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(71) Applicant:
SALVAGNINI ITALIA S.p.A.
I-36040 Sarego (Vicenza) (IT)

(72) Inventors:
- **Venturini, Gianfranco**
  37044 Cologna Veneta (Verona) (IT)
- **Zaccaria, Flavio**
  36040 Grumolo Delle Abbadesse (Vicenza) (IT)

(74) Representative:
Mittler, Enrico et al
c/o Mittler & C. s.r.l.,
Viale Lombardia, 20
20131 Milano (IT)

(54) Improved punching machine for metal sheet panels

(57) Punching machine for metal sheet panels comprising a work table (1), a bearing structure (2; 2', 2") for punching means (4', 4") having a groove (3) where said work table passes through, and moving means (13, 14; 13, 60) for a panel on said work table to bring the panel in correspondence of said punching means, characterised in that said punching means comprise two punching units (4', 4") that are mounted to said bearing structure (2; 2', 2") and are substantially facing one another.

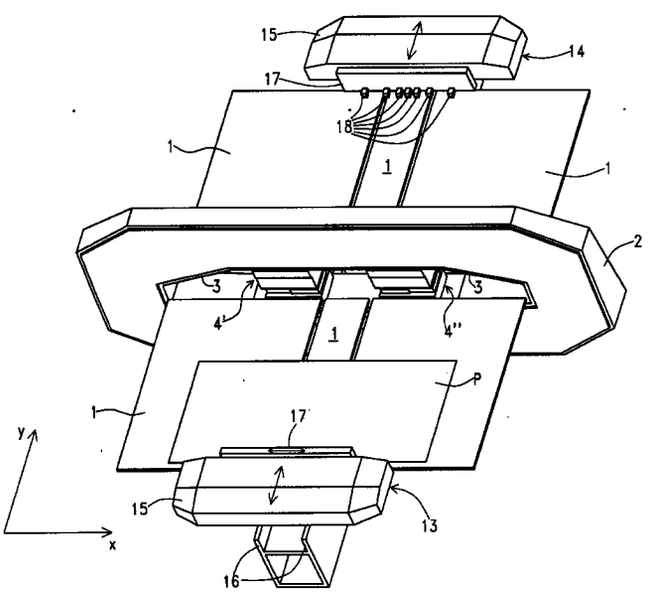

Fig.1

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Description

[0001] The present invention refers to an improved punching machine for metal sheet panels.

[0002] As known, punching machines for metal sheet panels generally comprise a work table for a panel to be punched, a "C" shape or an "arched" annular bearing structure, having a groove where the work table passes through and to which a punching head is mounted, and moving means (manipulator) for the panel to be punched on the work table to hold the panel at one of its sides and to bring it in correspondence of the punching head.

[0003] Since in general the panel must be punched in points even very distant from each other, for example along all the sides of the same, the manipulator must also have an extended stroke in order to be able to bring all those points of the panel that have to be punched in correspondence of the punching head. According to the dimension of the panel such stroke can be so extended to make it necessary to carry out the movement of the panel in successive stages, getting hold of the panel, moving it by a certain length, releasing it, bringing the manipulator back to its original position, getting again hold of the panel and then going on with the movement of the same. Obviously, this slows machining time considerably.

[0004] In view of the state of the art described, object of the present invention has been to provide a punching machine that would solve the problem pointed out above.

[0005] According to the present invention, such object is attained thanks to a punching machine for metal sheet panels comprising a work table, a bearing structure for punching means having a groove where said work table passes through, and moving means for a panel on said work table to bring the panel in correspondence of said punching means, characterised in that said punching means comprise two punching units that are mounted to said bearing structure and are substantially facing one another.

[0006] The characteristics and the advantages of the present invention will be rendered more evident by the following detailed description of some embodiments thereof, illustrated as non-limiting examples in the enclosed drawings, in which:

Figure 1 shows in axonometry a punching machine according to a first embodiment of the present invention;

Figure 2, 3 and 4 are plan views of the punching machine of Figure 1, showing three different operating conditions;

Figure 5 is sectional view along line V-V of Figure 3;

Figure 6 shows, in a sectional view analogous to the one of Fig. 5, a first variation of the punching machine according to the first embodiment;

Figure 7 shows, in a sectional view analogous to the one of Fig. 5, a second variation of the punching machine according to the first embodiment;

Figure 8 shows a punching machine in accordance with a second embodiment of the present invention, in axonometry;

Figure 9 is a plan view of the punching machine of Figure 8, in a particular operating condition; and

Figure 10 is section along line X-X of Figure 9.

[0007] With reference to the drawings, in Figures 1 to 7 there is shown a punching machine according to a first embodiment of the present invention. Such punching machine comprises a work table 1 for the panels to be machined, and a bearing structure 2 that can have a substantially close arched annular shape, as in Figures 1 to 6, or that can be made of two substantially facing "C" shape or "arched" structures 2', 2", as in Figure 7. In both cases, the bearing structure 2 has a central groove 3 through which the work table 1 passes.

[0008] Two substantially facing punching heads 4', 4" are mounted to the bearing structure 2, inside the groove 3. Each punching head comprises two overlapping parallelepiped blocks 5 and 6, the first known as punch holder block, fixed to the upper part of the bearing structure 2 and provided with one or more punching tools, the second, known as matrix holder block, fixed instead to the lower part of the bearing structure 2 and below the work table 1 and provided with respective matrix dies for the punching tools. In the example shown in the drawings, the two punching heads are of the "multi-press" type, that is, each one provided in the punch holder block 5 with a plurality of punching tools 7 (small tools), 8 (large tools) having variable dimensions and operable independently one from another by means of respective actuator pistons 9, 10 and, in the matrix holder block 6, a respective plurality of matrix dies 11 (for small tools), 12 (for large tools). Punching heads of this type, already known and described for example in EP-A-0028588, allow to perform a plurality of punching operations without the need to substitute the punching tools. As an alternative, the punching heads could be of the "mono-press" type, each one provided with one single actuator piston in the punch holder block, and either provided or not with systems for the quick change of the punch-matrix set. This is not essential to the purpose of the present invention.

[0009] Still with reference to Figures 1 to 7, the punching machine comprises two manipulators 13, 14 located in correspondence of the two ends of the work table 1. Each manipulator 13, 14 comprises a first carriage 15 that is movable along slide guides 16 in a direction indicated by Y in Figure 1 perpendicular to the bearing structure 2, and a second carriage 17 movable instead along a direction indicated by X in the same Figure, parallel to the bearing structure 2. Pinchers 18 suitable to hold a metal sheet panel P in correspondence of an edge of the same are associated to the carriage 17.

[0010] With reference to Figures 2 and 4, a panel to

be punched P1 is fed either by an operator or automatically on the work table 1, in the direction indicated by A in Figure 2 (that is indifferently from the right or from the left) in correspondence with the manipulator 13, while the manipulator 14 is engaged in the handling of a previous panel P0 for the machining of the same on behalf of the punching heads 4', 4". After having carried out the centring of panel P1 with the aid of the centring means 19 (for example, pawls projecting and retracting with regards to the work table 1), the manipulator 13 holds one back edge of the panel P1 with its pincers 18. Moving to Figure 3, once the machining of the panel P0 is completed, the carriage 15 of the manipulator 14 moves back along the guides 16, thus clearing the machining zone within the groove of the bearing structure 2, and it proceeds with the release of the panel P0 by means of the movement of carriage 17, indifferently in either one of the two directions S indicated in Figure 3. Simultaneously, the carriage 15 of the manipulator 13 moves forward along the guides 16 in the direction Y, thus bringing the fore edge of the panel P1 in the machining zone within the groove of the bearing structure 2. The carriage 17 of the manipulator 13, while moving in the direction X, moves the panel P1 into the various positions in such a way that the punching heads 4', 4" can carry out the machining where requested. Once the machining of the edge or more in general of the fore half of panel P1 has been completed, the manipulator 14 moves forward along the guides 16 and it gets hold of the fore edge of panel P1 by its pincers 18; therefore the two manipulators exchange panel P1 between themselves. The manipulator 13 releases panel P1 and moves back along the guides 16, getting back to the position shown in Figure 2. While the manipulator 14 moves the panel P1 in the various positions necessary to carry out machining of the edge or, more in general, of the back half of the same, the manipulator 13 is ready to receive a new panel, and the cycle is thus repeated.

[0011] Owing to the fact that two punching heads, instead of one single punching head as in the known punching machines, are mounted to the bearing structure 2, at a distance and substantially facing each other, the course in the direction X that the carriages 17 of the manipulators must run is considerably reduced. In particular, it is possible to avoid movements of the panel in successive stages, which largely slow the machining, by which the pincers of a manipulator get hold of the panel, therefore the carriage 17 moves along the direction X, the panel is released, the carriage 17 gets back to its initial position, gets again hold of the panel and therefore repeats the movement. For example, with a 1500 mm stroke along the direction X the punching machine is capable to carry out the machining of sheets having dimensions of 2500-2600 mm along X, without any need to carry out movements in successive stages.

[0012] The two punching heads 4', 4" can be fixed to the arch 2. It is also possible to provide for a plurality of fixing positions for the punching heads 4', 4" in the arch 2, so that during the assembly of the machine it is possible to vary the mutual distance between heads. As an alternative, as it is schematically shown in Figure 6, the two heads (or possibly only one of them) can be mounted in a sliding way along the direction X, by means sliders 50 and guides 51 and, for example, adjusting screws 52, in order to be able to adjust the mutual distance as a function of the dimensions of the panel to be punched.

[0013] A variation of the previously described punching machine is shown in Figure 7. Here, besides the fact that the bearing structure 2 is not a closed arch but it is formed of two arches 2', 2", it is also possible to observe that the two arches 2', 2" can be preferably made become mobile with regards to a base 100 of the punching machine, in order to be able to adjust the mutual distance between the two punching heads 4', 4".

[0014] In Figures from 8 to 10 there is shown a punching machine according to a second embodiment of the present invention. Unlike the previous embodiment, the punching machine comprises a single manipulator 13, and it is provided with a rotator 60 for the panel to be machined. The sole manipulator 13, without the rotator 60, would in fact not allow to carry out machining in correspondence of the edge of the panel that is engaged with the pinchers 18. The rotator 60 instead allows to rotate the panel once all the punching operations on the free edge of the panel have been completed, and therefore to be able to carry out the punching also on the other edge of the panel. In Figure 9 the operation of rotation of the panel P on behalf of the rotator 60 is shown.

Claims

1. Punching machine for metal sheet panels comprising a work table (1), a bearing structure (2; 2' 2") for punching means (4', 4") having a groove (3) where said work table passes through, and moving means (13, 14; 13, 60) for a panel on said work table to bring the panel in correspondence of said punching means, characterised in that said punching means comprise two punching units (4', 4") that are mounted to said bearing structure (2; 2', 2") and are substantially facing one another.

2. Punching machine according to claim 1, characterised in that said moving means (13, 14; 13, 60) comprise at least one manipulator (13; 13, 14) having a first carriage (15) movable along a first direction (Y) on said work table (1), said first direction being substantially orthogonal to said bearing structure (2; 2', 2"), and a second carriage (17) provided with hold means (18) for the panel mobile along a second direction (X) on the work table, said second direction being substantially parallel to said bearing structure.

3. Punching machine according to claim 2, characterised in that it comprises two manipulators (13, 14) each one associated with a respective end of the work table (1), said manipulators being located at opposite sides of the work table with regards to said bearing structure (2; 2', 2").

4. Punching machine according to claim 2, characterised in that said moving means comprise a manipulator (13) and a rotator (60) for the rotation of the panel on the work table (1).

5. Punching machine according to any one of the claims from 1 to 4, characterised in that said two punching units (4', 4") are substantially facing along said second direction (X).

6. Punching machine according to claim 5, characterised in that said two punching units (4', 4") are multi-press punching heads each comprising a plurality of punching tools (7, 8) operable independently one from the others.

7. Punching machine according to claim 5, characterised in that said two punching units (4', 4") are mono-press punching heads.

8. Punching machine according to any one of the claims 5, 6 or 7, characterised in that said two punching units (4', 4") have adjustable mutual distance.

9. Punching machine according to any one of the previous claims, characterised in that said bearing structure (2) is a substantially close annular structure.

10. Punching machine according to any one of the claims from 1 to 8, characterised in that said bearing structure (2', 2") comprises two substantially facing "C" shape half-structures, each one suitable to support a respective one of said two punching units (4', 4").

11. Punching machine according to claim 3, characterised in that said two manipulators (13, 14) have a stroke along said first direction (Y) that is sufficient to allow the feed and the release of a panel to be punched or already punched on behalf of a manipulator while the other manipulator is engaged in the machining of another panel.

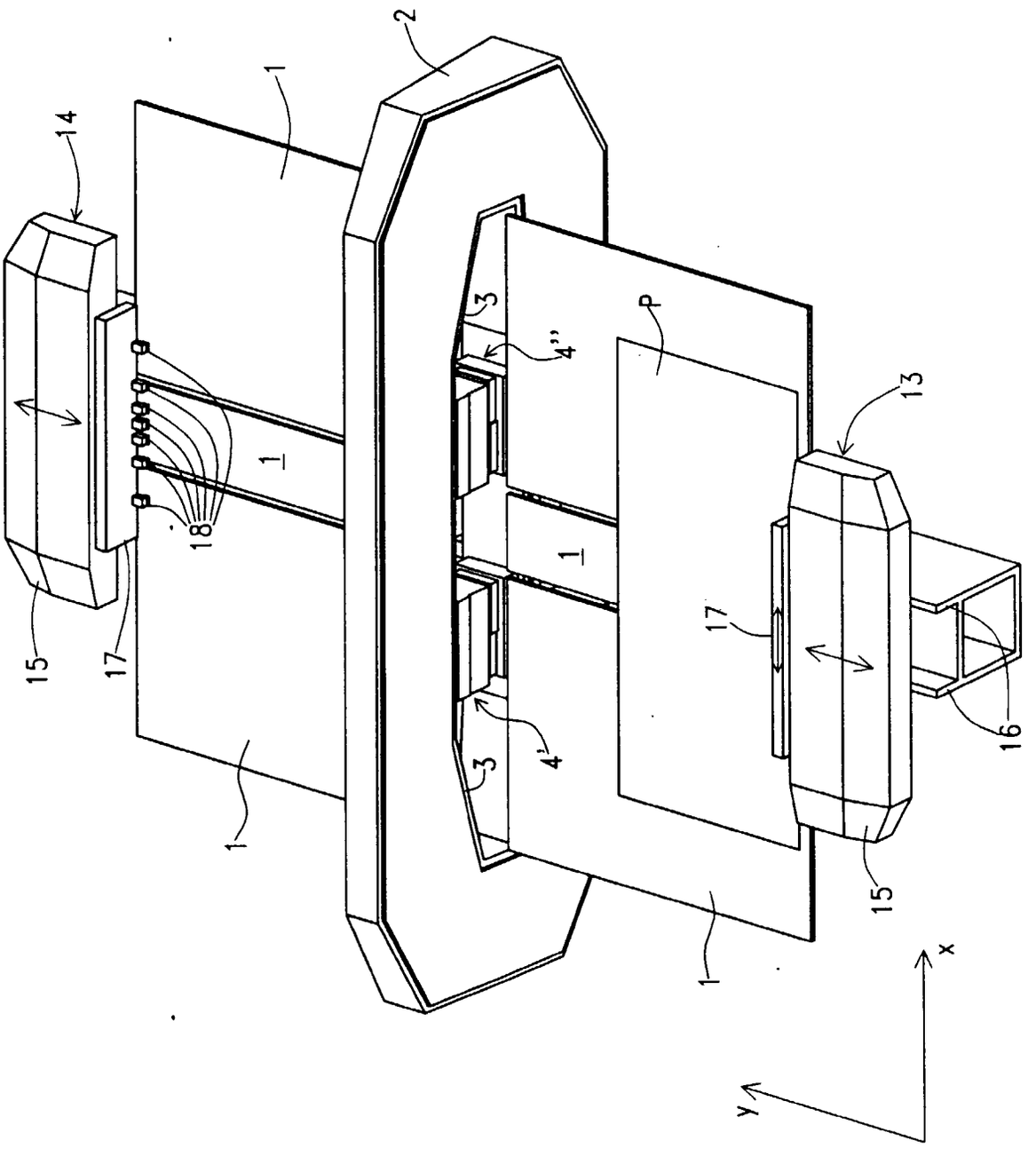
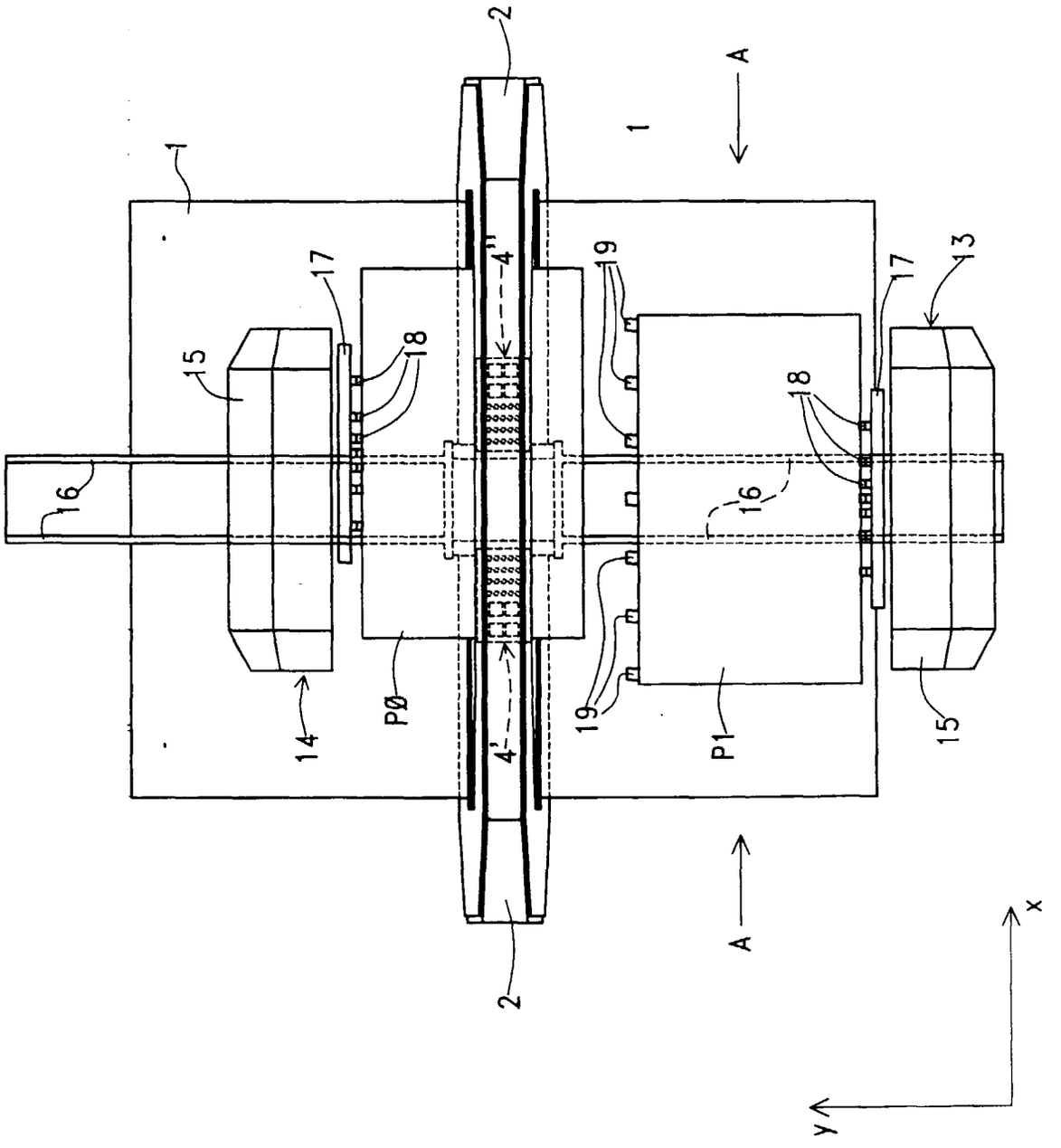


Fig.1

Fig.2



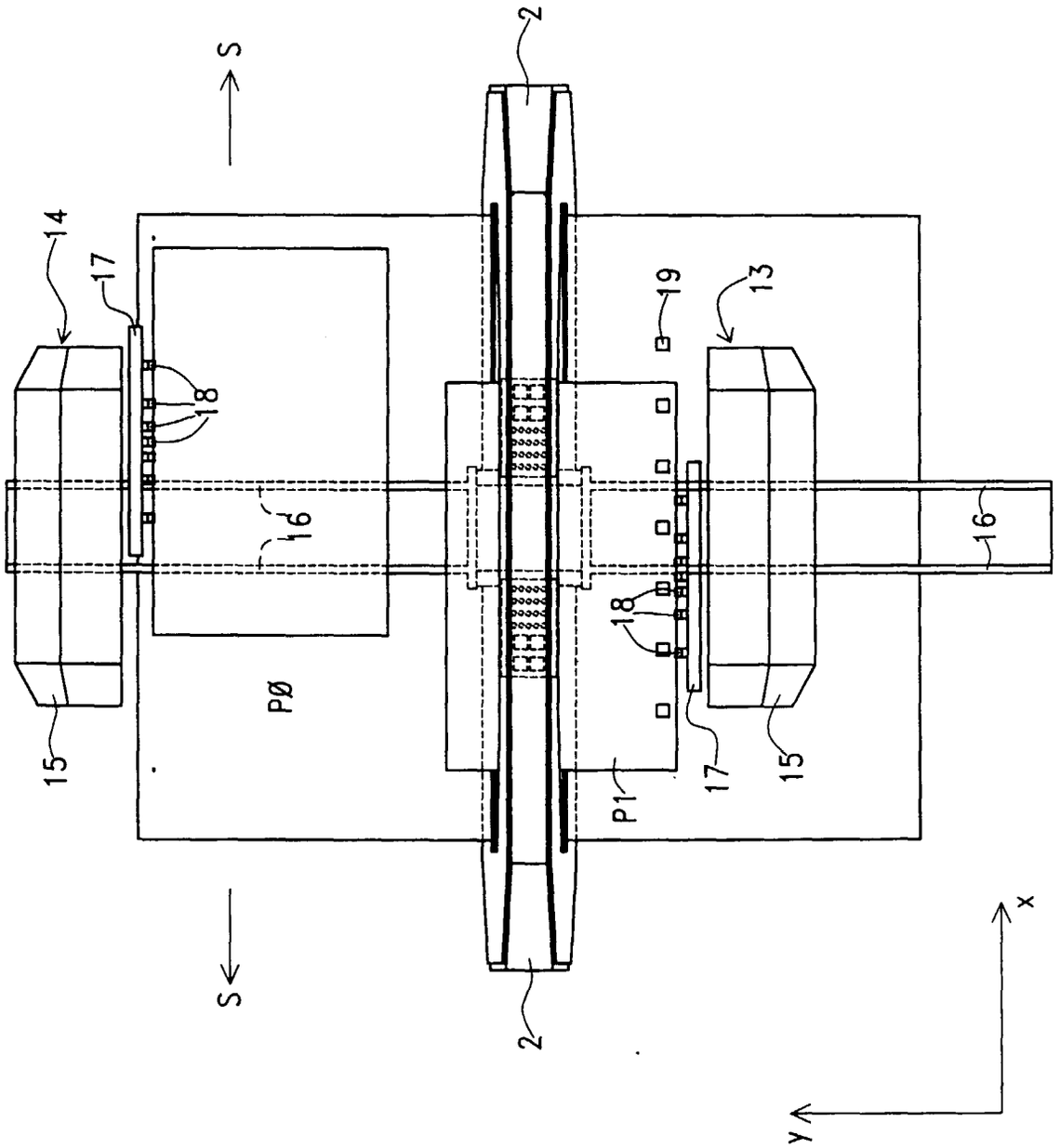


Fig.3

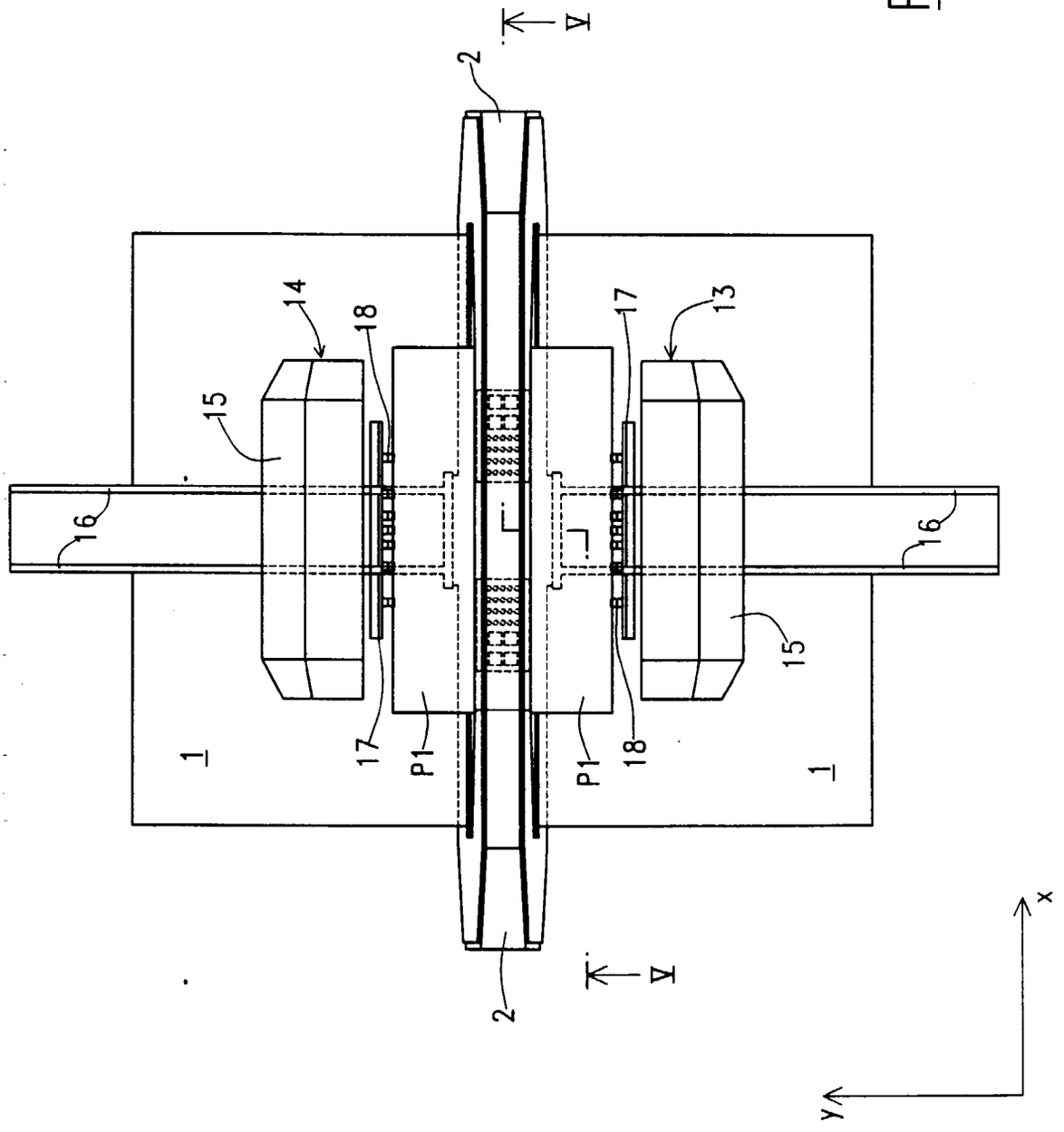


Fig.4

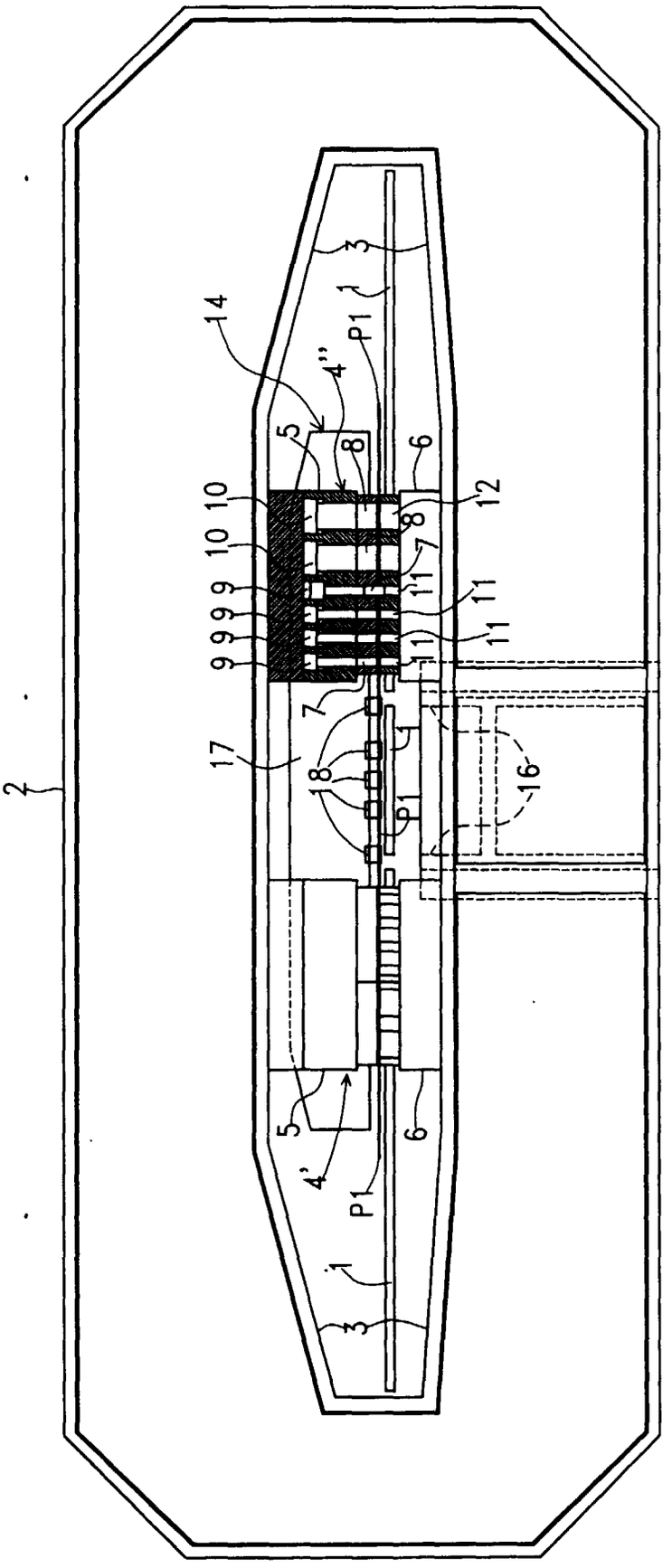


Fig.5

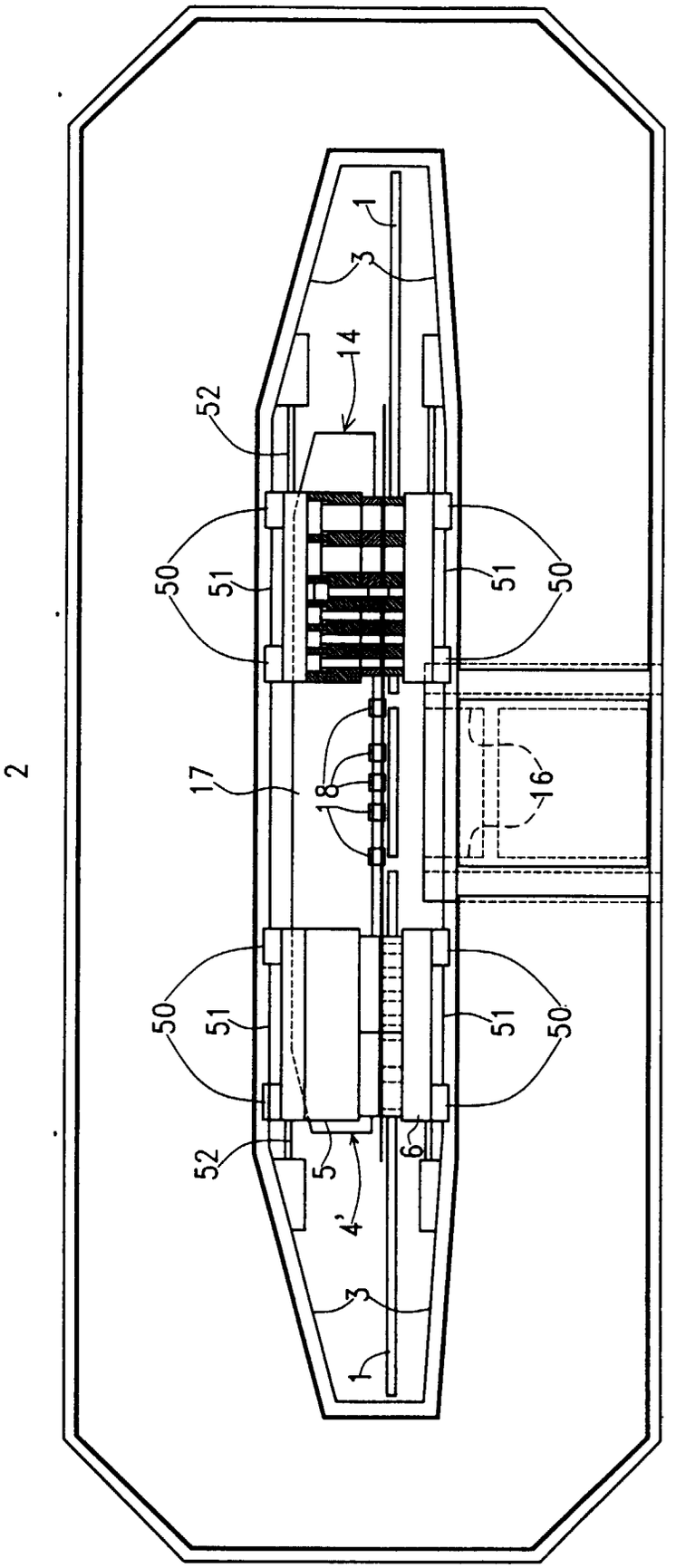


Fig.6

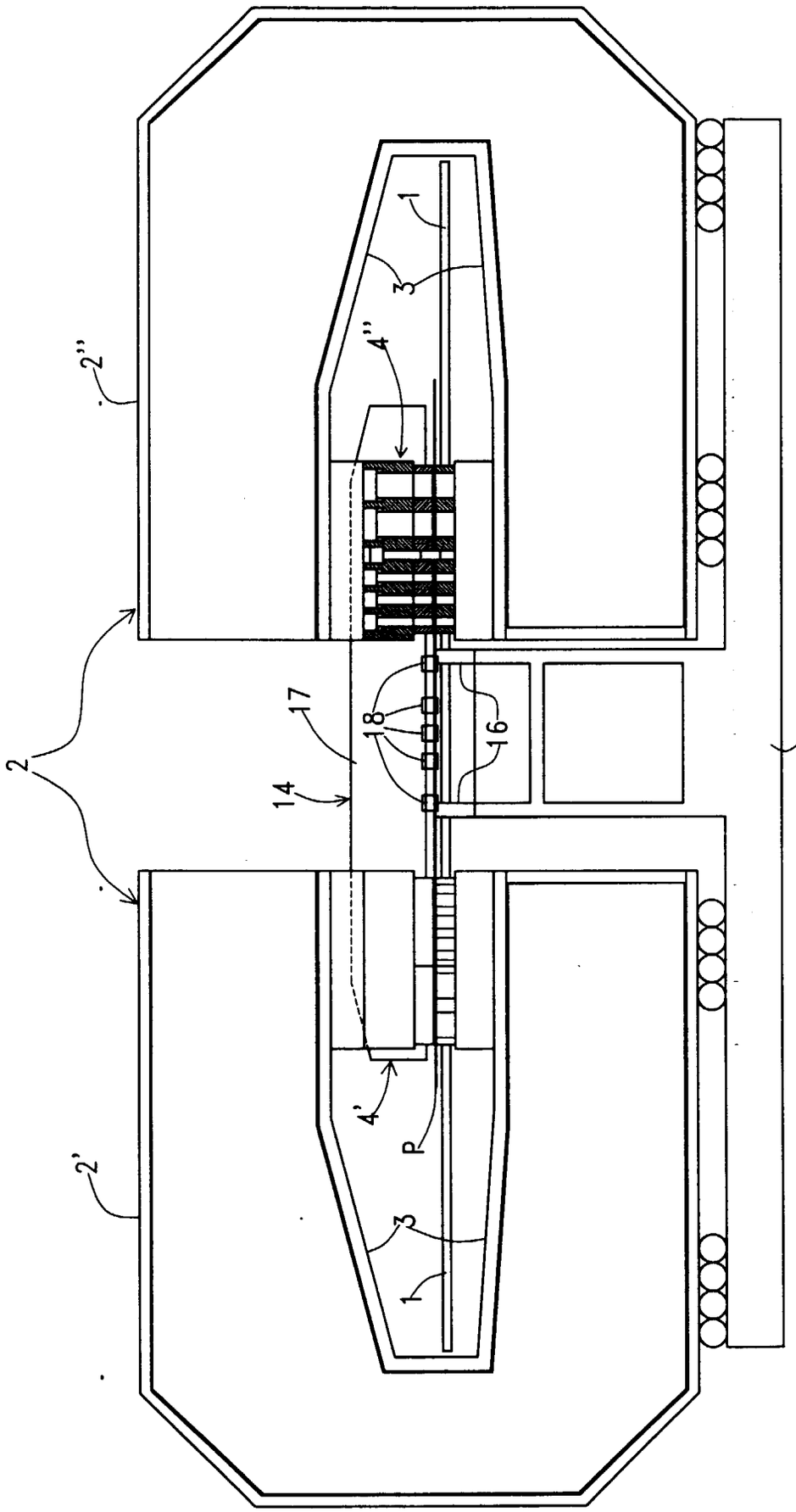
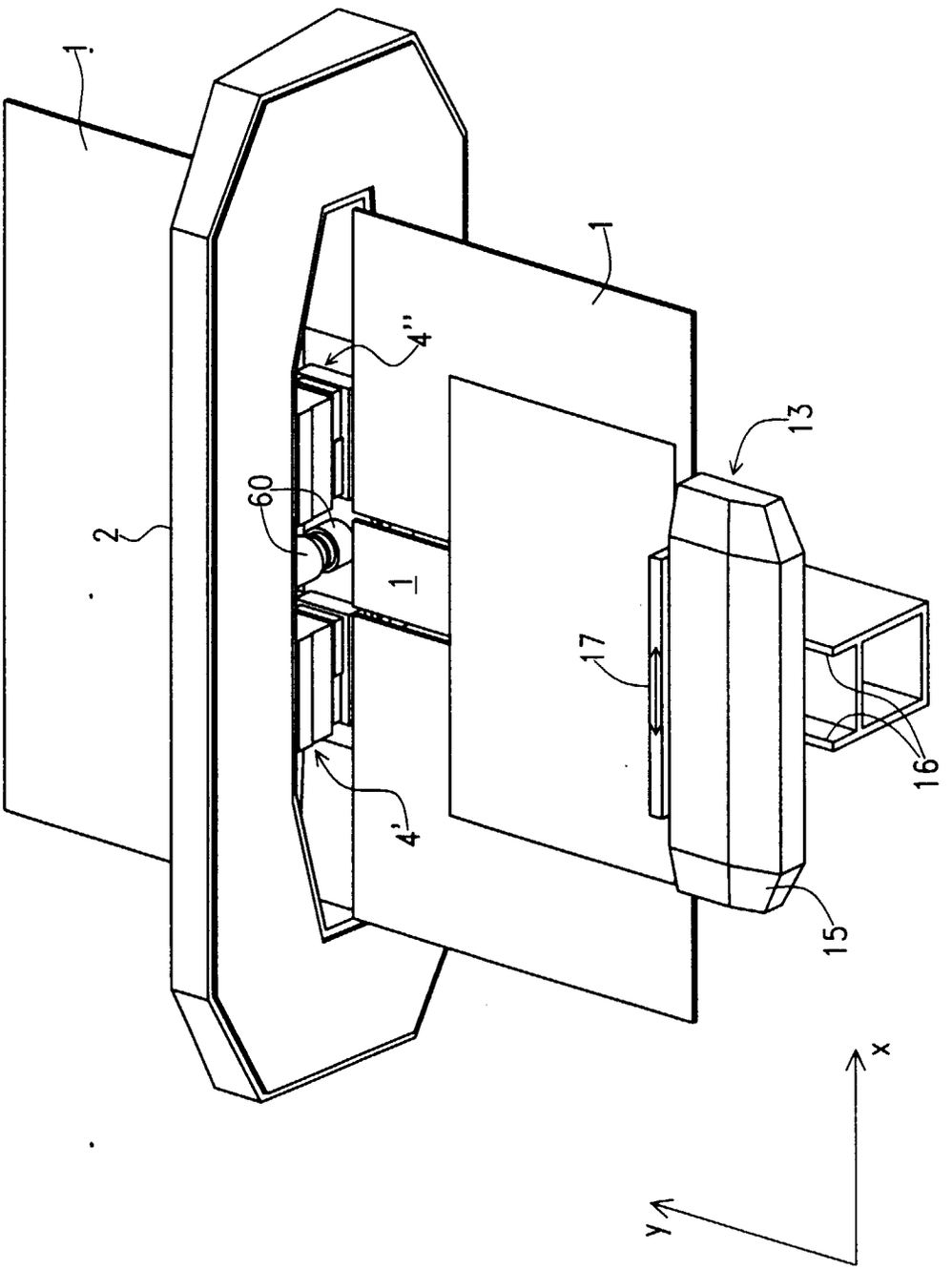


Fig.7

Fig.8



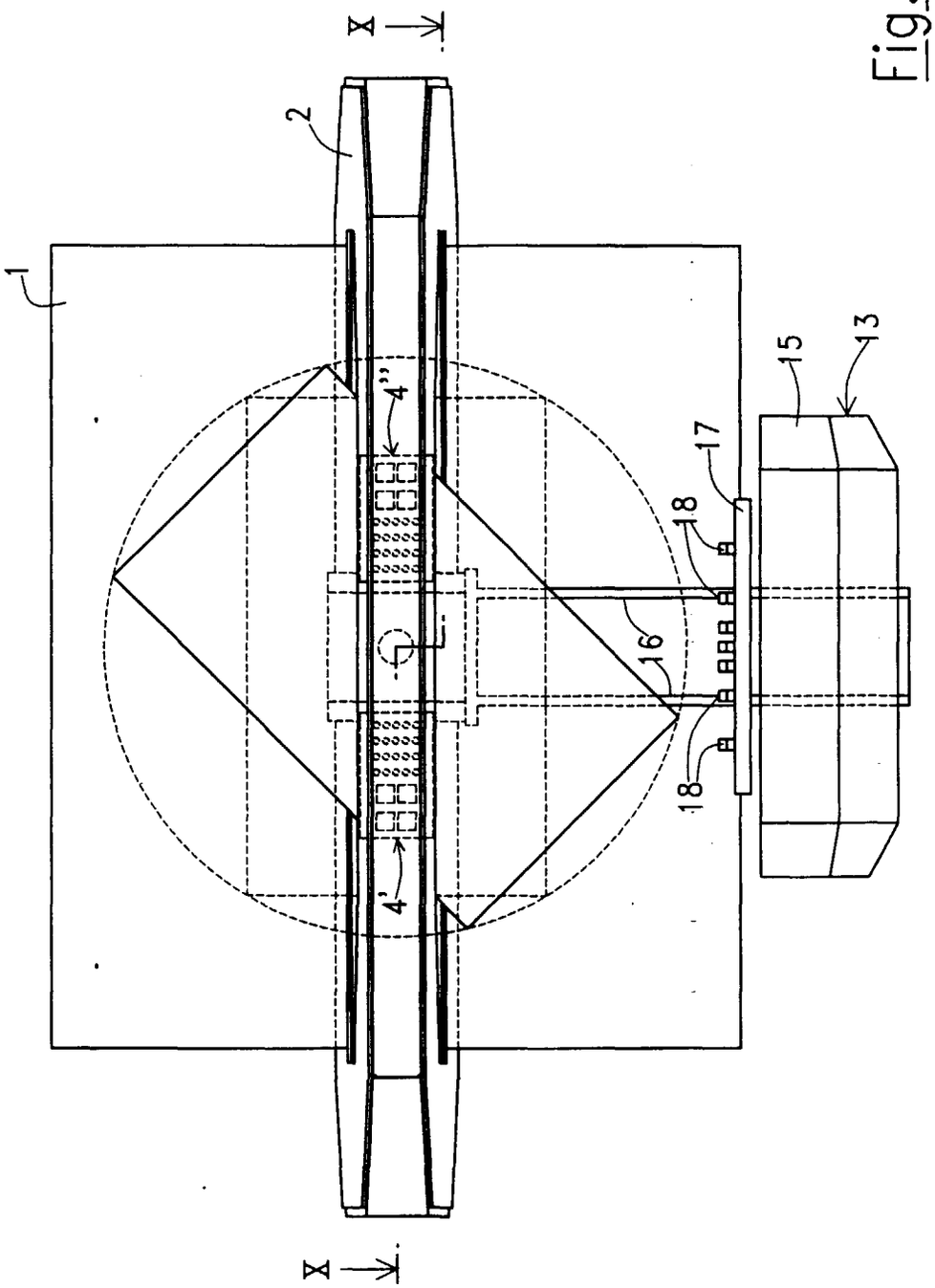


Fig.9

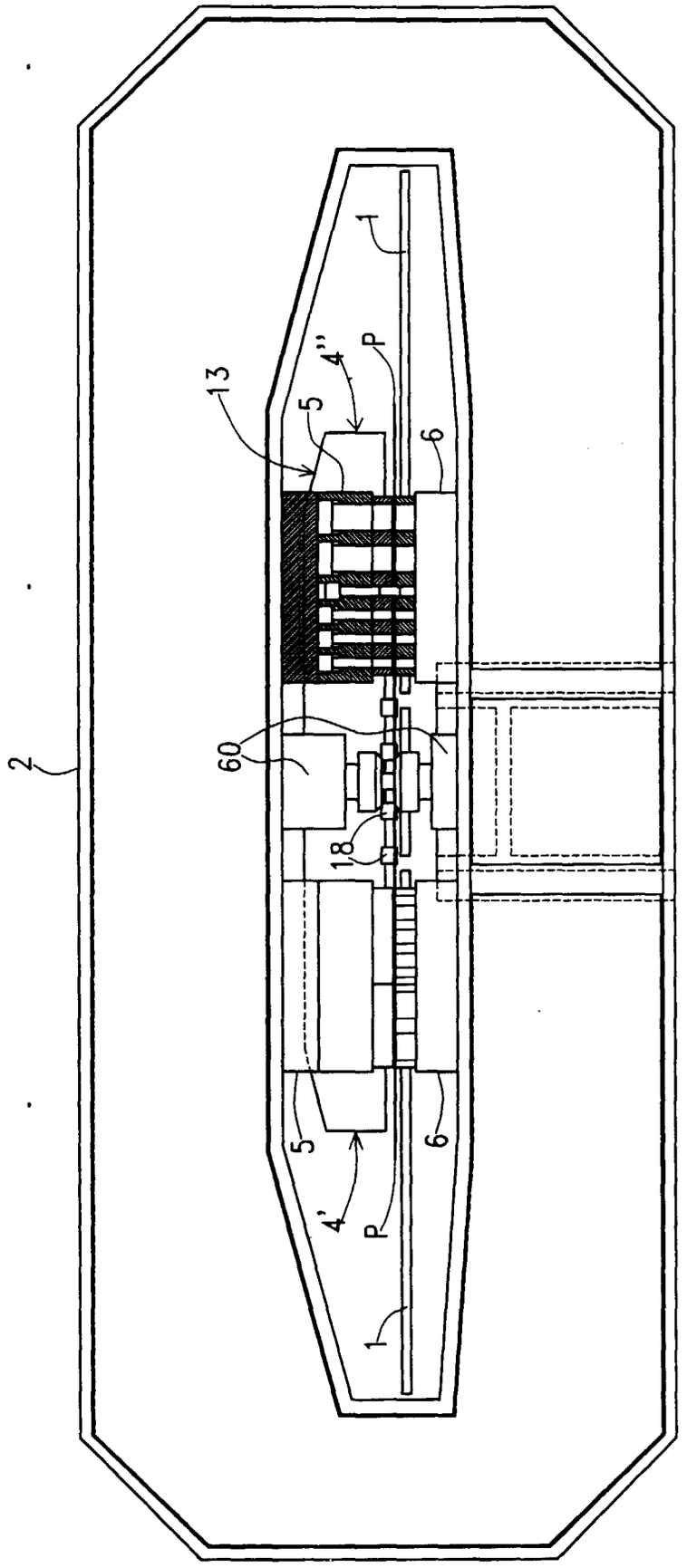


Fig.10