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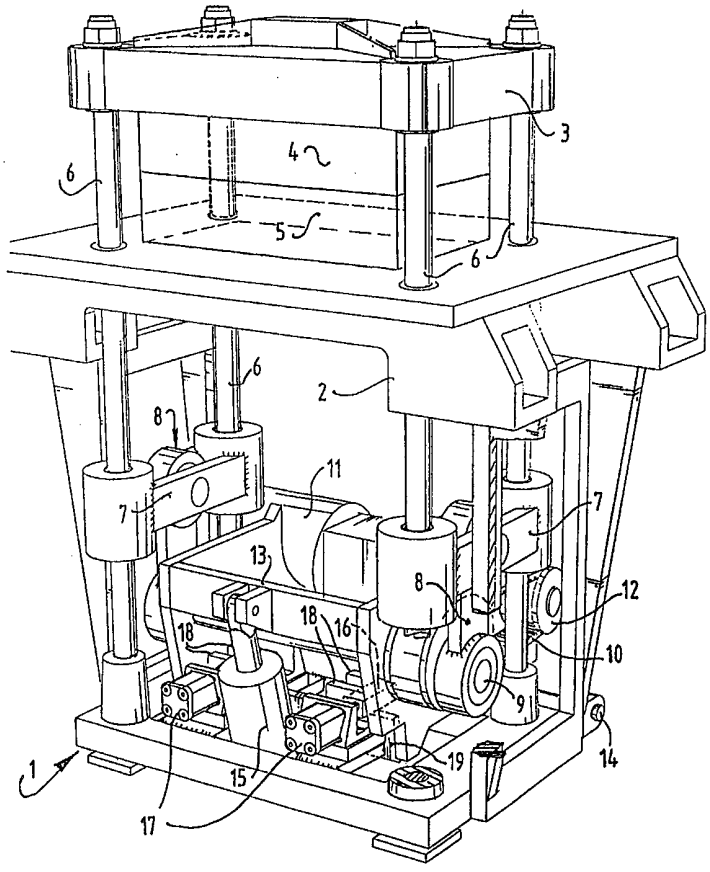
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(57) Abstract

The invention relates to a press device for processing lead frames, comprising: a frame, at least one ram part (3) mounted displaceably in the frame (2), and drive means coupled to the ram part for displacing the ram part (3) in the frame (2), wherein the drive means are mounted on a sub–frame (13), which sub–frame (13) is connected displaceably to the frame (2).



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PRESS DEVICE FOR PROCESSING LEAD FRAMES

The invention relates to a press device for processing lead frames, comprising:

- a frame,
- at least one ram part mounted displaceably in the frame, and
- drive means coupled to the ram part for displacing the ram part in the frame.

A press device according to the prior art generally has a ram part which can make an operating stroke. During the operating stroke only a relatively limited opening is created between separate tool parts for the placing of new products for processing and/or for removal of processed products. For maintenance, change-overs, repair and so on it is also desirable to be able to move the tool parts a greater distance apart. Such a comparatively large opening between tool parts is designated "daylight opening". In order to create a daylight opening, press devices according to the prior art are provided with coupling means of adjustable length which connect the displaceable ram part to the drive means. These coupling means are formed in practice by a crank in which is received a spindle construction with associated spindle drive. In order to create a daylight opening the crank is extended using the spindle drive. A drawback of this construction is that the forces are transmitted from these drive means to movable ram part through the spindle construction. The spindle construction must consequently take a relatively heavy form but generally remains a critical component of the press device. Another drawback is the relatively complex structure of the crank.

The present invention has for its object to provide an improved press device of the type stated in the preamble with which a daylight opening can be created without the use of the relatively sensitive crank construction with spindle received therein.

The present invention provides for this purpose a press device as described above, wherein the drive means are mounted on a sub-frame, which sub-frame is connected displaceably to the frame. In a preferred embodiment the sub-frame is pivotally connected to the frame. Drive means, such as for instance a drive cylinder, are preferably also arranged between sub-frame and frame. In order to displace the ram part such that a daylight opening is created, the sub-frame has to be displaced in a press device according to the invention. This is possible for instance by embodying the sub-frame pivotally and by pivoting it to create the daylight opening. It is however also conceivable to embody the sub-frame in linearly translatable form. For automatic displacement of the sub-frame drive means must be arranged between sub-frame and frame. Operation of these drive means will result in a displacement of a sub-frame. An inexpensive solution for the drive means is formed by a drive cylinder. This can take a relatively compact form.

An important advantage of this device according to the invention is that, in addition to the absence of the relatively costly and vulnerable crank construction, the weight of the movable press parts is limited during normal operation. The provisions for creating a daylight opening, in particular sub-frame and drive means for sub-frame, are in any case stationary during execution of a normal operating stroke. Reduction in weight and size of movable parts results in many derived advantages, such as for instance lower energy consumption, faster start and stop options, limitation of noise production and so on.

Yet another advantage is that change-over of the press device from an operational position to a daylight position and vice versa can take place much more rapidly by means of the press device according to the invention than according to the prior art. The replacing of a crank can also take place much more rapidly and more easily.

In a preferred embodiment the frame is provided with at least one stop and the sub-frame is provided with at least one counter-stop co-acting with the stop of the frame for accurate positioning of the sub-frame in a

determined position relative to the frame. At least the stop or counter-stop can herein be embodied for displacement between an active position and a non-active position. It is of great importance to be able to position the sub-frame precisely relative to the frame, particularly in the position of the sub-frame in which the press device is set to perform the operating stroke. A precise position determination of the sub-frame is anyway required for control of the extreme positions of the tools during the operating stroke. By positioning the sub-frame by means of stops a precise position determination can be ensured with a relatively inexpensive construction. When at least one of the stops is displaceable, it is also possible to use this stop as locking element. It is thus possible to prevent the sub-frame displacing when it has to be situated in a precisely determined end position. Another advantage of a displaceable stop is that when the stop is situated in active position the sub-frame can be urged against the stop in the direction of movement.

In a preferred embodiment the drive means for displacing the sub-frame also produce a bias for urging the counter-stop of the sub-frame against the stop of the frame. The drive means thus contribute toward control of the position of the sub-frame at a determined location. When a stop is displaceable it is even possible herein to cause the drive means to exert a biasing force in the direction of movement of the sub-frame. This makes it possible to cause the drive means for the sub-frame to produce bias in a direction in which this bias can be applied relatively simply. It is thus possible to suffice with relatively inexpensive drive means for the sub-frame.

In a preferred embodiment the drive means for displacing the ram part are formed by a rotatable eccentric shaft and a drive motor coupled thereto. This drive motor can be coupled directly to the eccentric shaft or via coupling means such as for instance a drive belt. All these elements can be assembled on the sub-frame in relatively simple manner.

The present invention will be further elucidated with reference to the non-limitative embodiments shown in the following figures. Herein:

Fig. 1 shows a perspective view of a press device according to the invention in closed position,

Fig. 2 is a perspective view of the press device of fig. 1 in an opened, operating position,

Fig. 3 is a perspective view of the press device of fig. 1 and 2 in an opened, daylight position,

Fig. 4 is a perspective rear view of the press device shown in fig. 1-3 in closed position,

Fig. 5 shows a cross-section through the underside of the press device of fig. 1-4 in closed position,

Fig. 6 is a perspective view of an alternative press device in an opened, operating position,

Fig. 7 shows the press device of fig. 6 in a perspective view from another side,

Fig. 8 is a perspective view of the press device of fig. 6 and 7 in a daylight position,

Fig. 9 shows a schematic view of a part of the press device according to fig. 6-8 in an operating position, and

Fig. 10 shows a schematic view corresponding with fig. 9 in a daylight position.

Fig. 1 shows a press device with a frame 2 relative to which a ram part 3 is vertically displaceable. Mounted between ram part 3 and the top part of frame 2 are two tool parts 4,5 which connect onto each other in the shown position. For vertical movement of ram part 3 this latter is rigidly connected to guide rods 6. Yokes 7 engage on guide rods 6 on the side of rods 6 remote from ram part 3. Yokes 7 are vertically displaceable in that two cranks 8 are connected to rotatable eccentric shaft 9. It will be apparent that cranks 8 are pivotally connected to both yokes 7 and eccentric shaft 9.

To cause rotation of eccentric shaft 9 this latter is coupled via a toothed belt 10 to a motor 11. Toothed belt 10 engages on one side onto a belt pulley connected to eccentric shaft 9 and runs on the other side over a pulley 12.

The drive means of cranks 8 (i.e. the assembly of eccentric shaft 9, toothed belt 10, pulley 12 and motor 11) is mounted on a sub-frame 13. This latter is connected to frame 2 for pivoting round a shaft 14. The position of sub-frame 13 can be changed by an actuating cylinder 15. In the shown position the sub-frame 13 is situated in an operating position, wherein the position of the sub-frame is secured by locks 16. Locks 16 are mounted on frame 2 via locking cylinders 17. Also mounted on frame 2 are lock guides 18 having recesses therein through which a lock 16 is movable with clearance fit. Space is left clear between two co-acting lock guides 18 for passage of a sub-frame beam 19 when locks 16 are retracted.

In fig. 1 the sub-frame beam 19 lies under locks 16. For a precise positioning of sub-frame 13, and therefore also the upper tool part 4, the sub-frame beam 19 is urged against locks 16 by cylinder 15. Locks 16 hereby support on the top against lock guides 18.

Tool parts 4,5 are placed mutually apart in fig. 2 in that eccentric shaft 9 is displaced relative to the position shown in fig. 1. Cranks 8 are situated in a higher position whereby yokes 7, guide rods 6 and ram part 3 are also placed further upward. The position of sub-frame 13 in fig. 2 corresponds with the position shown in fig. 1.

Fig. 3 shows press device 1 in a position in which tool parts 4,5 are moved a greater distance apart than in fig. 2. The shown position is also designated the day-light position. In this position repairs can for instance be carried out and tool parts 4,5 can be exchanged for different ones. This position hereby differs from a "normal" operating position.

In the situation according to fig. 3 the position of sub-frame 13 is changed. From the positions shown in fig. 1 and 2 the locks 16 are first of all moved to a released position. It is noted here that, for simple displacement of locks 16, the upward directed bias of cylinder 15 is first released for this purpose. After the space between two co-acting lock guides 18 has been left clear, the sub-frame 13 can be tilted round rotation shaft 14 by

cylinder 15. Sub-frame beam 19 herein moves through between the co-acting lock guides 18.

As protection against sub-frame 13 falling back in undesired manner, the locks 16, after passing sub-frame beam 19, can be moved back again to the starting position as shown in fig. 1. This is shown in fig. 3. Sub-frame beam 19 is thus blocked on the underside by the locks 16.

By displacing sub-frame 13 the eccentric shaft 9 is displaced upward. The displacement of eccentric shaft 9 is transmitted through cranks 8, yokes 7 and guide rods 6 to ram part 3. The desired daylight opening is thus obtained.

For a better view of the connection between frame 2 and sub-frame 13 the press device 1 is shown from another side in fig. 4 in a position corresponding with fig. 1. Clearly visible is that rotation shaft 1 connects frame 2 to sub-frame 13.

Fig. 5 shows a cross-section through the underside of press device 1 as shown in fig. 1-4 as according to the position of fig. 1. The construction of lock guides 18 forming part of frame 2 is shown particularly clearly here. The lock 16 extended by locking cylinder 17 blocks sub-frame 19 in its lower position. By subsequently exerting a force directed as according to arrow P1 on sub-frame 13 with cylinder 15, the sub-frame 13 will tend to rotate round shaft 14. Sub-frame beam 19 will hereby exert a force directed as according to arrow P2 on lock 16. Beam 19 hereby urges lock 16 against lock guides 18. A precise positioning of sub-frame 13 is thus obtained.

Fig. 6 shows a press device 20 of which frame 21, ram part 22, tool parts 23,24, yokes 25 and cranks 26 substantially correspond with the corresponding components of press device 1. Essentially different is the construction of sub-frame 27, which is substantially plate-like. At the rear of the view according to this figure are situated actuating cylinders 28. Only one of these actuating cylinders 28 is partly visible in this figure. Similarly to the movable sub-frame 13, the sub-frame 27 is pivotable in frame 21 by means of the actuating cylinders 28.

Situated on the underside of sub-frame 27 is a partially visible motor 29 which is coupled to rotatable eccentric shaft 31 via a reduction gearbox 30. The assembly of motor 29, transmission 30 and eccentric shaft 31 is relatively compact when compared to the corresponding components of press device 1.

Two locking cylinders 32 actuate two horizontally displaceable locks 33. In the position shown in fig. 6, the locks 33 are extended and the upper part of sub-frame 27 is urged against the undersides of locks 33 by actuating cylinders 28. A precise positioning of sub-frame 27 is thus ensured.

Fig. 7 shows press device 20 in the position depicted in fig. 6 from the opposite side. Clearly shown are actuating cylinders 28 and a pivot shaft 35 with which sub-frame 27 is pivotally suspended in frame 21.

Fig. 8 shows the press device 20 in daylight position, wherein tool parts 23,24 are moved relatively far apart. For this purpose the sub-frame 27 is pivoted by actuating cylinders 28 after the locks have first been retracted. For securing of the daylight position, the locks 33, after reaching the tilted daylight position of sub-frame 27, are moved again to the starting position as according to fig. 6. Blocks 34 are placed on the underside of sub-frame 27, whereby sub-frame 27 cannot pivot back to a more horizontal position.

Fig. 9 and 10 show sub-frame 27 in respectively operating position and daylight position. In fig. 9 the upper part lies against the underside of the lock 33 in that cylinder 28 exerts a downward force on sub-frame 27.

In fig. 10 the pivoted position of sub-frame 27 is secured by the extended lock 33 which protrudes to a position beneath block 34.

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CLAIMS

1. Press device for processing lead frames, comprising:
- a frame,
- at least one ram part mounted displaceably in the frame, and
- drive means coupled to the ram part for displacing the ram part in the frame, wherein the drive means are mounted on a sub-frame, which sub-frame is connected displaceably to the frame.

2. Press device as claimed in claim 1, wherein the sub-frame is pivotally connected to the frame.

3. Press device as claimed in claim 1 or 2, wherein the sub-frame is connected to the frame via drive means.

4. Press device as claimed in claim 3, wherein the drive means are formed by at least one drive cylinder.

5. Press device as claimed in any of the foregoing claims, wherein the frame is provided with at least one stop and the sub-frame is provided with at least one counter-stop co-acting with the stop of the frame for accurate positioning of the sub-frame in a determined position relative to the frame.

6. Press device as claimed in claim 5, wherein at least the stop or the counter-stop is displaceable between an active position and a non-active position.

7. Press device as claimed in any of the claims 3-6, wherein the drive means for displacing the sub-frame also produce a bias for urging the counter-stop of the sub-frame against the stop of the frame.

8. Press device as claimed in any of the foregoing claims, wherein the drive means for displacing the ram part are formed by a rotatable eccentric shaft and a drive motor coupled thereto.

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FIG.1

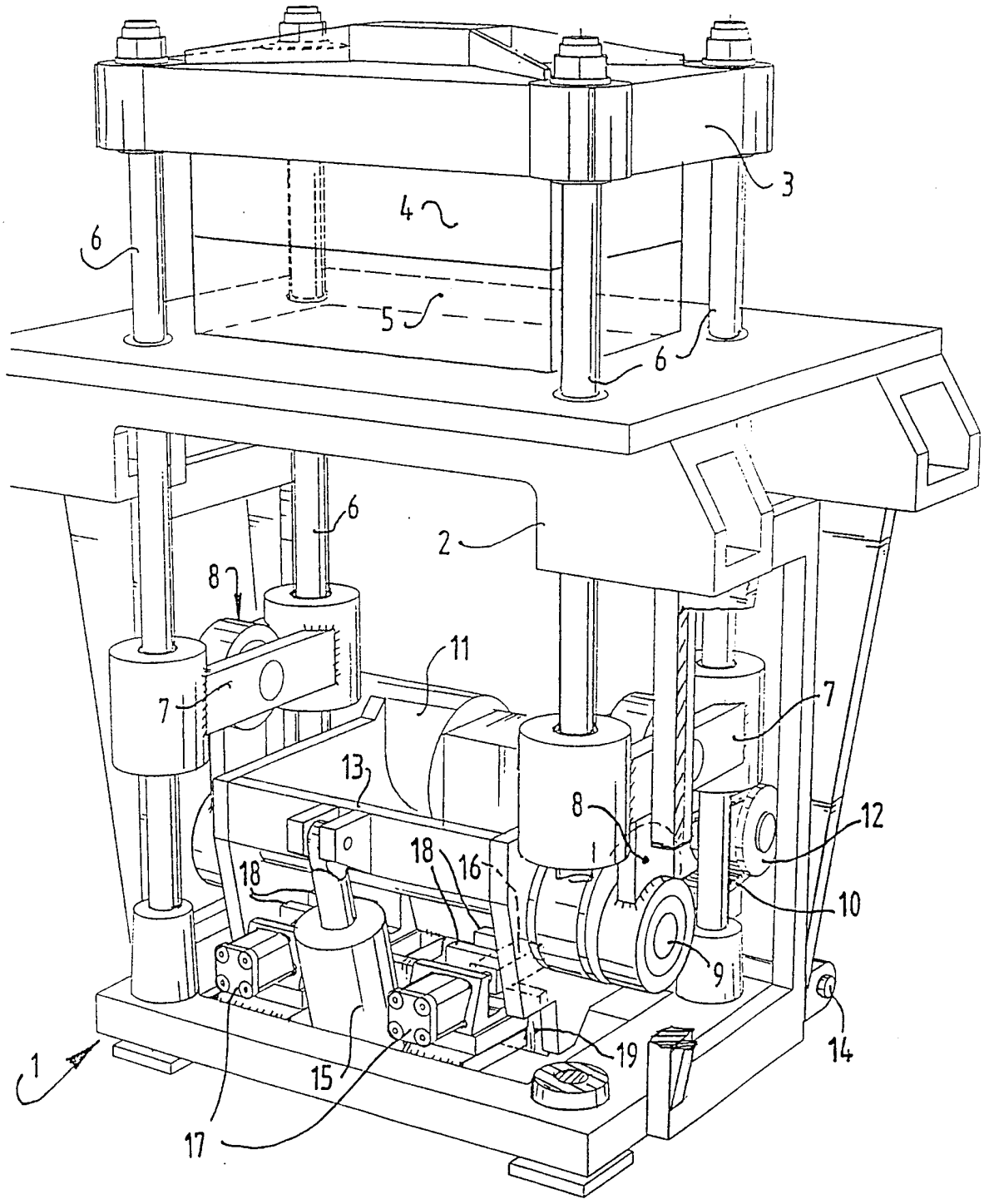


FIG.2

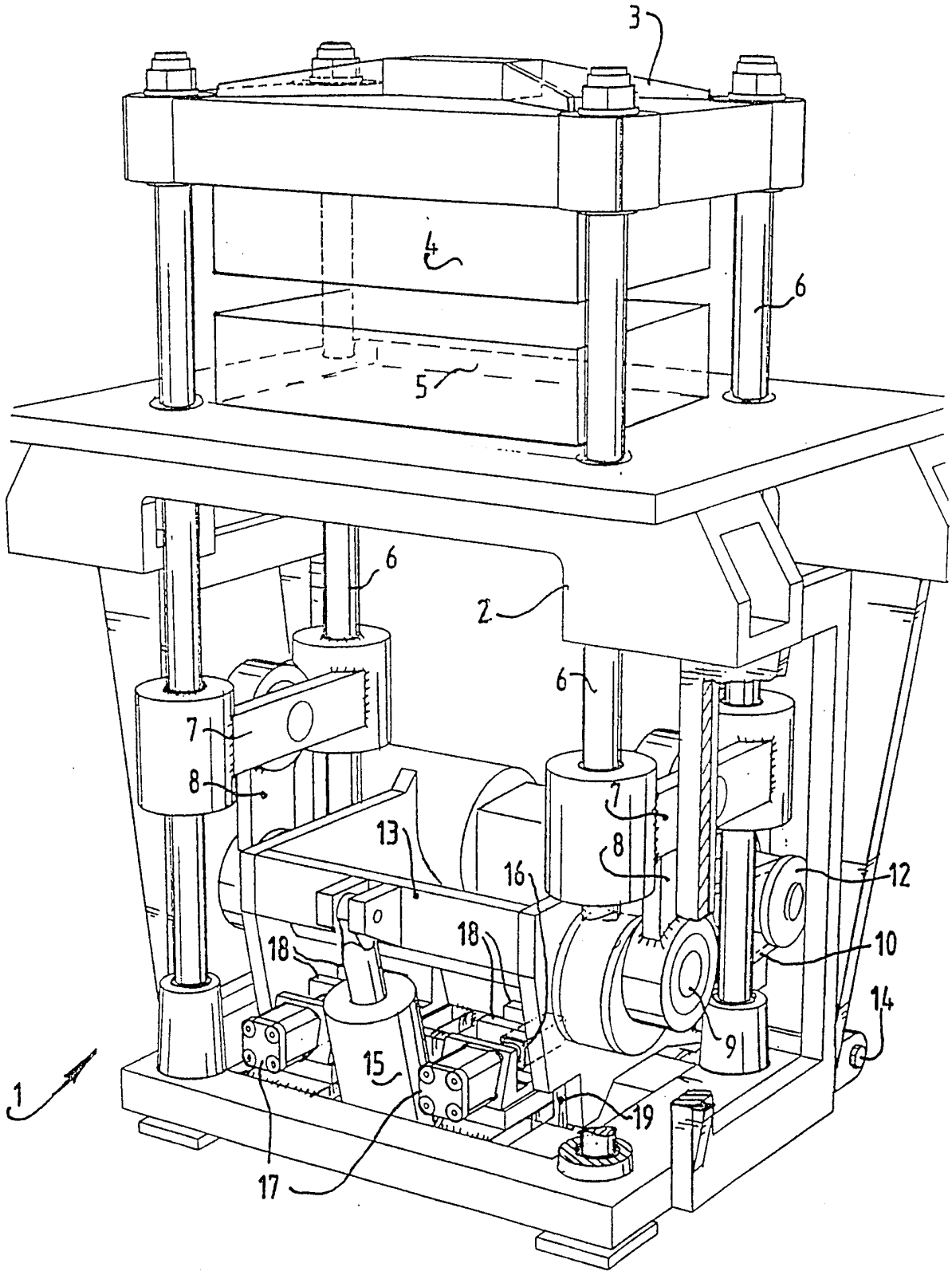


FIG.3

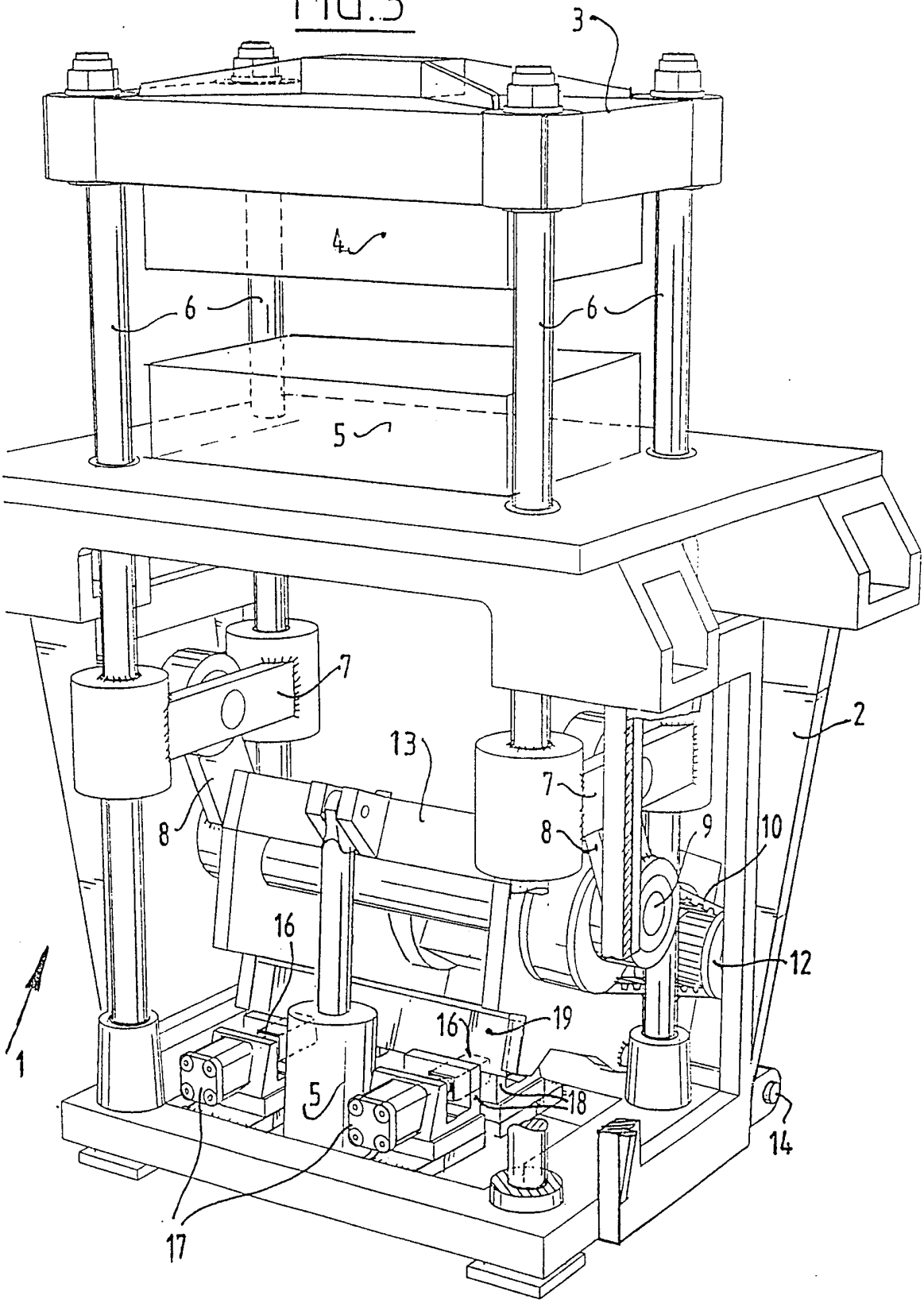


FIG.4

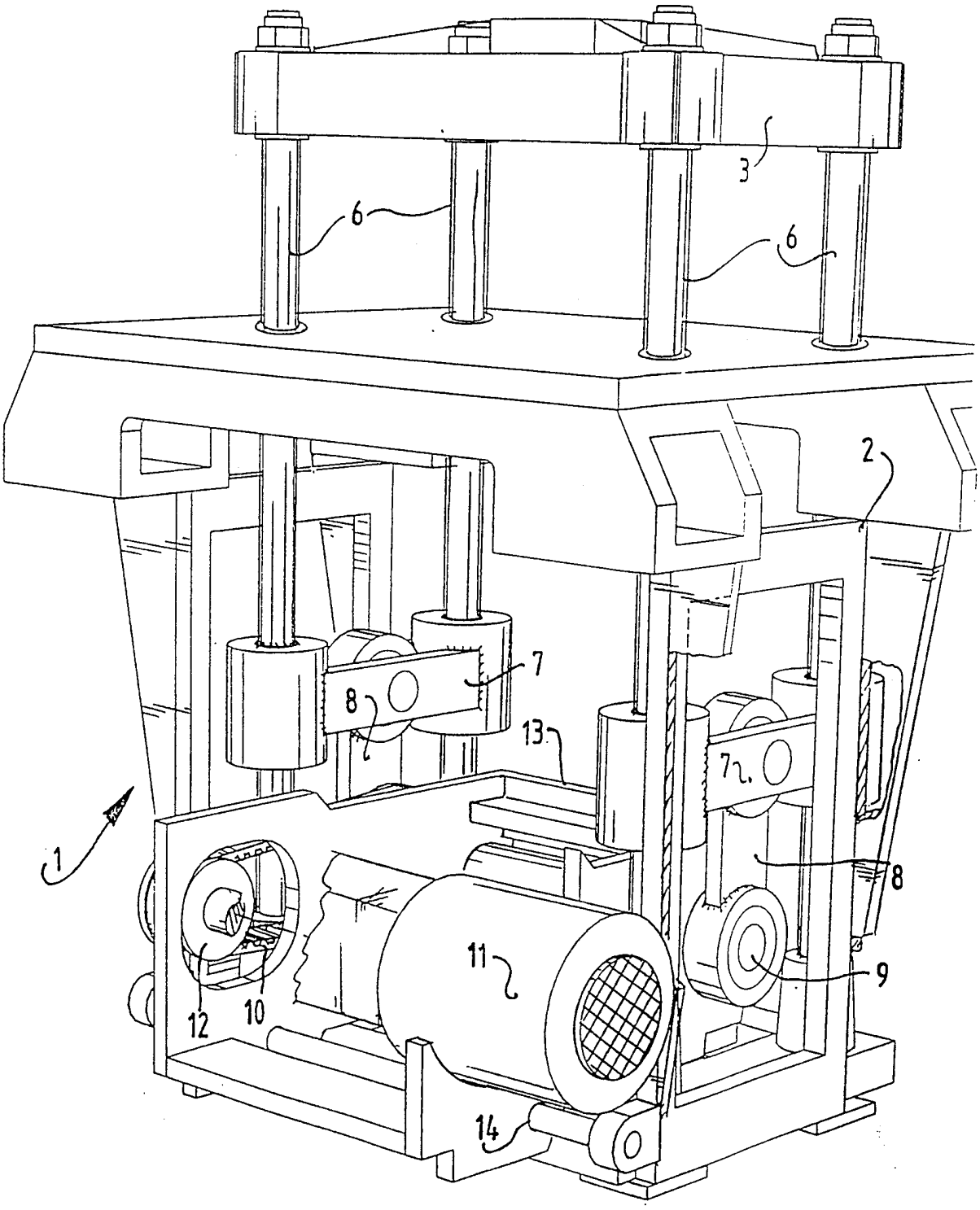


FIG.5

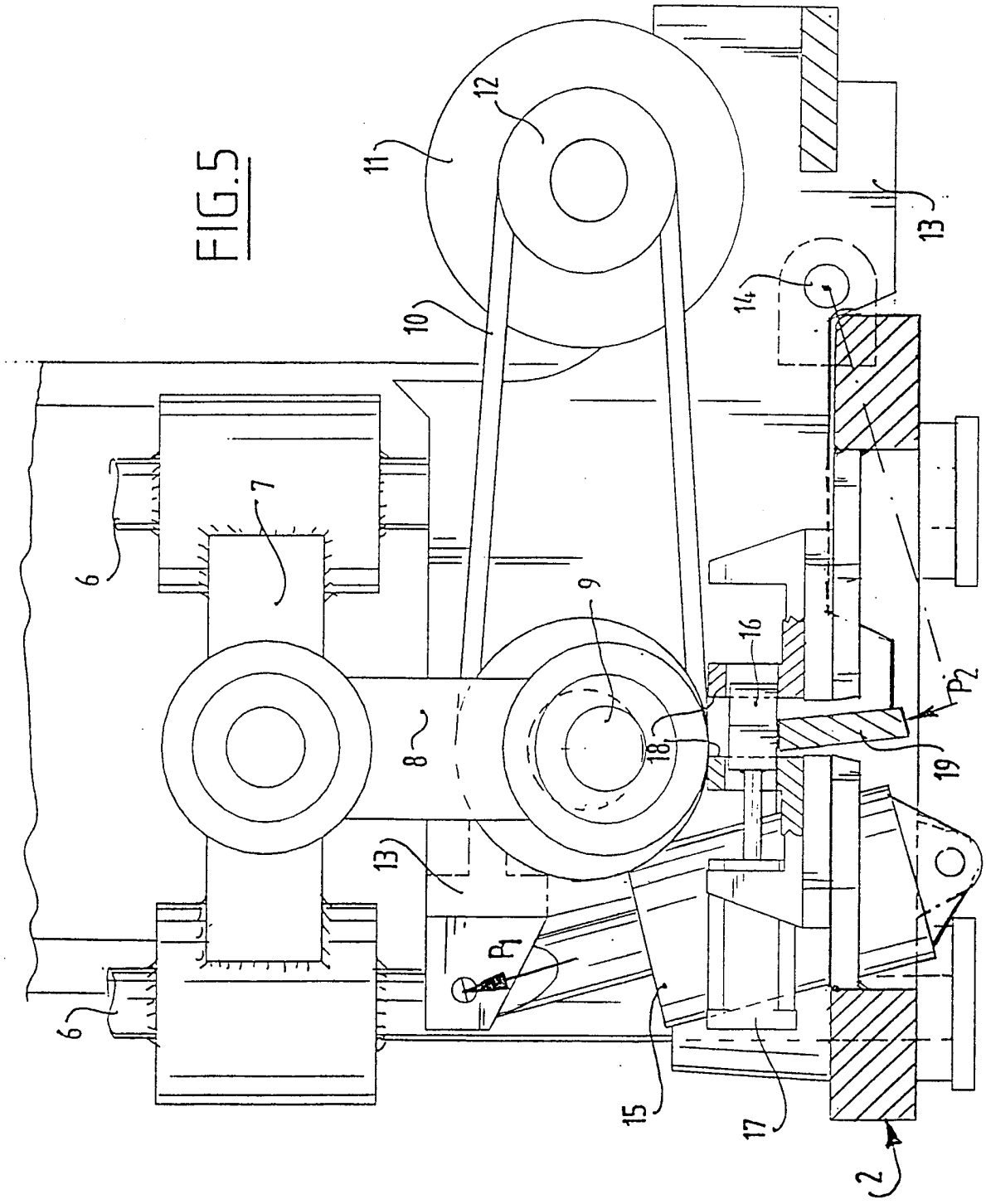


FIG.6

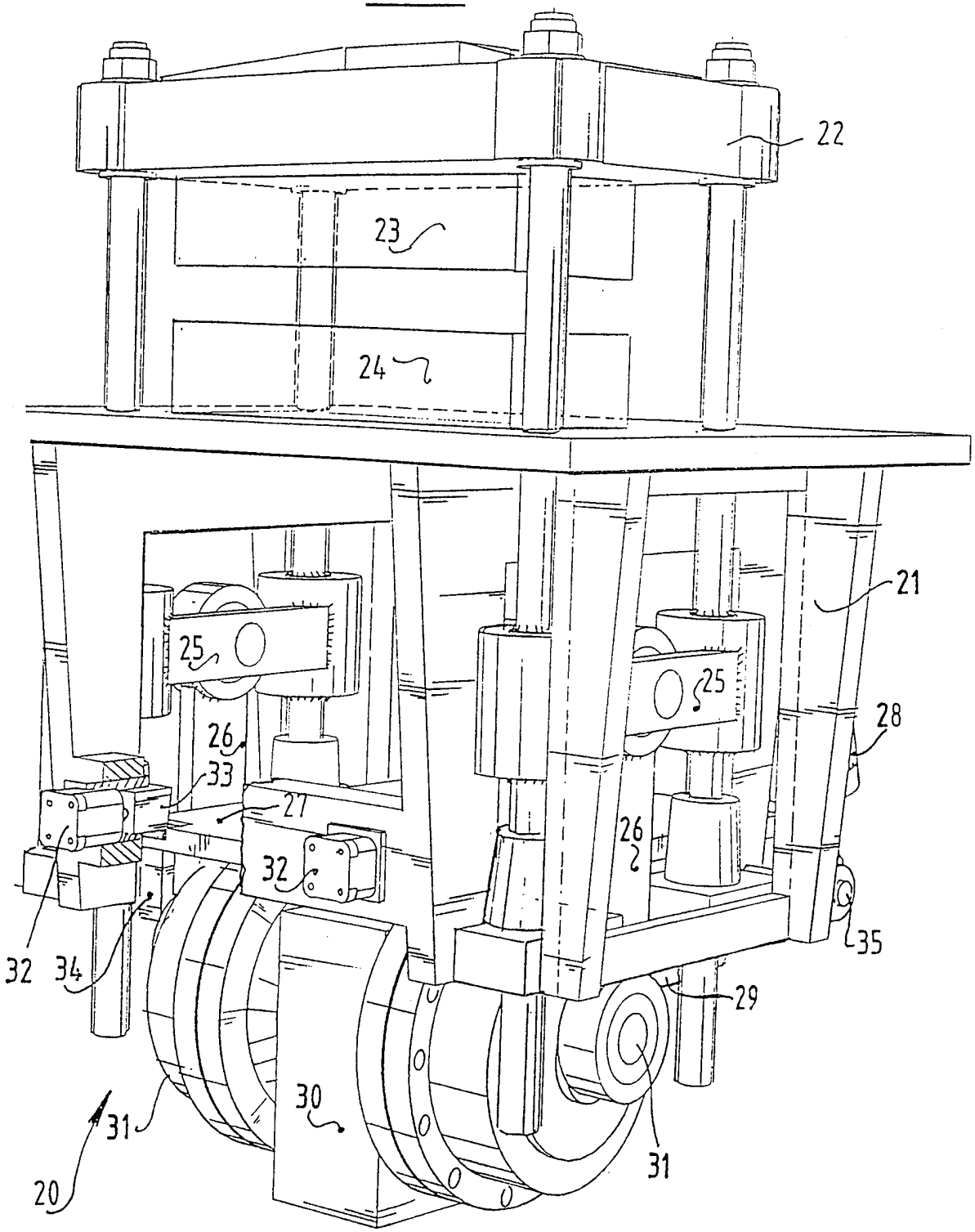


FIG. 7

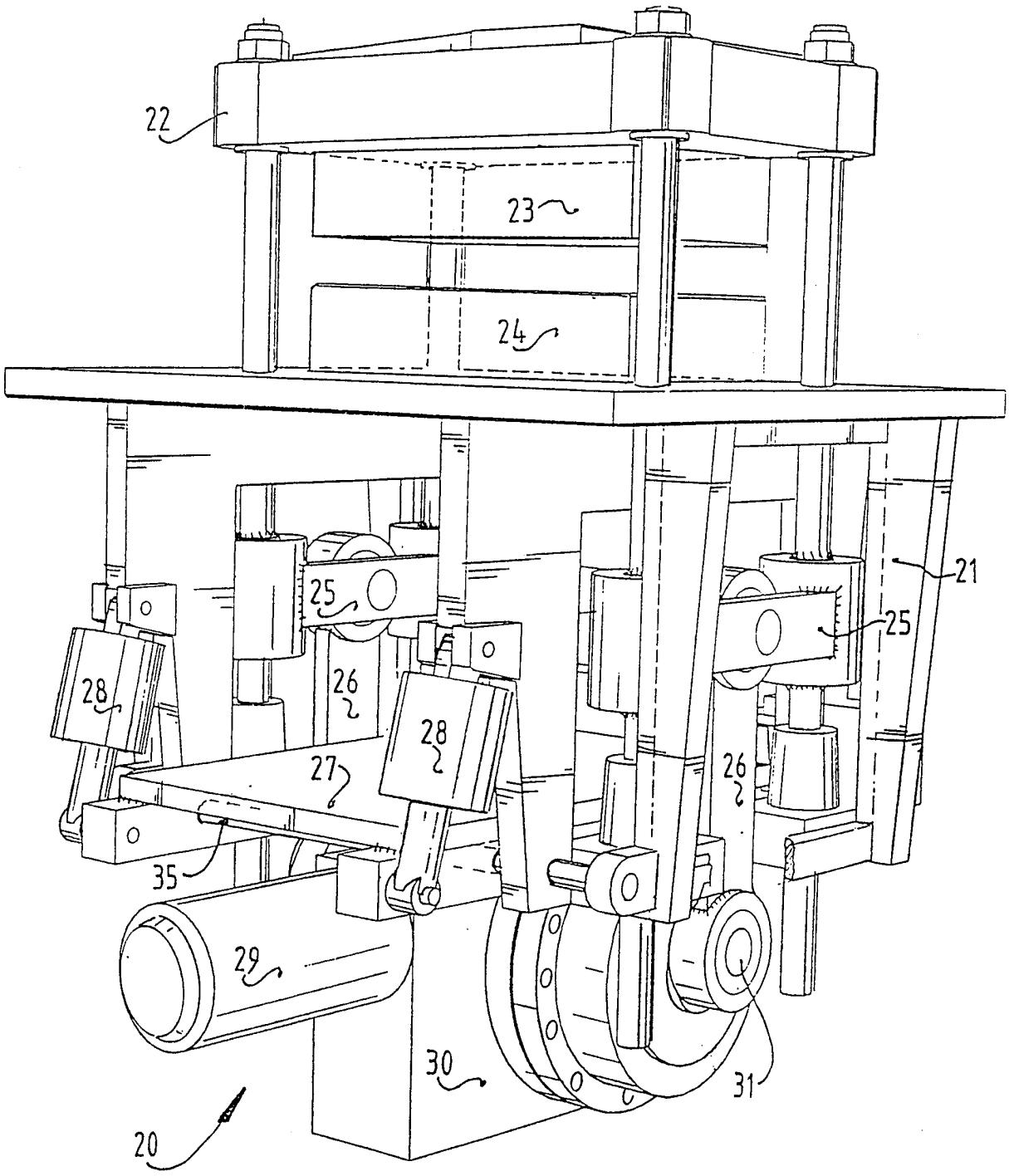


FIG.8

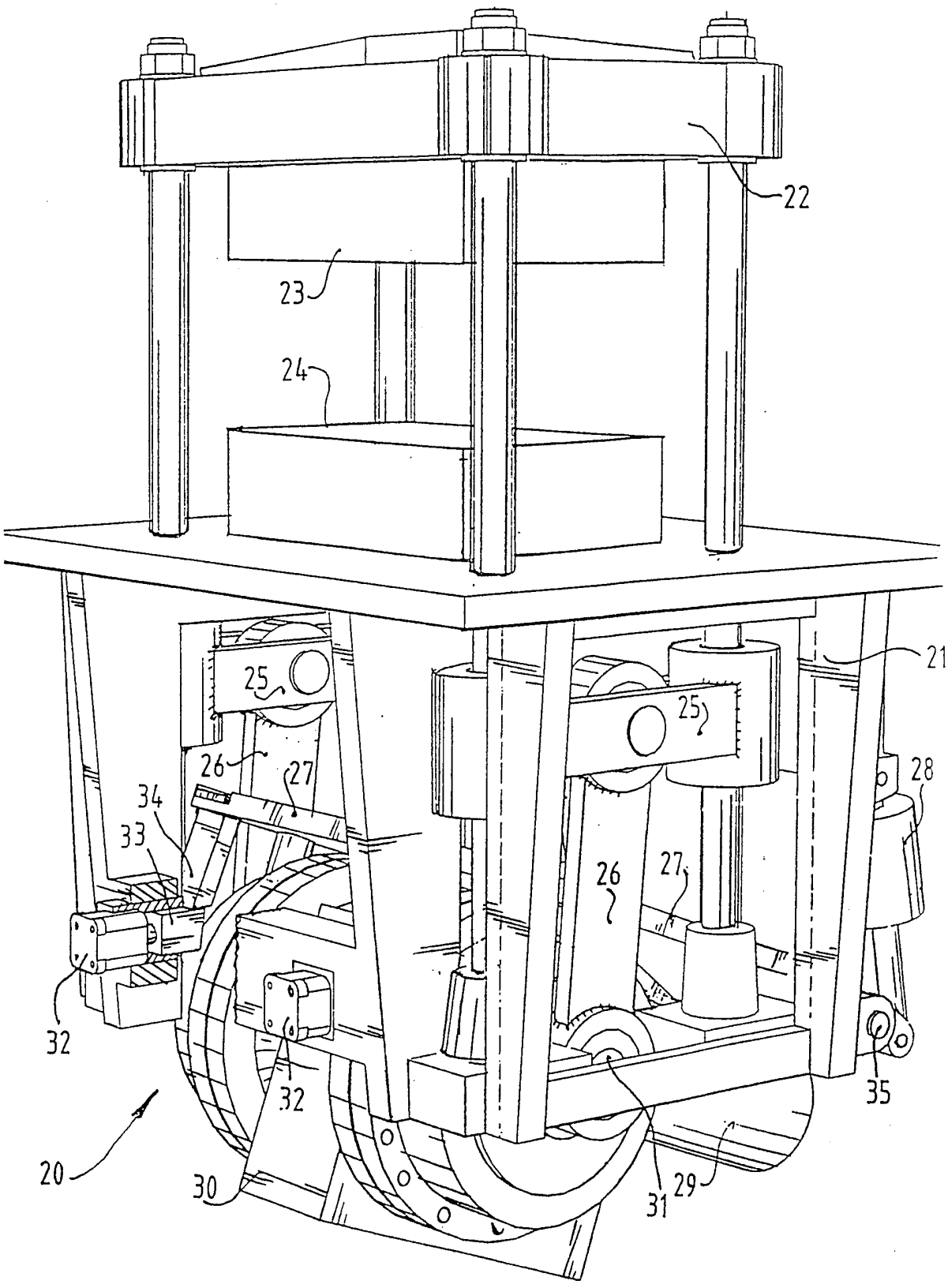


FIG.9

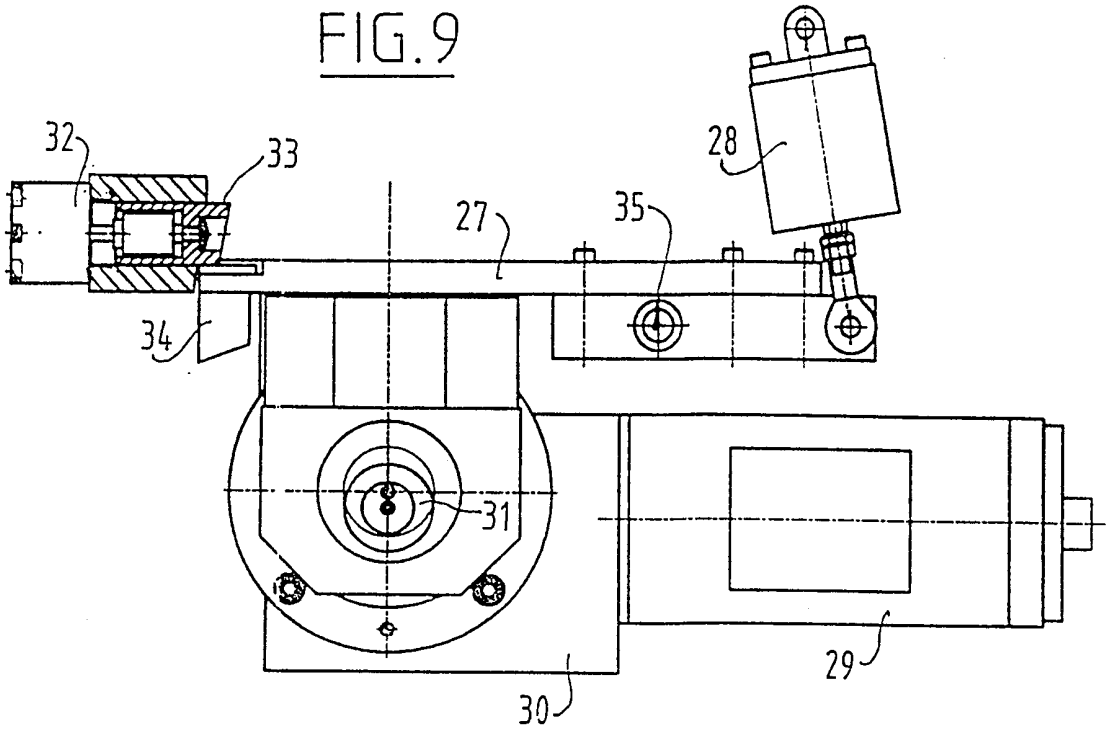
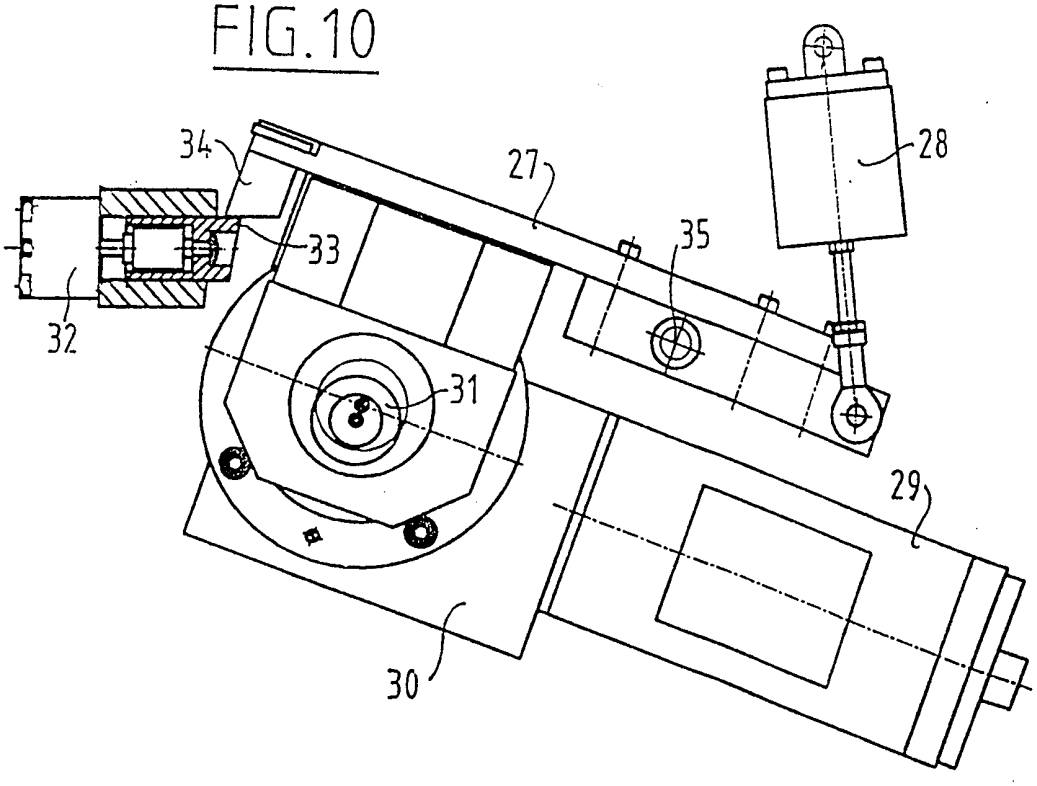


FIG.10



INTERNATIONAL SEARCH REPORT

Im tional Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B30B1/28 B30B1/26 B30B15/04

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)
IPC 6 B30B

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

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 013, no. 244 (M-834), 7 June 1989 & JP 01 053800 A (MITSUBISHI ELECTRIC CORP), 1 March 1989 see abstract	1-8
A	US 4 923 386 A (ESHIMA TAIZO ET AL) 8 May 1990 see abstract; figures 2,12	1,8
A	US 4 620 352 A (SULEJ JOHN) 4 November 1986 see abstract; figures 1-3	1,3
A	FR 2 192 909 A (SCHULER GMBH L) 15 February 1974 see figures	1-3,8

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[X] Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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