

(19)



(11)

EP 2 210 686 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
26.12.2012 Bulletin 2012/52

(51) Int Cl.:
B21J 5/02 ^(2006.01) **B21J 13/02** ^(2006.01)
B21J 13/03 ^(2006.01) **B21J 9/18** ^(2006.01)

(21) Application number: **10150080.9**

(22) Date of filing: **05.01.2010**

(54) **Press for hot pressing billets and the like**

Presse zum Heisspressen eines Rohlings mit geschlossenem Gesenk

Presse pour presser à chaud un lopin en matrices fermées

(84) Designated Contracting States:
**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 SE SI SK SM TR**

(30) Priority: **21.01.2009 IT MI20090056**

(43) Date of publication of application:
28.07.2010 Bulletin 2010/30

(73) Proprietor: **Mecolpress S.p.A.
25020 Flero (BS) (IT)**

(72) Inventor: **Caggioli, Domenico
I-25020, Flero (BRESCIA) (IT)**

(74) Representative: **Modiano, Micaela Nadia et al
Modiano & Partners (IT)
Via Meravigli, 16
20123 Milano (IT)**

(56) References cited:
**DE-A1- 19 933 998 DE-B3-102006 023 721
ES-A1- 397 281**

EP 2 210 686 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a press for hot pressing billets and the like.

[0002] As is known, for hot pressing articles, usually made of a brass material, mechanical or hydraulic presses which comprise toolings allowing to provide, by using a contoured pattern in the press die or molds and suitable movable punches, a desired configuration or shape are conventionally used.

[0003] In actual practice, upon having introduced a heated material length, the pressed pieces, even including large depth borings, are achieved by the press punch assemblies, thereby achieving saving materials and a greatly reducing the press operating time.

[0004] Typically, the above mentioned toolings comprise one or more movable punch elements which are mounted, by resilient mounting support elements, on the bottom half-die or mold.

[0005] The top half-die, in turn, is directly fixed to the sledge or ram of the press.

[0006] As the press ram is downward driven, the top half-die, as it contacts the bottom half-die, presses the resilient system supporting the bottom half-die holding means and, in the meanwhile, through one or more crank levers or the like, causes all the punch elements to simultaneously penetrate into the material being pressed.

[0007] While the above operating method is satisfactory under several aspects, it, however, does not allow to individually control each punch element, both with respect to its penetrating stroke and to a possibility of properly differentiating the starting and end of stroke times.

[0008] In order to overcome the above mentioned problem, a prior approach provides to use a driving system with corresponding hydraulic cylinders directly arranged on each punch element; however, such approach, because of the required high force and operating speed, requires to use high power driving motors, and corresponding large displacement hydraulic pumps as well as large amounts of circulating oil.

[0009] Accordingly, because of the high inlet and outlet speed of the punch element with respect to the die, it is necessary to use large size and high cost mechanical detent elements and manual adjusting assemblies. A forging press that has the features set forth in the preamble of claim 1, is known from DE 19933998.

SUMMARY OF THE INVENTION

[0010] Accordingly, the aim of the present invention is to overcome the above mentioned problems, by providing a press for hot molding billets and the like, allowing to manage the driving of the punch elements in an adjustable time and with variable operating strokes between respective punch elements, without using large displacement hydraulic pumps.

[0011] Within the scope of the above mentioned aim, a main object of the invention is to provide such a press adapted to operate with large pressing forces, while facilitating the forming of the workpieces, to provide high quality end pressed products.

[0012] Another object of the present invention is to provide such a press which, owing to its specifically designed constructional features, is very reliable and safe in operation.

[0013] Yet another object of the present invention is to provide such a press for hot pressing or molding billets and the like, which can be easily made and which, moreover, is very competitive from a mere economic standpoint.

[0014] The above aim and these and other objects, which will become apparent better, hereinafter, are achieved by a press for hot processing billets and the like, according to the invention, that has the features of claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] Further characteristics and advantages of the present invention will become more apparent hereinafter from the following detailed disclosure of a preferred, though not exclusive, embodiment of a press for hot pressing billets and the like, which is illustrated, by way of an indicative, but not limitative, example in the accompanying drawings, where:

Figure 1 is a schematic perspective view showing the press according to the present invention;

Figure 2 is a front elevation view of the press according to the present invention;

Figure 3 is a further side elevation view of the press according to the present invention;

Figure 4 shows a top plan view of the press according to the present invention;

Figure 5 shows a further cross-sectional view substantially taken along the section line V-V of figure 2; Figure 6 shows a further cross-sectional view, substantially taken along the section line V-V of figure 2, of the inventive press including three punch elements;

Figure 7 is a further cross-sectional view showing the punch elements in a lowered or introduced position thereof;

Figure 8 is a schematic view showing the punch element at an opening position thereof; and

Figures 9 and 10 show a position transducer for controlling the operating strokes of hydraulic pistons controlling the punch elements.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] With reference to the number references of the above mentioned figures, the press for hot pressing bil-

lets and the like according to the invention, which has been generally indicated by the reference number 1, comprises a bearing framework 2, which supports the operating equipment or tooling with a bottom mold or forging die 3 which is coupled with rigid supporting elements.

[0017] More specifically, the top forging die 4 is coupled to the ram or sledge 5 of the press, which is advantageously driven by hydraulic driving means.

[0018] At the lower mold or forging die of the press, a plurality of movable punch elements, generally indicated by the reference number 10 are provided.

[0019] The main feature of the invention is that the movable punch elements 10 comprise a punch member, indicated by the reference number 11, which is introduced to provide a forming or shaping operation on the billet 8, into the corresponding mold or die.

[0020] A further very important feature of the invention is that two toggle levers are herein provided, and, more specifically, a first toggle lever 13, pivoted to the movable carriage 14 supporting the punch member 11, and adapted to be driven with respect to the forging die.

[0021] The first toggle lever 13, in particular, is pivoted, at the other end portion thereof, to a fixed point of the punch bearing carriage support, coupled to the base of the bottom die bearing equipment, which is rigidly fixed to the framework 2.

[0022] To properly drive the movable carriage 14, a hydraulic cylinder 20, the piston stem 21 of which is coupled to the pivot point of the levers 16 and 13 is herein provided.

[0023] This assembly comprises the toggle levers and movable carriage and may be arranged both vertically and horizontally on its supporting base.

[0024] In this connection it should be apparent that the inventive press may comprise any desired number of punch elements, as shown, for example, in figures 5 and 6, which show press embodiments including four and three punch elements respectively.

[0025] In operation, the telescopically sliding movable carriage will support the punch element or member 11 to be driven for introducing it for engaging the pivot region of the levers and cylinder.

[0026] The pressing cylinder comprises, as is shown in figures 9 and 10, a first piston 30 coupled to the lever pivot stem 21, thereby allowing the punch element to be easily introduced into and withdrawn from the die.

[0027] Moreover, a second piston 35 projecting from a rear flange 36 for adjusting the piston stroke is herein provided.

[0028] More specifically, the adjustment of the full stroke of the punch element is performed by driving and locating the second piston 35 in the cylinder chamber directly through the electrohydraulic system, generally indicated by the reference number 40, which also allows to electronically detect the achieved position.

[0029] If the press equipment or tooling comprises two or more punch bearing assembly, then each said assem-

bly will be an actually independent and autonomous operating arrangement.

[0030] Moreover, it is herein possible to manage or control in a separate manner the operation time, to facilitate the material extruding operation, while facilitating its displacement to points which could not be easily reached and to prevent undesirable urging or pressing forces from being applied to the other punch elements.

[0031] From the above disclosure it should be apparent that the invention fully achieves the intended aim and objects.

[0032] In particular, the fact is to be pointed out that the provision of a toggle lever system allows to greatly reduce the driving power, since the toggle arrangement provides the possibility of gradually multiplying the applied pressing force, while reducing the linear displacement speed or rate.

[0033] Thus, the forming of the workpiece will be greatly facilitated, since with a smaller penetration speed of the punch element into the material, the required effort or force will be correspondingly less.

[0034] Moreover, with the herein provided toggle lever system, as the linear driving speed or rate decreases, the penetrating force will correspondingly increase.

[0035] Thus, by suitably designing the size of the toggle levers, it is possible to achieve very high operating forces with small driving pressing efforts.

[0036] Thus, as stated, the invention fully achieves the intended aim and objects.

[0037] In particular, the fact is to be pointed out that the use of a mixed hydraulic and mechanical system, including the toggle lever arrangement and the hydraulic cylinder, allows to greatly improve the press operation, and to greatly reduce the required power.

[0038] The invention, as disclosed, is susceptible to several modifications and variations, all of which will come within the scope of the invention, as defined in the claims.

Claims

1. A press for hot pressing billets and the like, said press (1) comprising: a bottom press-forging die (3); a top forging-die (4) associated with the sledge (5) of said press, on said bottom forging die (3) being provided at least a movable punch element (10) for forming the workpiece (8); driving means for driving said movable punch element (10), said driving means including two toggle levers (13, 16) operating between said movable punch element (10) and a fixed point, **characterized in that** it further comprises a hydraulic cylinder (20) operating at a pivot point of said toggle levers (13, 16) for driving said movable punch element (10), and **in that** said hydraulic cylinder (20) comprises a first hydraulic cylinder piston (30) coupled to a piston stem (21) that operates at said pivot point and a second piston (35) projecting from a rear

flange (36) of said hydraulic cylinder (20) for adjusting the operating stroke of said punch element (10); said bottom press-forging die (3) being rigidly coupled to the base of the equipment and to a basic frame (2) through resilient supporting elements.

2. A press, according to claim 1, **characterized in that** it comprises a movable press carriage (14) supporting, at an end portion thereof, at least a said punch element (10) and, at the other end portion thereof, being coupled to one (13) of said toggle levers 10
3. A press, according to claim 1, **characterized in that** it comprises a plurality of mutually independently driven punch elements (10). 15
4. A press, according to claim 1, **characterized in that** the overall stroke of said movable punch element (10) is adjusted by driving and arranging the second, rear piston (35) inside the hydraulic cylinder chamber (20). 20
5. A press, according to claims 1 or 4, **characterized in that** it comprises an electrohydraulic actuator (40) adapted to directly drive and locate said second piston (35) in the chamber of said cylinder (20) for the adjustment of the full stroke of said movable punch element (10) and to operate as an absolute position transducer for detecting the achieved position. 25 30

Patentansprüche

1. Presse zum Heißpressen von Warmbolzen und ähnlichem, wobei die Presse (1) folgendes umfasst: eine untere Pressschmiedematritze (3); eine obere Schmiedematritze (4), die mit dem Hammer (5) der Presse verbunden ist, wobei an der unteren Schmiedematritze (3) wenigstens ein bewegliches Schlagelement (10) zum Formen des Werkstückes (8) angeordnet ist; Antriebsmittel zum Antreiben des beweglichen Schlagelementes (10), wobei die Antriebsmittel zwei Kniehebel (13, 16) beinhalten, die zwischen dem beweglichen Schlagelement (10) und einem festen Punkt arbeiten, **dadurch gekennzeichnet, dass** sie zudem einen Hydraulikzylinder (20) aufweist, der an einem Drehpunkt der Kniehebel (13, 16) angreift, um das bewegliche Schlagelement (10) anzutreiben und dadurch, dass der Hydraulikzylinder (20) einen ersten hydraulischen Zylinderkolben (30), der mit einem Kolbenschaft (21) verbunden ist, der an dem Drehpunkt angreift, und einen zweiten Kolben (35) aufweist, der von einem hinteren Flansch (36) des Hydraulikzylinders (20) hervorsteht, um den Arbeitshub des Schlagelementes (10) einzustellen, wobei die untere Pressschmiedematritze (3) starr mit der Basis der Anlage und mit einem 35 40 45 50 55

Basisrahmen (2) durch elastische Stützelemente verbunden ist.

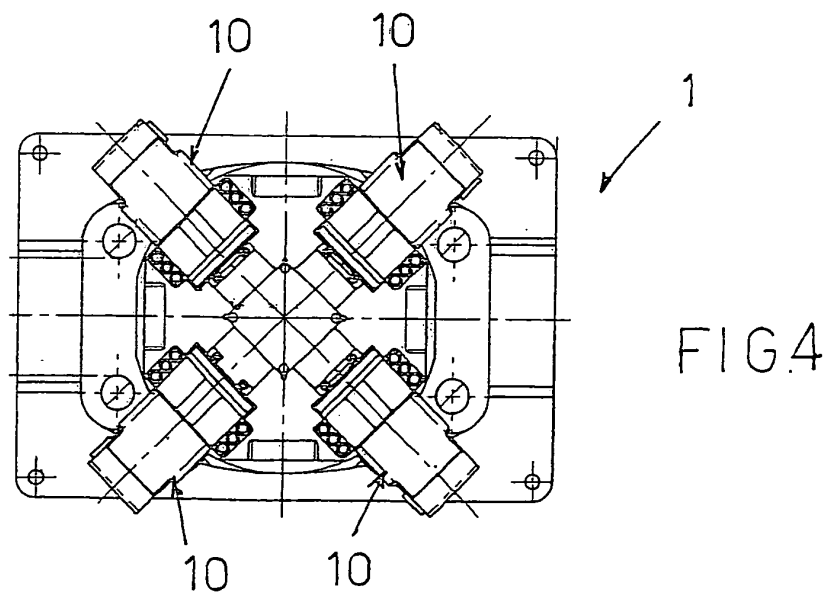
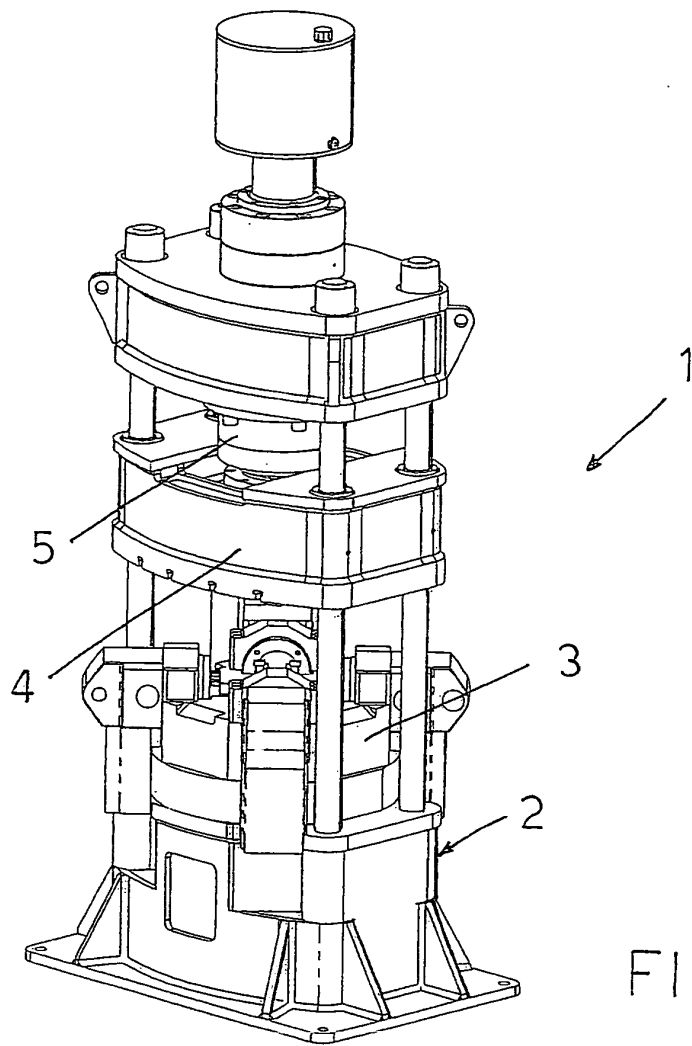
2. Presse nach Anspruch 1, **dadurch gekennzeichnet, dass** sie einen beweglichen Pressenschlitten (14) aufweist, der an seinem einen Endanteil das wenigstens ein Schlagelement (10) stützt und mit seinem anderen Endanteil mit einem der Kniehebel (13) verbunden ist.
3. Presse nach Anspruch 1, **dadurch gekennzeichnet, dass** sie eine Mehrzahl von gegenseitig unabhängig angetriebenen Schlagelementen (10) aufweist.
4. Presse nach Anspruch 1, **dadurch gekennzeichnet, dass** der Gesamthub des beweglichen Schlagelementes (10) durch Antreiben und Anordnen des zweiten hinteren Kolbens (35) in der Hydraulikzylinderkammer (20) angepasst wird.
5. Presse nach Anspruch 1 oder 4, **dadurch gekennzeichnet, dass** sie einen elektrohydraulischen Aktuator (40) aufweist, der angepasst ist, um direkt den zweiten Kolben (35) in der Kammer des Zylinders (20) anzutreiben und zu positionieren, zum Anpassen des Gesamthubs des beweglichen Schlagelementes (10) und als ein absoluter Positionsmesswandler zu arbeiten, um die erreichte Position zu detektieren.

Revendications

1. Presse pour le pressage à chaud de billettes et objets similaires, ladite presse (1) comprenant : une matrice de forgeage à la presse inférieure (3), une matrice de forgeage supérieure (4) associée à la masse (5) de ladite presse, sur ladite matrice de forgeage inférieure (3) étant placé au moins un élément de poinçon mobile (10) pour former la pièce (8), un moyen d'entraînement pour entraîner ledit élément de poinçon mobile (10), ledit moyen d'entraînement comprenant deux leviers articulés (13, 16) fonctionnant entre ledit élément de poinçon mobile (10) et un point fixe, **caractérisée en ce qu'elle** comprend en outre un vérin hydraulique (20) fonctionnant au niveau d'un point de pivotement desdits leviers articulés (13, 16) pour entraîner ledit élément de poinçon mobile (10), **et en ce que** ledit vérin hydraulique (20) comprend un premier piston de vérin hydraulique (30) couplé à une tige de piston (21) qui fonctionne au niveau dudit point de pivotement et un deuxième piston (35) faisant saillie depuis une bride arrière (36) dudit vérin hydraulique (20) pour régler la course fonctionnelle dudit élément de poinçon (10), ladite matrice de forgeage à la presse inférieure (3) étant couplée rigi- 35 40 45 50 55

dement à la base de l'équipement et à un cadre de base (2) à travers des éléments de support résilients.

2. Presse selon la revendication 1, **caractérisée en ce qu'elle** comprend un chariot de presse mobile (14) supportant, en une partie d'extrémité de celui-ci, au moins un dit élément de poinçon (10) et étant, à l'autre partie d'extrémité de celui-ci, couplé à l'un (13) desdits leviers articulés. 5
10
3. Presse selon la revendication 1, **caractérisée en ce qu'elle** comprend une pluralité d'éléments de poinçon (10) entraînés de façon mutuellement indépendante. 15
4. Presse selon la revendication 1, **caractérisée en ce que** la course totale dudit élément de poinçon mobile (10) est réglée en entraînant et en agénçant le deuxième piston, ou piston arrière (35) à l'intérieur de la chambre du vérin hydraulique (20). 20
5. Presse selon la revendication 1 ou 4, **caractérisée en ce qu'elle** comprend un actionneur électro-hydraulique (40) adapté pour entraîner directement et positionner ledit deuxième piston (35) dans la chambre dudit vérin (20) pour le réglage de la course complète dudit élément de poinçon mobile (10), et pour fonctionner en tant que transducteur de position absolue pour détecter la position atteinte. 25
30
35
40
45
50
55



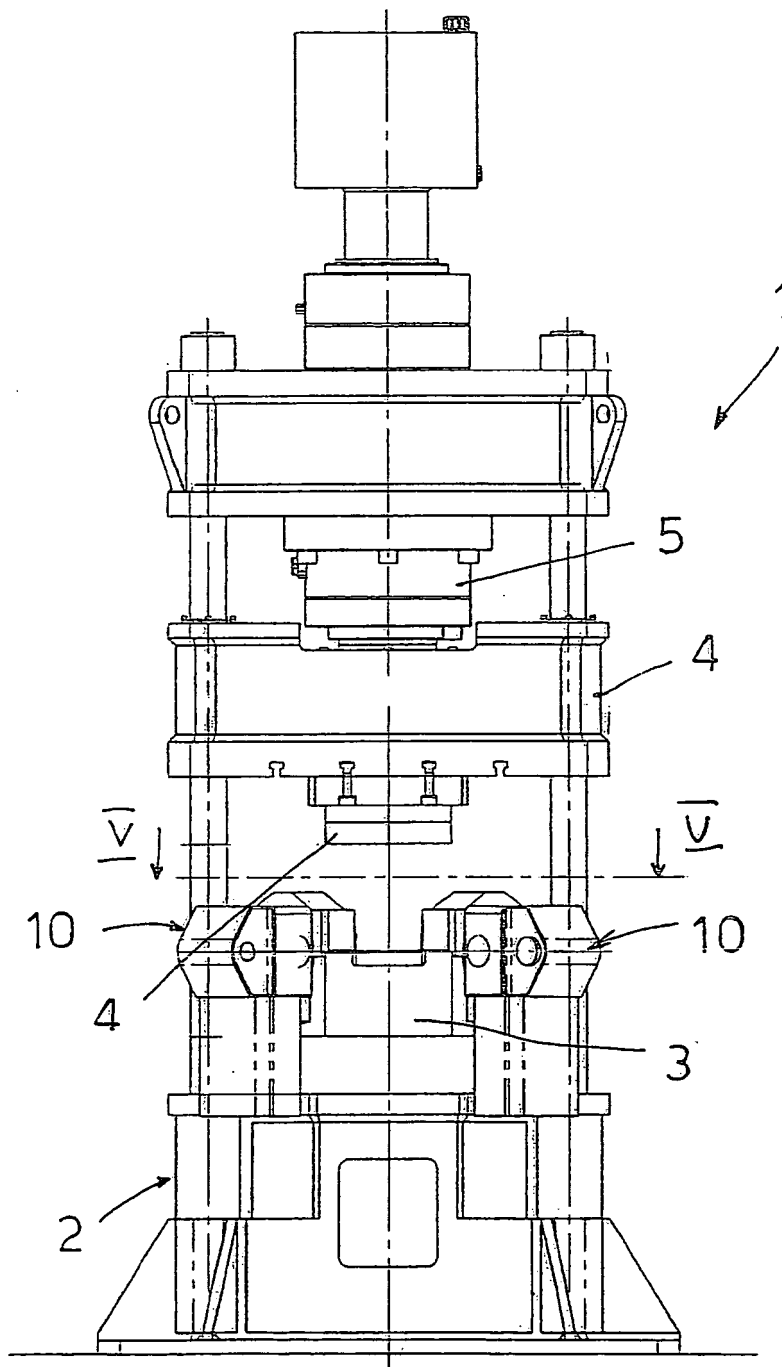


FIG.2

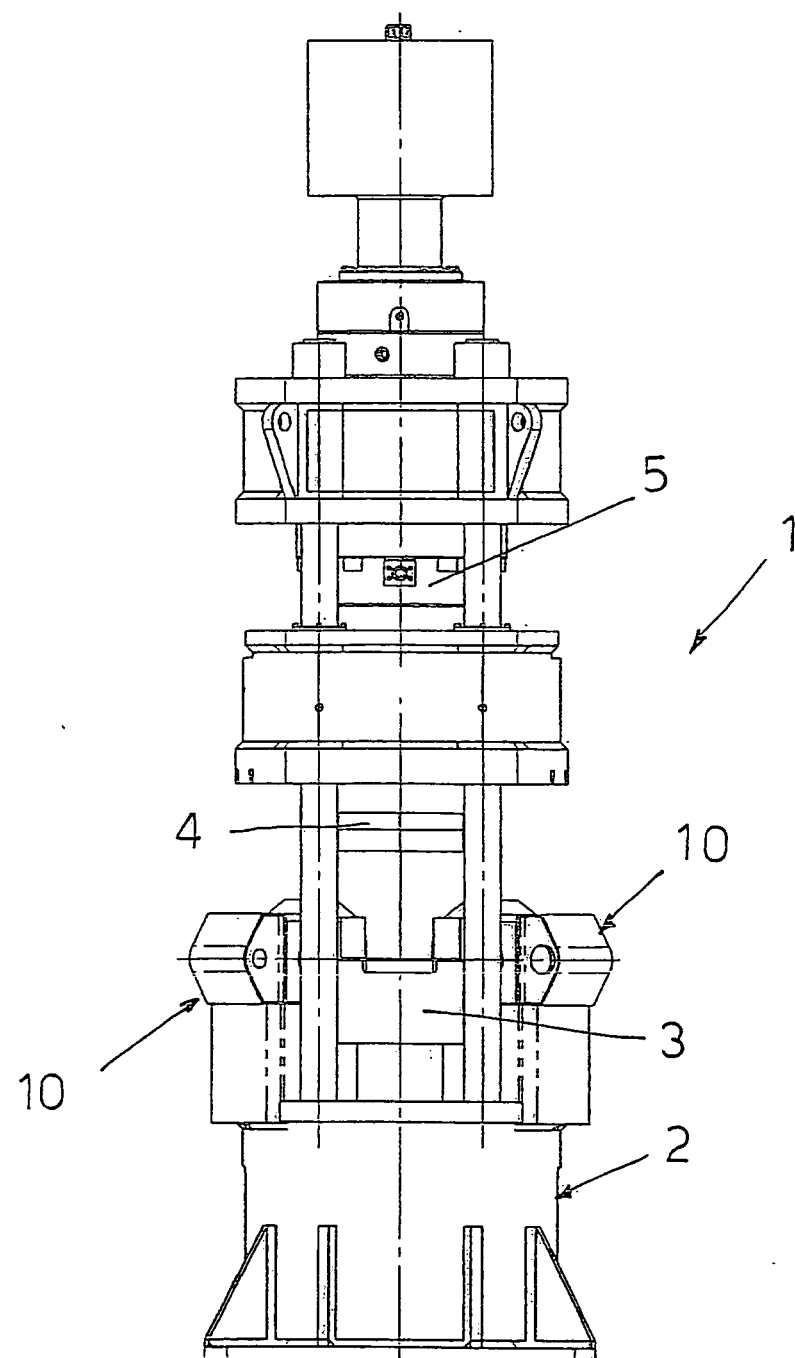
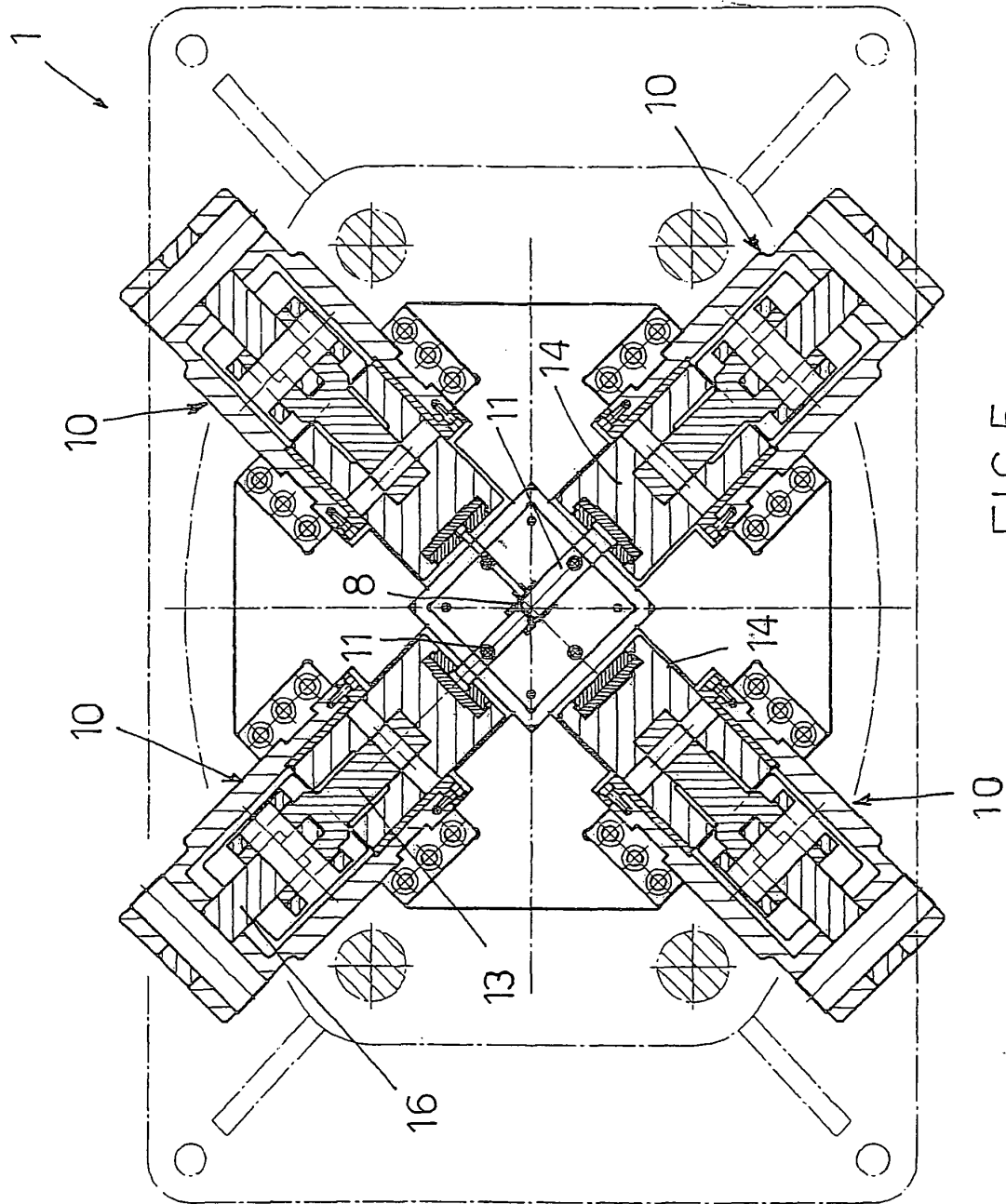
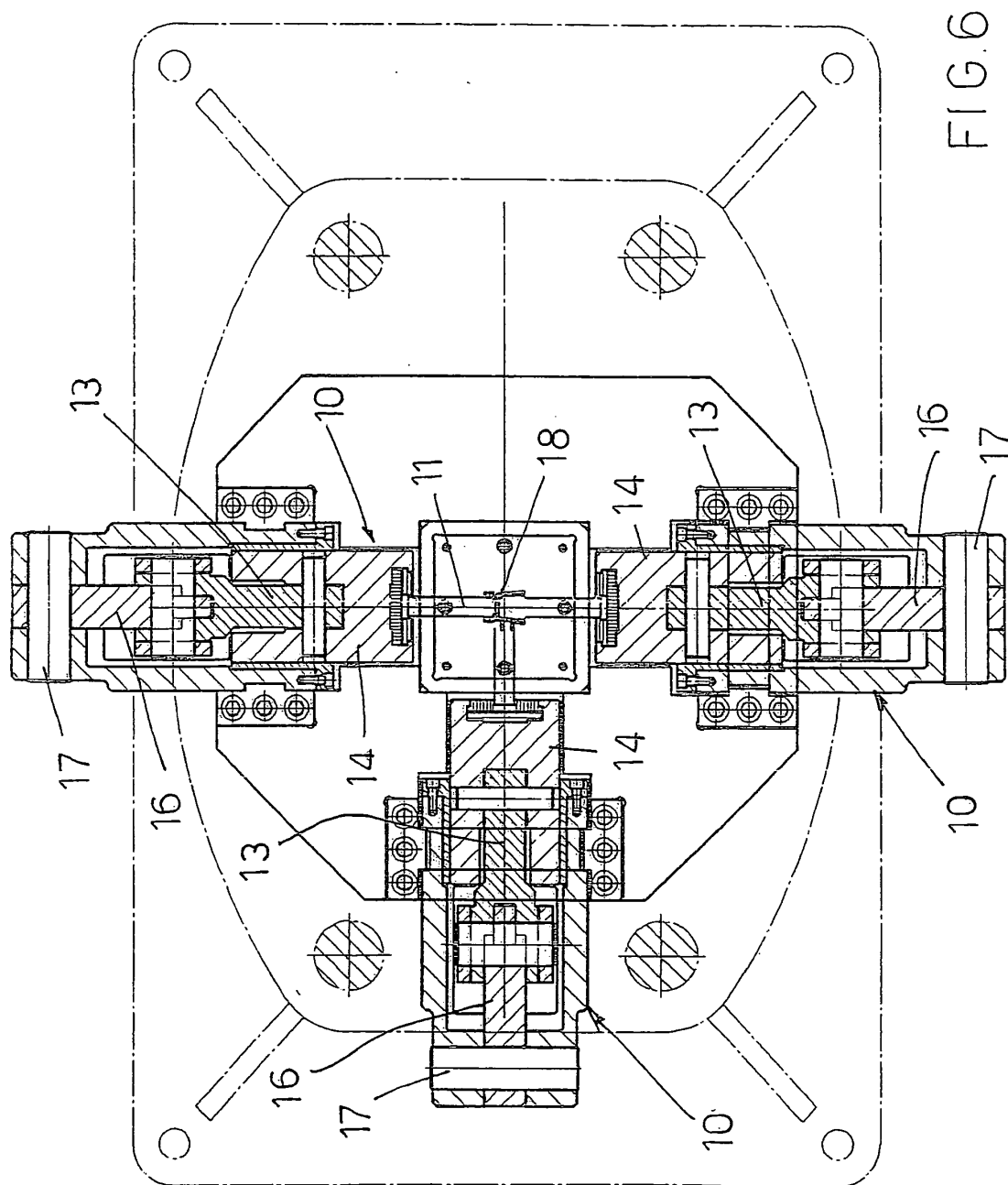


FIG. 3





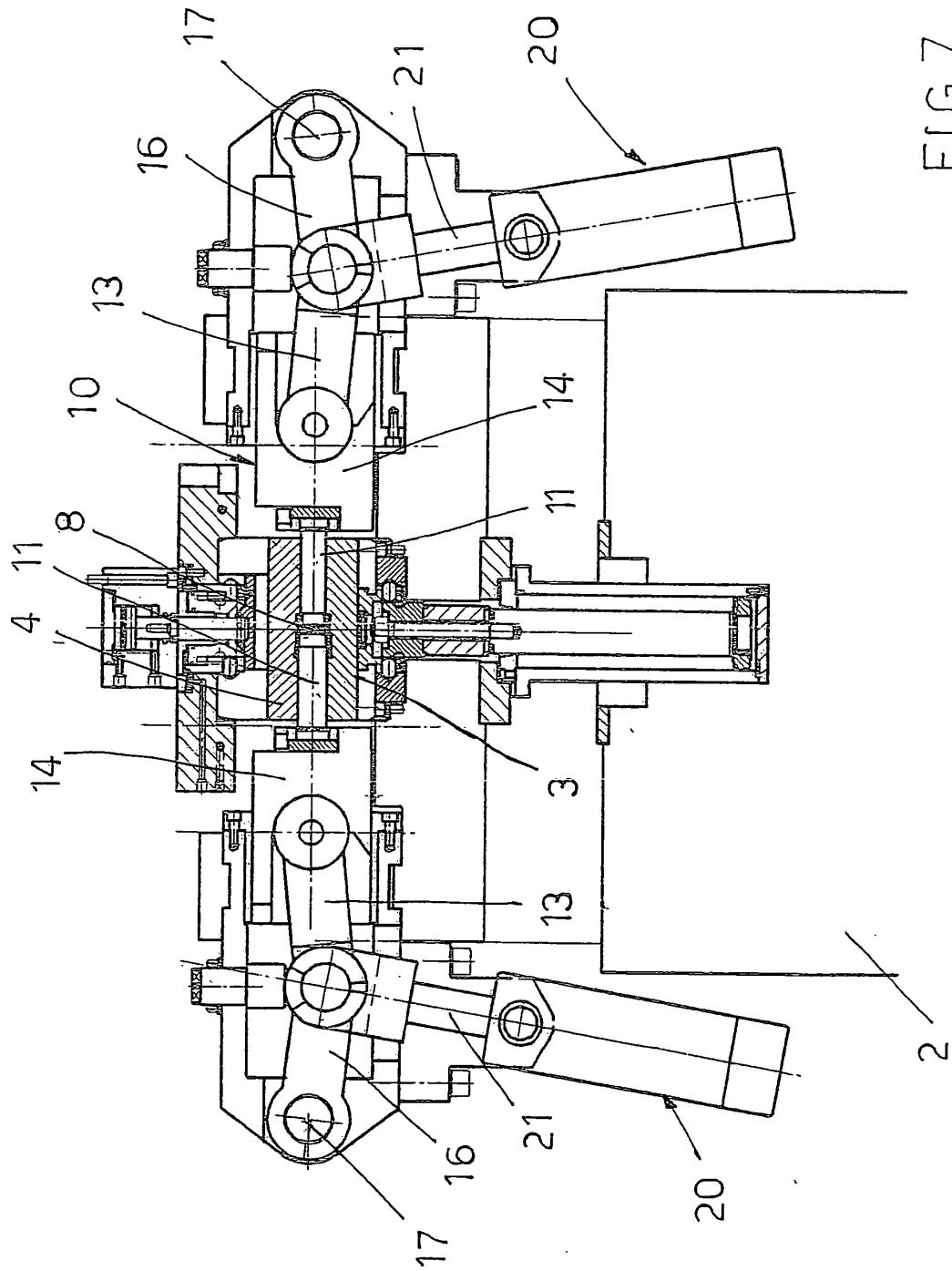


FIG. 7

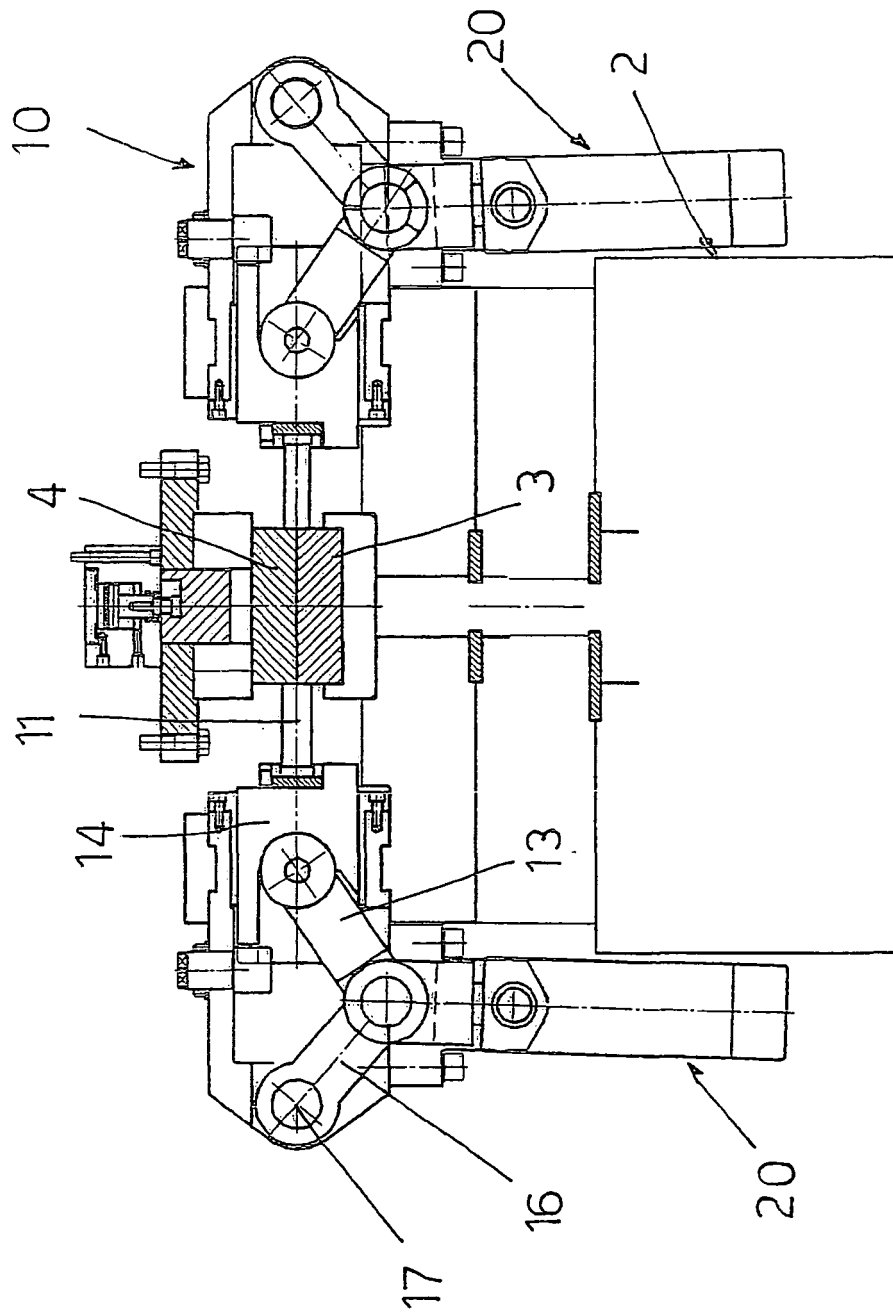


FIG. 8

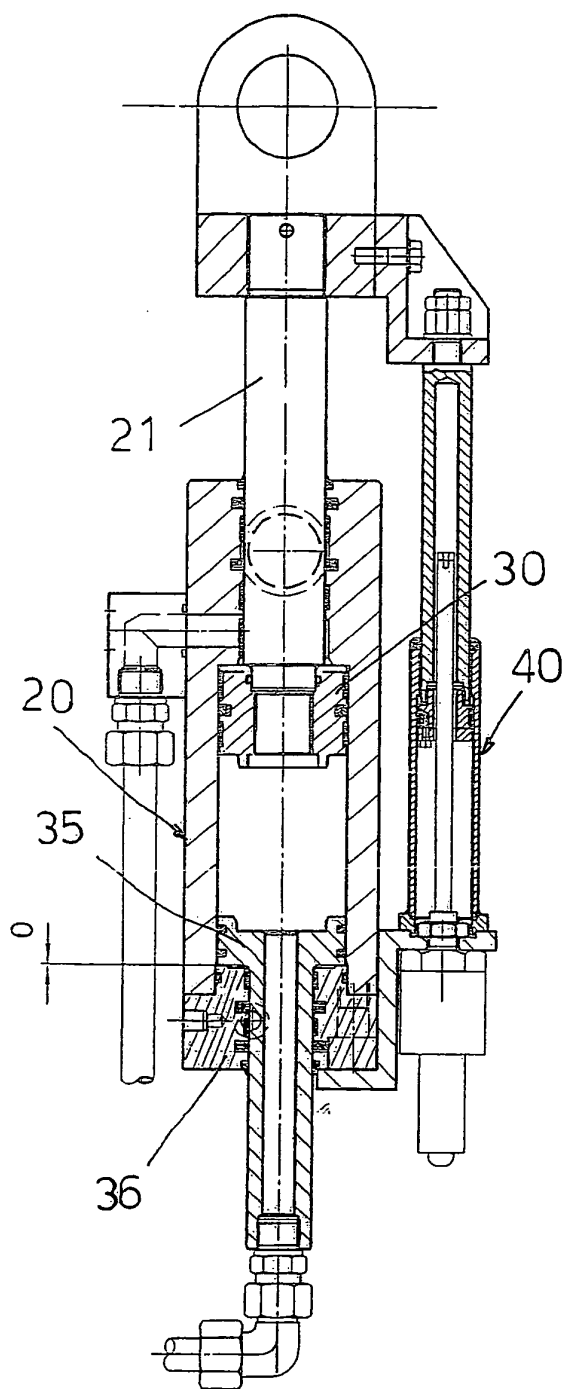


FIG. 9

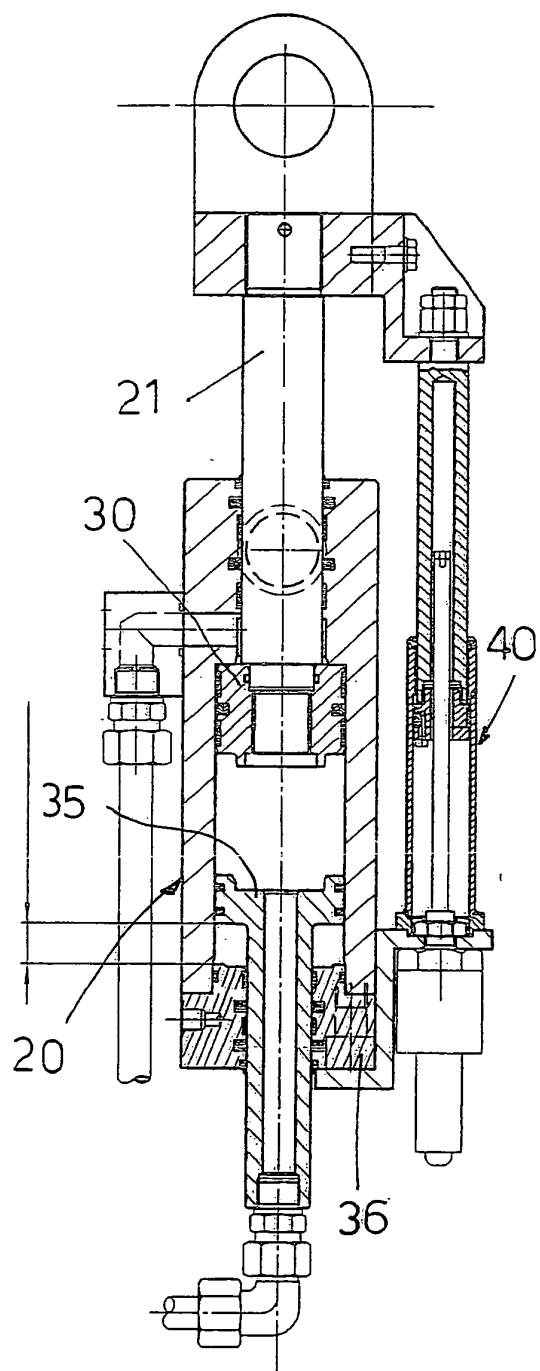


FIG. 10

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

- DE 19933998 [0009]