 45 because the resiliency of the stripper spring 50 is smaller than the resiliency of the punch-proper spring 60. Then, the punch-proper spring 60 is deflected, and thereby the punch pusher 56 and the punch proper 51 are pushed down to a predetermined stroke. Thus, the workpiece 45 placed on the die 42 is pierced or blanked by the punch 41.

In general, the shape of piercing or blanking with a punch-die set is not always kept constant, but may usually be varied as necessary. In such a case, the punch and die used in the punch-die set have to be changed to a shape corresponding to the required piercing or blanking shape. At the same time, the shape of the punch passing hole provided on the stripper also has to be changed.

In the prior art shown in Fig. 5, not only the punch 41 and the die 42 but also the stripper 48 having the punch passing hole 49 have to be changed to cope with changes in the piercing or blanking shape. Although the replacement of the punch 41 and the die 42 is not so difficult, the replacement of the stripper 48 is extremely difficult, increasing the required manhours for the replacement. The stripper 48 not only requires large manhours for the replacement, but also is difficult to manufacture, requiring considerable manufacturing manhours.

Furthermore, since the punch passing hole 49 provided on the bottom of the stripper 48 has to be formed in accordance with the location and shape of the punch 41, it is not easy to machine the punch passing hole 49.

Moreover, the vertical positions of the punch 41, the punch passing hole 49 and the die 42 and the horizontal angular positions thereof must be accurately aligned to improve machining accuracy.

In the prior art shown in Fig. 5, however, the die 42 is fixedly fitted in such a manner that the die 42 is forced onto the set holder 46 by the die fixing screw 43 while setting the angular position thereof in the horizontal direction by the die locking pin 44. Although it is seemed that this accurately positions vertical and horizontal angular positions of these components, it is in fact difficult to accurately position them vertically or in horizontal angular direction by merely pushing the die 42 by the die fixing screw 43 to the set holder 46 because of the presence of small gaps among the die 42, the die fixing screw 43 and the set holder 46. Additional fine adjustment is therefore required, leading to increased replacement operations.

DISCLOSURE OF THE INVENTION

It is an object of this invention to provide a punch-die set that facilitates the replacement of the punches and the dies, and improves machining accuracy.

The punch-die set of this invention comprises a stripper that is vertically slidable with respect to a set holder formed into a bottomed hollow shape, a punch proper that is vertically slidable with respect to the inner surface of the stripper, a punch installed on the lower end of the punch proper in such a manner as to pass through the bottom of the stripper, and a die disposed on the set holder in such a manner as to face the punch with a gap for inserting a workpiece, in which the stripper comprises a stripper proper formed into a hollow shape, a stripper plate detachably installed on the lower open end of the stripper proper, and the stripper plate has a punch passing hole through which the punch is passed.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a diagram illustrating the construction of an embodiment of this invention.

Fig. 2 is a cross-sectional view taken along line A-A shown in Fig. 1.

Fig. 3 is a cross-sectional view taken along line B-B shown in Fig. 1.

Fig. 4 is a perspective view of assistance in explaining the positioning means of this invention.

Fig. 5 is a diagram illustrating the construction of a punch-die set of a conventional type.

PREFERRED EMBODIMENTS OF THIS INVENTION

Fig. 1 is a diagram illustrating the construction of an embodiment of this invention. Fig. 2 is a cross-sectional view taken along line A-A shown in Fig. 1. Fig. 3 is a cross-sectional view taken along line B-B in Fig. 1. Fig. 4 is a perspective view of assistance in explaining the positioning means of this invention.

In Fig. 1, reference numeral 1 refers to a punch; 2 to a die; 3 to a workpiece; 4 to a set holder; 5 to a sleeve; 6 to a stripper proper; 7 to a stripper plate; 8 to a punch passing hole; 9 to a stripper parallelism reference plane; 10 and 11 to springs; 12 to a punch proper; 13 to a punch holder; 14 to punch plate; 15 to a punch parallelism reference plane; 16 to a punch head; 17 and 18 to a stroke adjusting screw; 19 to a parallelism reference jig plate; 20 to a die holder; and 21 to a die pad, respectively.

In the embodiment shown in Fig. 1, the stripper proper 6 is formed into a hollow cylindrical shape, and adapted to be vertically slidable in the sleeve 5 that is fixedly fitted to the set holder 4 by means of adhesive. The stripper plate 7 having the punch passing hole 8 through which the punch 1 is passed is detachably installed on the lower open end of the stripper proper 6. The stripper proper 6 has the stripper parallelism reference plane 9 formed by machining part of the stripper proper 6 to match with the parallelism reference jig plate 19, which will be described later, and is constructed so that the stripper parallelism reference plane 9 slidably comes in contact with the end face of the parallelism reference jig plate 19 provided on the set holder 4 to control the rotation of the stripper proper 6. The manner in which the rotation of the stripper proper 6 is controlled will be described in more detail later, referring to Fig. 3, and the manner in which the stripper plate 7 is installed will be described in detail, referring to Figs. 2 and 4. The stripper proper 6 is supported on the set holder via the stripper springs 10.

The punch proper 12 is constructed so that the punch proper 12 is vertically slidably inserted in the stripper proper 6, and incorporates the punch holder 13 on the bottom of which the punch 1 is detachably installed by adhesive or crimping or other means. The punch holder 13 is detachably supported by being pushed by the punch plate 14. The punch proper 12 has the punch parallelism reference plane 15 formed by machining part of the outer circumferential surface thereof; the punch parallelism reference plane 15 being constructed so as to vertically slidably come in contact with the end face of the parallelism reference jig plate 19 to control the rotation of the punch proper 12, that is, the punch 1. The manner in which the rotation of the punch proper 12 is controlled will be in detail later, referring to Fig. 3.

Furthermore, the punch proper 12 has the punch head 16 formed by protruding on the upper end thereof, to which the stroke adjusting screws 17 and 18 for adjusting the punching stroke are screwed. The punch-proper spring 11 is interposed between the punch proper 12 and the stripper proper 6.

The die 2 is detachably installed on the die holder 20 embedded in the set holder 4 via the die pad 21 in such a manner as to face the punch 1 and the stripper plate 7. The manner in which the die 2 is installed will be described in detail later.

In the foregoing, the construction of the punch-die set of this invention shown in Fig. 1 has been described. Now, the construction of the essential part characterizing this invention will be described in detail in the following, referring to Figs. 2 through 4.

Fig. 2 is a cross-sectional view taken along line A-A shown in Fig. 1, which is of assistance in explaining the manner in which the stripper plate 7 is installed. Fig. 4 is a perspective view of assistance in explaining the positioning means (positioning protrusions and positioning recesses, which will be described later). Numeral 22 in the figure refers to positioning protrusions; 23 to positioning recesses; 24 to a fixing screws; 25 to fixing screw holes, respectively. Other numerals correspond to like numerals in Fig. 1.

In Fig. 2, the positioning protrusions 22 is formed by providing protrusions on the surface of the stripper plate 7 mating with the stripper proper 6. The positioning recesses 23 are formed on the lower end face of the stripper proper 6 corresponding to the positioning protrusions 22. These positioning protrusions 22 and the positioning recesses 23 are formed by using as references the Y axis parallel with the aforementioned stripper parallelism reference plane 9 and the punch parallelism reference plane 15 (shown in Fig. 3), and the X axis orthogonally intersecting with the Y axis. The punch passing hole 8 formed on the stripper plate 7 is machined using as references the X and Y axes. The stripper plate 7 is installed on the stripper proper 6 by the fixing screws 24 after the positioning protrusions 22 are engaged with the positioning recesses 23.

In this way, the punch passing hole 8, the positioning protrusions 22, the positioning recesses 23 are machined using as references the X and Y axes. Consequently, when changing the stripper plate 7 with a new one, the punch passing hole 8 corresponding to the punch 1 is automatically positioned. In Figs. 2 and 4, the positioning protrusions are provided on the stripper plate 7, and the positioning recesses are provided on the stripper proper 6. Needless to say, the positioning protrusions may be provided on the stripper proper 6 and the

positioning recesses on the stripper plate 7. In the following, these positioning protrusions and the positioning recesses are called positioning means.

Though not shown in the figure, the positioning means are provided between the die 2 and the die holder 20, and between the lower end face of the punch proper 12 and the punch plate 14. As a result, the die 2 and the punch plate 14 can also be replaced easily and with high accuracy, as noted above.

Fig. 3 is a cross-sectional view taken along line B-B shown in Fig. 1 of assistance in explaining the manner in which the rotation of the stripper proper 6 and the punch proper 12 is controlled. Like numerals in the figure correspond to those used in Fig. 1.

In Fig. 3, the stripper parallelism reference plane 9 formed on the stripper proper 6 and the punch parallelism reference plane 15 formed on the punch proper 12 are constructed so as to slidably come in contact with the end face of the parallelism reference jig plate 19 provided on the set holder 4. As a result, the stripper proper 6 or the punch proper 12 is prevented from being rotated even during its vertical movement.

Now, the method of fixing the sleeve 5 and the die holder 20 will be described. The sleeve 5 and the die holder 20 are fixedly fitted to the set holder 4. If the fixing positions of the sleeve 5 and the die holder 20 are not accurate, high-precision machining is not possible. In this invention, therefore, the sleeve 5 and the die holder 20 are accurately positioned using a fixing jig (not shown) in the following manner.

The fixing jig has such an outside diameter that the jig is vertically slidable with the inner circumferential surface of the sleeve 5, and is of a cylindrical or columnar shape having on the lower end face thereof a positioning means corresponding to the positioning means provided on the die holder 20. The fixing jig is inserted into the sleeve 5 downwards from above until the jig reaches the die holder 20 in the state where those other than the sleeve 5 and the die holder 20 are not installed, causing the positioning means of the fixing jig to match with the positioning means of the die holder 20. The sleeve 5 and the die holder 20 are fixed at accurate positions by filling and curing adhesive in the gap provided in advance between the sleeve 5 and the outer circumferential surface of the die holder 20 and the set holder 4.

In the foregoing, description has been made about the construction of the punch-die set of this invention. Now, the operation of the embodiment shown in Fig. 1 will be described in the following. The punch-die set is set on a press table, for example, and the punch proper 12 is pushed downwards by exerting a pushing force to the

stroke adjusting screws 17 and 18 by a press or cylinder ram (not shown). As the punch proper 12 is pushed downwards, the stripper spring 10 is first deflected, and then the entire punch mechanism is pushed down until the stripper plate 7 comes in contact with the workpiece 3 because the resiliency of the stripper spring 10 is smaller than the resiliency of the punch-proper spring 11. Then, the punch-proper spring 11 is deflected, and the punch 1, together with the punch proper 12, is pushed down by a predetermined stroke. As a result, the workpiece 3 placed on the die 2 is pierced or blanked by the punch 1.

Moreover, if a change has to be made in the machining shape, etc. high-precision machining can be maintained merely by changing the punch 1, the stripper plate 7 and the die 2, together with the punch holder 13, the punch plate 14, as noted earlier. Needless to say, the punching stroke can be adjusted by the stroke adjusting screws 17 and 18 as necessary.

In this invention, since the stripper comprises a stripper proper formed into a hollow cylindrical shape, and a stripper plate detachably installed on the lower open end of the stripper proper and having a punch passing hole through which the punch is passed, the stripper proper need not be replaced during the replacement of the punch. This makes the replacement of the punch easy.

Furthermore, since positioning means are provided between the stripper proper and the stripper plate, between the die and the die holder, and between the punch proper and the punch plate, positioning in the circumferential direction can be accurately and easily carried out during the replacement of punches and dies, and machining accuracy can also be improved.

As set forth above, this invention makes it possible to provide a punch-die set, in which punches and dies can be easily changed with changes in machining shape, etc., and machining accuracy can be improved.

INDUSTRIAL APPLICABILITY

As described above, the punch-die set according to this invention is useful as a punch-die set used for piercing and blanking sheet metal by installing on a punching press, etc., and is particularly suitable as a punch-die set in which punches and dies can be easily changed and accurately positioned.

Claims

1. A punch-die set comprising at least a stripper formed into a bottomed hollow cylindrical shape and adapted so as to be vertically slid-

ble with respect to a set holder; a punch proper adapted so as to be vertically slidable with respect to the inside surface of said stripper, a punch installed on the lower end of said punch proper in such a manner as to pass through the bottom of said stripper, and a die disposed on said set holder in such a manner as to face said punch via a gap for inserting a workpiece, characterised in that said stripper comprises a stripper proper formed into a hollow shape and a stripper plate detachably installed on the lower open end of said stripper proper; said stripper plate having a punch passing hole through which said punch is passed.

2. A punch-die set as set forth in Claim (1) wherein a die holder on which said die is placed is provided under a location at which said die is installed; said die and said die holder have positioning means for positioning said die and said die holder in the circumferential direction; and said die is detachably fitted to said die holder via said positioning means.
3. A punch-die set as set forth in Claim (1) wherein said stripper proper and said stripper plate have positioning means for positioning said stripper proper and said stripper plate in the circumferential direction; said stripper plate is detachably fitted to said stripper proper via said positioning means.
4. A punch-die set as set forth in Claim (1) wherein said punch proper and said punch plate provided at the lower end face of said punch proper have positioning means for positioning said punch proper and said punch plate in the circumferential direction; and said punch plate is detachably fitted to said stripper proper via said positioning means.

FIG. 1

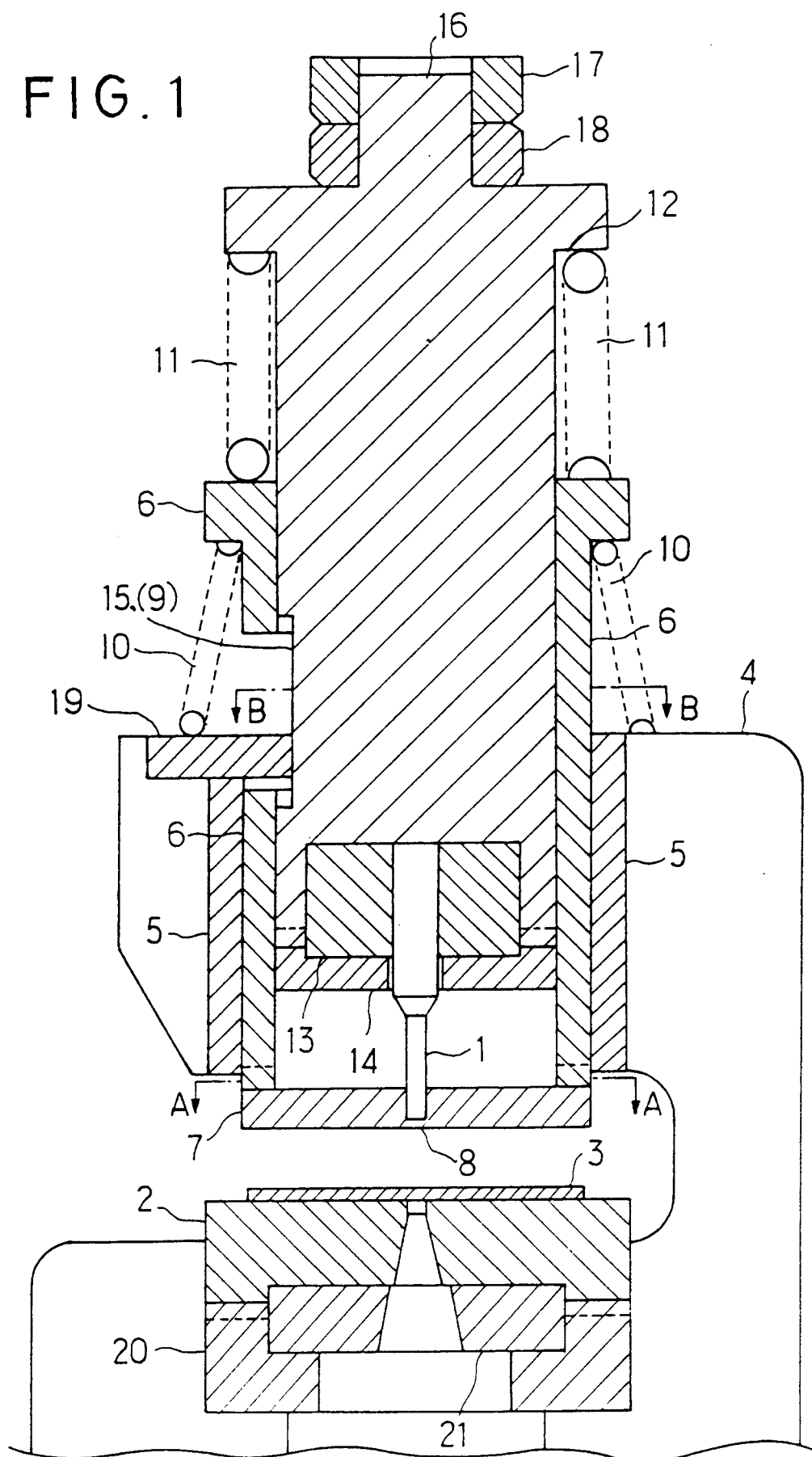


FIG. 2

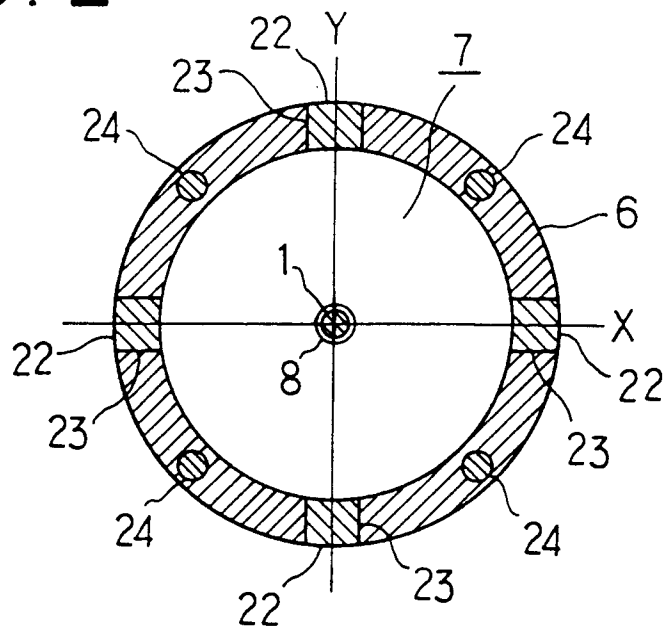


FIG. 3

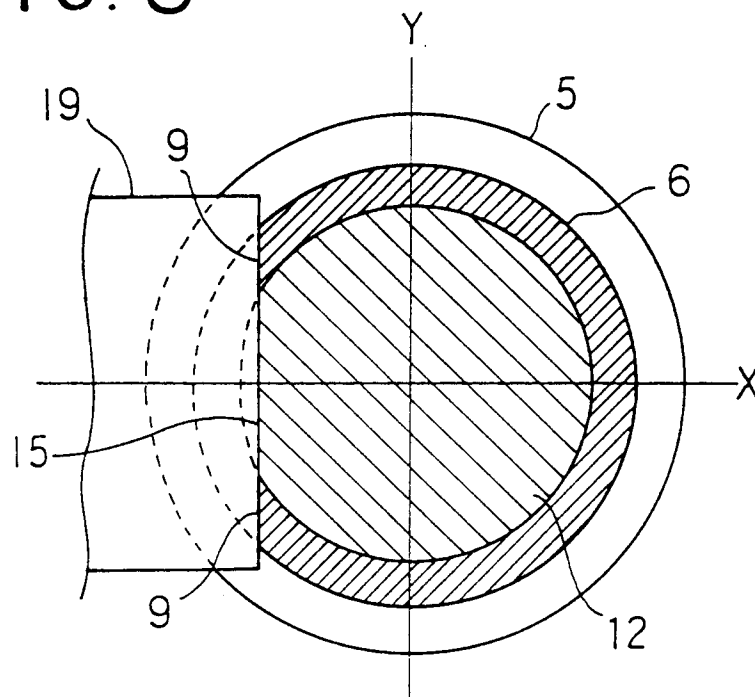


FIG. 4

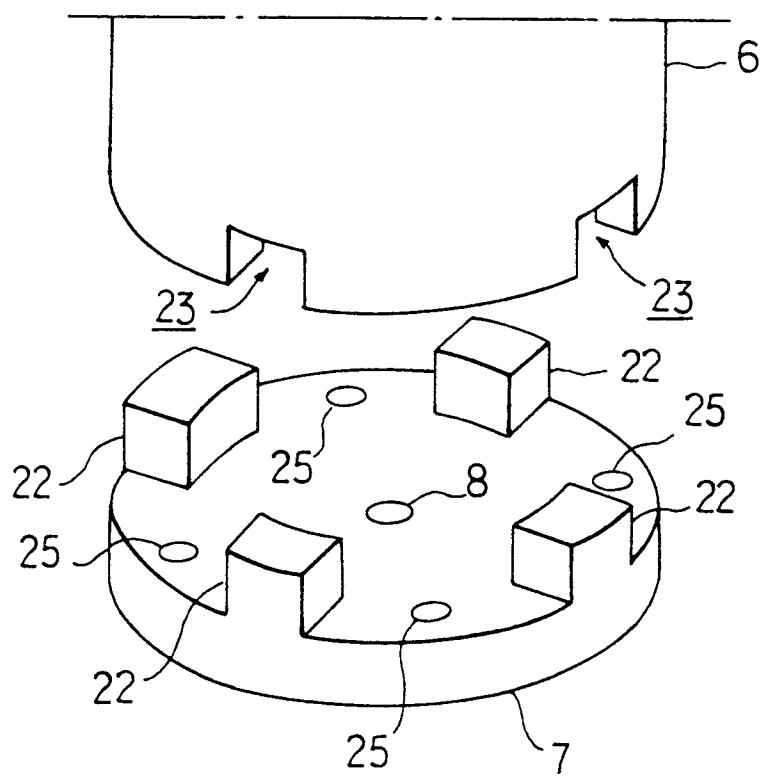
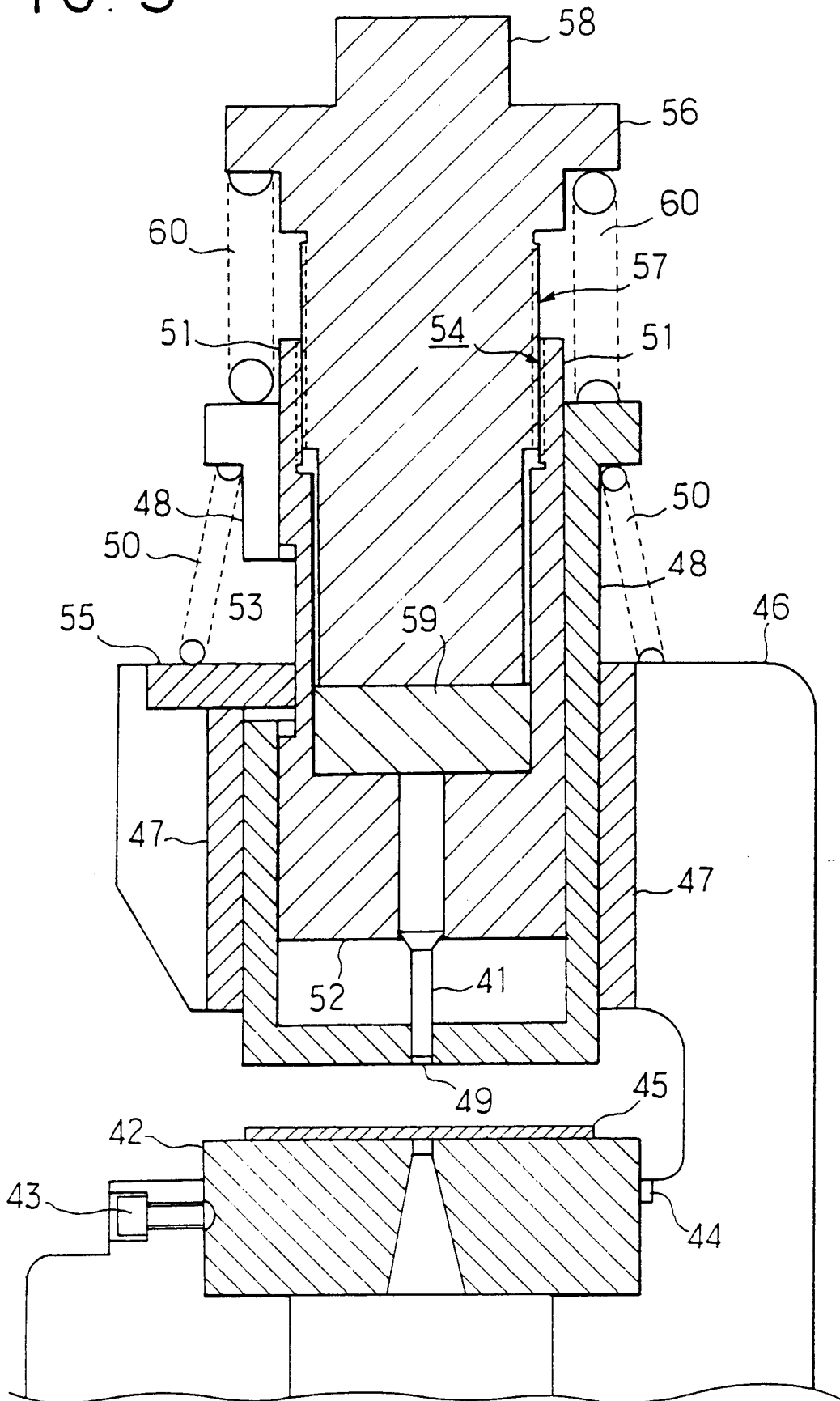


FIG. 5



INTERNATIONAL SEARCH REPORT

International Application No PCT/JP92/00104

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int. Cl ⁵ B21D28/14, 28/34, 45/08		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC	B21D28/00, 28/14, 28/34, 45/08	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
Jitsuyo Shinan Koho 1942 - 1991 Kokai Jitsuyo Shinan Koho 1971 - 1991		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category [*]	Citation of Document, ¹¹ with Indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	JP, Y2, 1-10110 (Amada Metreco Co., Ltd.), March 22, 1989 (22. 03. 89), (Family: none)	1, 3
Y	JP, Y2, 2-21148 (Futaba Denshi Kogyo K.K.), June 7, 1990 (07. 06. 90), (Family: none)	2-4
Y	JP, U, 56-87232 (Mitsubishi Electric Corp.), July 13, 1981 (13. 07. 81), (Family: none)	2-4
[*] Special categories of cited documents: ¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
March 12, 1992 (12. 03. 92)	March 31, 1992 (31. 03. 92)	
International Searching Authority	Signature of Authorized Officer	
Japanese Patent Office		