



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
13.04.2016 Bulletin 2016/15

(51) Int Cl.:
B21D 28/34 (2006.01) **B21D 28/36** (2006.01)
B21D 37/14 (2006.01)

(21) Application number: **14800914.5**

(86) International application number:
PCT/JP2014/060551

(22) Date of filing: **11.04.2014**

(87) International publication number:
WO 2014/188814 (27.11.2014 Gazette 2014/48)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(72) Inventor: **SAKAMOTO, Hiroichi**
Inuyama-shi
Aichi 484-8502 (JP)

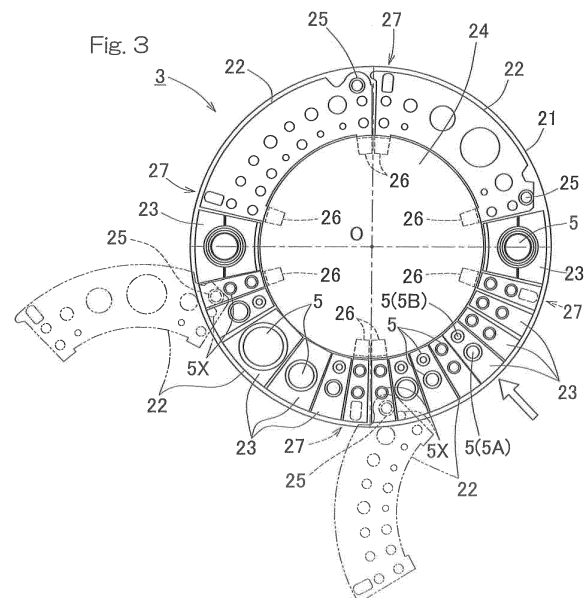
(30) Priority: **24.05.2013 JP 2013109586**

(74) Representative: **Zimmermann, Tankred Klaus et al**
Schoppe, Zimmermann, Stöckeler
Zinkler, Schenk & Partner mbB
Patentanwälte
Radtkoferstrasse 2
81373 München (DE)

(71) Applicant: **Murata Machinery, Ltd.**
Kyoto-shi, Kyoto 601-8326 (JP)

(54) **PUNCH PRESS**

(57) The punch press includes a punch support body, on which a plurality of punches are mounted, and an integrated die support body (3) positioned below the integrated punch support body and having a plurality of dies (5) mounted thereon to perform a punching process in cooperation with the punches. The integrated die support body (3) is of such a design that the plurality of the dies (5) are juxtaposed along a rim of the integrated die support body (3). The integrated die support body (3) includes an integrated die support main body (21) and an in-and-out moving body (22) that enables at least a portion thereof to assume a condition emerging out of the rim of the integrated die support body (21) while its connection with the integrated die support main body (21) is retained. Some of the dies (5) disposed in the integrated die support body (3) are disposed in the in-and-out moving body (22).



Description

[Prior Art Literature]

CROSS REFERENCE TO THE RELATED APPLICATION**[0005]**

[0001] This application is based on and claims Convention priority to Japanese patent application No. 2013-109586, filed May 24, 2013, the entire disclosure of which is herein incorporated by reference as a part of this application.

5 Patent Document 1: Japanese Patent No. 2861928
 Patent Document 2: JP Laid-open Utility Model Publication No. H07-053777
 Patent Document 3: Japanese Patent No. 2602176

BACKGROUND OF THE INVENTION

(Field of the Invention)

[0002] The present invention relates to a punch press which performs a punching process on a sheet material and, more particularly, to the improvement in a die replacement work.

10 **[0006]** Removal of the die holder in part or whole of the die holder as disclosed in the patent document 1 referred to above requires, in addition to the die replacement work, a heavy and arduous work to remove the die holder relative to the lower turret. Therefore, a substantial amount of time is required, and also the attendant worker is loaded too much. The use of the mechanism for replacement of the die holder such as disclosed in the patent document 2 referred to above tends to render the equipment to be bulky. In addition, according to the patent document 3 referred to above, the need is realized to increase the outer diameter of the lower turret to a value greater than the outer diameter of the upper turret.

(Description of Related Art)

SUMMARY OF THE INVENTION

[0003] By way of example, a turret punch press includes a die holder disposed in a lower turret, which defines an integrated die support body, and a die supported by the die holder, which defines a lower tool. When it comes to replacement of the die, a replacement work is carried out with an attendant worker's hand or a tool inserted between upper and lower turrets. This replacement work is difficult to accomplish because a die placement section of the die holder is hidden beneath the upper turret and is not therefore readily available within the sight. In particular, in the case of the die holder in which a plurality of dies are supported having been juxtaposed relative to each other in a radial direction of the lower turret, the attendant worker's hand would hardly reach, from below the lower turret, the die situated at a far deep side as viewed from an outer periphery of the lower turret and, hence, the replacement is substantially impossible to achieve.

25 **[0007]** In view of the foregoing problems and inconveniences inherent in the prior art, the present invention has for its object to provide a punch press that is simple in structure and make it possible to easily and efficiently perform the replacement of the die relative to an integrated die support body such as, for example, the lower turret.

[0004] In view of the above, so that the work to replace the die may be facilitated, suggestions have been made, for example, to make a portion of the die holder to be removable and to enable the die holder to be removable from the lower turret such as disclosed in the patent document 1 listed below. Also, another suggestion has been made to enable the die holder to be removable from the lower turret and to use a mechanism for replacing the removed die holder with a die holder for a tool magazine that is provided separate from the lower turret such as disclosed in, for example, the patent document 2 listed below. In addition, the patent document 3, for example, discloses that the lower turret has its outer diameter greater than the outer diameter of the upper turret so as to provide a space above the die for replacement purpose.

30 **[0008]** In order to accomplish the foregoing object of the present invention, a punch die designed and herein disclosed in accordance with the present invention includes: a plurality of punches; a plurality of dies configured to perform a punching process in cooperation with the punches; an integrated punch support body, on which the punches are mounted; and an integrated die support body positioned below the integrated punch support body and having the dies mounted thereon. The integrated die support body referred to above is such that the plurality of the dies are juxtaposed along a rim of the integrated die support body. This integrated die support body includes an integrated die support main body and an in-and-out moving body that is configured to enable at least a portion thereof to assume a condition emerging out of the rim of the integrated die support body while connection of the in-and-out moving body with the integrated die support main body is retained. In such case, some of the dies disposed in the integrated die support body are disposed in the in-and-out moving body.

45 **[0009]** According to the present invention, while at least a portion of the in-and-out moving body is brought out of the rim of the integrated die support body, the die mounted on the in-and-out moving body is replaced with a different die, or once the die is removed and is subjected to a process such as, for example, grinding, the die once removed is remounted. Since the in-and-out moving body

is in position brought to the outside of the integrated die support body, a large space is available between upper and lower sides of the die mounting area of the die holder and, at the same time, the die can be well ascertained with the worker's eyes. Therefore, the die replacement work can be easily, assuredly and safely accomplished. Since the plurality of dies are mounted on the in-and-out moving body, bringing one in-and-out moving body out of the rim of the integrated die support body makes it possible to replace the plurality of dies, and the efficiency is hence good. The in-and-out moving body is held in a condition emerged out of the rim of the integrated die support body while the connection with the integrated die support body is maintained. Accordingly, unlike the type in which the in-and-out moving body is removed, the in-and-out moving body, brought to the outside of the integrated die support body, can be secured at a proper position and the die replacement work can be easily accomplished.

[0010] In a preferred embodiment of the present invention, the integrated die support body may be a turret. In the case where the integrated die support body is a turret, a number of the dies can be mounted on the turret. Accordingly, the advantage of the present invention, in which the replacement of the die relative to the integrated die support body such as, for example, the lower turret can be easily and efficiently accomplish, becomes effective.

[0011] In another preferred embodiment of the present invention, the in-and-out moving body referred to above may be rotatable about a traverse center shaft, provided in the integrated die support main body, to be movable in and out with respect to the rim of the integrated die support body. The construction, in which the in-and-out moving body can traverse about the traverse center shaft, makes it possible for the in-and-out moving body to be precisely brought into and out of the rim of the integrated die support body, as compared with the construction in which the in-and-out moving body is selectively advanced and retracted in a linear direction. Also, a mechanism for bringing the in-and-out moving body in and out is rendered to be simplified, and can therefore be manufactured inexpensively.

[0012] In a further preferred embodiment of the present invention, the punch press may further include a plurality of die holders removably secured to the in-and-out moving body, in which case the plurality of the dies are mounted individually or in a plural number on each of the die holders. The number of the dies that can be mounted on one die holder is not specifically limited. If the die is mounted on the in-and-out moving body through the die holder, a variety of types of dies can be mounted on the in-and-out moving body by replacing the die holder with that appropriate to the die.

[0013] Any combination of at least two constructions, disclosed in the appended claims and/or the specification and/or the accompanying drawings should be construed as included within the scope of the present invention. In

particular, any combination of two or more of the appended claims should be equally construed as included within the scope of the present invention.

5 BRIEF DESCRIPTION OF THE DRAWINGS

[0014] In any event, the present invention will become more clearly understood from the following description of preferred embodiments thereof, when taken in conjunction with the accompanying drawings. However, the embodiments and the drawings are given only for the purpose of illustration and explanation, and are not to be taken as limiting the scope of the present invention in any way whatsoever, which scope is to be determined by the appended claims. In the accompanying drawings, like reference numerals are used to denote like parts throughout the several views, and:

Fig. 1 is a schematic side view of a punch press according to a preferred embodiment of the present invention;

Fig. 2 is a perspective view of the punch press with a portion removed away;

Fig. 3 is a schematic top plan view of a lower turret used in the punch press;

Fig. 4 is a perspective view showing a lower turret of the punch press with one of in-and-out moving bodies emerged out of the rim of the lower turret;

Fig. 5 is a perspective view showing an in-and-out moving body disposed portion of the lower turret;

Fig. 6 is a schematic sectional view showing a traversing support unit of the in-and-out moving body in the lower turret;

Fig. 7A is a schematic top plan view showing a fixture unit for the in-and-out moving body;

Fig. 7B is a cross sectional view taken along the line VIIB-VIIB in Fig. 7A;

Fig. 7C is a cross sectional view taken along the line VIIC-VIIC in Fig. 7A;

Fig. 8A is a schematic top plan view showing a portion of the lower turret; and

Fig. 8B is a cross sectional view taken along the line VIIIB-VIIIB in Fig. 8A.

45 DESCRIPTION OF PREFERRED EMBODIMENTS

[0015] The present invention will now be described in detail in connection with a preferred embodiment thereof with reference to the accompanying drawings. In particular, Fig. 1 is a schematic side view of a punch press in its entirety according to the preferred embodiment of the present invention, and Fig. 2 is a perspective view showing the punch press with a portion thereof removed. The illustrated punch press is of a type having upper and lower turrets 2 and 3. It is to be noted that the upper turret 2 is not shown in Fig 2 for the sake of brevity. Each of the upper and lower turrets 2 and 3 is of a substantially flat round configuration, and those upper and lower turrets

2 and 3 are supported respectively by upper and lower horizontal frame sections 1a and 1b of a press frame structure 1 for rotation coaxially about associated vertical shafts. The upper turret 2 forms an integrated punch support body and has a plurality of punches 4 arranged in line along a rim of the upper turret 2. On the other hand, the lower turret 3 forms an integrated die support body and has a plurality of dies 5 arranged in a line along a rim of the lower turret 3. It is to be noted that the term "rim" referred to above and hereinafter means an outer peripheral edge of each of the turrets 2 and 3.

[0016] When the upper and lower turrets 2 and 3 are synchronously driven by a motor (not shown), a pair of a punch 4 and a die 5 are successively indexed to assume a processing station P. When the punch 4, which are brought to the processing station P, is driven via a ram 7 by a punch drive source 8 such as, for example, a drive motor so as to lower to a descended position, the punch 4 cooperates with the die 5 to perform a punching process on a sheet material W.

[0017] As shown in Fig. 1, the sheet material W is fed, by a sheet material feeding unit 13, on a table in a forward and rearward direction and/or in a leftward and rightward direction so that a portion of the sheet material W to be processed can be brought to the processing station P. The sheet material feeding unit 13 includes a carriage 15 movable in the forward and rearward direction (Y direction), a cross slide 16 movable in the leftward and rearward direction (X direction), which slide 16 is mounted on the carriage 15, and a work holder 17 for holding one end of the sheet material W, which holder 17 is mounted on the cross slide 16.

[0018] Fig. 3 illustrates a schematic top plan view of the lower turret 3, and Fig. 4 is a perspective view showing the lower turret 3 in a condition different from that shown in Fig. 3. The lower turret 3 includes a lower turret main body 21 which defines an integrated die support main body, and a plurality of, for example, four in-and-out moving bodies 22 juxtaposed one after another in a circumferential direction along the rim of an upper surface of the lower turret main body 21. A plurality of die holders 23 are removably secured to the upper surface of the lower turret main body 21 or the in-and-out moving bodies 22, and the dies 5 are disposed respectively in each of the die holders 23. In the present embodiment, one or two dies 5 are disposed on one die holder 23, but three or more dies 5 may be disposed on one die holder 23.

[0019] A center portion of the lower turret main body 21 is provided with a sheet material feeding table 24 having its upper surface substantially level with an upper surface of each of the dies 5. It is to be noted that two of the in-and-out moving bodies 22, which are depicted on an upper portion of the figure of Fig. 3, are shown as in a condition having no die holder 23 provided therein.

[0020] As shown in Fig. 5, the in-and-out moving body 22 is supported by the lower turret main body 21 for rotation about a traverse center shaft 25 that is positioned in the vicinity of one circumferential end of the in-and-out

moving body 22. The in-and-out moving body 22 is switchable between a use position (shown by the solid line in Fig. 3), at which the whole thereof is inside of the rim of the lower turret 3, and a replacement position (shown by the double dotted line in Fig. 3) at which a major portion thereof is outside of the rim of the lower turret 3. At the use position, the in-and-out moving body 22 is positioned having been brought into contact with a positioning member 26 provided in the upper surface of the lower turret main body 21 so as to protrude therefrom. A fixture unit 27 for fixing the in-and-out moving body 22 in the use position in the vicinity of the circumferentially opposite end of the in-and-out moving body 22 is provided so as to extend between the lower turret main body 21 and the in-and-out moving body 22.

[0021] At the replacement position, the die 5 mounted on each of the die holder 23 provided in the in-and-out moving body 22 is held in condition having been emerged out of the rim of the lower turret 3. It is, however, to be noted that all of the dies 5 mounted on the corresponding die holders 23 provided in the in-and-out moving body 22 may not be necessarily brought out of the rim of the lower turret 3 and a portion of the dies 5 may be positioned inside of the rim of the lower turret 3. In the present embodiment, with the in-and-out moving body 22 held at the use position, the single die 5 (shown by 5X in Fig. 3), which is positioned in the vicinity of the traverse center shaft 25, is positioned inside of the rim of the lower turret 3, but the position thereof is so close to the rim that an attendant worker's hand can make an easy access to the die 5X from the outer periphery of the lower turret 3. Therefore, no problem will arise during execution of a die replacement work as will be discussed later.

[0022] As discussed above, where a plurality of dies 5 are mounted on the in-and-out moving body 22, at the replacement position one or some of the dies 5 may be positioned inside of the rim of the lower turret 3 as long as the attendant worker's hand can make access to them from the outer periphery of the lower turret 3. It is to be noted that the wording "one or some of the dies 5" means not all of the dies 5 regardless of the number of the dies used.

[0023] Fig. 6 illustrates a sectional view of a traverse support unit for the in-and-out moving body 22 about the traverse center shaft 25. The traverse center shaft 25 referred to above is in the form of a stepped shaft including a large diameter portion 25a and a reduced diameter portion 25b. The large diameter portion 25a is engaged in a recessed area 30 defined in the upper surface of the lower turret main body 21. The reduced diameter portion 25b is rotatably engaged in a throughhole 31, defined in the in-and-out moving body 22, through a bushing 32. The traverse center shaft 25 is, when a bolt 33 inserted from a bolt insertion hole defined in the bottom surface of the lower turret main body 21 is threaded into an internally threaded hole defined in the large diameter portion 25a, fixed to the lower turret main body 21. In this way, the in-and-out moving body 22 is supported for

traversal movement (i.e., rotation) about the traverse center shaft 25.

[0024] The bushing 32 referred to above has its upper portion formed with a collar 32a which is placed on a counter sunken portion defined in an upper portion of the throughhole 31, and is fixed to the in-and-out moving body 22 by means of a bolt 34 inserted into the collar 32a. The reduced diameter portion 25b of the traverse center shaft 25 has its outer peripheral surface formed with a plurality of circumferentially extending grease reserving grooves 35.

[0025] Also, a restraint member 36 is fitted from above to the traverse center shaft 25 by means of a bolt 37, and the restraint member includes a collar portion 36a placed onto an upper surface of the collar 32a of the bushing 32, whereby the in-and-out moving body 22 and the bushing 32 are prevented from separating from the traverse center shaft 25. It is to be noted that, in a condition in which the restraint member 36 is in contact with an upper end face of the traverse center shaft 25, a minute dimension is formed between the collar 36a of the restraint member 36 and the bushing 32.

[0026] Fig. 7A illustrates a schematic top plan view showing a fixture unit 27 for the in-and-out moving body 22 and Figs. 7B and 7C are a cross sectional view taken along the lines VIIB-VIIB and VIIC-VIIC in Fig. 7A, respectively. The fixture unit 27 includes a female screw member 41 engageable in a recess 40, defined in the upper surface of the lower turret main body 21, a bolt insertion member 42 provided in the in-and-out moving body 22, and a fixing bolt 43. It is to be noted that Figs. 7A and 7C illustrate the fixture unit 27 with no fixing bolt 43 employed.

[0027] The female screw member 41 is fixed to the lower turret main body 21 by a bolt 45 inserted from a bottom surface of the lower turret main body 21. The bolt insertion member 42 referred to above has its lower portion defining a mounting area 42a, which spreads in a flat plate shape, and is fixed at this mounting area 42a to the in-and-out moving body 22 by a bolt 46. The female screw member 41 and the bolt insertion member 42 are formed respectively with a threaded hole 47 and a bolt insertion hole 48 that are held in coaxial relation with each other. The threaded hole 47 and the bolt insertion hole 48 are inclined inwardly from the outer periphery of the lower turret in a direction radially of the lower turret. When the fixing bolt 43 is inserted from the lower turret outer diametric side into the bolt insertion hole 48 and a threaded portion thereof is then threaded into the threaded hole 47. By so doing, the in-and-out moving body 22 is fixed to the lower turret main body 21.

[0028] As described above, the structure is employed in which, when the in-and-out moving body 22 is turned about the traverse center shaft 25, the in-and-out moving body 22 can be moved selectively inside and outside of the rim of the lower turret 3. Accordingly, the in-and-out moving body 22 can be precisely brought in and out, and also a mechanism for drawing the in-and-out moving

body 22 in and out can be simplified and is therefore assembled inexpensively. Also, since the fixture unit 27 is of such a design that the fixing bolt 43 can be advanced and retracted in a diagonally downward direction, an operation to loosening and fastening the fixing bolt 43 from the lower turret outer diametric side can be easily accomplished. It is to be noted that the traverse center shaft 25 referred hereinbefore may be fixed to the in-and-out moving body 22, but rotatable relative to the lower turret 3.

[0029] Figs. 8A and 8B are a schematic top plan view and a schematic sectional view, both showing a portion of the lower turret 3 and, specifically, a mounting area for the die holder 23 shown by the outline arrow in Fig. 3. The die holder 23 is of a type designed to support two dies 5 (5A and 5B) with respect to the in-and-out moving body 22. For example, the die 5A represents a substantially round shape in top plan representation and has a rectangular perforating hole 5Aa defined in a center portion thereof. Also, the die 5B represents a substantially round shape in top plan representation and has a round perforating hole 5Ba defined in a center portion thereof. The die holder 23 is of a generally sector shape flaring in a direction radially outwardly of the lower turret 3, and is secured to the in-and-out moving body 22 by means of a plurality of bolts 50 inserted from a bottom surface of the in-and-out moving body 22.

[0030] Each of the dies 5 is engaged in a die holding recess 51 in the form of a counter sunken bore defined in an upper surface of the die holder 23, and is seated on an annular bottom surface of the die holding recess 51 with its upper end protruding outwardly beyond the upper surface of the die holding recess 51. A slug discharge hole 52 of a diameter smaller than the die holding recess 51 extends downwardly from the bottom surface of the die holding recess 51. The slug discharge hole 52 is communicated with a slug dropout hole 53 defined in the in-and-out moving body 22 and also with a slug dropout hole 54 defined in the lower turret 3.

[0031] A flat plate shaped table 56 is provided on an upper portion of the die holder 23, and a plurality of brushes 57 are implanted in the table 56 so as to be oriented upwardly for supporting the sheet material W from below. Also, brushes 58 similar to the brushes 57 are also implanted on the table 24 of the lower turret main body 21 so as to be oriented upwardly. It is, however, to be noted that in place of those brushes 57 and 58, ball bearings (not shown) may be employed and disposed on the tables 24 and 56.

[0032] Figs. 8A and 8B illustrate only one of a plurality of die holders 23 for the purpose of illustration, but except for number of the dies 5 mounted, the dimension and shape, the remaining die holders 23 are basically similar in structure to that shown in Figs. 8A and 8B.

[0033] As shown in Figs. 3 and 4, the lower turret 3 includes the die holders 23, fixed to the lower turret main body 21, and the die holders 23 fixed to the in-and-out moving body 22. In the present embodiment, the number of the die holders 23 fixed to the lower turret main body

21 is two, and those two die holders 23 are disposed on respective sides opposite to each other with respect to the center O of the lower turret 3. Those two die holders 23 are each used to accommodate a relatively large die 5. The number of the in-and-out moving body 22 is four, and each of the four in-and-out moving body 22 has six or eight die holders 23 fixed thereto.

[0034] The two in-and-out moving bodies 22 having the six die holders 23 fixed thereto are disposed at respective positions opposite to each other with respect to the center of the lower turret 3. Similarly, the two in-and-out moving bodies 22 having the eight die holders 23 fixed thereto are also positioned at respective positions opposite to each other with respect to the center of the lower turret 3. Also, each of the in-and-out moving bodies 22 is capable of traversing about the traverse center shaft 25 on the same side of a lower turret circumferential direction. In other words, each of the in-and-out moving bodies 22 and each of the die holders 23 are disposed in point symmetry. While the number and the disposition of the foregoing is one example shown and described for the purpose of illustration, the in-and-out moving bodies 22 and/or the number and the disposition of the die holders 23 provided in the in-and-out moving bodies 22 are not limited to those shown and described. For example, the number of the in-and-out moving bodies 22 used may be within the range of one to three or not smaller than five.

[0035] In the punch press of the construction hereinabove described, during use, all of the in-and-out moving bodies 22 are positioned at the use position and are fixed in position by means of the fixing units 27. When it comes to the replacement of the die 5, the in-and-out moving body 22 having mounted thereon the die 5 desired to be replaced is positioned at the replacement position. Since at the replacement position, a relatively large space is available between upper and lower sides of the die mounting portion of the die holder 23 and, also, the die mounting portion can be well viewable and ascertained with the worker's eyes, the replacement of the die 5 can be easily, assuredly and safely accomplished.

[0036] Since a plurality of dies 5 are mounted on the in-and-out moving body 22, a plurality of dies 5 can be replaced with only one in-and-out moving body 22 brought to the replacement position, and, therefore, the efficiency is high. Since the in-and-out moving body 22 is held in position emerged out of the rim of the lower turret 3 while the connection thereof with the lower turret main body 21 is maintained, the in-and-out moving body 22 then at the replacement position can be secured at a proper position, and therefore, the work to replace the die 5 can be easily accomplished.

[0037] If the die holder 23, in which the dies 5 tending to be replaced at a high frequency are provided, is collectively mounted on the same in-and-out moving body 22, the frequency of the in-and-out moving body 22 brought in and out can be reduced, allowing the efficiency of the work to replace to be increased. Also, even when the dies 5, which are used in processing one product,

are collectively provided in the same in-and-out moving body 22, the efficiency of the work to replace can be similarly increased.

[0038] If, as is the case with the above described embodiment, the dies 5 are disposed on the lower turret main body 21 of the lower turret 3 or the in-and-out moving body 22 through the die holders 23, replacement of the die holders 23 with ones appropriate to the dies 5 makes it possible that a variety of dies 5 are disposed on the lower turret 3 which defines the integrated die support body. It is, however, to be noted that without the die holders 23 used the dies 5 may be disposed directly on the lower turret main body 21 or the in-and-out moving body 22.

[0039] Although the present invention has been fully described in connection with the preferred embodiments thereof with reference to the accompanying drawings which are used only for the purpose of illustration, those skilled in the art will readily conceive numerous changes and modifications within the framework of obviousness upon the reading of the specification herein presented of the present invention. Although, in describing the preferred embodiment of the present invention, reference has been made to the turret punch press, the present invention is not necessarily limited thereto and can be applicable to any punch press other than the turret type. For example, the present invention can be equally applicable to a punch press of the type in which each of the integrated punch support body and the integrated die support body is of a rectangular configuration.

[0040] Accordingly, such changes and modifications are, unless they depart from the scope of the present invention as delivered from the claims annexed hereto, to be construed as included therein.

Reference Numerals

[0041]

- 2 Upper turret (Integrated punch support body)
- 3 Lower turret (Integrated die support body)
- 4 Punch
- 5 Die
- 21 Lower turret main body (Integrated die support main body)
- 22 In-and-out moving body
- 23 Die holder
- 25 Traverse center shaft

Claims

1. A punch press which comprises:

a plurality of punches;
a plurality of dies configured to perform a punching process in cooperation with the punches;
an integrated punch support body, on which the

punches are mounted; and
an integrated die support body positioned below
the integrated punch support body and having
the dies mounted thereon, wherein:

5

the integrated die support body is of such a
design that the plurality of the dies are jux-
taped along a rim of the integrated die
support body;

10

the integrated die support body includes an
integrated die support main body and an in-
and-out moving body that is configured to
enable at least a portion thereof to assume
a condition emerging out of the rim of the
integrated die support body while a connec-
tion of the in-and-out moving body with the
integrated die support main body is re-
tained; and

15

some of the dies disposed in the integrated
die support body are disposed in the in-and-
out moving body.

20

2. The punch press as claimed in claim 2, wherein the
integrated die support body is a turret.

25

3. The punch press as claimed in claim 1 or 2, wherein
the in-and-out moving body is rotatable about a
traverse center shaft, provided in the integrated die
support main body, to be movable in and out with
respect to the rim of the integrated die support body.

30

4. The punch press as claimed in any one of claims 1
to 3, further comprising a plurality of die holders re-
movably secured to the in-and-out moving body, the
dies being mounted individually or in a plural number
on each of the die holders.

35

40

45

50

55

Fig. 1

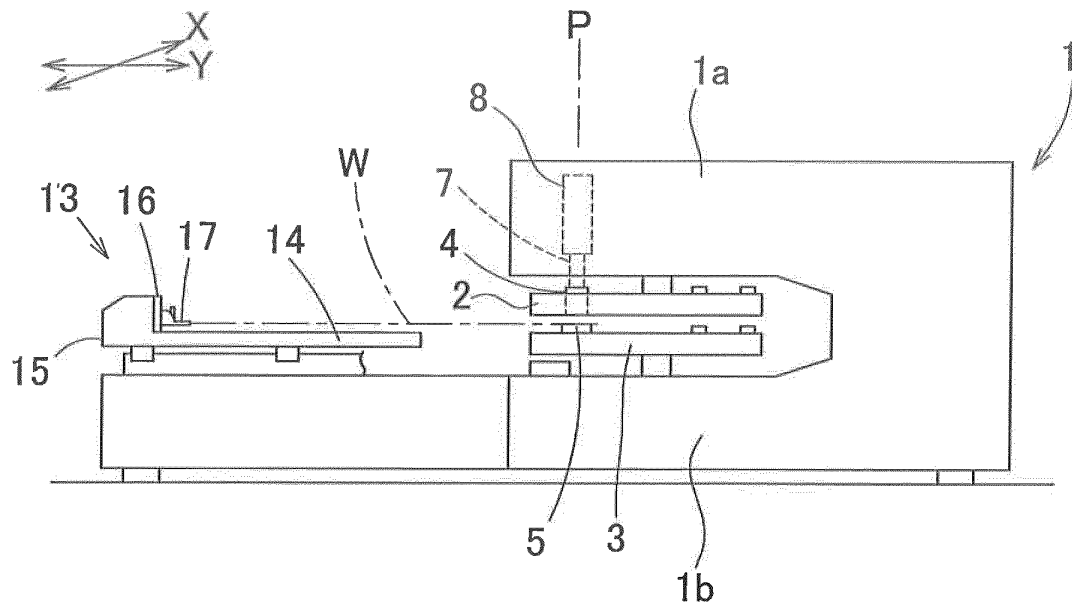
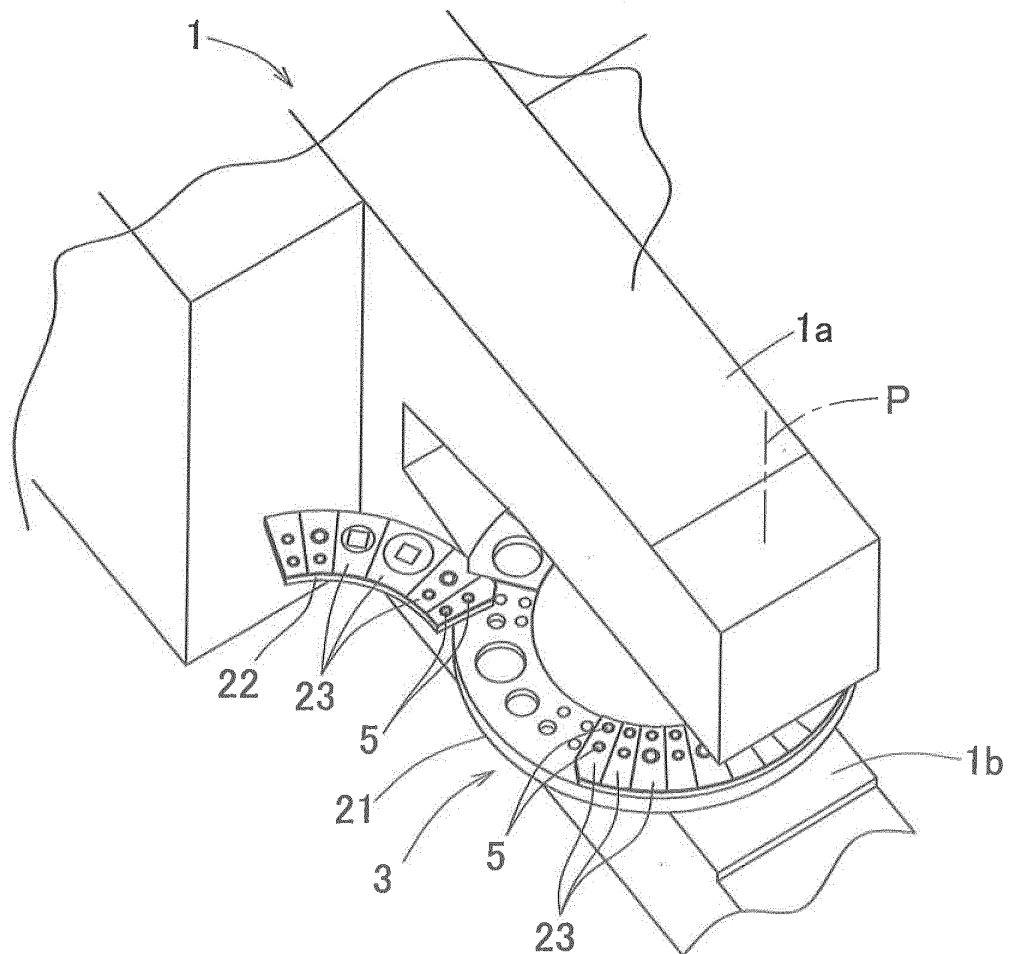
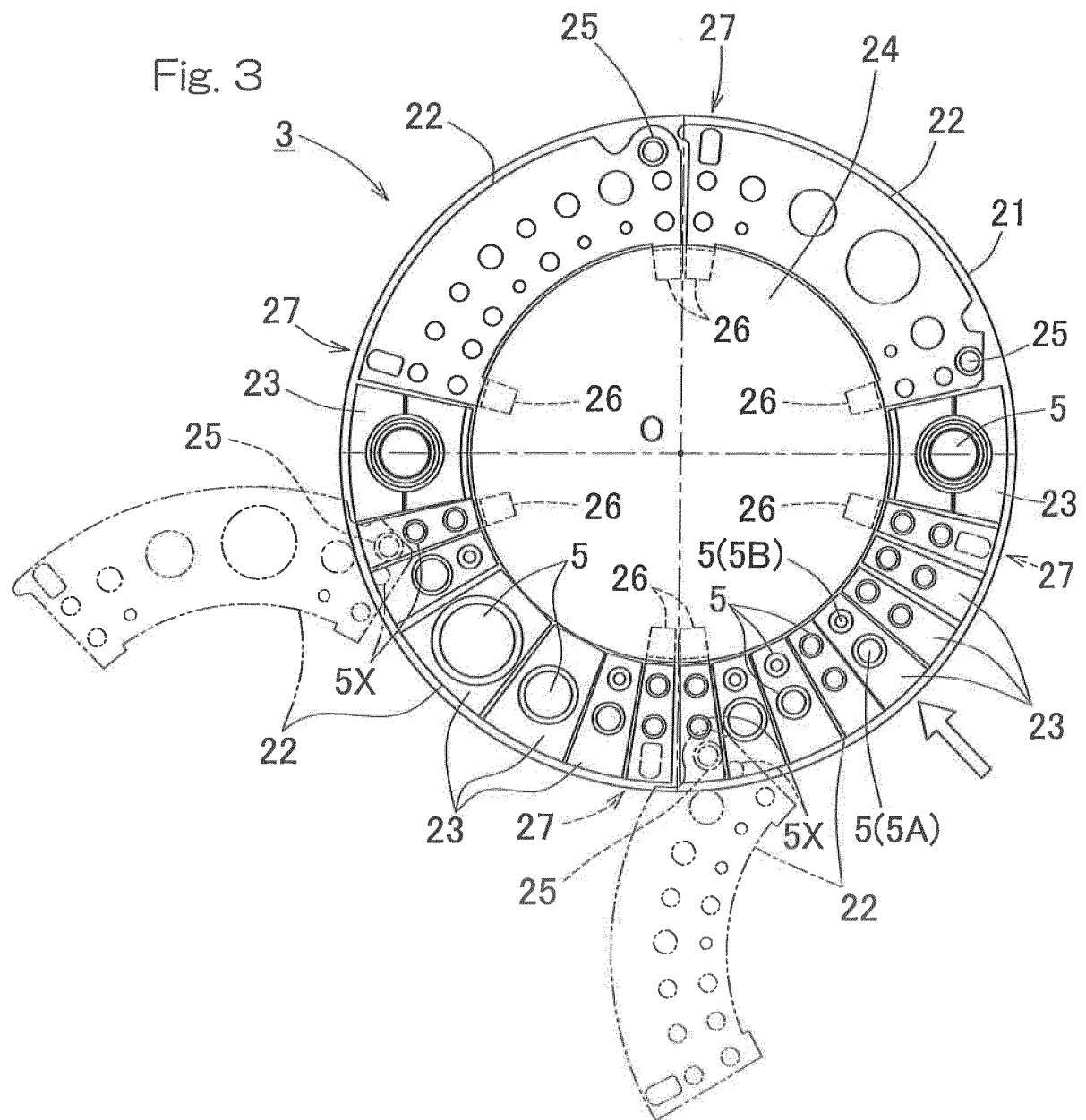
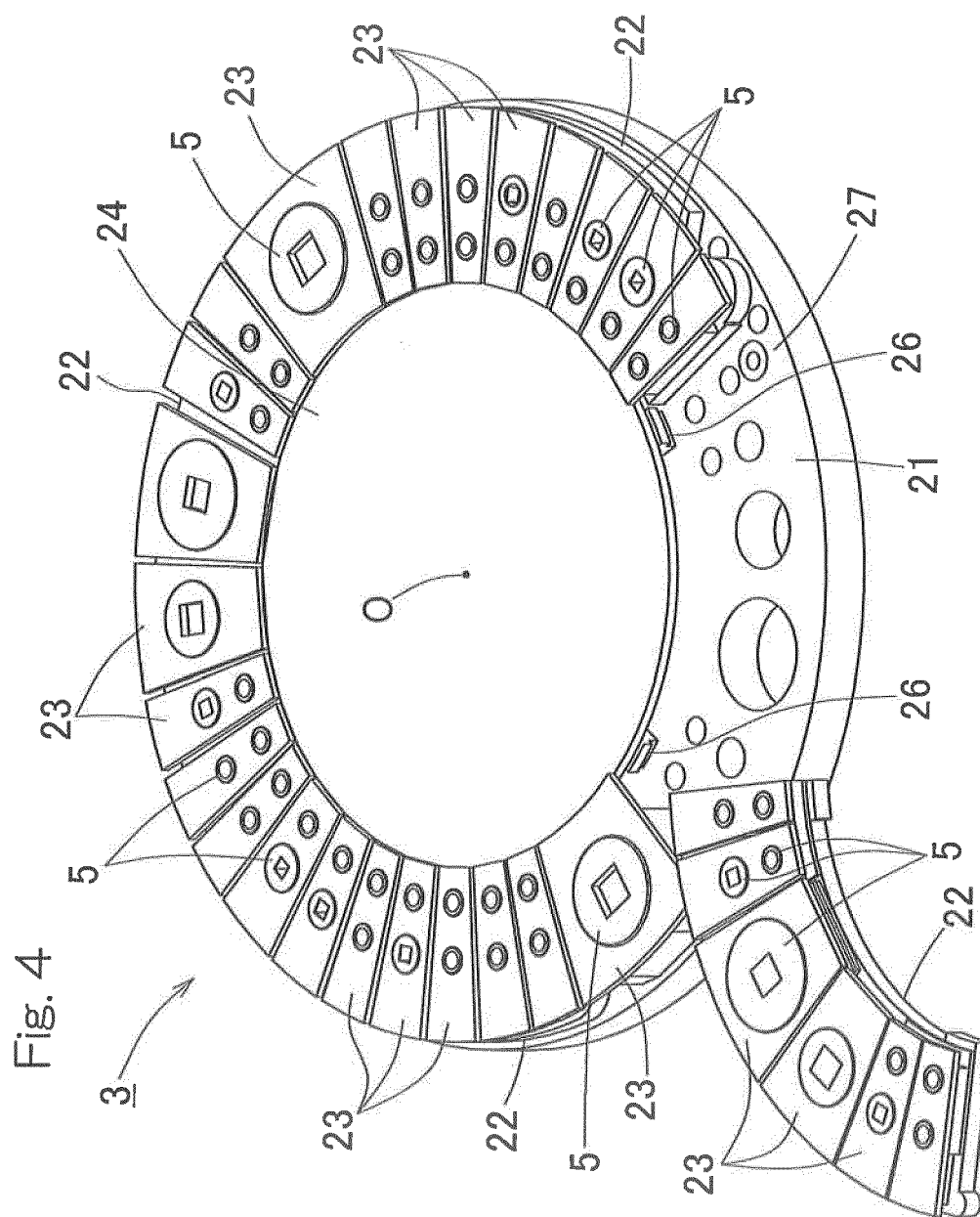


Fig. 2







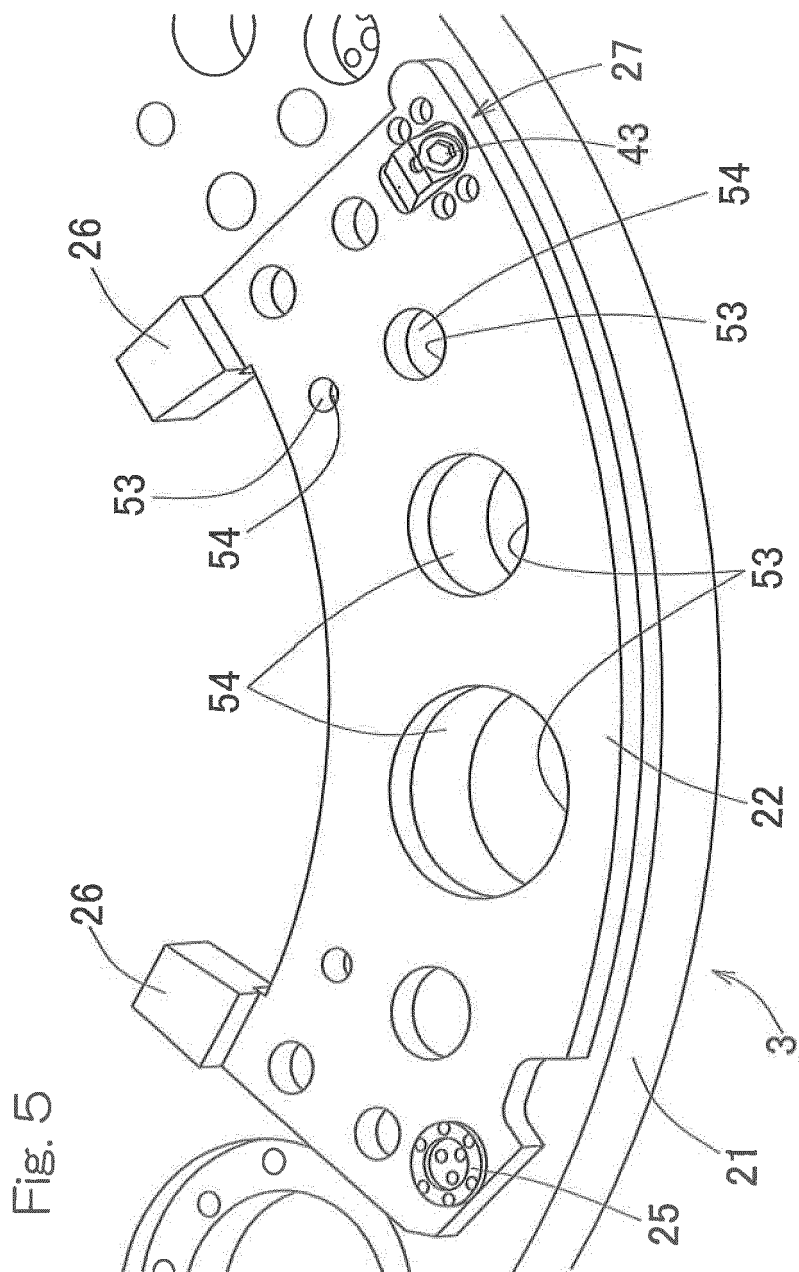


Fig. 6

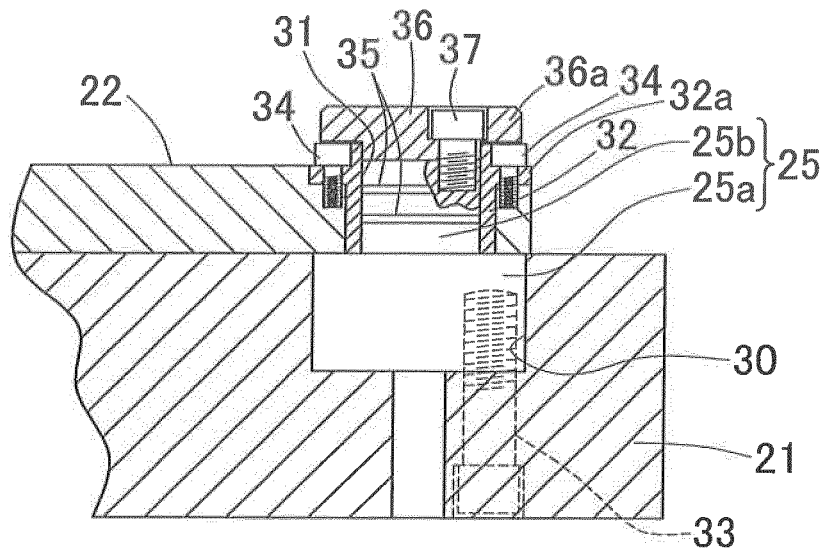


Fig. 7A

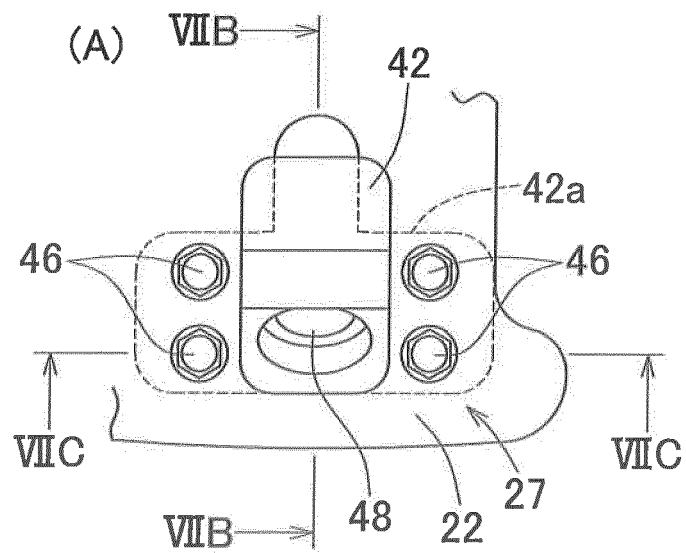


Fig. 7B

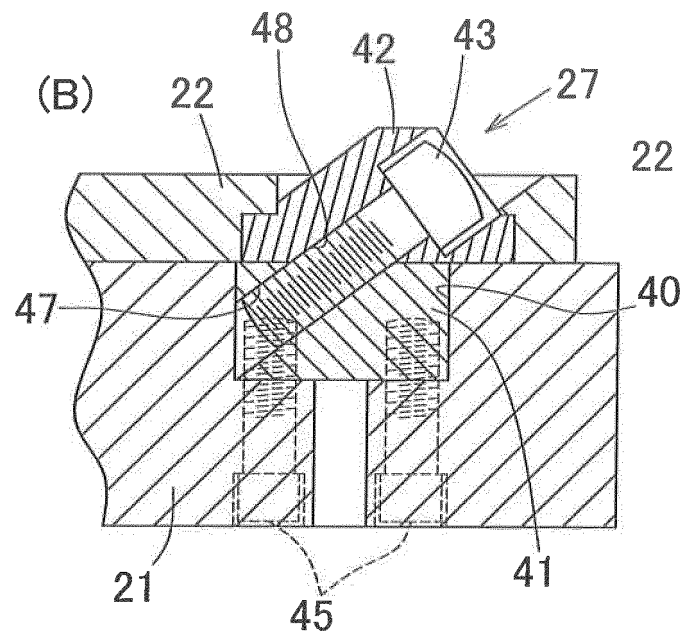
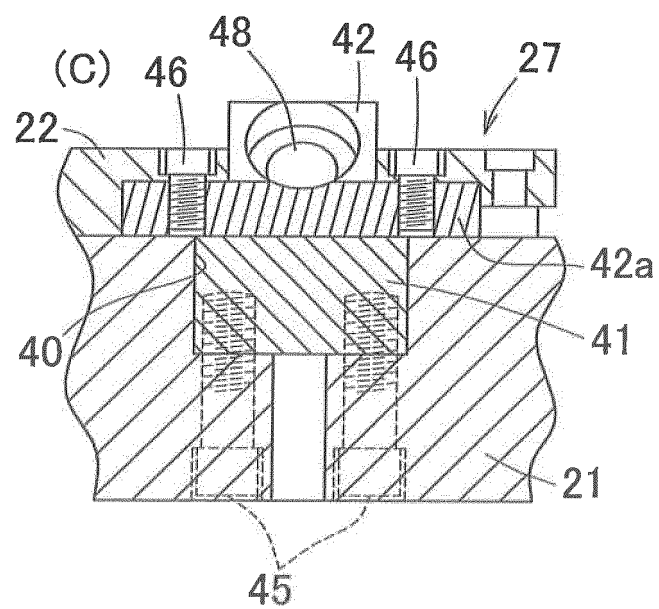
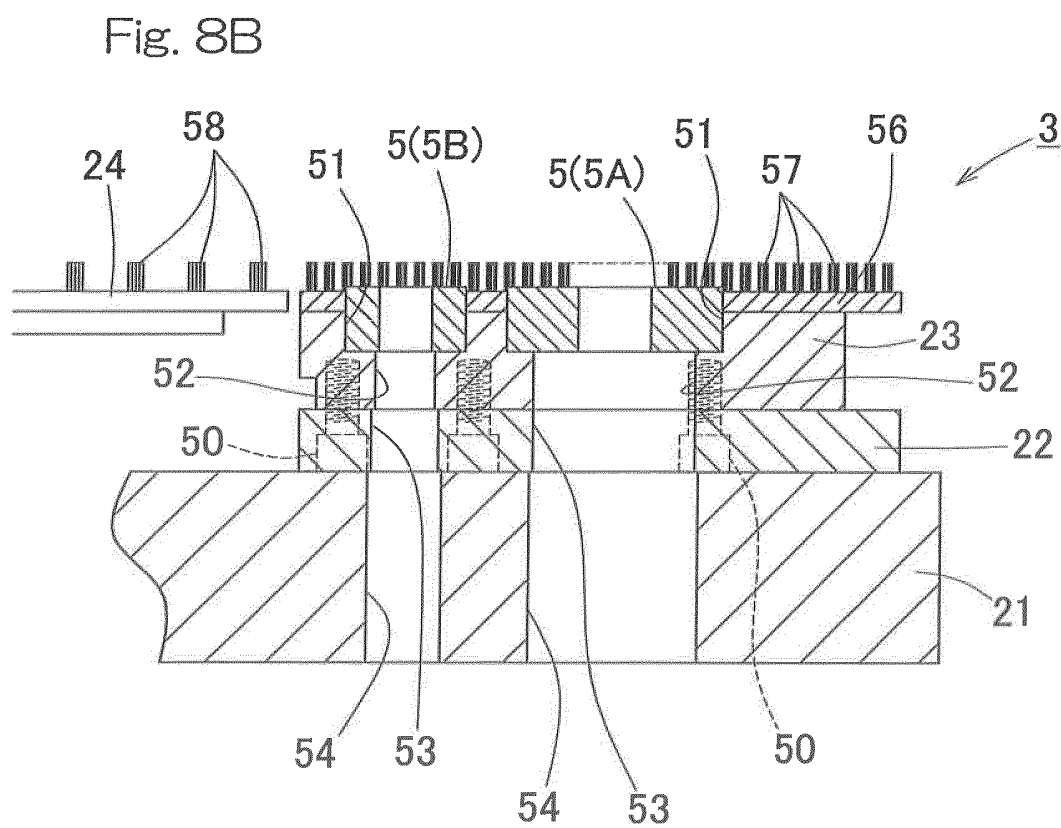
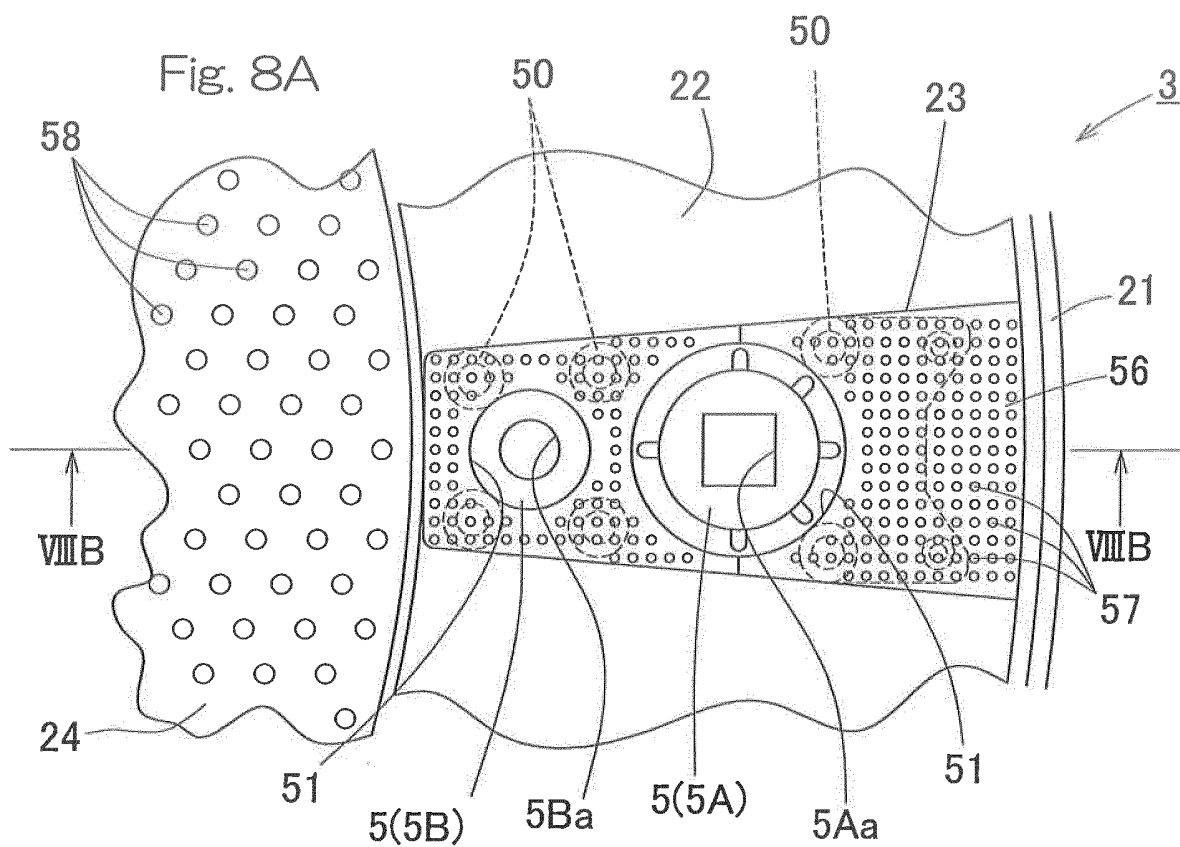


Fig. 7C





INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/060551

A. CLASSIFICATION OF SUBJECT MATTER

B21D28/34(2006.01)i, B21D28/36(2006.01)i, B21D37/14(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B21D28/34, B21D28/36, B21D37/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2014

Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2012-106248 A (Murata Machinery Ltd.), 07 June 2012 (07.06.2012), claim 1; paragraphs [0021] to [0022]; fig. 2 & WO 2010/106902 A1	1-4
A	US 2009/0019977 A1 (WILSON TOOL INTERNATIONAL INC.), 22 January 2009 (22.01.2009), paragraphs [0055] to [0056]; fig. 9 & WO 2009/012028 A1	1-4

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent 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 when the document is taken alone

"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

Date of the actual completion of the international search
13 June, 2014 (13.06.14)Date of mailing of the international search report
24 June, 2014 (24.06.14)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2013109586 A [0001]
- JP 2861928 B [0005]
- JP H07053777 A [0005]
- JP 2602176 B [0005]