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(54) UPPER CROSS MEMBER OF A PRESS BRAKE EQUIPPED WITH IMPROVED PNEUMATIC INTERMEDIATE SLIDING ELEMENTS AND RELATED PRESS BRAKE EQUIPPED WITH SAID UPPER CROSS MEMBER

(57) An upper cross member (4) of a press brake (8) comprising a cross member body having a transverse guide (20) along a prevailing extension axis (X-X), at least one intermediate element (24) slidingly associated to the transverse guide (20) by means of first clamping means (28), to translate parallel to said axis of prevailing extension (X-X), remaining bound to the upper cross member (4) in a vertical direction (Y-Y), perpendicular to said prevailing extension axis (X-X), the first clamping means (28) being pneumatically-actuated clamping means, the intermediate element (24) being equipped with second clamping means (30), of pneumatic type, for clamping at least one tool. Advantageously, the upper cross member (4) comprises a manifold (32), arranged posteriorly or anteriorly with respect to said transverse guide (20), and fluidically connectable to a compressed air supply,
- wherein the manifold (32) is configured to supply compressed air to a plurality of outlet holes (36) opening into respective seats (40) of the upper cross member (4),
- each seat (40) being equipped with a self-closing valve (44) having a ferrule (48) that faces a front side (50) of the upper cross member (4), opposite to the manifold (32) and to the posterior side (34), to interface with said intermediate element (24) and for supplying the second clamping means (30) of the intermediate element (24).

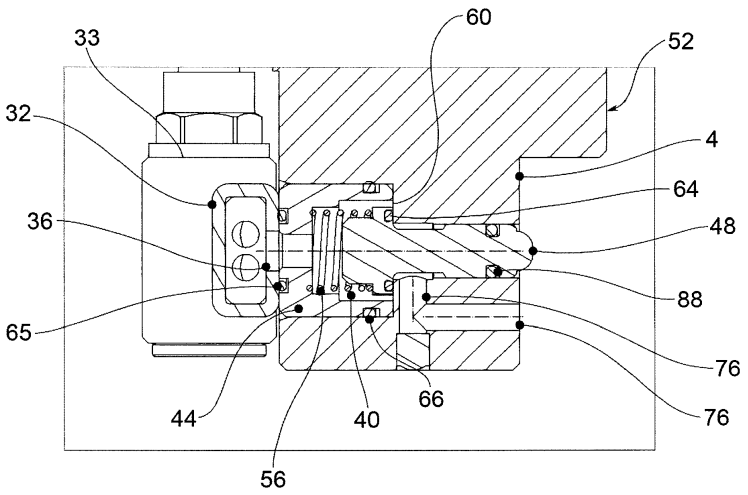

FIG.8a

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Description

FIELD OF APPLICATION

[0001] This invention relates to an upper cross member of a press brake equipped with improved pneumatic intermediate sliding elements and a related press brake equipped with said upper cross member.

STATE OF THE ART

[0002] As is known, press brakes comprise, among the main components, a vertically movable upper cross member and a fixed lower cross member.

[0003] To the lower cross member are fixed, forming continuous or discrete lines, tools called dies; to the upper cross member, always forming continuous or discrete lines, are instead fixed tools called punches.

[0004] Usually, a metal sheet is inserted between the punch and die; the punch acts on the metal sheet by pressing it against the die so as to plastically deform it according to the shape set by the punch and the die.

[0005] In case of particular needs, typically for bending boxes, see Figure 1, the punches are not clamped directly to the upper cross member, but between the two elements is inserted an extension called intermediate.

[0006] The intermediate, in the upper part, is fixed to the cross member by means of clamping brackets, while in the bottom part it supports the tools.

[0007] If the clamping of the tool by the intermediate is of the pneumatic type, the latter requires a supply of compressed air: in other words, it is necessary to supply the intermediate with compressed air so that it can clamp/unclamp the tool.

[0008] Currently this pneumatic part consists of the following possible solutions.

[0009] According to a first known embodiment (Figure 2), the air enters laterally from one of the end intermediates, passes through it, at the same time supplying an internal tool clamping piston, exits and then enters the next intermediate thanks to a mobile connection tube (indicated with T in Figure 3). End intermediate means intermediates arranged at the transverse ends of the cross member.

[0010] The connection tube is mobile as it has the possibility of sliding along its axis, inside its seat, in such a way as to allow the movement of the intermediates towards/away from each other by a few millimetres.

[0011] The limitations of such a system are obvious:

- for example, the inability to freely remove the non-end intermediates without having to "re-compact" everything or inserting longer replacements to not interrupt the supply of compressed air,
- moreover the movements of the individual intermediates are limited, since they are constrained by the length of the related connection tube.

[0012] Solutions similar to the preceding are also known wherein the connection tubes are telescopic or flexible: however, the limitations described above apply to these solutions as well.

[0013] Furthermore, an intermediate solution is known from patent EP 1155757 B1 of ABIEMME Srl wherein the supply of air is provided by exploiting the upper brackets that clamp the intermediates themselves to the upper cross member; a supply slot is formed on the brackets that allows horizontal movements of the intermediates, even if limited. There is also a valve that interrupts the flow of air if the intermediate is removed.

[0014] This solution has the advantage that any intermediate can be disengaged in any position without compromising the compressed air supply to the other modules. However, there is still the problem of the limited sliding of the individual modules, linked to the dimensions of the groove formed on the clamping brackets to the upper cross member.

PRESENTATION OF THE INVENTION

[0015] As can be seen from the above description, the current state of the art regarding the compressed air supply of the intermediates involves drawbacks and limitations.

[0016] Therefore, there is a need to solve the drawbacks and limitations mentioned in reference to the prior art.

[0017] This need is met by a brake press upper cross member according to claim 1.

DESCRIPTION OF THE DRAWINGS

[0018] Further characteristics and advantages of this invention will be more understandable from the following description of its preferred and non-limiting examples of embodiments, in which:

- Figures 1 to 3 show various views of press brake solutions of the prior art;
- Figure 4 is a perspective view of a press brake detail according to an embodiment of this invention;
- Figure 5 is a rear view with several enlarged details of an upper cross member according to an embodiment of this invention;
- Figure 6 shows various views of a manifold of a press brake according to this invention;
- Figure 7 is a front view with several enlarged details of an upper cross member according to an embodiment of this invention;
- Figures 8a and 8b are section views of a detail of an upper cross member according to this invention, in rest, and not operating, configuration;
- Figures 9a and 9b are section views of a detail of an upper cross member according to this invention, in operating configuration;
- Figure 10 is a perspective view of an intermediate

element according to this invention;

- Figure 11 is a sectional view of a portion of the intermediate element of Figure 10;
- Figure 12 is a sectional view of a further portion of the intermediate element of Figure 10;
- Figure 13 is a front view of an upper cross member according to an embodiment of this invention.

[0019] The elements, or parts of elements, in common between the embodiments described below will be indicated with the same reference numbers.

DETAILED DESCRIPTION

[0020] With reference to the above figures, reference number 4 globally indicates an overall schematic view of an upper cross member of a press brake 8 according to this invention.

[0021] The press brake 8 typically comprises an upper cross member 4 equipped with tools such as at least one punch 12, a lower cross member 14 equipped with a die 16 and motor means (not shown) for moving the upper cross member 4 towards (and/or away) with respect to the lower cross member 14 along a vertical direction Y-Y, substantially perpendicular to a support surface of the press brake 8.

[0022] For the purposes of this invention the dimensions, power and type of actuators used for the press brake 8 are irrelevant.

[0023] In particular, the upper cross member 4 comprises a cross member body having a transverse guide 20 along a prevailing extension axis X-X; said prevailing extension axis X-X is perpendicular to the vertical direction Y-Y.

[0024] The upper cross member 4 comprises at least one intermediate element 24 slidably associated to the transverse guide 20 by means of first clamping means 28, to translate parallel to said prevailing extension axis X-X, remaining bound to the cross member in the vertical direction Y-Y, perpendicular to said prevailing extension axis X-X.

[0025] The first clamping means 28 are manual, pneumatic or hydraulic clamping means.

[0026] The intermediate element 24 is equipped with second clamping means 30, for example of the pneumatically-actuated type, for the clamping of at least one tool (not shown). For example, said tool is a punch suitable to appropriately bend a metal sheet by pressing it against the die 16 arranged on the lower cross member 14.

[0027] Advantageously, the upper cross member 4 comprises a manifold 32, arranged posteriorly or possibly anteriorly with respect to said transverse guide 20, and fluidically connectable to a compressed air supply (not shown), for example via a fitting 33.

[0028] The manifold 32 is typically, but not exclusively, in the form of a rectangular-section tube, which transversely passes through the upper cross member 4, from a posterior side 34, i.e., opposite to the intermediate elements 24.

[0029] The manifold 32 is configured to supply compressed air to a plurality of outlet holes 36 opening into respective seats 40 of the upper cross member 4.

[0030] Preferably, each seat 40 is equipped with a self-closing valve 44 having a ferrule 48 that faces a front side 50 of the upper cross member 4, opposite to the manifold 32 and to the posterior side 34, to interface with said intermediate element 24 and for supplying the second clamping means 30 of the intermediate element 24.

[0031] The ferrule 48, in the dismounting configuration of an intermediate element 24 (Figures 8a and 8b), is arranged in a rest configuration in which it projects at least partially from the transverse guide 20 of the upper cross member 4, opposite to said manifold 32, fluidically sealing the manifold 32.

[0032] Fluidically sealing the manifold 32 means that, as better explained below, the compressed air is not allowed to flow out of the manifold 32 since such compressed air, once it has flowed out of the outlet holes 36, is confined inside the upper cross member 4 without being able to escape further and/or flow into the intermediate element 24.

[0033] The ferrule 48 is configured so as to be moved in the operating configuration (Figures 9a and 9b) following the mounting of an intermediate element 24, to allow the passage of compressed air from the manifold 32 to the intermediate element 24.

[0034] In its axial movement, the ferrule 48 is preferably guided inside a related counter-shaped hole 55, fluidically communicating with said seat 40.

[0035] For example, the self-closing valve 44 comprises elastic means 56 that influence it in the rest configuration, said elastic means 56 pushing the ferrule 48 of the self-closing valve 44 away from the manifold 32, against a shoulder 60 of the seat 40, said shoulder 60 realising an end-of-stroke of the ferrule 48 in extraction, i.e., away from the manifold 32.

[0036] The ferrule 48 is equipped with sealing means 64 that realise a pneumatic seal against said shoulder 60.

[0037] Preferably, a distance or transverse step 68 of at least two adjacent ferrules 48 arranged on the guide 20 in the front side 50 of the upper cross member 4 is less than or equal to a transverse width 72 of the intermediate elements 24 associated to the upper cross member 4. In this way, it is ensured that, whenever an intermediate element is inserted on the transverse guide 20 of the upper cross member 4, said intermediate element 24 interfaces with at least one ferrule 48 so as to be pneumatically supplied through the pneumatic supply received through said tip 48 when arranged in operating position.

[0038] According to an embodiment of this invention, the upper cross member 4 is equipped, in correspondence of each ferrule 48, with a supply channel 76, separated from the seat 40 and fluidically connectable to it by said self-closing valve 44, the supply channel 76 flowing frontally on the upper cross member 4, in offset po-

sition with respect to the seat 40 and interfacing with the second pneumatically-actuated clamping means 30 of the intermediate element 24. Offset position means any position not coincident and not coaxial in any direction; for example, the offset can occur in the vertical direction Y-Y, but also in the transverse direction X-X, or even according to a combination of said vertical and transverse offsets.

[0039] From a technical point of view, the offset allows distinguishing the compressed air supply channel, which precisely allows the inflow of compressed air to the intermediate element 24, from the channel or seat 40 housing the self-closing valve 44 and the related ferrule 48. In other words the counter-shaped hole 55 that houses the ferrule 48 acts as a mere guide of the ferrule itself and not as a passage of compressed air; in fact, in the latter case, the very presence of the ferrule 48 would constitute a considerable obstruction and therefore a non-trivial limitation of the flow rate of air suppliable to the intermediate element 24. Instead, the derivation of the supply channel 76 allows maximising the flow rate of compressed air suppliable to the intermediate element 24, as it is not reduced by the physical presence of the ferrule 48 itself.

[0040] In particular, the supply channel 76 intercepts the seat 40 downstream of the sealing means 66 between the valve 44 and the seat 40, so as to receive compressed air to be sent to the second clamping means 30 of the intermediate element 24, when the ferrule 48 is arranged in operating configuration.

[0041] The intermediate element 24 comprises in turn at least one connection duct 80 suitable to receive compressed air from the supply channel 76 of the upper cross member 4 and to actuate, as the second clamping means 30, a clamping piston 84 of an associable tool.

[0042] The clamping piston 30,84 is, for example, operatively connected to one or more jaws 86 for clamping the associable tool.

[0043] The ferrule 48 is provided with at least one gasket 88 that prevents the compressed air from flowing out of the ferrule itself, from the front side 50 of the upper cross member 4, even when the ferrule 48 is in operating configuration in which the passage of compressed air is allowed from the manifold 32 to the intermediate element 24.

[0044] The intermediate element 24 is equipped with a coupling head 92 suitable to interface with said ferrules 48 of the upper cross member 4 and shaped so as to realise a prismatic type shape connection with the transverse guide 20 of the upper cross member 4 so as to be able to slide transversely with respect to the transverse guide 20, remaining attached to the guide itself. The coupling head 92 is equipped with at least one gasket 93.

[0045] For example, the first clamping means 28 of the intermediate element 24 comprise a front bulkhead 96 which clamps the coupling head 92 towards the transverse guide 20 of the upper cross member 4, the front bulkhead 96 delimiting with the transverse guide 20 a compartment 100 for housing with play, when not closed, the coupling head 92, in a movable coupling configuration in which the coupling head 92 does not influence the ferrule 48 and can translate transversely to the upper cross member 4 while remaining attached to it.

[0046] As can be appreciated from the description, this invention allows overcoming the drawbacks presented in the prior art.

[0047] In fact, this invention provides an upper cross member that allows to supplying along all its length and with continuity each pneumatic intermediate, without the limitations of the solutions of the prior art.

[0048] Furthermore, this invention allows any of the intermediates to slide along the entire length of the cross member without this resulting in air leaks or to the lack of compressed air supply to the intermediate itself.

[0049] Furthermore, the invention allows operating without the need for connection tubes between the intermediates or between the clamping brackets of these latter to the upper cross member.

[0050] It is therefore possible to remove at any time and position one or more intermediates without this compromising the compressed air supply of the remaining intermediates associated to the cross member.

[0051] Moreover, thanks to this invention it is possible to slide the intermediates with continuity, without completely unhooking them, along the entire cross member and without ever losing the supply of air, which would compromise the safety of the clamps. This possibility is highly appreciated and useful in the case of heavier intermediates that would be very awkward to handle by hand, completely unhooking them from the cross member for their positioning.

[0052] A person skilled in the art, in order to satisfy contingent and specific needs, may make numerous modifications and variations to the cross members and press brakes described above, all however contained within the scope of the invention as defined by the following claims.

Claims

1. Upper cross member (4) of a press brake (8) comprising

   - a cross member body 4 having a transverse guide (20) along a prevailing extension axis (X-X),
   - at least one intermediate element (24) slidably associated to the transverse guide (20) by means of first clamping means (28), to translate parallel to said prevailing extension axis (X-X), remaining bound to the upper cross member (4) in a vertical direction (Y-Y), perpendicular to said prevailing extension axis (X-X),
   - the first clamping means (28) being manual, pneumatic or hydraulic clamping means,

- the intermediate element (24) is equipped with second clamping means (30), for example of pneumatic type, for clamping at least one tool,

characterised in that

- the upper cross member (4) comprises a manifold (32), arranged posteriorly or anteriorly with respect to said transverse guide (20), and fluidically connectable to a compressed air supply,
- wherein the manifold (32) is configured to supply compressed air to a plurality of outlet holes (36) opening into respective seats (40) of the upper cross member (4),
- each seat (40) being equipped with a self-closing valve (44) having a ferrule (48) that faces a front side (50) of the upper cross member (4), opposite to the manifold (32) and to the posterior side (34), to interface with said intermediate element (24) and for supplying the second clamping means (30) of the intermediate element (24).

2. Upper cross member (4) of a press brake (8) according to claim 1, wherein said ferrule (48), and in dismounting configuration of an intermediate element (24), is arranged in a rest configuration in which it projects at least partially by the transverse guide (20) of the upper cross member (4), opposite to said manifold (32), fluidically sealing the manifold (32), the ferrule (48) being configured so as to be moved in the operating configuration as a result of the mounting of an intermediate element (24), to allow the passage of compressed air from the manifold (32) to the intermediate element (24).

3. Upper cross member (4) of a press brake (8) according to claim 2, wherein the self-closing valve (44) comprises elastic means (56) that influence it in the rest configuration, said elastic means (56) pushing the ferrule (48) of the self-closing valve (44) away from the manifold (32), against a shoulder (60) of the seat (40), said shoulder (60) realising an end-of-stroke of the ferrule (48) in extraction, i.e., away from the manifold (32).

4. Upper cross member (4) of a press brake (8) according to claim 3, wherein the ferrule (48) is equipped with sealing means (64) that realise a pneumatic seal against said shoulder (60).

5. Upper cross member (4) of a press brake (8) according to any of the preceding claims, wherein a distance or transverse step (68) of at least two adjacent ferrules (48) arranged on the transverse guide (20) in the front side (50) of the upper cross member (4) is less than or equal to a transverse width (72) of the intermediate elements (24) associated to the upper cross member (4).

6. Upper cross member (4) of a press brake (8) according to any of the preceding claims, wherein the upper cross member (4) is equipped, in correspondence of each ferrule (48), with a supply channel (76), separated from the seat (40) and fluidically connectable to it by said self-closing valve (44), the supply channel (76) flowing frontally on the upper cross member (4), in offset position with respect to the seat (40) and interfacing with the second pneumatically-actuated clamping means (30) of the intermediate element (24).

7. Upper cross member (4) of a press brake (8) according to claim 6, wherein the supply channel (76) intercepts the seat (40) downstream of the sealing means (66) between the valve (44) and the seat (40), so as to receive compressed air to be sent to the second clamping means (30) of the intermediate element (24), when the ferrule (48) is arranged in operating configuration.

8. Upper cross member (4) of a press brake (8) according to any of claims 6 to 7, wherein the intermediate element (24) comprises at least one connection duct (80) suitable to receive compressed air from the supply channel (76) of the upper cross member (4) and to actuate a clamping piston (84) of the associable tool.

9. Upper cross member (4) of a press brake (8) according to claim 8, wherein the clamping piston (84) is, for example, operatively connected to one or more jaws (86) for clamping the associable tool.

10. Upper cross member (4) of a press brake (8) according to any of the preceding claims, wherein the ferrule (48) is provided with at least one gasket (88) that prevents the compressed air from flowing out of the ferrule (48) itself, from the front side (50) of the upper cross member (4), even when the ferrule (48) is in operating configuration in which the passage of compressed air is allowed from the manifold (32) to the intermediate element (24).

11. Upper cross member (4) of a press brake (8) according to any of the preceding claims, wherein the intermediate element (24) is equipped with a coupling head (92) suitable to interface with said ferrules (48) of the upper cross member (4) and shaped so as to realise a prismatic type shape connection with the guide (20) of the upper cross member (4) so as to be able to slide transversely with respect to the guide (20), remaining attached to the guide itself.

12. Upper cross member (4) of a press brake (8) according to any of the preceding claims, wherein the upper cross member (4) is equipped with a front bulkhead (96) which clamps the coupling head (92) towards

the guide (20) of the upper cross member (4), the front bulkhead (96) delimiting with the guide (20) a compartment (100) for housing with play the coupling head (92), in a movable coupling configuration in which the coupling head (92) does not influence the ferrule (48) and can translate transversely to the upper cross member (4) while remaining attached to it.

13. Press brake (8) comprising an upper cross member (4) according to any of claims 1 to 12, the intermediate elements (24) of said upper cross member (4) being equipped with at least one punch, the press comprising a lower cross member (14) equipped with a die (16) and motor means for moving the upper cross member (4) relative to the lower cross member (14) along said vertical direction (Y-Y).

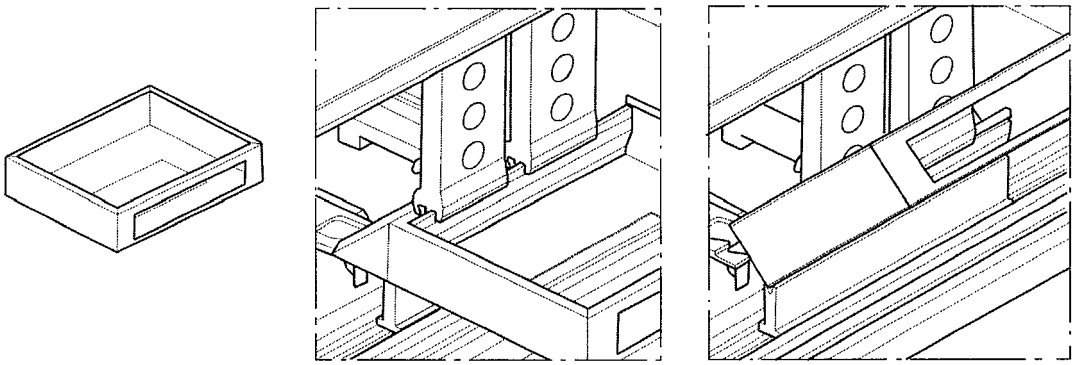

FIG.1

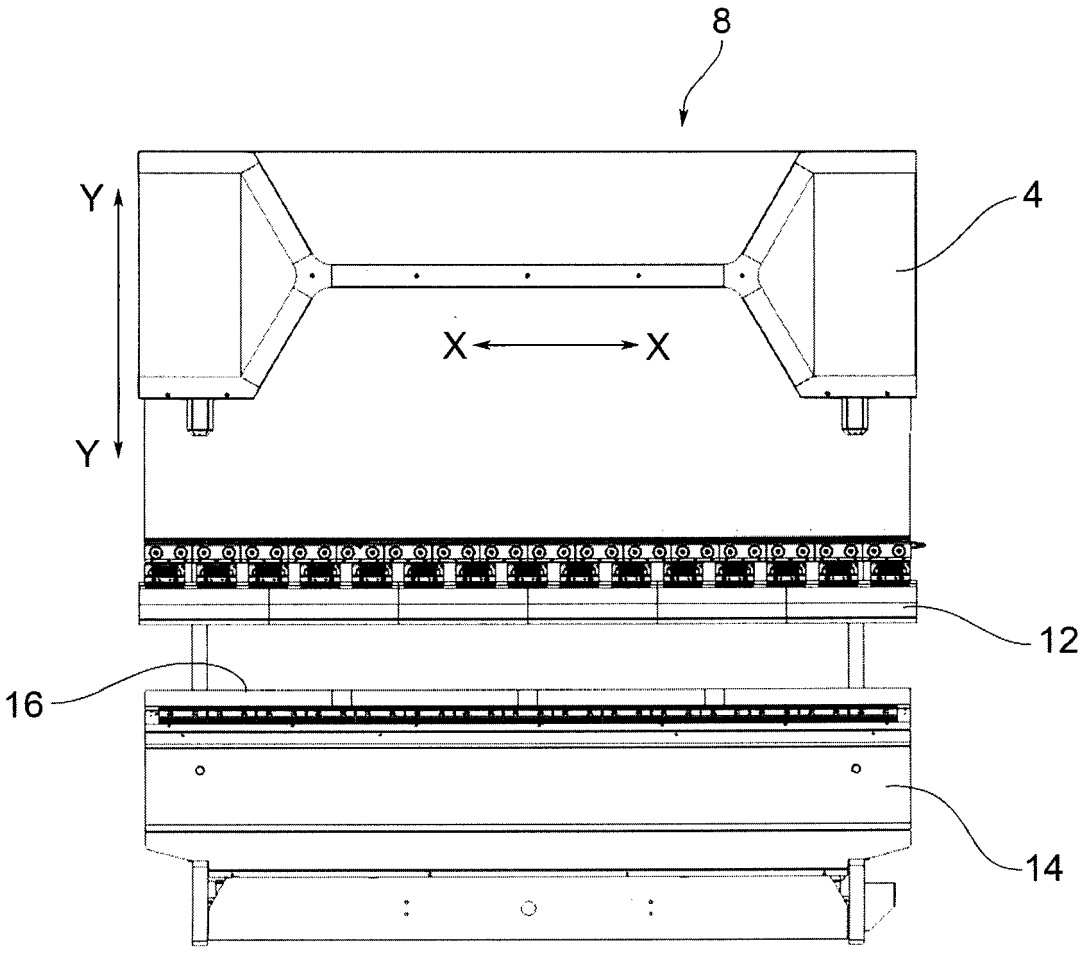

FIG.2

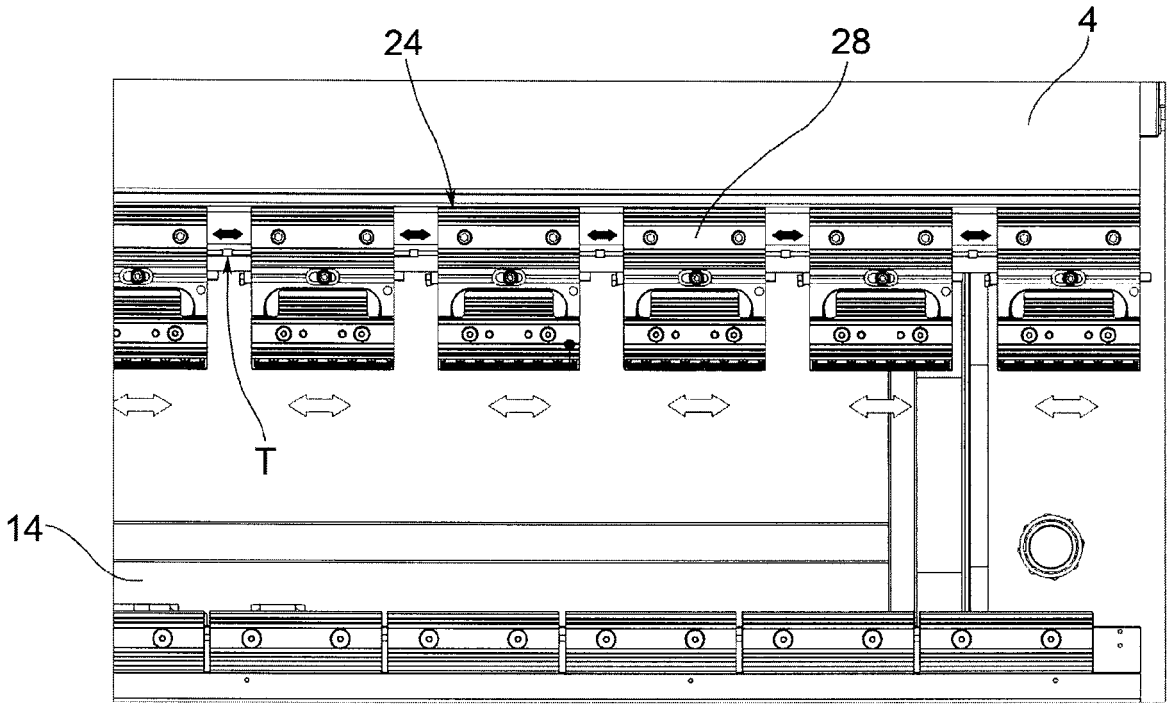

FIG.3

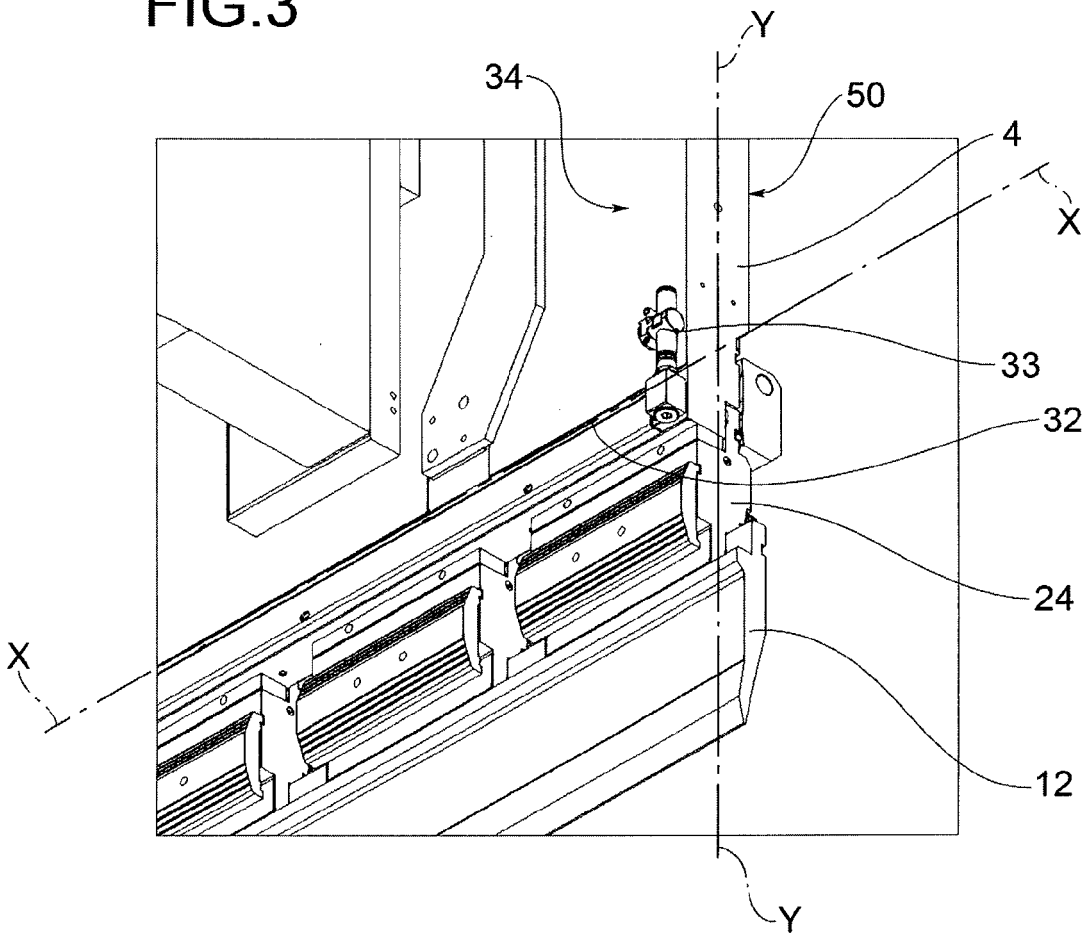

FIG.4

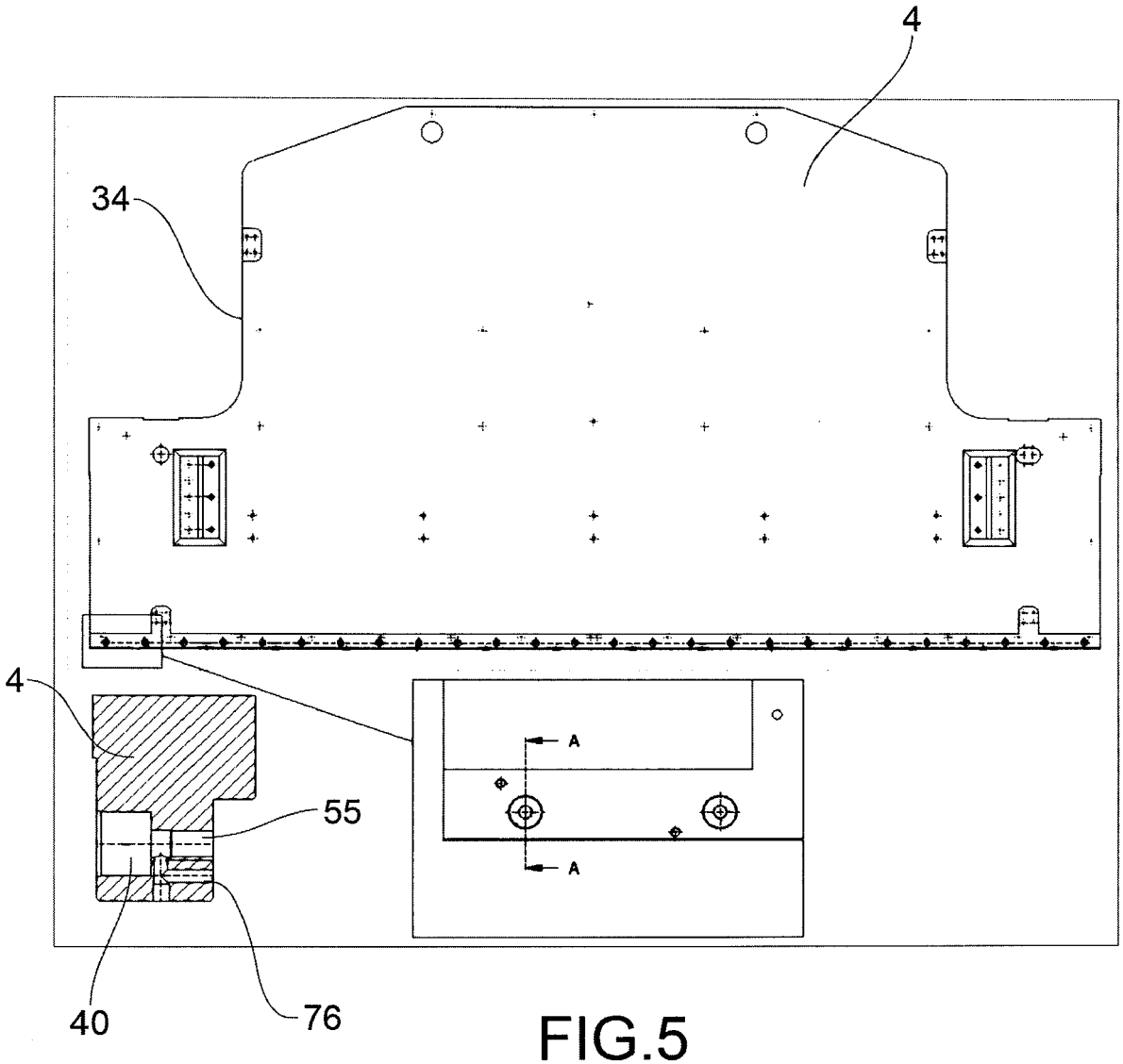

FIG.5

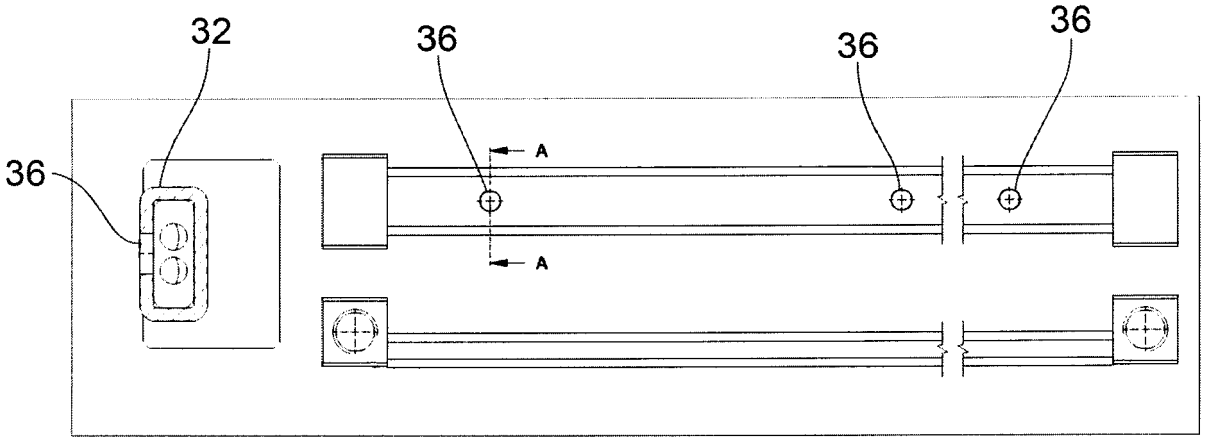

FIG.6

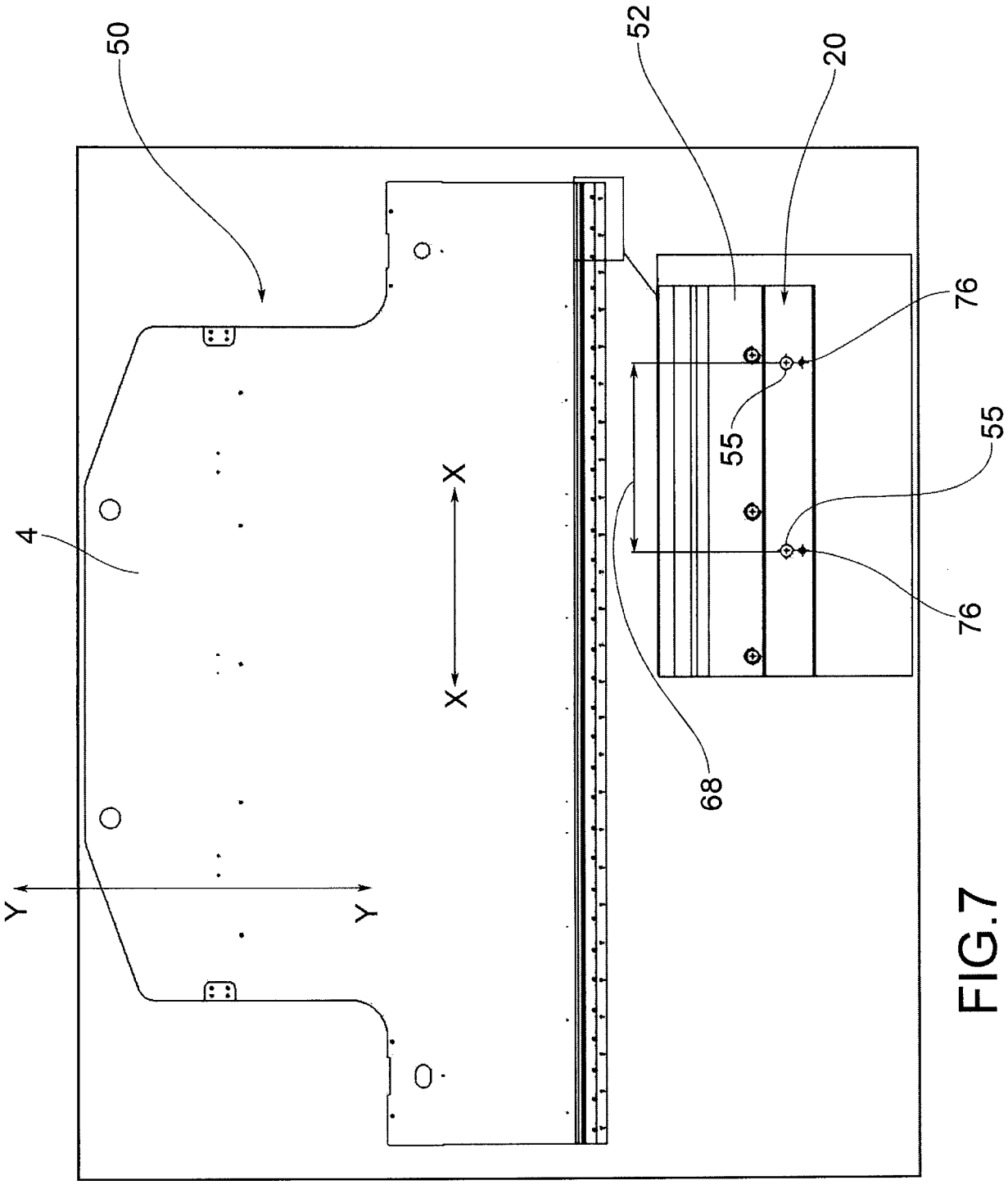

FIG.7

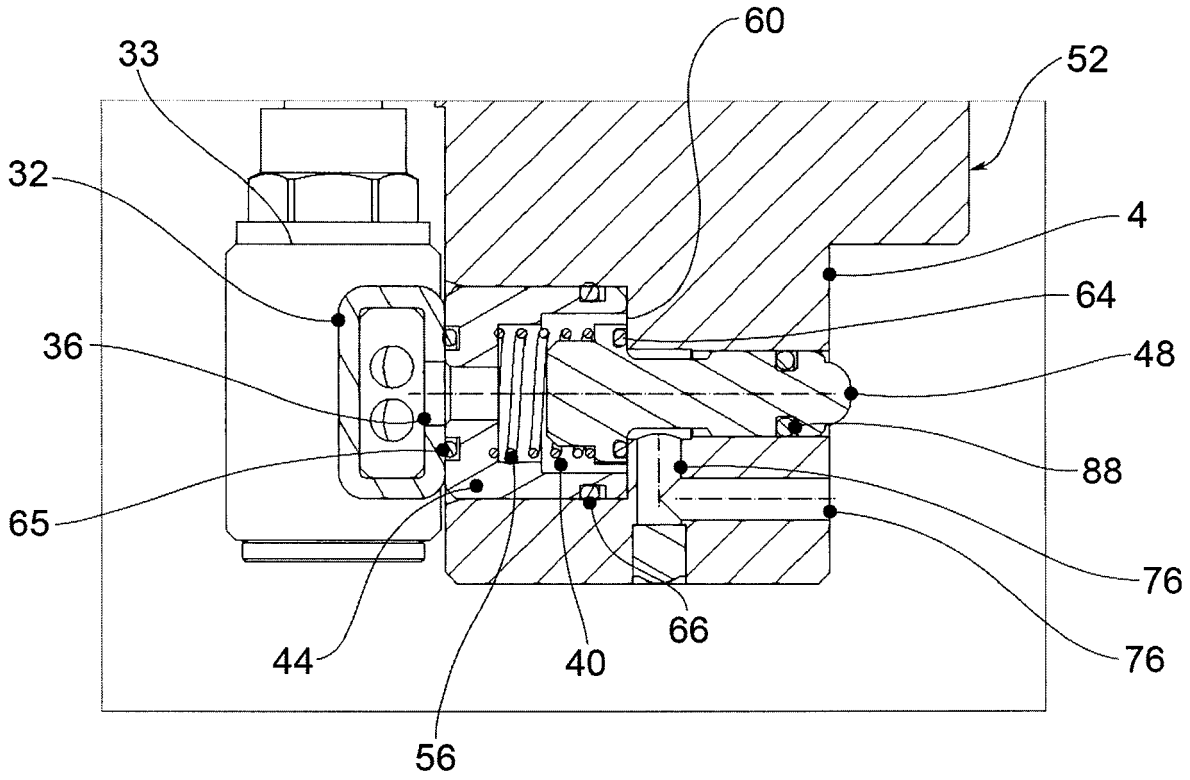
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FIG.8a

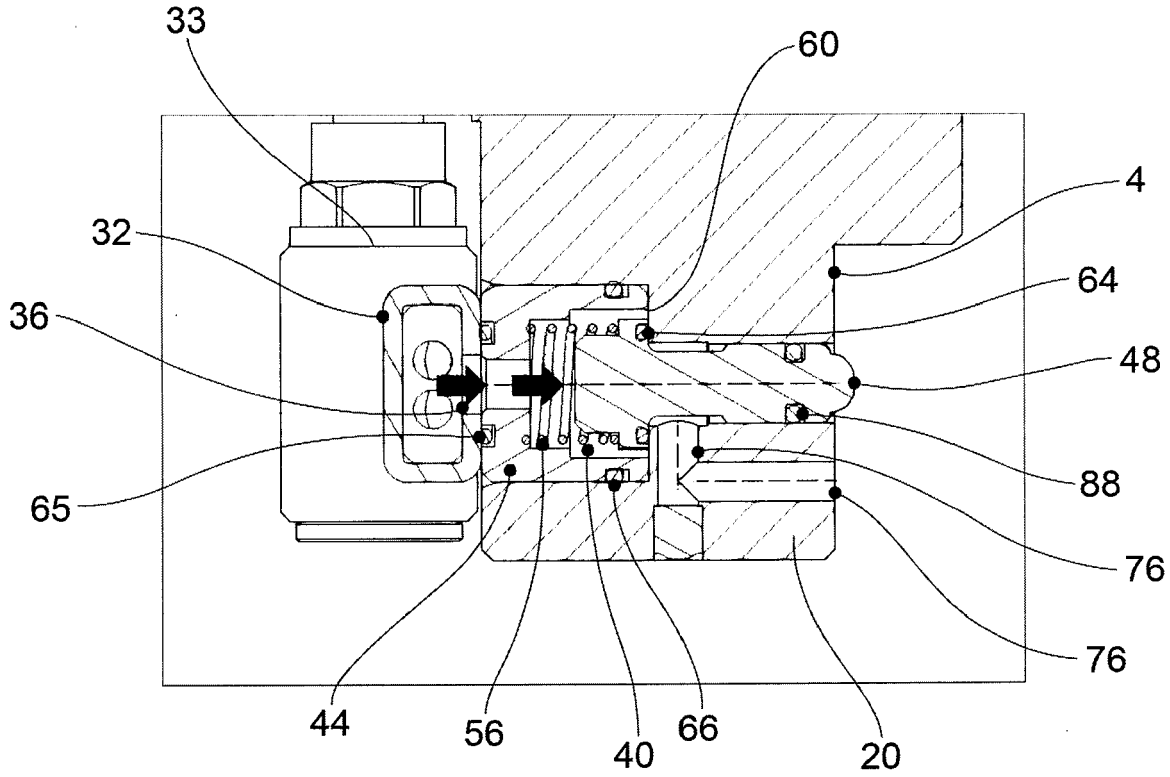
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FIG.8b

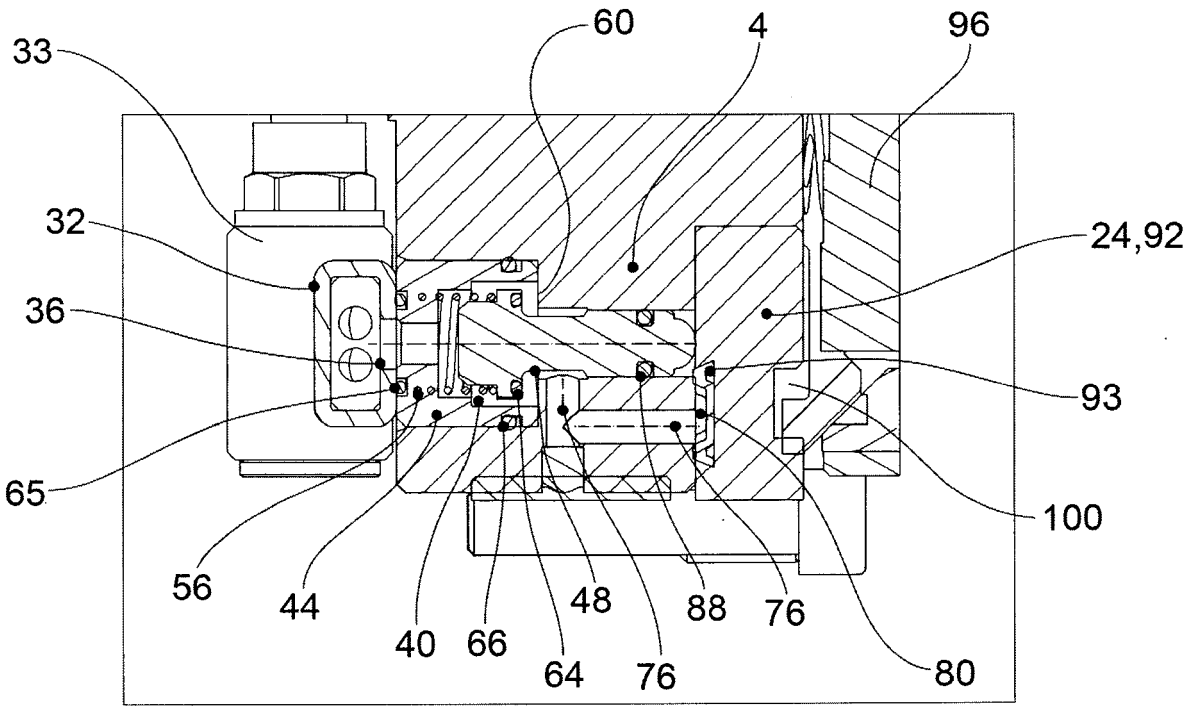
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FIG.9a

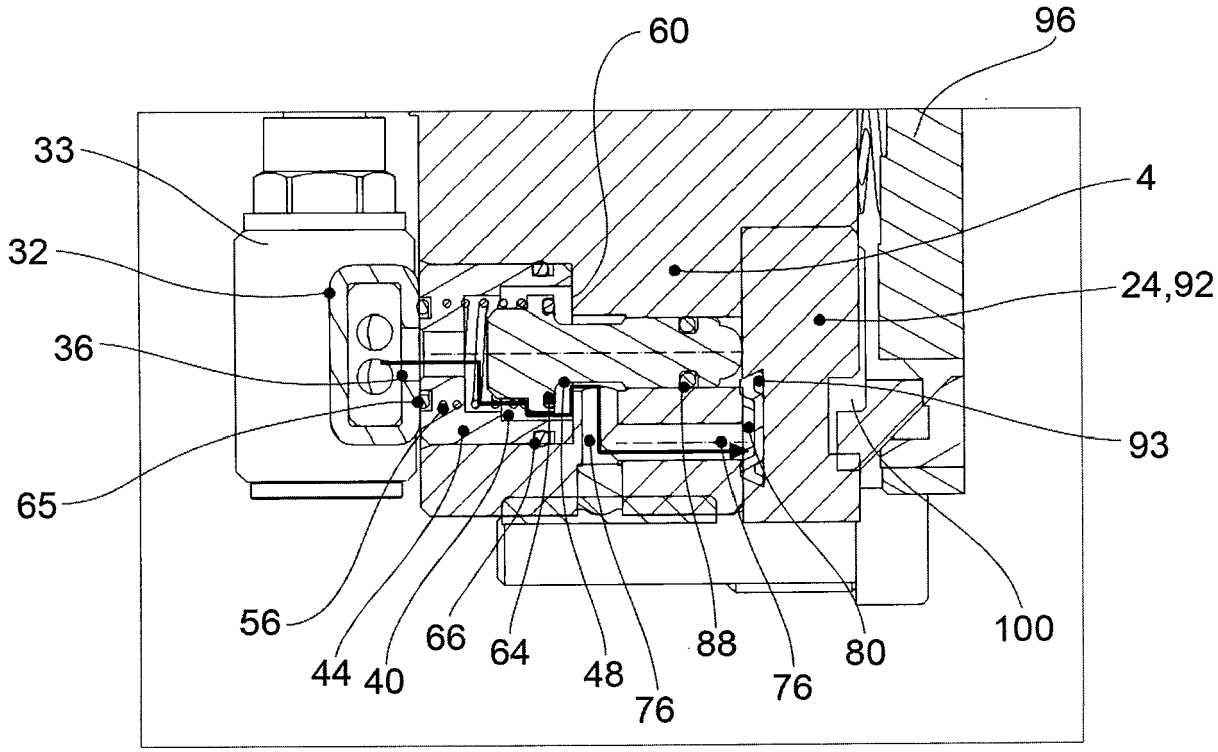
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FIG.9b

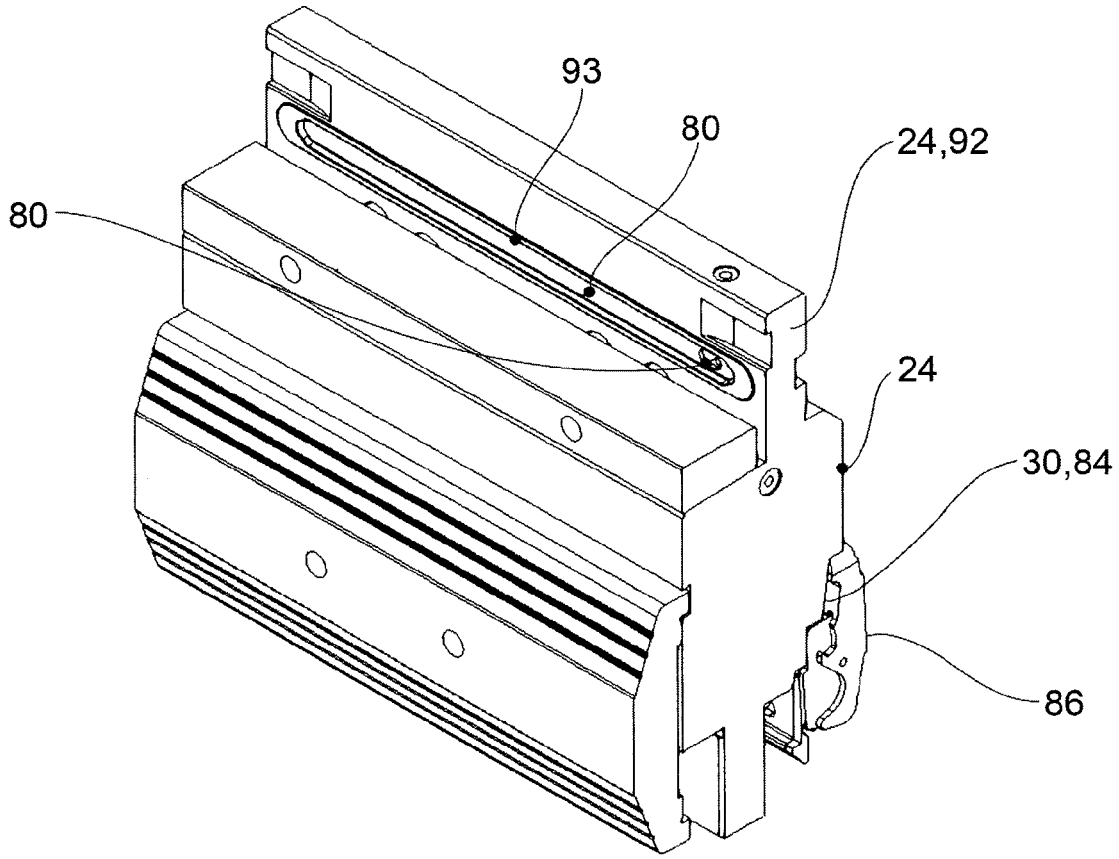

FIG.10

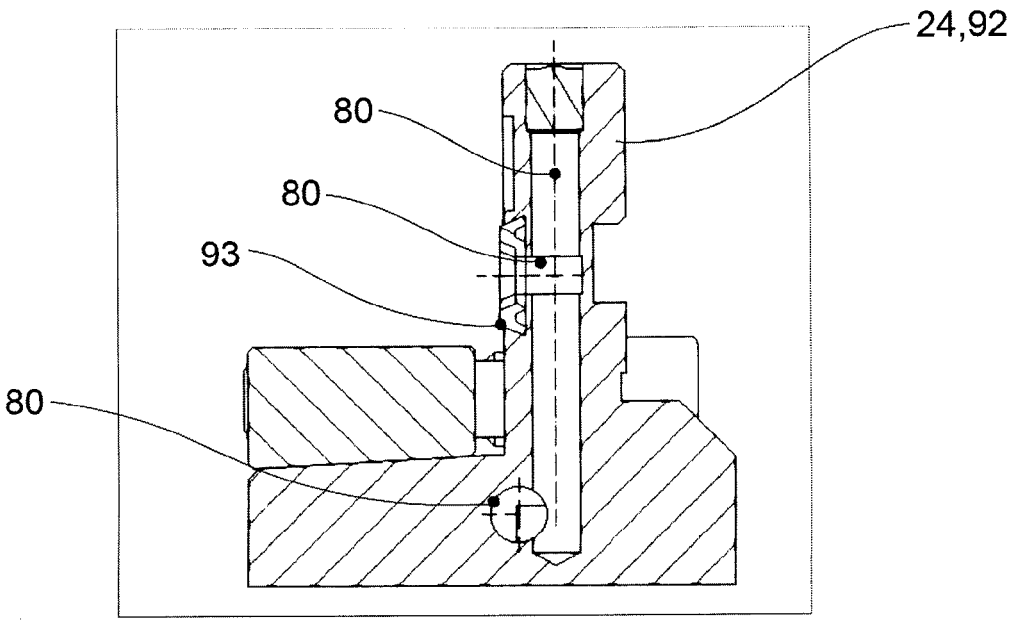

FIG.11

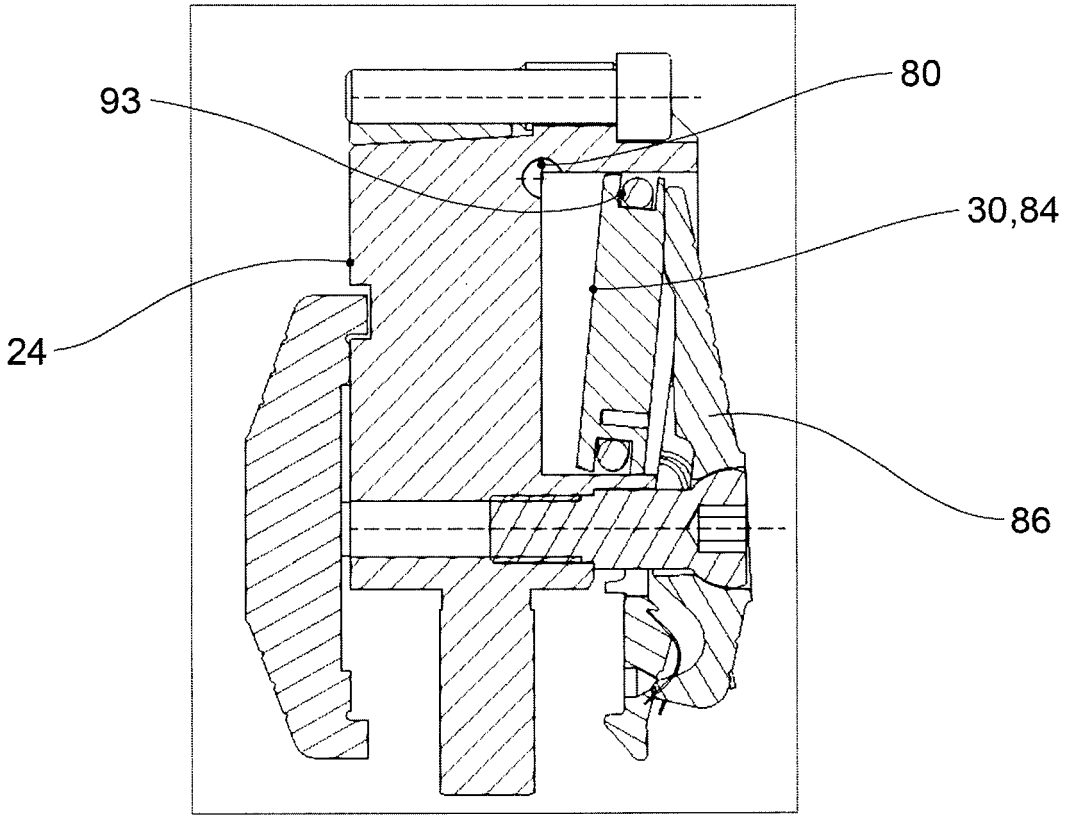

FIG.12

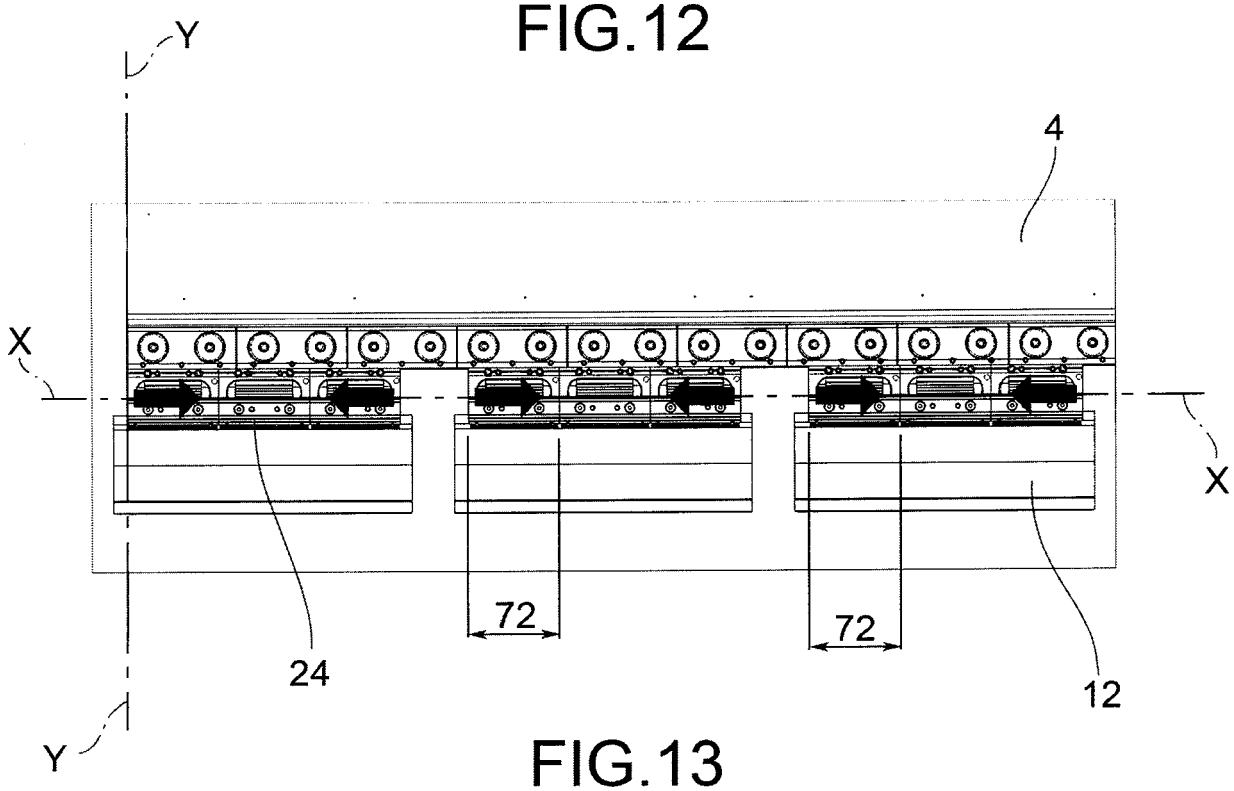

FIG.13

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European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 16 42 5019

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Munich	23 August 2016	Pieracci, Andrea

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