

Bruderer AG,

Frasnacht (Schweiz)

A punch press with a long space for receipt of a tool

AMS/hek
23.06.1995

46 116



A punch press with a long space for
receipt of a tool

5 The present invention relates to a punch
press, having a punch press frame, at least one ram, a
punching operation space, a means for the producing of a
stroke movement, in which punching operation space a web
run plane of a respective web to be worked upon and to be
10 fed through the punching operation space is set.

 The developments of the modern punching tech-
nique lead to a complete processing of a raw material,
i.e. to a complete non-chip producing production of a
product. This means that a modern punch press is designed
15 to be a complete production center. Apart of the common
cutting and forming (bending) operations punch presses
are used the longer the more also for mounting and assem-
bling operations, weldings are performed, parts are
bolted together and even threads are formed. After each
20 working step made on a web to be worked upon this web is
fed in the punch press further by a predetermined dis-
tance. Furthermore, measuring apparatuses for quality
control during the running of the production process are
made use of. This means that the length of the space for
25 receipt of a tool in punch presses, i.e. the punching op-
eration space, becomes the more the longer due to the in-
creasing number of individual operation steps performed
in the punch press. Conclusively, the more the longer
spaces for receipt of a tool are needed.

30 In order now to have a longer space for re-
ceipt of a tool it basically would be merely necessary to
scale up a common punch press design. With such measure,
however, the allowable rated loading would increase in
the power of two in relation to the increased scale and
35 the masses of such punch press would increase in the
power of three.

However, in practical applications it hardly becomes needed to demand in case of longer spaces for receipt of a tool at the same time higher rated loads. The extreme growing of the masses and specifically of the
5 moving masses is extremely undesired.

Thus, a mere scaling up, i.e. increasing of the dimensions of a punch press in order to achieve a longer space for receipt of a tool, leads an excessively high price of such machine, too low rotational speeds of
10 the machine, to a high consumption of energy and to dynamic mass forces which are extremely difficult to control, specifically in case of a production of and working on fine parts of extremely high precision.

Here the invention intends to provide a remedy. It is an object of the invention to provide a punch press which includes an extremely long space for receipt of a tool but at the same time allows high operational speeds, which does not call for an increased expenditure of energy and does not cause excessively high dynamic
20 mass forces.

The inventive punch press is characterized in that the means for the producing of a stroke movement is pivotably mounted at two points located at a distance from each other seen in the direction of feed of the web
25 and producing in operation of the punch press stroke movements, to one end of a respective link group, of which the links are pivotably mounted at their opposite end at a respective point forming a pivot point to a first end of double levers of respective pairs of double
30 levers, whereby the individual double levers of each pair of double levers project relative to the pivot point in opposite directions and are supported at rocker bearing points which are located symmetrically opposite of each other relative to the pivot point, which double levers
35 are pivotably mounted at their second end to a respective pressing column.

Thus, the inventive punch press includes a means for the producing of a stroke movement which is pivotably mounted at at least two points which are located at a mutual distance seen in the direction of the feed of the web and perform stroke movements during operation of the punch press to one end of a respective link group, of which the links are pivotably mounted at their opposite end at a respective point forming a pivotal point to a first end of double levers of respective pairs of double levers, whereby the individual double levers of every double lever pair project in relation to the pivotal point in opposite directions and are supported at rocker bearing points, which rocker bearing points are located symmetrically opposite to each other relative to the pivotal point and which double levers are pivotably mounted at their second end to a respective pressing column.

The advantages gained by the present invention are specifically that an extremely long space for receipt of a tool is made possible, whereby, however, high rotational speeds of the punch press, a relatively small consumption of energy and low dynamical mass forces prevail.

The invention will hereinbelow be explained more in detail based on the appended drawings, wherein:

Fig. 1 is a section through a punch press,
Fig. 2 is a section along line II-II of Fig. 1,

Fig. 3 illustrates on an enlarged scale an area of Fig. 1,

Fig. 4 is a section along line IV-IV of Fig. 3,

Fig. 5 is a section along line V-V of Fig. 3,
Fig. 6 is a section along line VI-VI of Fig. 3, and

Fig. 7 is a section along line VII-VII of Fig. 1.

In the following description of a preferred embodiment a means for producing a stroke movement is described which includes an eccentric shaft and corresponding structural members. There are, however, also other designs or embodiments, resp., of the means for producing a stroke movement possible, for instance, structures having a crankshaft, hydraulic drives, drives having cams etc.

The punch press of the illustrated embodiment includes an eccentric shaft 1, which is supported at both its ends in main bearings 2a, 2b in the frame 2 of the press. The drive of the eccentric shaft 1 is accomplished, for instance, via a coupling and brake device 3. Such coupling and brake devices for punch presses are generally known, such that a detailed description thereof is not needed. The eccentric shaft 1 includes an eccentric section 4. In the illustrated embodiment this eccentric section 4 is an integral part of the eccentric shaft 1. Obviously, other designs are possible, at which in order to adjust the stroke of the ram of the punch press sleeves are located at the eccentric section 4, which can be rotated relative to each other. Such designs for adjusting the stroke of a punch press are known and attention is specifically drawn to the CH-A-574 323 and US-A-4 160 409, resp. Two rods 5, 5a located adjacent each other are supported via roller bearings on the eccentric section 4. A pin 6 is located at the lower ends of the rods 5, 5a. The pin 6 includes end sections 6a, 6b, whereby each end section 6a, 6b is connected to a sliding block 11a, 11b, resp., which sliding blocks 11a, 11b are guided in sliding block guides 12a, 12b.

By the structures described up to here the rotating movement of the eccentric shaft 1 is transformed into a rectilinear stroke movement of the pin 6 of the rods when the punch press is running.

Single arm levers 7, 7a, 8 and 8a are supported on the rod pin 6. At their opposite ends the sin-

gle arm levers 7, 7a, 8 and 8a are pivotably mounted via bolts 13, 13a, 13b and 13c and links 14, 14a, 14b and 14c to respective nuts 15, 15a of spindles, which nuts are arranged on respective spindles 16, 16a.

5 The sliding blocks 11a, 11b and sliding block guides 12a, 12b form therefore a structure, by means of which one of the ends of the single arm levers 7, 7a, 8, 8a are guided in direction of the stroke movement of the machine.

10 As can be seen clearly in the drawings, totally four bolts 13-13c, four links 14-14c, two nuts 15, 15a and two threaded spindles 16, 16a are present.

 Thus, the single arm levers 7, 7a, 8 and 8a are supported at their ends remote or opposite, resp., from the pin 6 on the frame 2 of the press. These ends are, thereby, such as will be explained in detail further below supported in a height or level, resp., adjustable manner, wherewith the height position of the rams 32, 32a can be adjusted.

20 At a point between the above described ends of the single arm levers 7, 7a, 8 and 8a a bolt 18 and 18a is arranged in a forced fit at a bearing point 17 and 17a, resp. These bearing points 17, 17a are points which conduct stroke movements during operation of the punch press, whereby it shall be mentioned for reasons of completeness that these movements are not rectilinear movements.

 Links 19, 19a, 19b and 19c are supported at one of their ends on the bolts 18 and 18a, resp., which links form together one group of links. These links 19, 19a, 19b and 19c are supported at their lower ends on axially aligned bolts 20, 21, 20b and 20a, 21a, 20c, resp.

 These bolts 20, 21, 20b and 20a, 21a, 20c, resp., are set into pairs of double levers.

 The bolt 21 is thereby set into the double lever 23 such as is clearly illustrated in Fig. 1 and

specifically Fig. 5, and likewise bolts 20, 20b are set into the double lever 22.

Similarly, bolt 21a is set into the double lever 23a and the bolts 20a, 20c are set into the double
5 lever 22a.

The double lever 23 is supported on a bolt 24 defining a rocker bearing point, which bolt 24 is in turn supported in the frame 2 of the press.

The double lever 22 is supported on a further
10 bolt 25 forming a further rocker bearing point, which bolt 25 is in turn supported in the frame 2 of the press.

Correspondingly, the double lever 23a is supported on the bolt 24a and the double lever 22a is supported on the bolt 25a.

15 The double lever 23 is pivotably mounted at its opposite end via a bolt 26 to a pressing column 28 and the double lever 22 is pivotably mounted at its opposite end via a bolt 27 to a pressing column 29.

Similarly, the double lever pair located in
20 Fig. 1 at the right side and having the double levers 22a and 23a is pivotably mounted by the double lever 22a to the pressing column 29a and by the double lever 23a to the pressing column 28a.

The pressing columns 28 and 29 are mounted
25 via bolts 30 and 31 to the ram 32 and the pressing columns 28a and 29a are mounted via bolts 30a and 31a to the ram 32a.

Alternatively, all four pressing columns 28, 28a, 29, 29a could be mounted to one single ram or each
30 pressing column could be mounted to an own ram.

Now the arrangement of the guides for the rams will be described, whereby attention is specifically drawn to Figs. 3 and 4.

The ram 32 is rigidly mounted to two guiding
35 columns 35, 35b projecting downwards. These guiding columns 35, 35b are guided in the plane 36 of the direction of feed of the web in guides 33, 33b and the guiding col-

umns 35a, 35c guided at the same height location in guides 33a, 33c. This design or structure of guides is disclosed in detail in the CH-A-568 848 and US-A-3 998 498, resp., and reference is made specifically to the disclosure of these documents.

The rams 32, 32a comprise additionally a further, i.e. a third guide 34 and 34a, resp., which guides are located above the plane 36 defined by the direction of the feed of the web. Further guiding columns 37, 37a mounted rigidly to the frame 2 of the press project into these third guides 34 and 34a, resp. The guides 34, 34a include gliding surfaces 38 (Fig. 4), (see specifically the documents listed above), which gliding surfaces 38 extend in the longitudinal direction of the punch press, i.e. in the direction of feed of the web. These guides 34, 34a prevent accordingly a pivoting movement of the rams 32, 32a laterally of the punch press, but allow due to their gliding surfaces 38 a thermally caused expansion of the rams 32, 32a without causing a clamping action at the ram guides 33, 33b; 33a, 33c; 34, 34a.

The clamping plate of the punch press is identified in the figures by the reference numeral 39 and its base plate by the reference numeral 40.

In case of a punch loading F acting off-center relative to the longitudinal direction of the punch press or direction of feed of the web, resp., (Fig. 3), which loading F acts between e.g. the ram 32 and the clamping plate 39 or base plate 40, resp., the pressing columns 28, 29 are differently elastically deformed. The ram 32 attains a slanted position such as illustrated in Fig. 3 by the distance S , whereby the (exaggerated designed) slanted position of the ram 32 is illustrated by the broken line T . The elastic deformation and the shifting of the position of the pressing column 29 are illustrated by the broken line U and correspondingly by the pressing column 28 by the broken line V . Furthermore, the

slanted position of the guiding column 35 is illustrated by the broken line W.

Because now the guides 33, 33b are located at the plane 36 of feed of the web, the tilting point K of the ram 32 will remain in the plane 36 of feed of the web. This means that the ram 32 or the tool 51 (upper tool) mounted thereto do not pivot out of the plane 36 of the feed of the web.

The guide 34, i.e. its sliding surfaces 38 (Fig. 4) allow a corresponding shifting. The seals 52, 52b between the frame 2 of the press and the pressing columns 28, 29 are movable seals, which prevent also when the ram 32 is in a slanted position oil from exiting out of the closed frame 2 of the press into the working space and soiling the web to be worked upon and also the tool.

Above, the behavior of the various structural members has been described for the case of an off-center loading of the ram 32. Exactly the same behavior of the corresponding structural members occurs in case of an off-center loading of the ram 32a.

Fig. 5 illustrates a section along line V-V of Fig. 3, and specifically a section through the double levers 22, 23.

The group of pulling links 19, 19a pivotably mounted to the single arm lever 7, 8 comprises inner pulling links 19b, which are in connection with the inner bolt 21 which is set into the end of the double lever 23. In operation these inner pulling links 19b transmit the force symmetrically via the double lever 23 supported at the rocker bearing point on the bolt 24 to the bolt 26 and accordingly onto the pressing column 28. The outer pulling links 19 are connected to the outer bolts 20, 20b, which are set into the end of the double lever 22. In operation these outer pulling links 19 transmit the force symmetrically via the double lever 22 supported at the rocker bearing point on the bolt 25 to the bolt 27 and accordingly onto the pressing column 29.

The same corresponding design of the corresponding structural members is present at the single arm levers 7a, 8a, double levers 22a, 23a, etc. appearing at the right side of Fig. 1.

5 Fig. 6 illustrates a section along line VI-VI of Fig. 3 and specifically a section through the single arm levers 7, 8, 7a and 8a, whereby in Fig. 6 only the levers 7 and 8 located according to Fig. 1 at the left side are designed completely. The following description
10 refers again to the structural members located at the left side in Fig. 1.

The load transmitted in operation of the punch press from the ram 32 via the above described structural members is transmitted partly by the inner
15 pulling links 19b onto the common bolt 18 and accordingly symmetrically onto the bearing points 17 of the single arm levers 7, 8. The other part of the load is transmitted via the outer pulling links 19 also to the common bolt 18 and accordingly symmetrically onto the bearing
20 points of the single arm levers 7, 8.

The single arm levers 7, 8 transmit on the one hand the loading acting onto the bolt 18 and bearing point 17, resp., via the bolt 6 and via the rods 5, 5a (Figs. 1, 2) onto the eccentric section 4 of the eccentric shaft 1, which is supported in the main bearings 2a,
25 2b at the frame 2 of the press.

On the other hand, the loading is transmitted at the opposite end of the single arm levers 7, 8 via the bolts 13, 13b, the links 14, 14b, the nut 15 onto the
30 threaded spindle 16 which is supported stationarily, but rotationally at the frame 2 of the press.

By means of this above described arrangement of structural members the height position of the ram 32 can be adjusted.

35 To this end the threaded spindle 16 includes a worm gear 43 which meshes with a worm 42 (Figs. 5, 6). The nut 15 of the spindle 16 has a projection 44, which

projects into a guiding groove 45 of the frame 2 of the press, wherewith the nut 15 is arrested against a rotational movement. The worm gear 42 is driven by a servomotor 41.

5 If the worm 42 is rotated by the servomotor 41, it causes a rotating of the threaded spindle 16 and accordingly a movement of the nut 15 in a vertical direction. This movement is transmitted via the links 14, 14b onto the bolt 13 and accordingly onto the lever pairs 7, 8 and 7a, 8a, resp.

10 The oppositely located pin 6 is arrested in its position relative to a respective position of the eccentric shaft 1. Conclusively, the pin 6 forms the pivotal point of the lever pairs 7, 8, when they are moved
15 by the links 14, 14b. Therefore, a vertical movement of the links 14, 14b caused by operation of the servomotor 41, the movement of the worm 42, the worm gear 43 and the threaded spindle 16 a pivoting movement of the bolt 18 and accordingly an upwards or downwards, resp., movement
20 of the links 19, 19b. This movement is transmitted by the double levers 22, 23 onto the pressing columns 28, 29, wherewith finally the position of the ram 32a is shifted, i.e. its height position is adjusted.

 Because each threaded spindle 16, 16a is
25 drivingly connected to its own servo drive, the rams 32, 32a may be operated to change their height position synchronously or also independently from each other. It is possible to adjust the height position of each ram 32, 32a independently from the other ram 32a, 32, when the
30 punch press is operating in increments of less than 10 μm .

 Any punch press needs some structure for a balancing of the moving masses, whereby a variety of designs inclusive mass balancing weight members is known.

35 Now, the balancing of the masses of the punch press will be described. Because the moving masses are mirror images of each other relative to the vertical cen-

ter line of Fig. 1, only the design of the structural members regarding the balancing of the masses located at the left hand side of this center line or axis of symmetry, resp., will be described.

5 The total mass of the guiding columns 35, 35b of the ram 32, of the pressing columns 28, 29 and of the portion of the double levers 22, 23, which extends from their pivotal point at the pressing columns 28, 29 (bolts 26, 27) up to the rocker bearing point, i.e. bolts 24, 25
10 equals the total mass of the portion of the double levers 22, 23 extending from the rocker bearing point, i.e. bolts 24, 25 to the pivotal point at the links 19, 19b, of the links 19, 19b, of the single arm levers 7, 8, of the sliding blocks 11a, 11b, of the rods 5, 5a, of the
15 rod pins 6, 6a, 6b of the eccentric section 4, of the elongated, upper ends 9, 9a of the rods 5, 5a of the links 47, 47a pivotably mounted to mentioned upper ends 9, 9a and of the bolts 46, 46a. Accordingly, in operation the oscillating masses of the punch press inclusive the
20 vertical component of the rotating unbalance are balanced, wherewith no additional balancing weights for a balancing of the masses oscillating in the vertical direction, inclusive the rotating unbalance in vertical direction must be present, which would unnecessarily in-
25 crease the mass forces and the friction forces occurring therewith.

 In order to balance the horizontal component of the rotating unbalanced mass, see Fig. 1, Fig. 2 and Fig. 7, the links 47, 47a pivotably mounted via the bolts
30 46, 46a to the elongated, upper ends 9, 9a of the rods 5, 5a at their opposite ends via bolts 48, 48a to a respective counterweight 49, 49a. These counterweights 49, 49a are supported on bolts 50, 50a. These bolts 50, 50a are, thereby, located at such a position in the frame 2 of the
35 press and the counterweights 49, 49a are supported in such a manner on the bolts 50, 50a that their mass centers M, Ma at the respective point of return of the coun-

terweights 49, 49a pivoting oppositely relative to the eccentric section 4 are located at least approximately at the height position of the center axis 10 of the eccentric shaft 1 such as illustrated in Figs. 1 and 7 by the
5 broken line 10.

Claims

1. A punch press, having a punch press frame
5 (2), at least one ram (32; 32a), a punching operation
space (53), a means (1, 5, 6, 11a, 12a, 7, 7a, 8a) for
the producing of a stroke movement, in which punching op-
eration space (53) a web run plane (36) of a respective
web to be worked upon and to be fed through the punching
10 operation space (53) is set, characterized in that the
means (1, 5, 6, 11a, 12a, 7, 7a, 8a) for the producing of
a stroke movement is pivotably mounted at two points (18,
18a) located at a distance from each other seen in the
direction of feed of the web and producing in operation
15 of the punch press stroke movements, to one end of a re-
spective link group (19, 19a; 19b, 19c), of which the
links are pivotably mounted at their opposite end at a
respective point (20, 21, 20b; 20a, 21a, 21c) forming a
pivot point to a first end of double levers (22, 23; 22a,
20 23a) of respective pairs of double levers, whereby the
individual double levers (22, 23; 22a, 23a) of each pair
of double levers project relative to the pivot point in
opposite directions and are supported at rocker bearing
points (24, 25; 24a, 25a) which are located symmetrically
25 opposite of each other relative to the pivot point (20,
21, 20b; 20a, 21a, 20c), which double levers (22, 23;
22a, 23a) are pivotably mounted at their second end to a
respective pressing column (28, 29; 28a, 29a).

2. The punch press of claim 1, characterized
30 in that the double levers (22, 23; 22a, 23a) of each pair
of double levers are located in succession seen in the
direction of the feed of the web.

3. The punch press of claim 1 or 2, charac-
terized in that two pairs of double levers are arranged
35 in succession seen in the direction of the feed of the
web.



4. The punch press of one of the preceding claims, characterized in that the means (1, 5, 6, 11a, 12a, 7, 7a, 8, 8a) for the producing of a stroke movement are pivotably mounted at two points (18, 18a) performing
5 stroke movements during the operating of the punch press, to one end of link groups (19, 19b; 19a, 19c), which points (18, 18a) are located at same distances from a plane of symmetry of the frame (2) of the punch press extending perpendicularly to the direction of the feed of a
10 web.

5. The punch press of one of the preceding claims, characterized in that two pairs of double levers are present, of which double levers (22, 23; 22a, 23a) each is pivotably mounted to a respective pressing column
15 (28, 29; 28a, 29a), such that the punch press has four pressing columns (28, 29; 28a, 29a).

6. The punch press of one of the preceding claims, characterized in that the pressing columns (28, 29; 28a, 29a) of each double lever pair are pivotably
20 mounted to one ram (32; 32a).

7. The punch press of one of the preceding claims, characterized in that the rams (32; 32a) are located at a distance from each other seen in the direction of feed of the web.

25 8. The punch press of one of the preceding claims, characterized in that each ram (32; 32a) includes at one end area two guiding columns (35, 35b; 35a, 35c) located at a distance from each other and which are guided in guiding units (33, 33b; 33a, 33c) located in
30 the web run plane (36).

9. The punch press of claim 8, characterized in that in the area of each ram (32; 32a) a further guiding column (37, 37a) located at a distance from its two guiding columns (35, 35b; 35a, 35c) is firmly mounted to
35 the frame (2) of the press, and projects into a further guiding unit (34; 34a) located in the ram (32; 32a), which guiding unit (34; 34a) is located above the web run



plane (36), such that each ram (32; 32a) is guided at three locations.

10. The punch press of one of the preceding claims, characterized in that the means (1, 5, 6, 11a, 5 12a, 7, 7a, 8, 8a) for the producing of a stroke movement includes two single arm levers (7, 8; 7a, 8a) which are mounted at their first end to a device, by means of which this first end is guided in the direction of the stroke movement of the punch press, and which are supported at 10 their second, opposite end at the frame (2) of the punch press, whereby the pivot points (18; 18a) of the respective link groups (19, 19b; 19a, 19c) which perform the stroke movements are located between the ends of the single arm levers (7, 8; 7a, 8a), which single arm levers 15 (7, 8; 7a, 8a) are supported at their second ends via threaded spindles (16; 16a) in a height adjustable manner at the frame (2) of the punch press, such that the height position of the second end of each single arm lever (7, 8; 7a, 8a) and accordingly the height position of the ram 20 (32; 32a) mounted thereto and thus the height position of each ram (32; 32a) is adjustable independently or in synchronism with any other ram (32; 32a).

11. The punch press of one of the preceding claims, characterized in that the total mass of the guiding columns (35, 35b; 35a, 35c), of the rams (32, 32a), 25 of the pressing columns (28, 29; 28a, 29a) and of the respective portion of the double levers (22, 23; 22a, 23a) which extends from the point (24, 25; 24a, 25a) where they are pivotably mounted to the pressing columns (28, 29; 28a, 29a) to the point where they are supported for 30 rocking, equals the total mass of the respective portion of the double levers (22, 23; 22a, 23a) which extends from the point (24, 25; 24a, 23a) where they are supported for rocking to the point where they are pivotably 35 mounted to the links (19, 19b; 19a, 19c), of the links (19, 19b; 19a, 19c), of the single arm levers (7, 8; 7a, 8a), of the sliding blocks (11a, 11b) of the rods (5, 5a)



and the rod pins (6, 6a, 6b) of the eccentric section (4), of the elongated upper ends (9, 9a) of the rods, of the links (47, 47a) pivotably mounted to said upper ends (9, 9a), and of the bolts (46, 46a).

5 12. The punch press of one of the preceding claims, characterized in that the means (1, 5, 6, 11a, 12a, 7, 7a, 8, 8a) for the producing of a stroke movement comprises an eccentric shaft (1) and a rod unit (5, 5a) supported on the shaft (1) and including a first end with
10 a sliding block (11a, 11b) which is guided in a sliding block guide (12a, 12b), to which sliding block (11a, 11b) single arm levers (7, 8, 7a, 8a) are pivotably mounted which at their opposite ends are supported in a height adjustable manner of the frame (2) of the press, whereby
15 the respective link groups (19, 19a; 19b, 19c) are pivotably mounted to said single arm levers (7, 8; 7a, 8a), which rod unit (5, 5a) is pivotably mounted at a second end located in relation to the eccentric shaft (1) diametrically opposite to the first end to a lateral bar
20 (47, 47a) which is at both its ends pivotably mounted to a respective eccentrically supported counterweight part (49; 49a), which counterweight parts are adapted to balance the horizontal components of the rotating imbalance mass of the punch press.

25 13. The punch press of one of the preceding claims, characterized in that the means (1, 5, 6, 11a, 12a, 7, 7a, 8a) for transforming the rotary movement of the eccentric shaft (1) into a stroke movement includes at least one rod (5, 5a) supported on an eccentric section (4) of the eccentric shaft (1), which includes an
30 end which is guided in a unit (11, 11a; 12, 12a) for a rectilinear guiding of this end, which unit (11, 11a, 12, 12a) for a rectilinear guiding includes a guiding block (11, 11a) with a pin (6, 6a, 6b), whereby the end of the
35 rod (5, 5a) is pivotably mounted to said pin (6, 6a, 6b), which guiding block (11, 11a) is connected to force transmitting members (7, 8, 19, 19b; 7a, 8a, 19a, 19c)



which in turn are pivotably mounted each to an end of double levers (22, 23; 22a, 23a) of respective pairs of double levers, which double levers (22, 23; 22a, 23a) are supported at rocker bearing locations (24, 25; 24a, 25a) and include a second end onto which a pressure column (28, 29; 28a, 29a) is pivotably mounted which is connected to a ram (32; 32a), so that the ram (32; 32a) is connected via two pressure columns (28, 29; 28a, 29a) to a respective pair of double levers.

- 10 14. The punch press of one of the preceding claims and having at least two rams (32; 32a), characterized in that each ram (32; 32a) is guided by three guiding columns (35, 35b, 37; 35a, 35c, 37a), (35, 35b; 35a, 35c), of which two (35, 35b; 35a, 35c) are rigidly
15 mounted to the ram (32, 32a) and one (37, 37a) is rigidly mounted to the frame (2) of the press.



* C L M S *



Abstract

The eccentric shaft (1) is coupled via the
5 rod (5) and sliding block (6) to single arm levers (7, 8;
7a, 8a) projecting at both sides away from the sliding
block (11a). At their ends remote from the sliding block
(11a) these levers (7, 8; 7a, 8a) are supported via
threaded spindles (16; 16a) at the frame (2) of the
10 press. Groups of links (19, 19b; 19a, 19c) are pivotably
mounted to the levers (7, 8; 7a, 8a) which are connected
to pairs of double levers (22, 23; 22a, 23a) located sym-
metrically relative to the center line of the frame (2)
of the press. Each double lever (22, 23; 22a, 23a) is
15 pivotably mounted to a pressing column (28, 29; 28a,
29a). The pressing columns (28, 29; 28a, 29a) of every
pair of double levers (22, 23; 22a, 23a) are mounted to a
ram (32; 32a). Every ram (32, 32a) is guided by three
guiding columns (35, 35b, 37; 35a, 35c, 37a) of which two
20 (35, 35b; 35a, 35c) are rigidly mounted to the ram (32;
32a) and one (37, 37a) is rigidly mounted to the frame
(2) of the press. By this symmetrically dividing of the
driving elements leading to two rams (32; 32a) the punch
press features an extremely long space (53) for the re-
25 ceipt of a tool without that the height of the punch
press, the allowable rated loading and the moving masses
must be overly large.

This Sheet Has Been Replaced

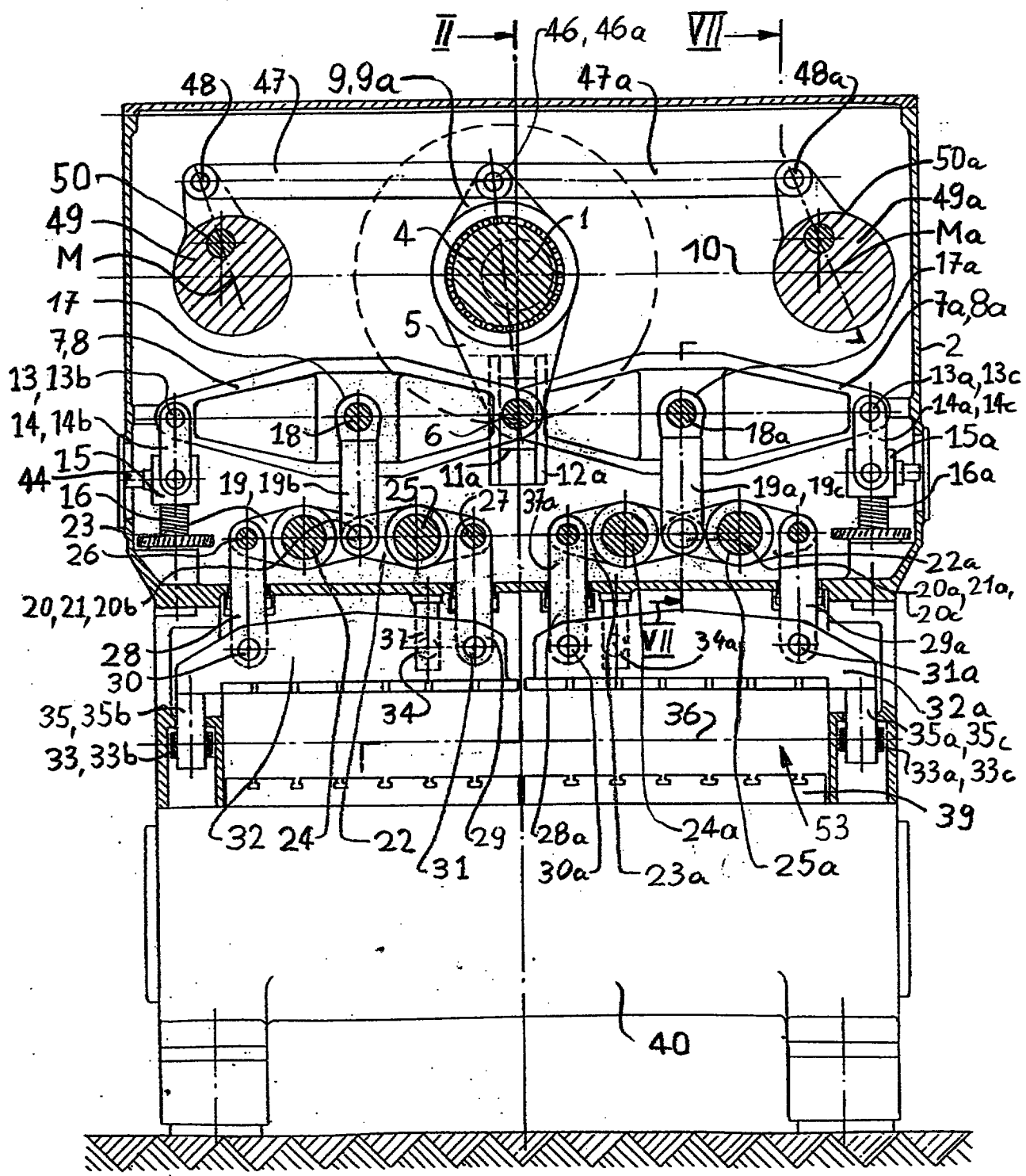


Fig. 1

This Sheet Has Been Replaced

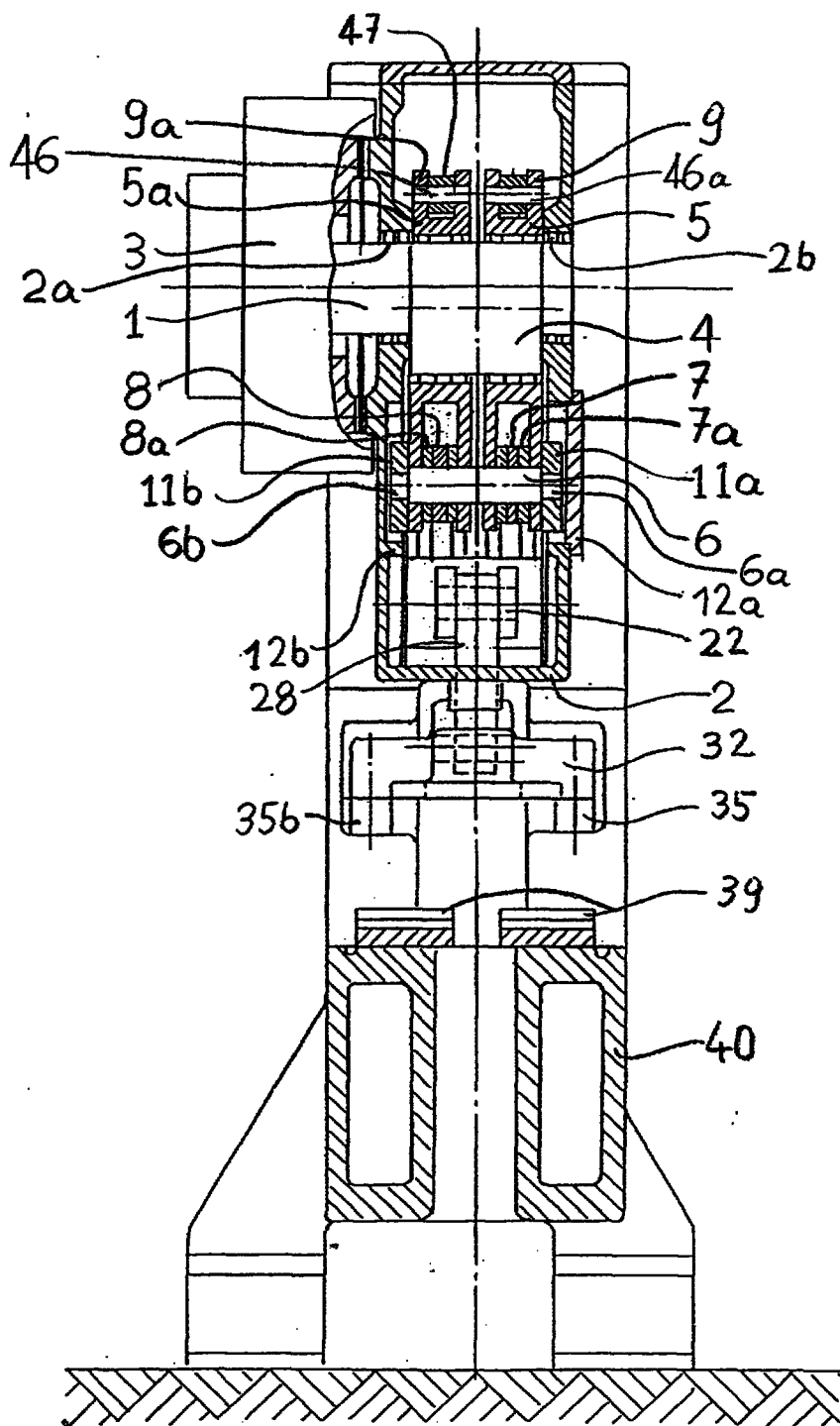


Fig. 2

This Sheet Has Been Replaced

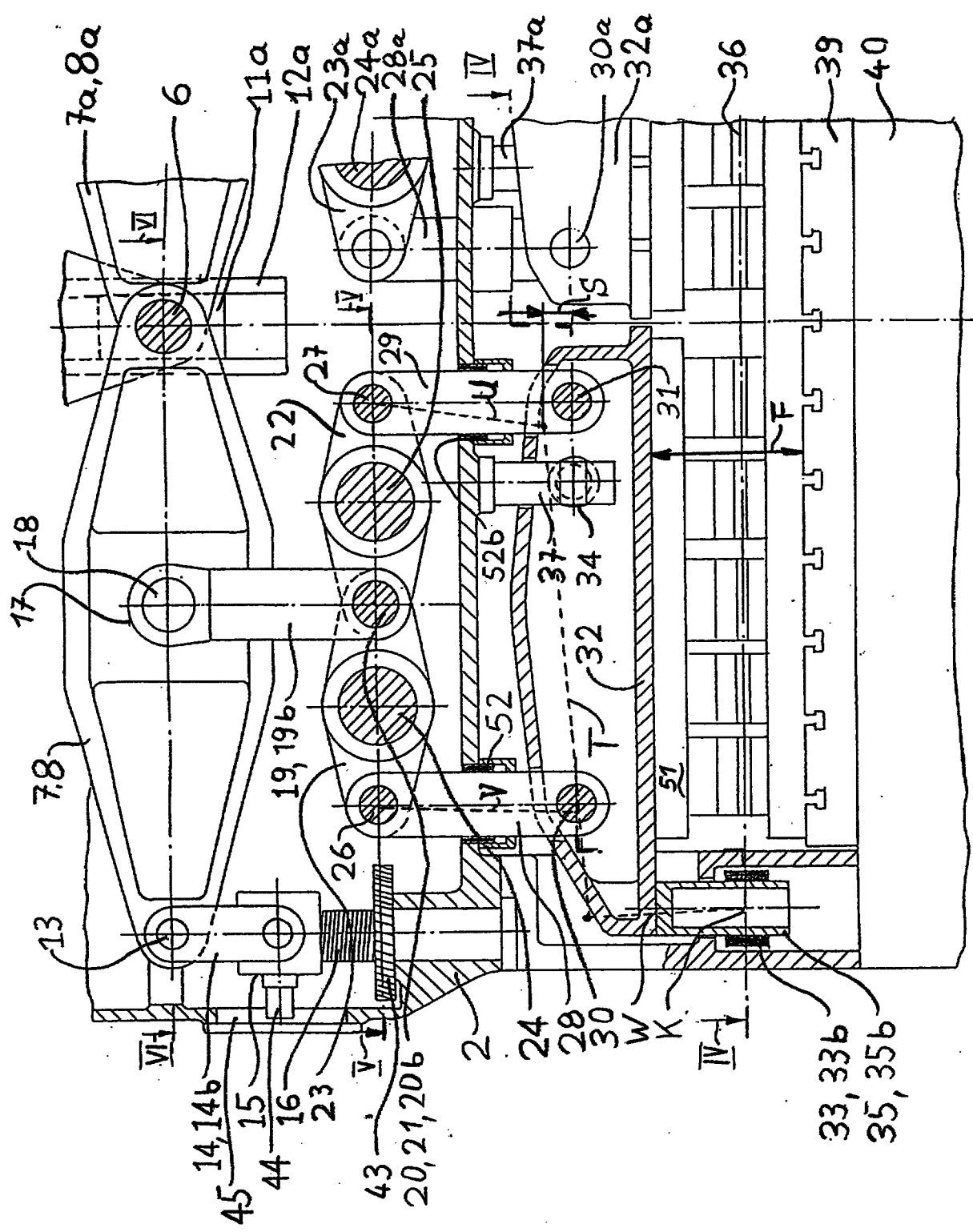


Fig. 3

This Sheet Has Been Replaced

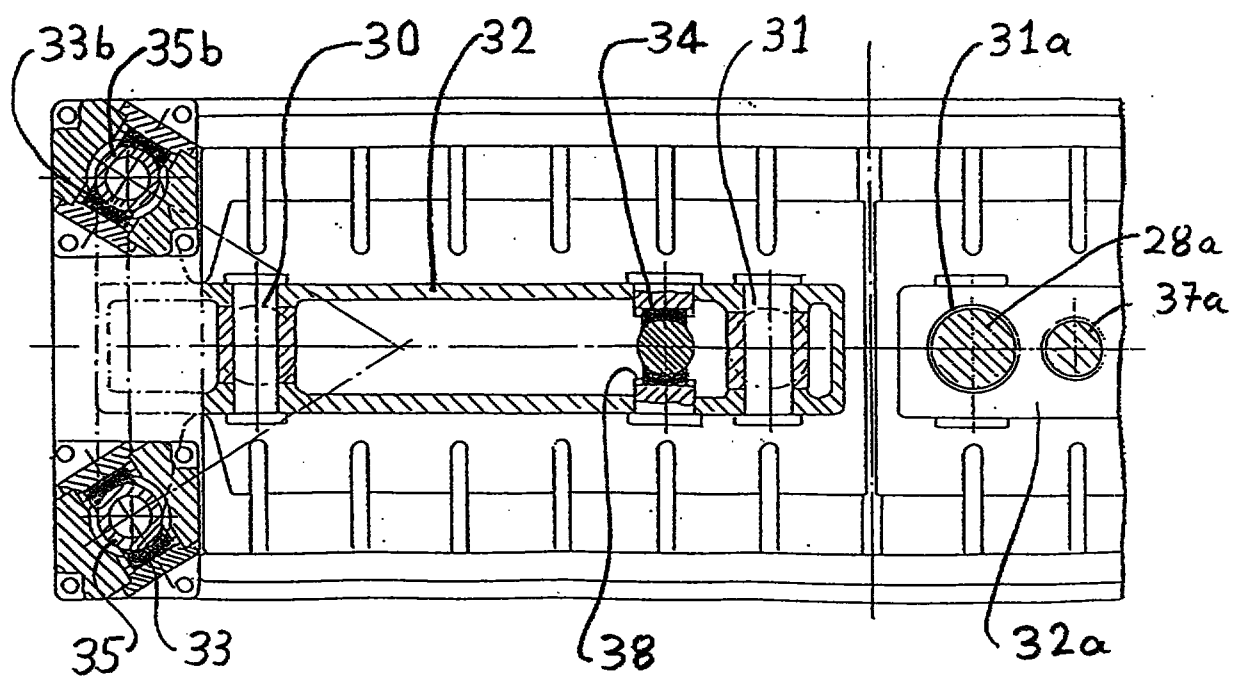


Fig. 4

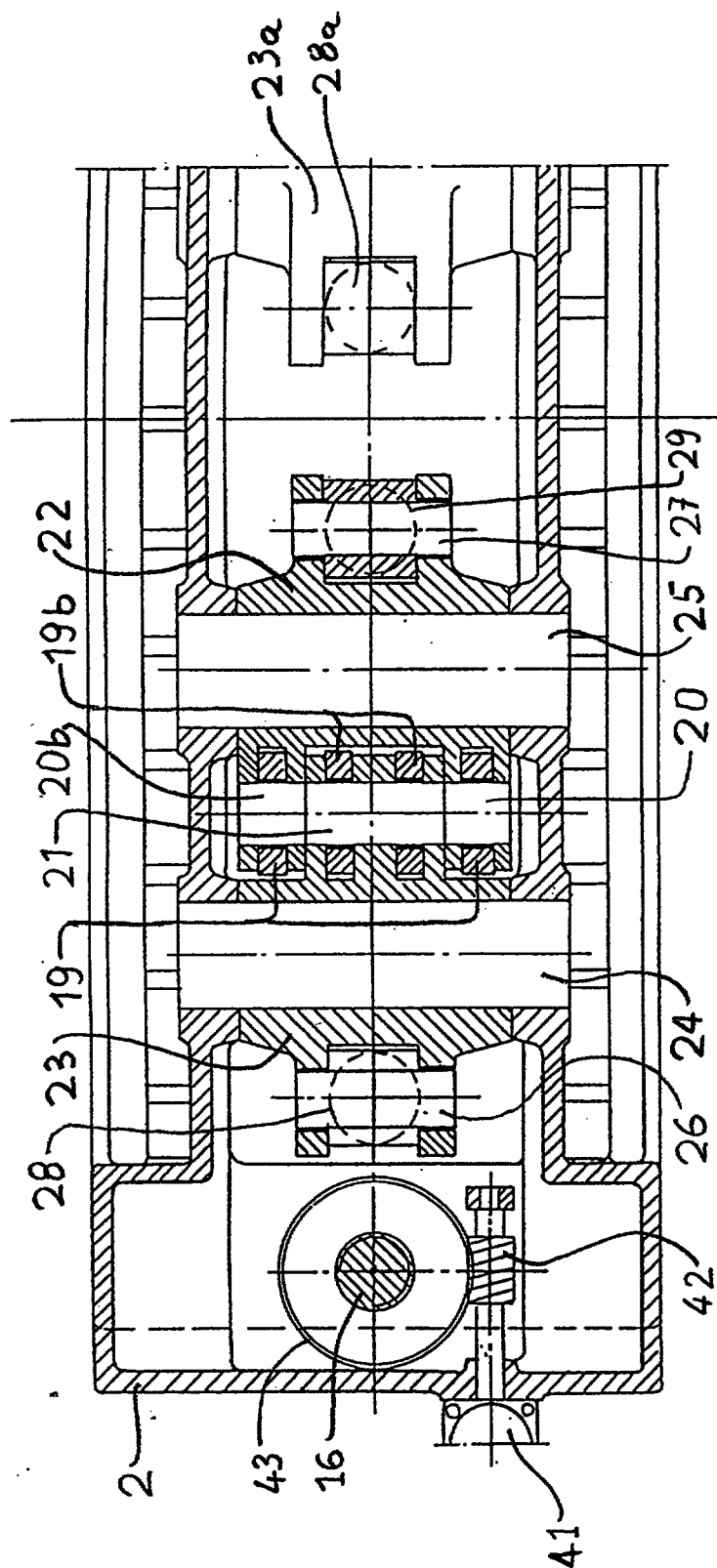


Fig. 5

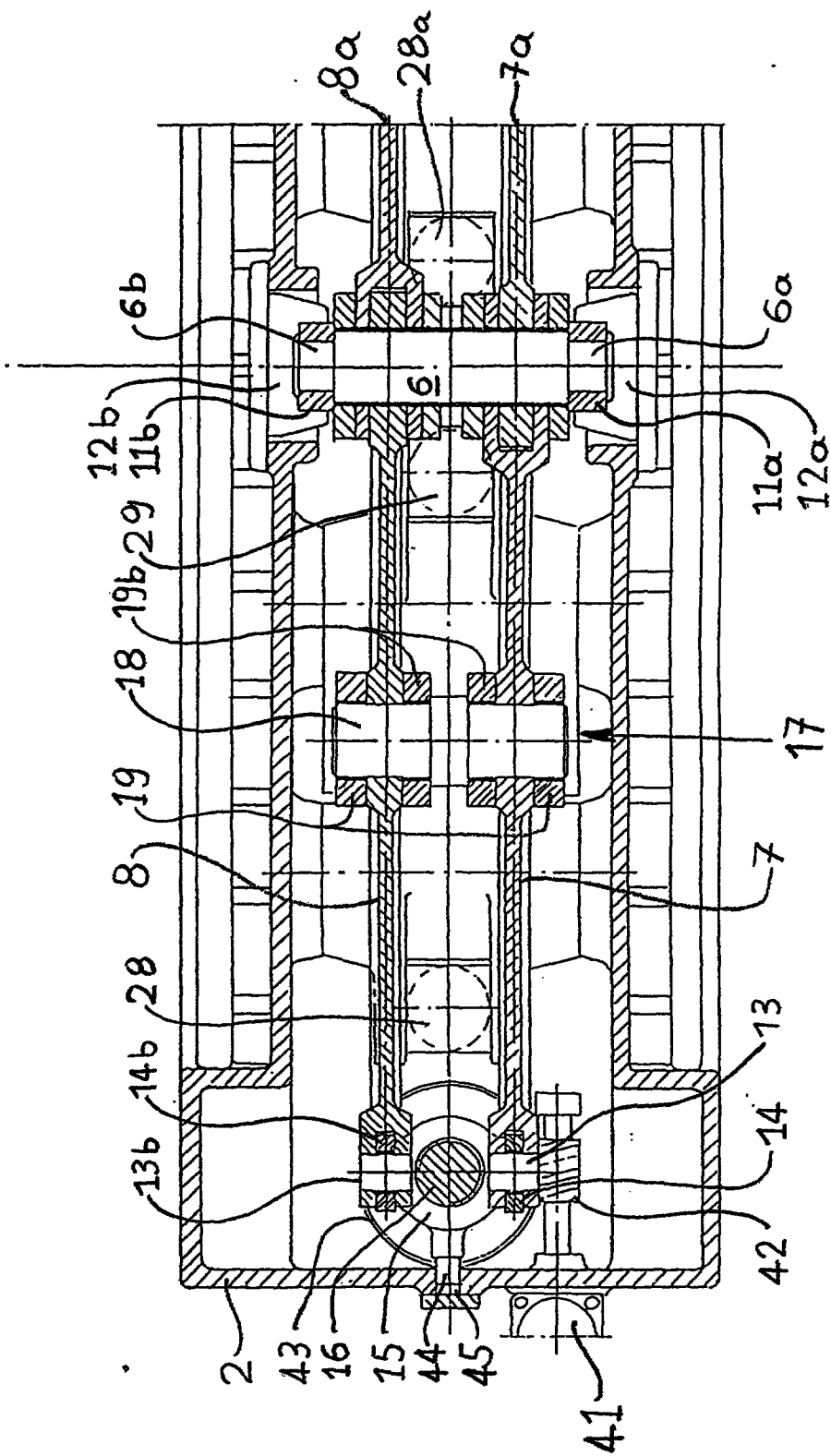


Fig. 6

This Sheet Has Been Replaced

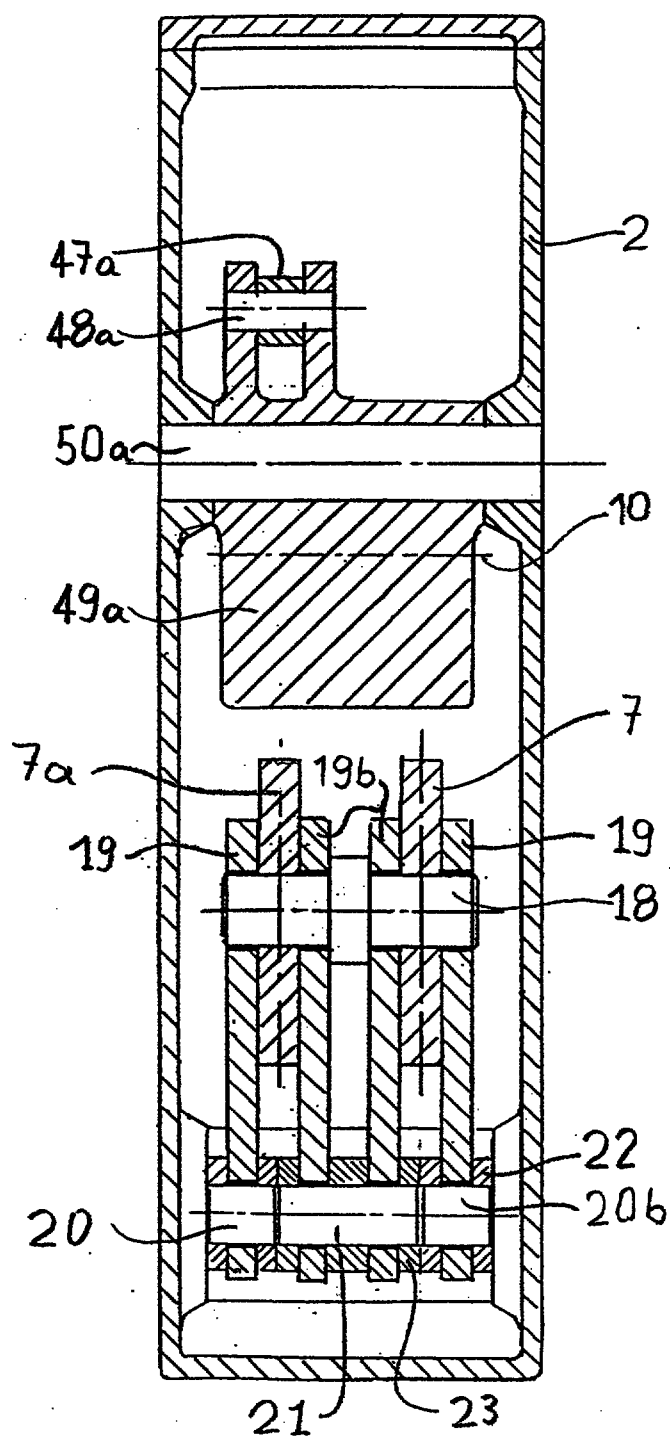


Fig. 7

14 MAY 1996

1

A punch press with a long space for receipt of a tool

5 The present invention relates to a punch press, having a punch press frame, at least one ram, a punching operation space, a means for the producing of a stroke movement, in which punching operation space a web run plane of a respective web to be worked upon and to be
10 fed through the punching operation space is set.

 The developments of the modern punching technique lead to a complete processing of a raw material, i.e. to a complete non-chip producing production of a product. This means that a modern punch press is designed
15 to be a complete production center. Apart of the common cutting and forming (bending) operations punch presses are used the longer the more also for mounting and assembling operations, weldings are performed, parts are bolted together and even threads are formed. After each
20 working step made on a web to be worked upon this web is fed in the punch press further by a predetermined distance. Furthermore, measuring apparatuses for quality control during the running of the production process are made use of. This means that the length of the space for
25 receipt of a tool in punch presses, i.e. the punching operation space, becomes the more the longer due to the increasing number of individual operation steps performed in the punch press. Conclusively, the more the longer spaces for receipt of a tool are needed.

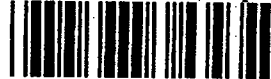
30 In order now to have a longer space for receipt of a tool it basically would be merely necessary to scale up a common punch press design. With such measure, however, the allowable rated loading would increase in the power of two in relation to the increased scale and
35 the masses of such punch press would increase in the power of three.

14 MAY 1996

Abstract**A PUNCH PRESS WITH A LONG SPACE FOR RECEIPT OF A TOOL**

The eccentric shaft (1) is coupled via the
5 rod (5) and sliding block (6) to single arm levers (7, 8;
7a, 8a) projecting at both sides away from the sliding
block (11a). At their ends remote from the sliding block
(11a) these levers (7, 8; 7a, 8a) are supported via
threaded spindles (16; 16a) at the frame (2) of the
10 press. Groups of links (19, 19b; 19a, 19c) are pivotably
mounted to the levers (7, 8; 7a, 8a) which are connected
to pairs of double levers (22, 23; 22a, 23a) located sym-
metrically relative to the center line of the frame (2)
of the press. Each double lever (22, 23; 22a, 23a) is
15 pivotably mounted to a pressing column (28, 29; 28a,
29a). The pressing columns (28, 29; 28a, 29a) of every
pair of double levers (22, 23; 22a, 23a) are mounted to a
ram (32; 32a). Every ram (32, 32a) is guided by three
guiding columns (35, 35b, 37; 35a, 35c, 37a) of which two
20 (35, 35b; 35a, 35c) are rigidly mounted to the ram (32;
32a) and one (37, 37a) is rigidly mounted to the frame
(2) of the press. By this symmetrically dividing of the
driving elements leading to two rams (32; 32a) the punch
press features an extremely long space (53) for the re-
25 ceipt of a tool without that the height of the punch
press, the allowable rated loading and the moving masses
must be overly large.

Fig. 1



14 MAY 1996

1

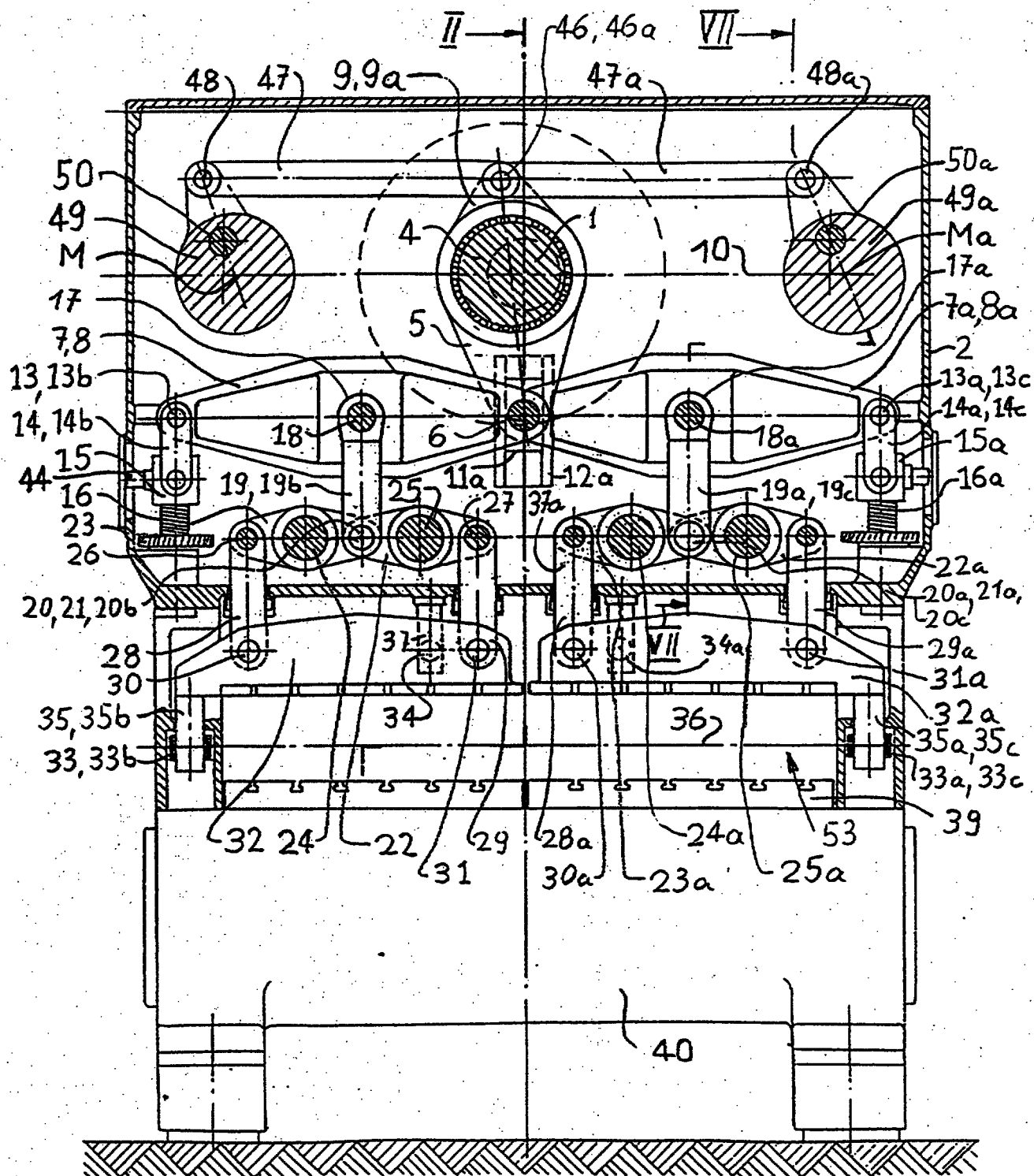


Fig. 1



14 MAY 1996

2

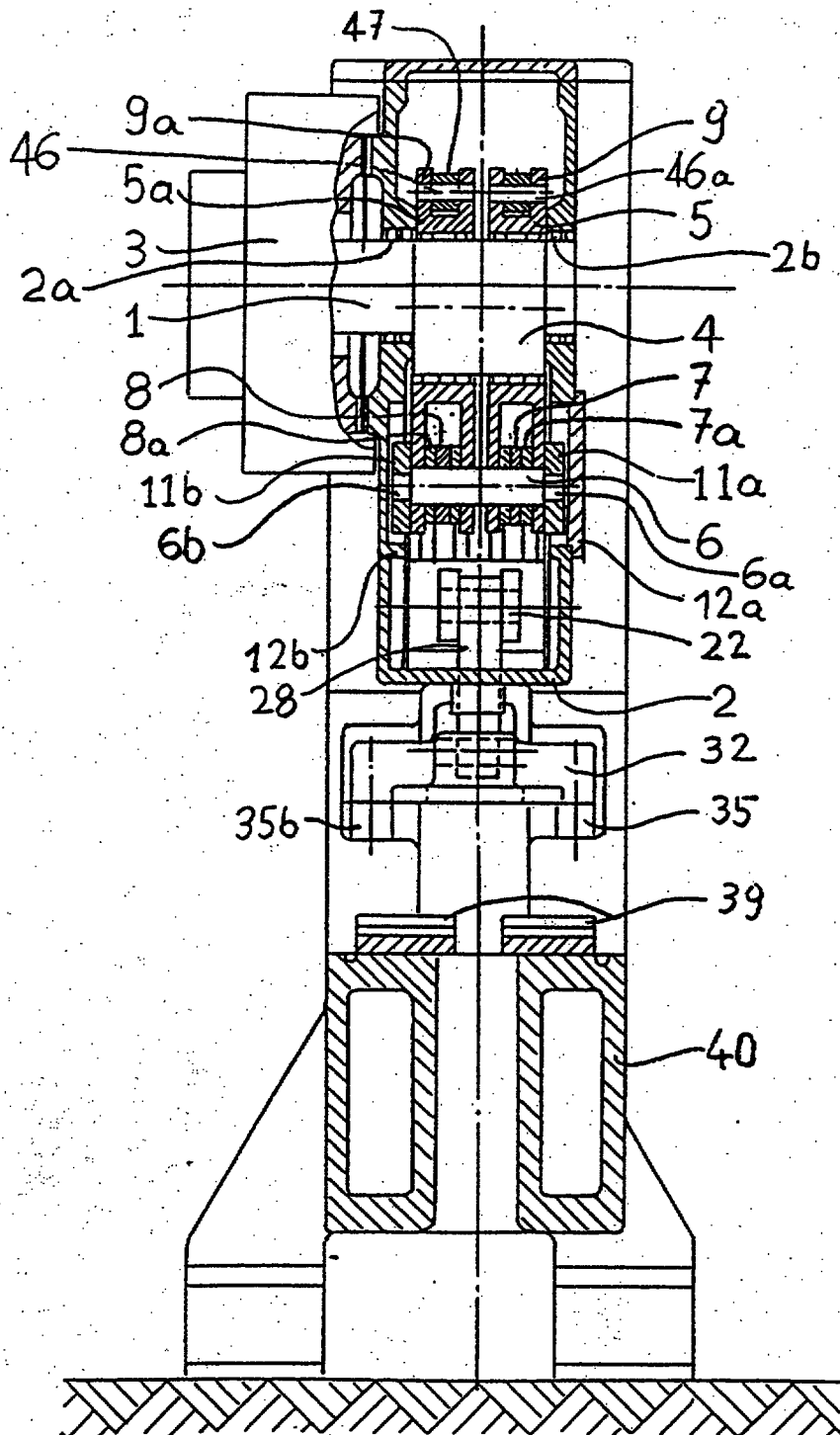


Fig. 2



14 MAY 1996

3

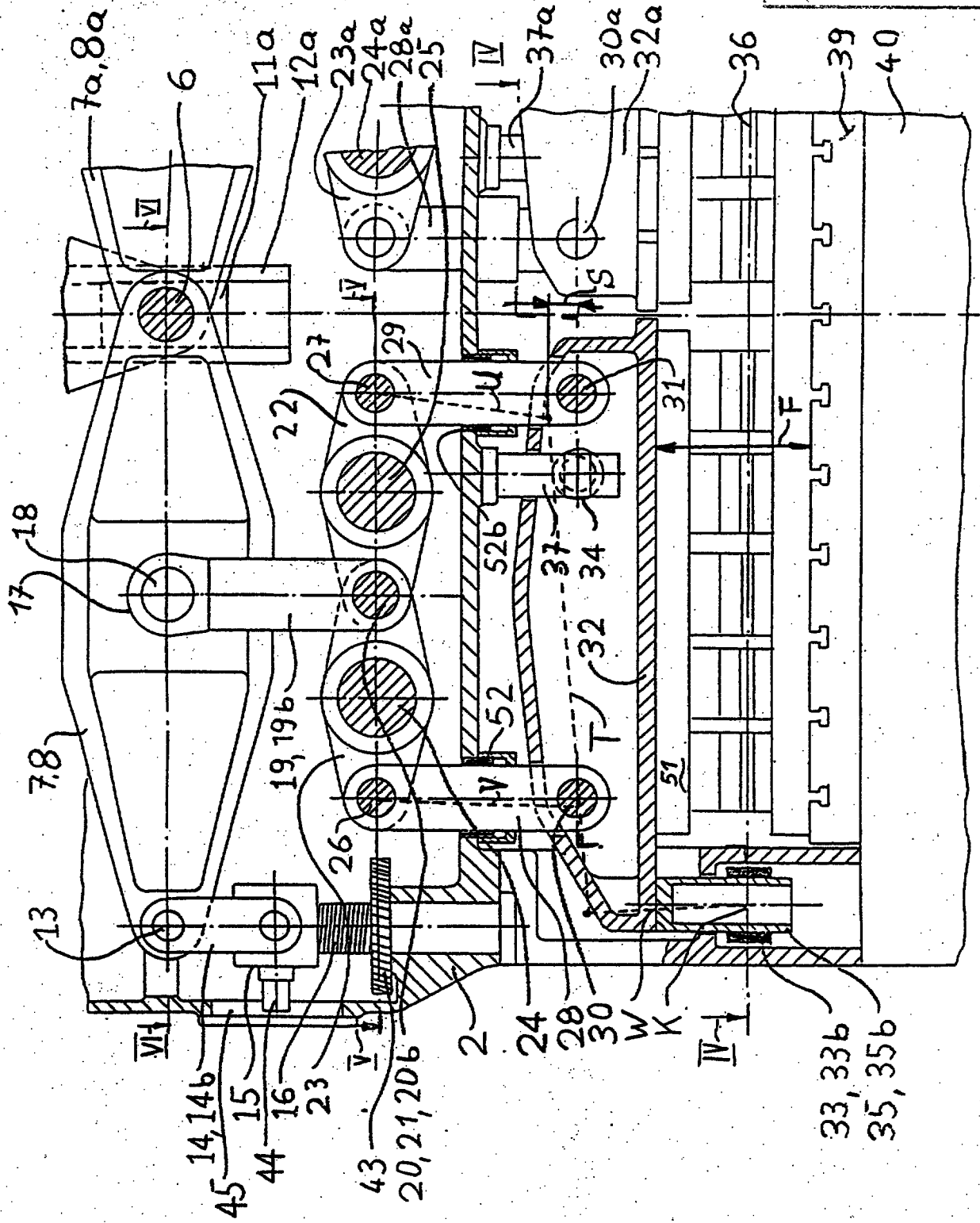


Fig. 3

Has Been Replaced

Fig. 4



14 MAY 1996

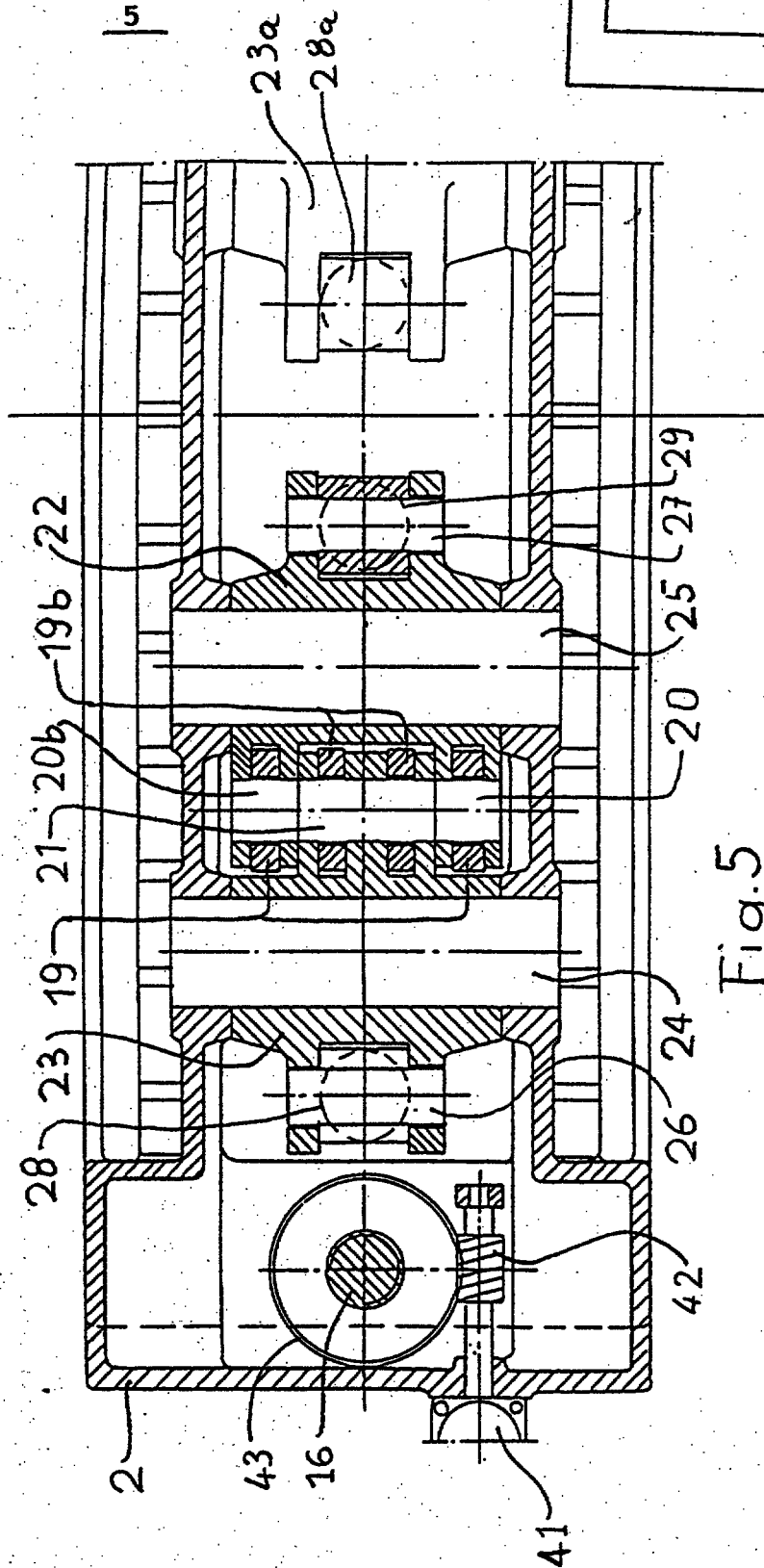
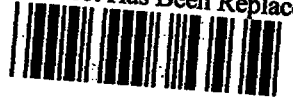


Fig. 5

This Sheet Has Been Replaced



6

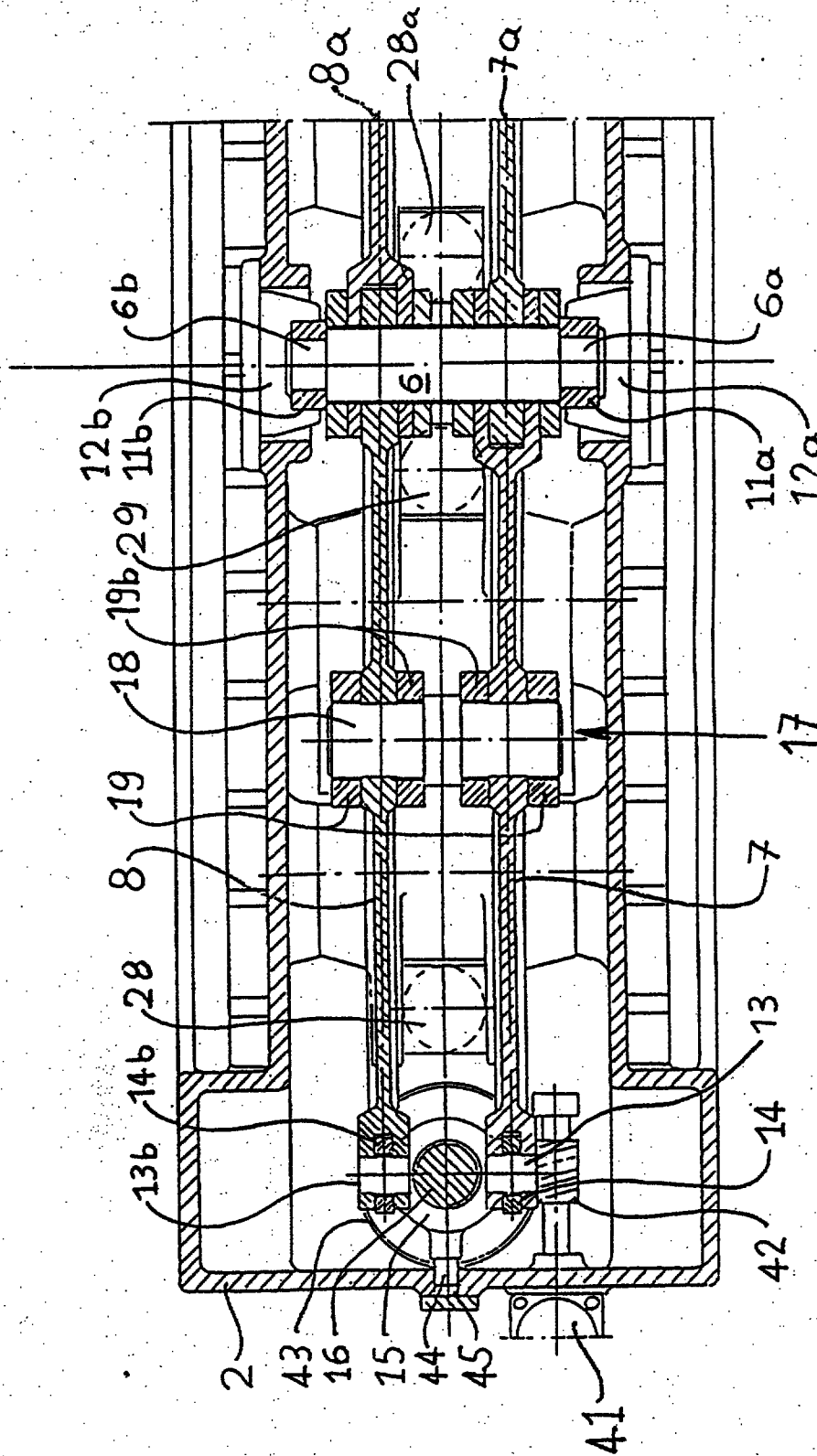


Fig. 6

REPLACEMENT SHEET

14 MAY 1996

7

This Sheet Has Been Replaced

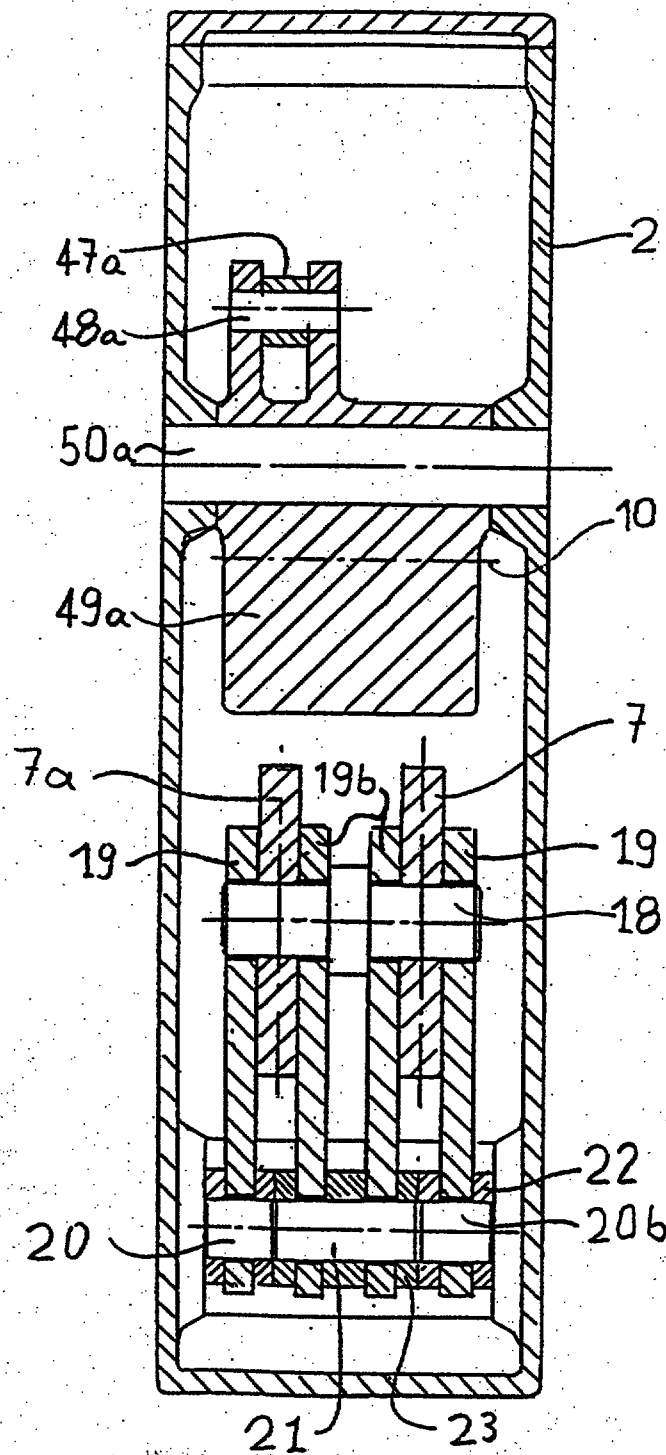
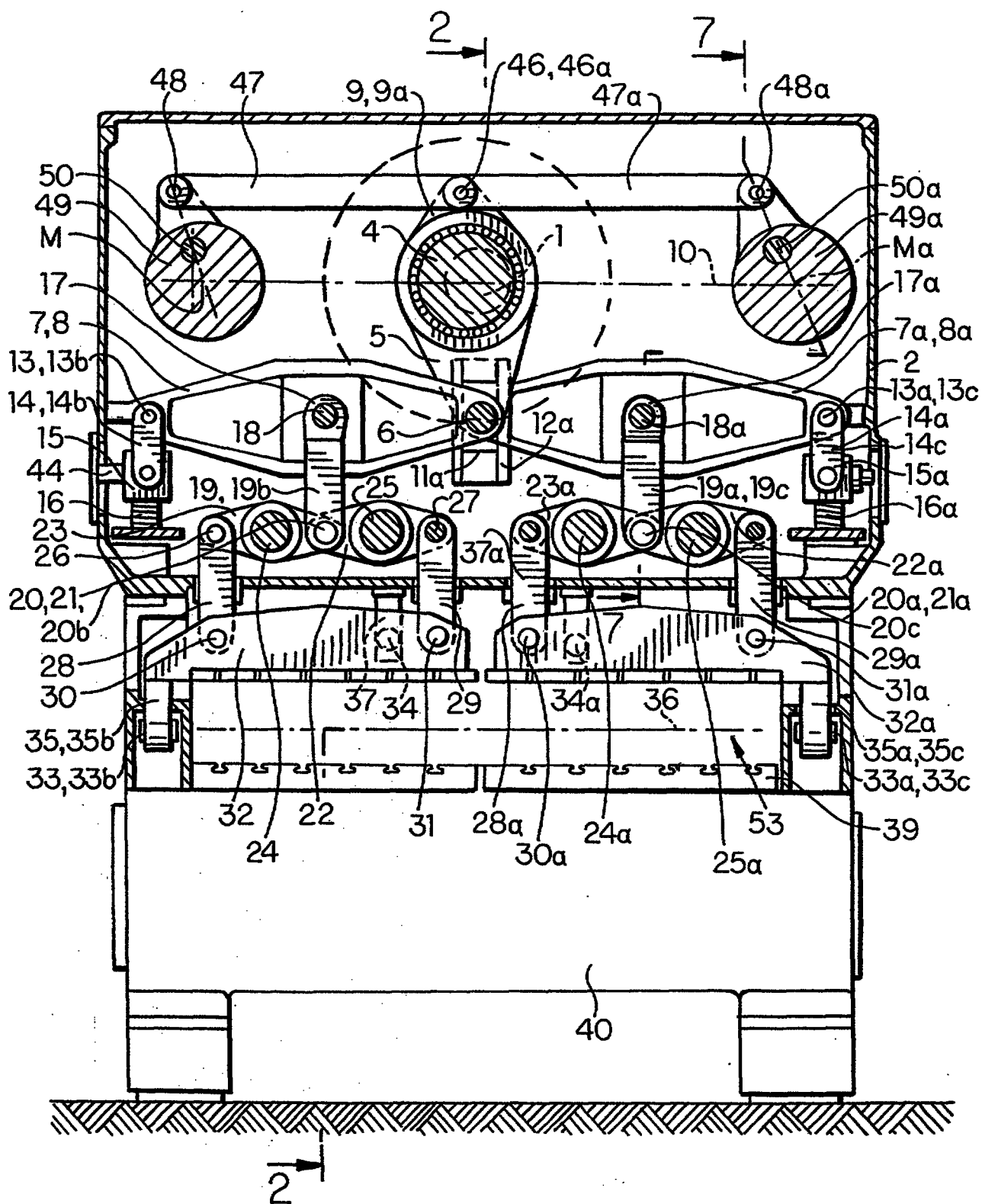


Fig. 7 00038

05 AUG 1997

1



05 AUG 1997

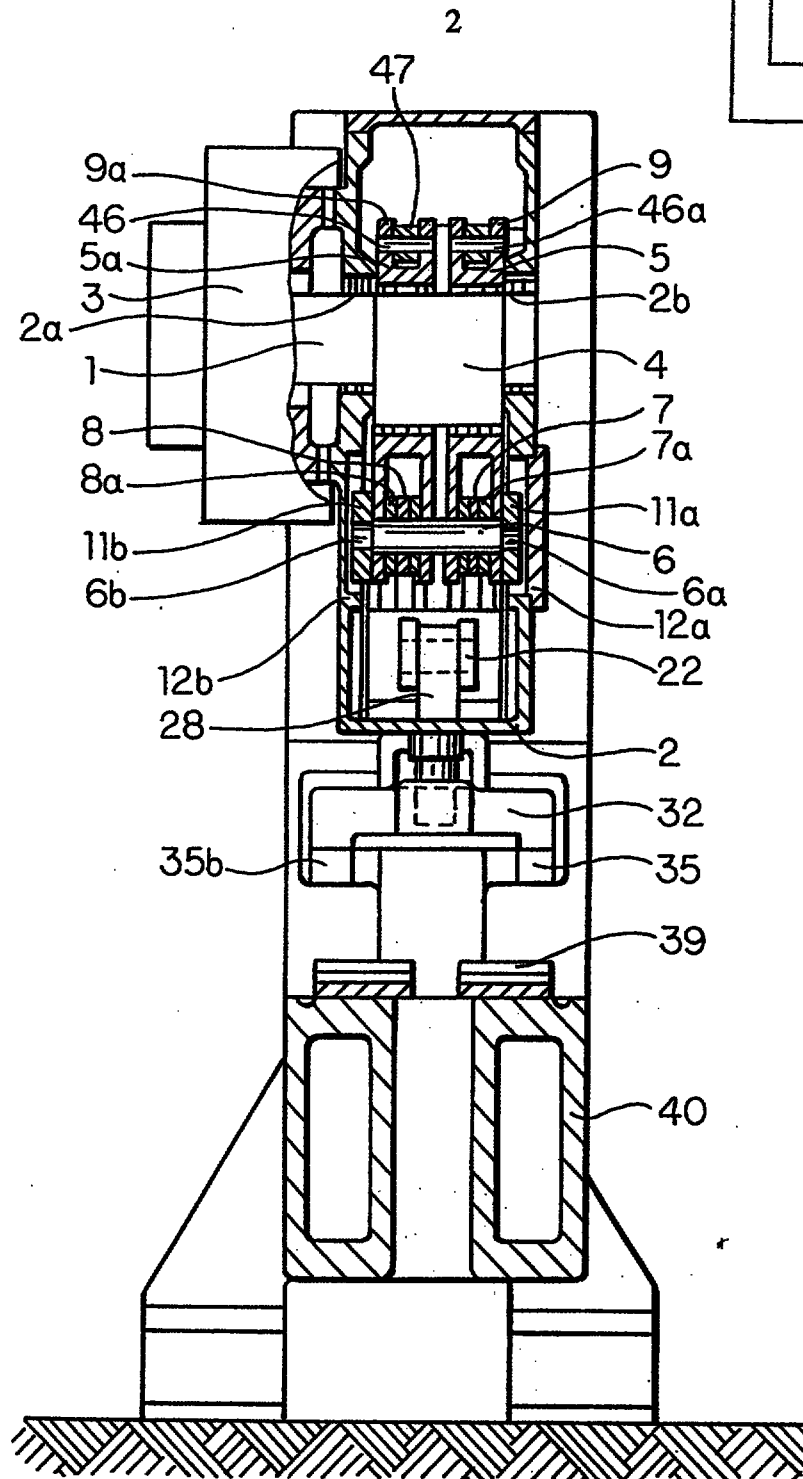
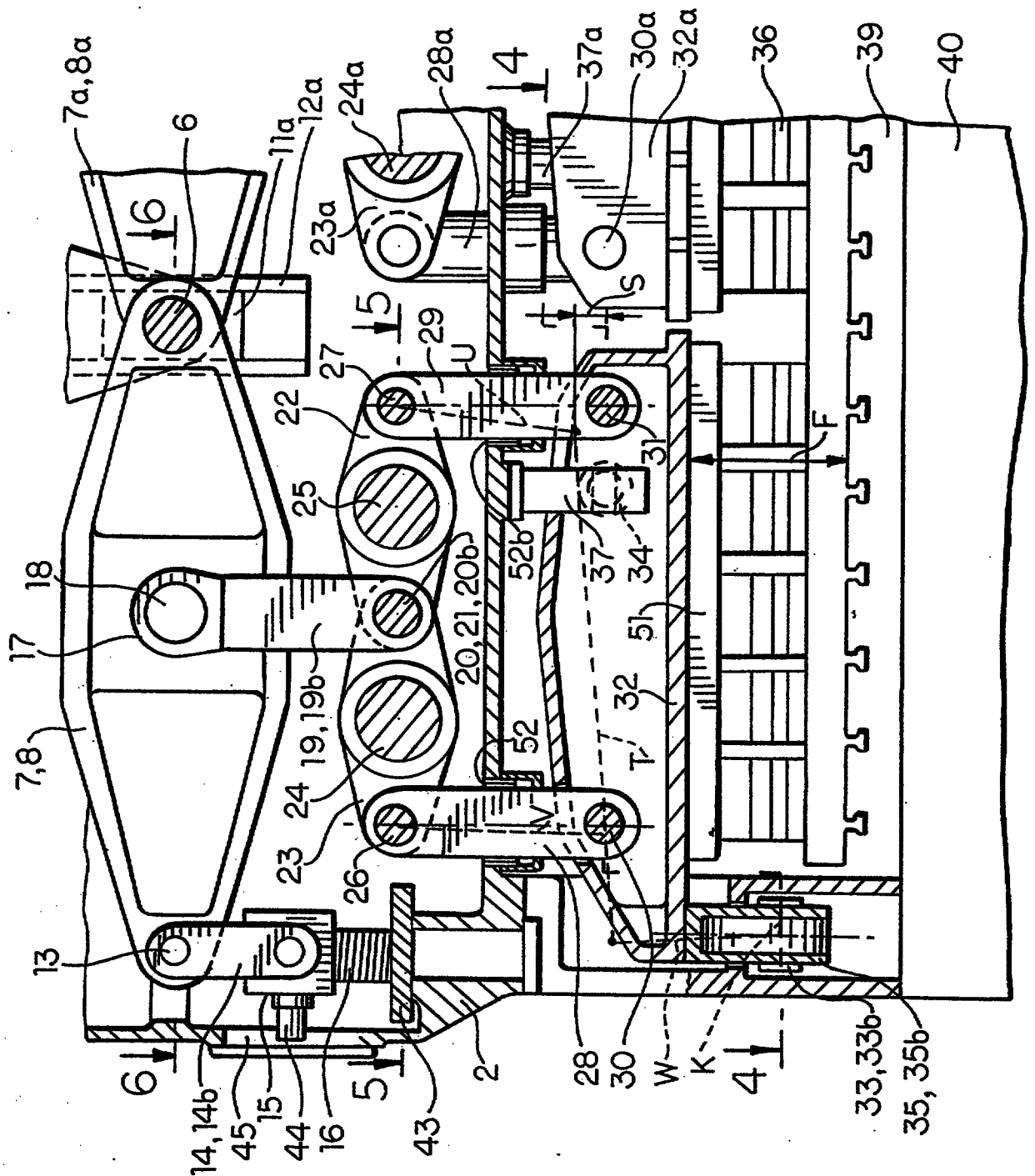


FIG. 2



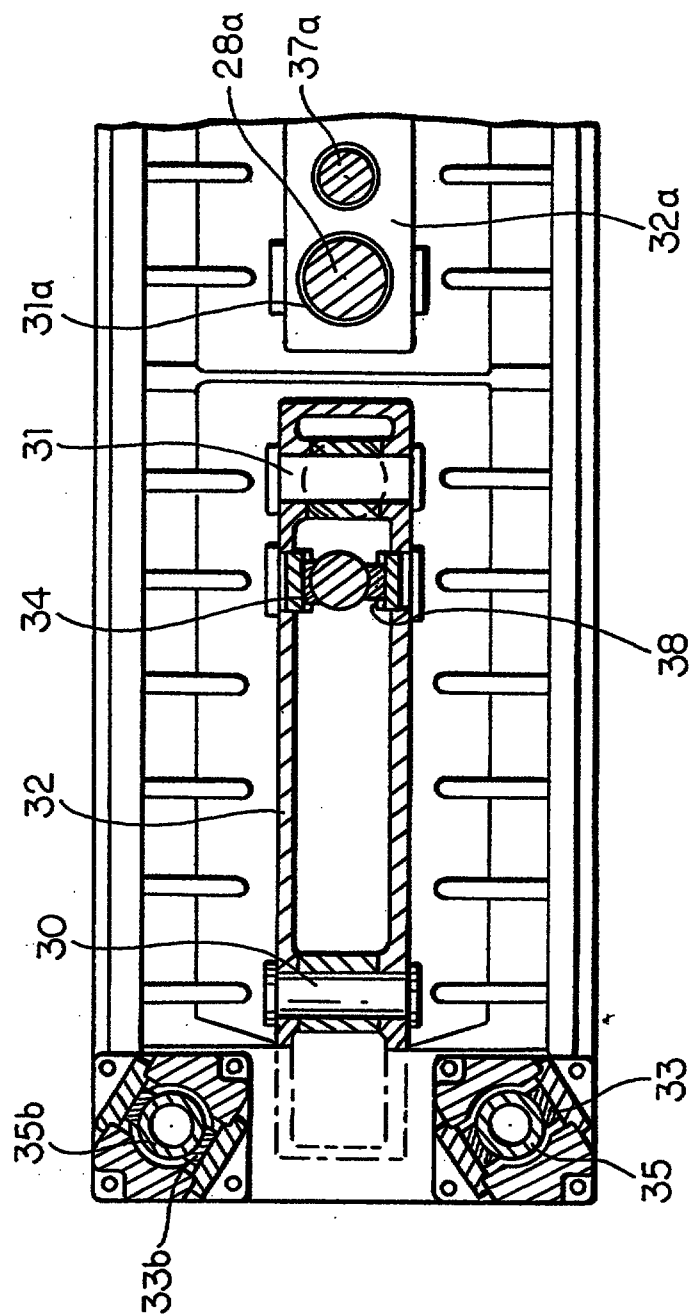


FIG. 4

5

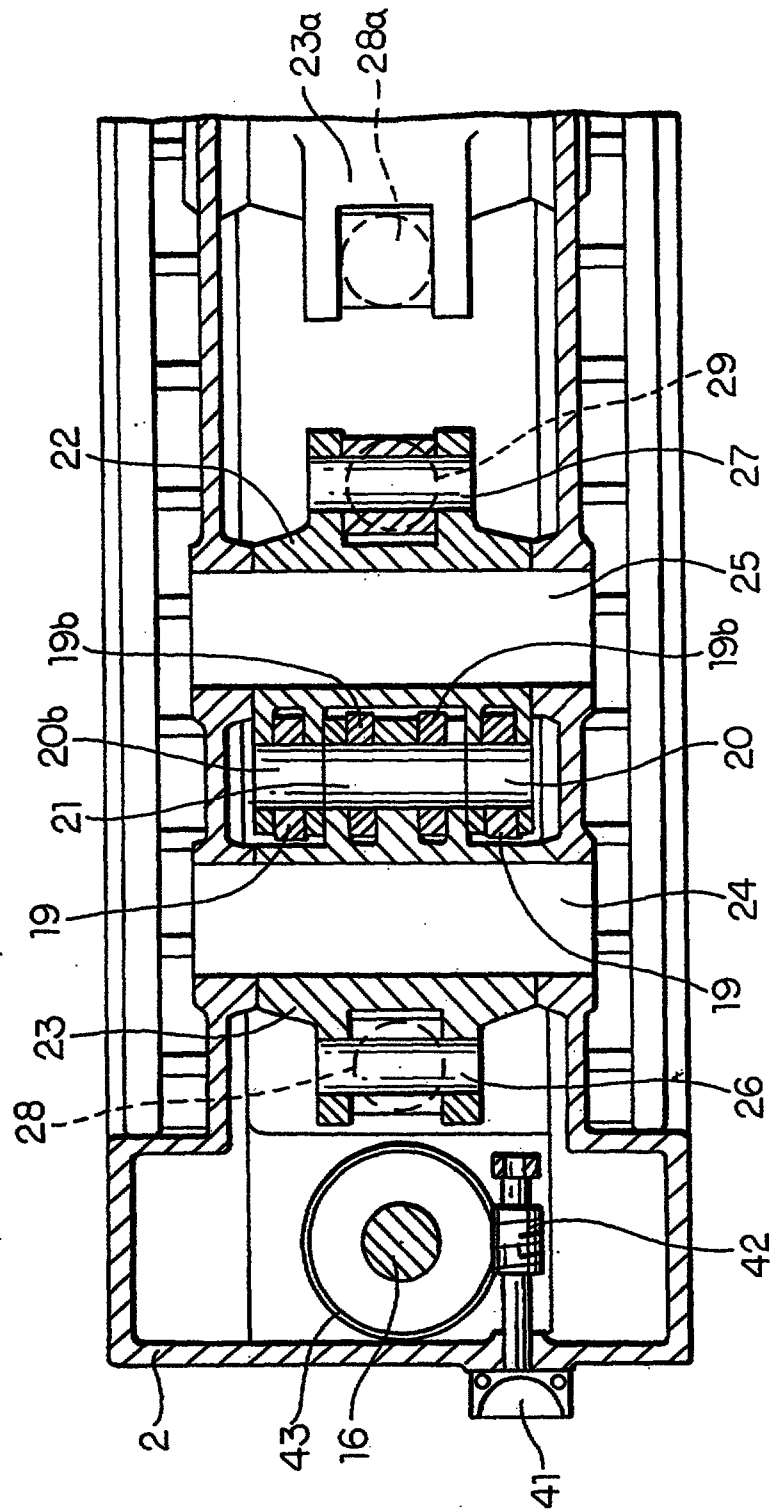


FIG. 5

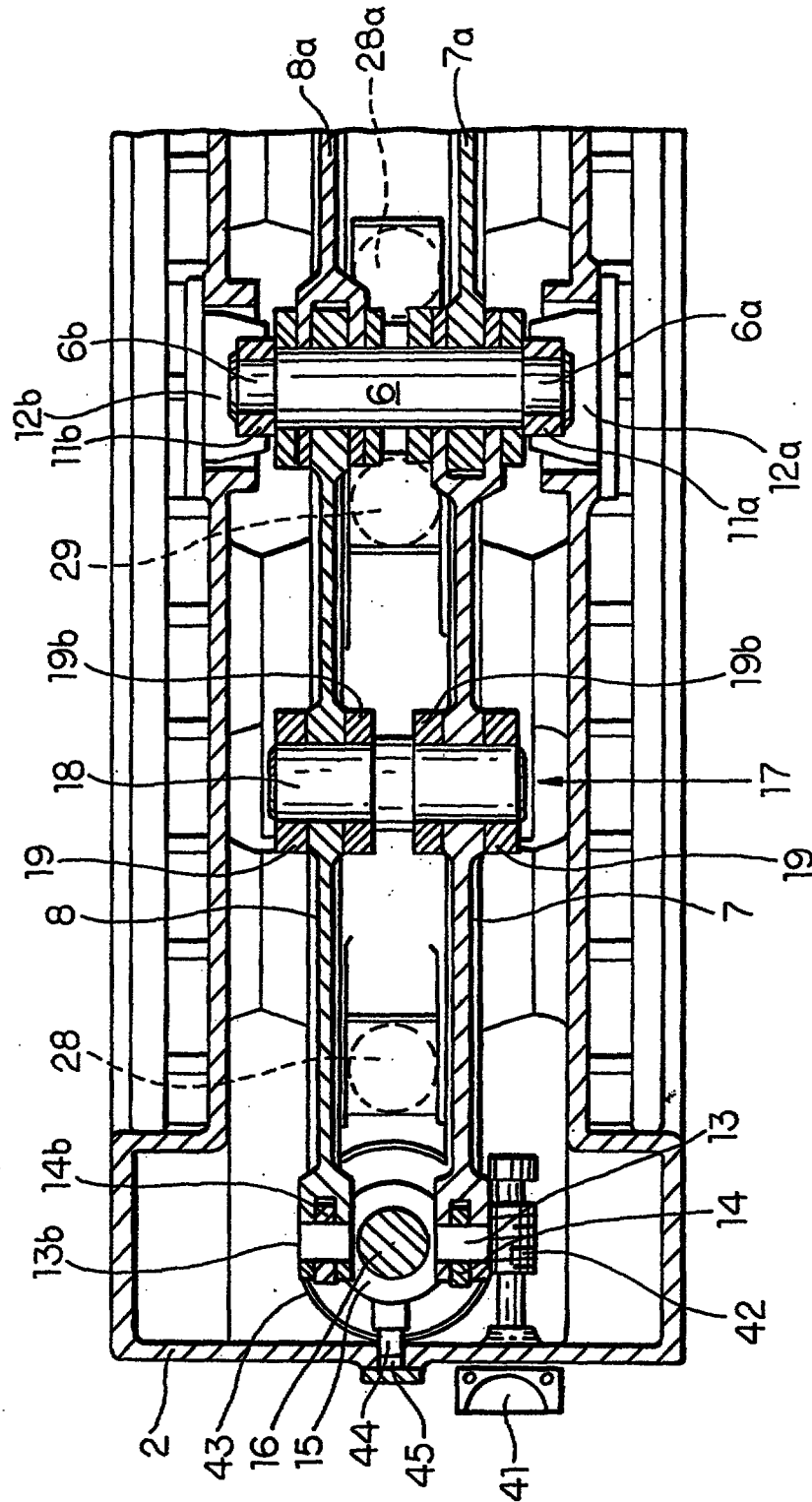


FIG. 6

05 AUG 1997

7

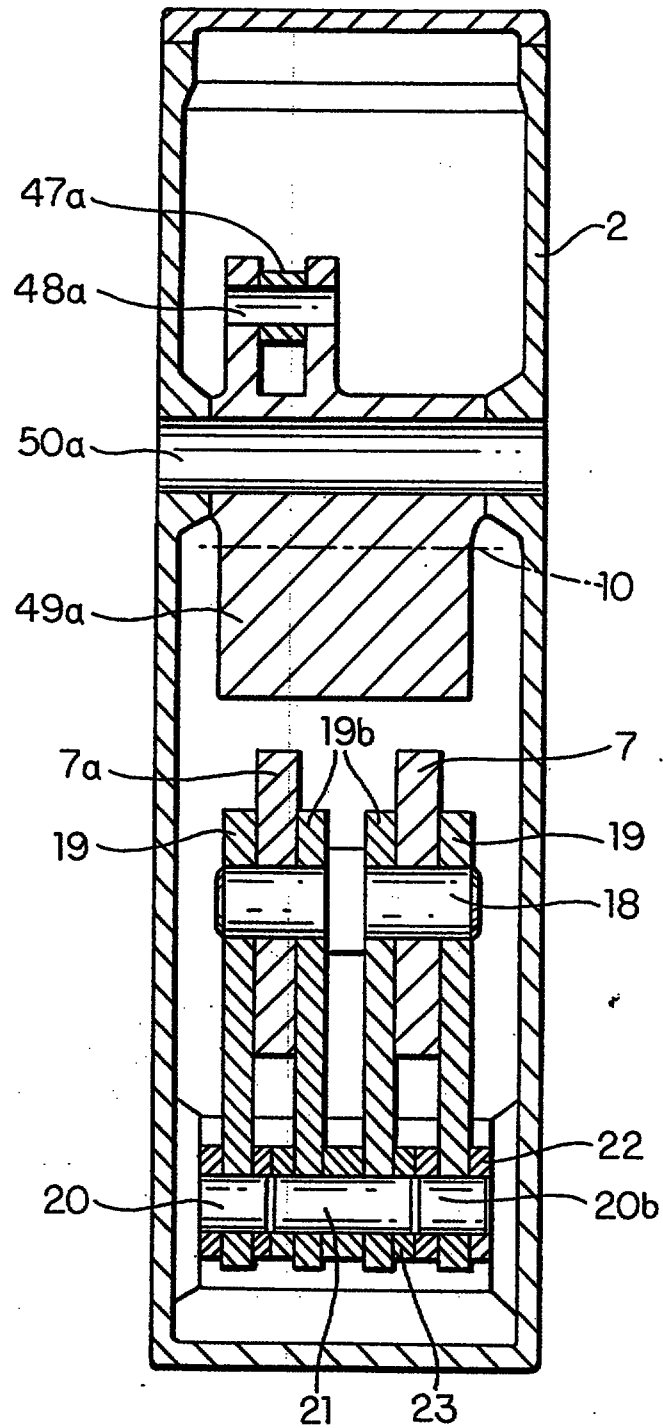


FIG. 7