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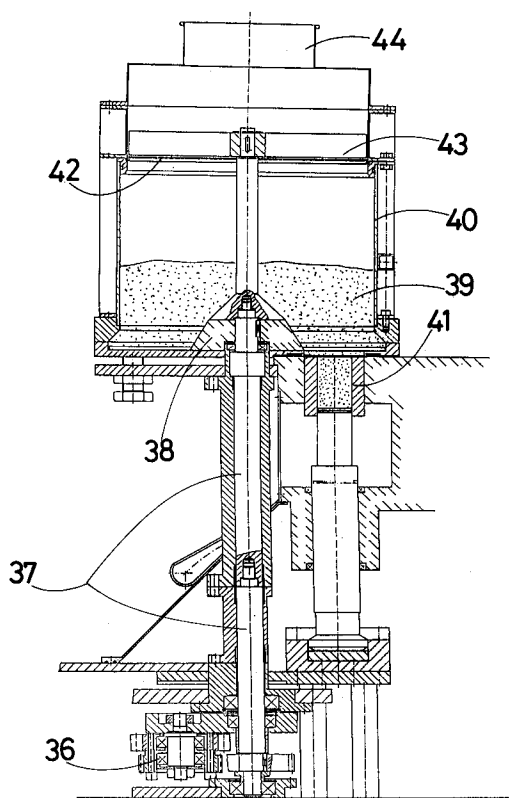
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(54) **Machine for the preparation of powder based detergent dose portions.**

(57) The machine comprises a continuously rotating table carrying the moulds for the compactation of the detergent individual doses, the corresponding reciprocating pistons being located within each of the moulds, which reciprocating movement is controlled by a lower assembly comprising ramps and pushers, the machine having an intermediate rotating support for the guiding of the individual pistons within the moulds and a multiple feeding unit to successively feed the various powder components to the moulds, which feeding is combined with the corresponding dose determining vertical displacements of the corresponding pistons, previous to the working stages for the compression of the detergent, for which compression action the machine has an upper compression unit cooperating with the top part of the moulds.

**Fig. 7****EP 0 549 839 A1**

The invention refers to a machine for the preparation of powder based detergent dose portions of the type which is compacted to a high pressure.

The use of powder detergents is well known, namely in the domestic domain, comprising the preparation of marketing recipients containing the detergents in powder form allowing the manual dosification of the detergent in domestic applications. This well known system has a low efficiency because the dosification of the product is not fully rational and its manual handling is prone to spilling the product.

To find a solution to the drawbacks which appear in the use of powder detergents it has been proposed to use excentric and hydraulic presses for the compactation of the detergent in powder form, which has meant only a partial solution to the problem, given the fact that although such process makes possible to obtain the detergent in compacted individual doses by means of presses, the cost is very high because the efficiency of such presses is very low for this purpose.

The machine disclosed by the present invention is aimed at giving a satisfactory solution to the above mentioned problems, disclosing means to obtain compacted doses of powder detergent with a good stability and a high yield of the machine, so that the manufacturing costs are very low, allowing an easy marketing of the powder detergents in compacted form which constitutes a substantial advantage for the user.

To accomplish its objectives the machine of the present invention is essentially based on a continuously rotating table which supports the moulds or forms for the compactation of the powder detergent, which rotating table combines with an intermediate support for corresponding compression pistons which operate individually in each of the stations of the rotating table. The machine has as well a lower set of driving ramps to operate the pistons, each ramp having specific profile and being distributed to adopt a generally round pattern, being aimed at controlling the vertical displacements of the pistons within the moulds of the rotating table. At the same time, the machine has in its upper part a system for the multi-stage feeding of the powder detergent or detergents with a driving means which are synchronized with the driving of the machine.

The driving means of the machine comprise a motor reducer for the driving of the rotating table and hydraulic means for the driving of the pistons during the compression and precompression stages and also to provide hydraulic fluid for other services of the machine.

The machine has as well a system which is complementary of the compression and precompression pistons, which permits the upper closing

of the moulds supported by the rotating table, synchronized with the rotation of the same and also with the driving of the pistons. This compression system operating from the top part comprises preferably corresponding rotating plattens.

After completing the various working stages along the circular path of the table, comprising the feeding of the powder detergents, the precompression and compression stages, the machine has means for the removal of the finished detergent portions, so arranged as to allow the removal of the compacted doses at a high velocity, without an excessive percussion and therefore reducing the danger of eventual damages inflicted to the individual detergent portions.

The machine has as well selection means combined with additional guiding means located on the outlet for the finished detergent dose portions, which selecting means allow the discharge of the correct detergent portions along one outgoing ramp, deriving to a second ramp those detergent portions which are not usable because of damages suffered during its manufacture.

For its better understanding, explanatory drawings are enclosed of a non limitative embodiment of the machine embodying the present invention.

Figures 1 and 2 are side views with partial cross sections of a machine according to this invention.

Figure 3 shows a partial cross section of the machine showing the rotating table and mechanical means associated with the same.

Figure 4 shows a side unfolded view of the driving ramps for the pistons.

Figure 5 shows an upper view corresponding to the driving ramps of figure 4.

Figure 6 corresponds to a cross section of the main transmission system.

Figure 7 is a cross section of the feeding assembly of the machine.

Figure 8 shows a cross section similar to figure 7, corresponding to the auxiliary feeding system.

Figures 9 and 10 correspond respectively to a side view and a longitudinal section of the precompression roller.

Figure 11 shows a side view with a partial cross section of the compression roller.

Figure 12 shows a complete cross section of the compression platten.

Figure 13 shows a detail of the guiding system for the detergent dose portions incorporated in the discharge outlet of the machine.

As shown in the figures, a machine according to this invention essentially comprises, figure 3, a rotating table -1- adopting a generally annular pattern, carrying multiple moulds -10-, figure 4, to receive the powder detergent, operating within each of the moulds, corresponding vertical driving

pistons -2-, figure 4, which are guided by means of support -3-, which moulds receive the detergents in powder form from the upper feeding means -4- and -5- which constitute a double feeding system for the successive partial feeding of the moulds. The machine has an upper compression system which is complementary of the pistons -2-, which compression system preferably comprises separate precompression and compression platens driven respectively by motors -6- and -7-.

The driving assembly consists of a motor reducer and a clutch -8- incorporating brake means, which objective consists in the driving of the rotating table and the intermediate support for the guiding of the pistons, while the individual pistons are hydraulically driven by means of an hydraulic system represented in the drawings by the hydraulic unit -9-.

The displacements of the pistons -2- within the individual moulds -10- represented in figure 4 are obtained, as indicated in the foregoing, by means of the driving action exerted on the lower parts of the pistons by a system comprising ramps and pushers arranged on an annular structure -11- represented in figure 5. The ramps comprise various segments -12-, -13-, -14- and -15- having rise and descent zones with the aim that starting from an initial position represented on the left part of figure 4, in which the moulds are completely filled by the pistons, a subsequent segment -12- of the ramps is aimed at the feeding of the different powder detergents forming one charge for each individual dose, having been represented in figure 2 the feeding zones -16- and -17- for eventually dispensing different powder detergent components one after the other, corresponding to different stages of the descent of the pistons -2- in combination with ramp -12-, which are capable of performing the feeding of the powder detergents from the feeding systems -16- and -17-. Subsequently the ramps -13- and -14- determine the rise movements of the pistons, which combine with the action of a precompression roller -18- and the action of the upper precompression platen -19- to allow the venting of the compressed and compacted detergent, to prevent the flowing of the product within the mould or form.

Subsequently, another roller -20- compresses the product by raising the piston within the corresponding mould, its action being combined with the operation of an upper compression platen -21-.

The compression and precompression platens are motor driven as shown by motors -7- and -6- respectively, to encompass the linear velocity of the platens with that of the rotating table -1-.

After having completed the compression stage of the compacted individual doses, the machine has means to expel the individual doses by means of a discharge ramp -22- which has a curved

pattern, figure 13. Said discharge ramp -22- which will adopt preferably the form of an Archimedean spiral, is the one which has been determined to show the highest efficiency to operate together with the table supporting the moulds or forms which continuously rotate with a high velocity. Additionally the machine has a system for the sorting out of the damaged detergent portions, comprising in the discharge ramp -23- an intermediate selecting device -24- capable of deriving towards an auxiliary ramp -25- those detergent portions which have been detected as faulty by means of sensors of optical, gravimetric or other nature.

After routing out the finished portions, the machine has a cleaning plate -26- to eliminate the traces of the product which may remain sticking on the upper part of the pistons and the moulds, to enable the following working cycle to be started.

The power transmission from the motor-reducer -8-, figure 2, and the table carrying the moulds is obtained as shown in detail in figure 6 starting from the driving shaft -27- of the reducer, which has a coupling flange -28- which, by means of safety pins -29- is coupled to flange -30- driving the shaft -31- which drives in its turn the mould carrying table. This shaft is located within bearing carrying body -32- which is hollow and supports bearings -33- and -34-. The shaft receives the upper pinion -35- for the driving of the rotating table.

The filling up of the different moulds is carried out by means of the feeding systems shown in figure 7, synchronized with the rotation of the rotating table and comprising a gear assembly -36- for the synchronization of the rotating table and a shaft -37- for exerting a forced feeding action, on which upper end a paddle wheel -38- is mounted for cooperating with the filling up of the product -39- contained in hopper -40- towards the individual moulds -41-. A granulating screen -42- located in the upper part of the unit allows the screening of the product, protecting the machine against the entry of foreign objects. A second paddle wheel -43- collaborates to obtain the regular granulation of the product fed through the upper inlet -44-.

As indicated in the foregoing, this feeding system is multiple, having a number of units which depends on the number of powder products to be fed to the moulds of the machine for its complete filling.

Alternatively, as shown in figure 8, the driving may be carried out by means of an external driving unit which has been represented by the same reference numerals as in figure 7, being shown only the shaft -45- for the driving of the forced feeding system by means of which the rotation is transmitted to the paddle wheels.

In figures 9 and 10 a precompression roller has been represented corresponding to that schematically represented with the reference numeral -18- in figure 4. Said roller effects the rise of the pistons so that the product is compressed against the rotating compression platten, carrying out a previous compression as it has been previously explained. The device has a support -46- which may be incorporated on an hydraulic shock absorber to dampen the eventual overloads which may appear during the operation. The support has a precompression roller -47- mounted on a shaft -48- by means of needle bearings or similar -49-. The shaft -48- has an offset structure to allow the adjustment of the working height, in order to change the precompression degree of the product.

The compression roller, corresponding to reference numeral -20- in figure 4, has been shown in figure 11 with the reference numeral -50-, being incorporated on the support -51-, and resting on the unit -52- by one of its side faces, allowing the regulation of the height of the roller and being supported on the other of its side faces by means of the device -53- consisting in a hydraulic cylinder which permits to operate under a constant pressure for the compacting of the products, acting at the same time as safety means against overloading.

Both the precompression roller and the compression roller operate in a combined form with the upper compression plattens as represented in figure 12, in which a compression platten has been shown, constituted by the disk -54- rotating within the support -55- on the adequate bearings, driven by the gears -56- and -57-, although it could be directly driven as well. Reference numeral -58- designates a blocking nut.

By the above described means the machine of the present invention permits to carry out the complete cycle for dosing different powder products as well as its precompression and compression within the moulds, proceeding afterwards to the discharge of the portions and to the cleaning operations, which allow the manufacture of compacted powder detergent portions with a high rationalization of the process which gives ground to the corresponding reduction of the costs.

As it will be understood, many variations could be introduced in the machine which has been represented and described in the foregoing only as an example, without departing from the scope of the invention as defined in the following claims.

## Claims

1. Machine for the manufacture of powder based detergent dose portions characterized by a continuously rotating table carrying the moulds for the compactation of the detergent individual

doses, the corresponding reciprocating pistons being located within each of the moulds, which reciprocating movement is controlled by a lower assembly comprising ramps and pushers, the machine having an intermediate rotating support for the guiding of the individual pistons within the moulds and a multiple feeding unit to successively feed the various powder components to the moulds, which feeding is combined with the corresponding dose determining vertical displacements of the corresponding pistons, previous to the working stages for the compression of the detergent, for which compression action the machine has an upper compression unit cooperating with the top part of the moulds.

2. Machine for the manufacture of powder based detergent dose portions according to claim 1, characterized in that each of the upper compression units consists of a platten mounted on a support with intermediate bearings and having an adjustable driving system for the encompassing of the linear velocity with respect to the velocity of the rotating table.

3. Machine for the manufacture of powder based detergent dose portions according to claim 1, characterized in that the ramp assembly for controlling the vertical displacement of the pistons is constituted by a fixed annular structure arranged under the rotating mould carrying table.

4. Machine for the manufacture of powder based detergent dose portions according to claim 3, characterized in that the ramp assembly for the driving of the pistons has an initial ramp segment provoking the descent of the pistons to obtain the dosification for the filling of the moulds, combining with a successive ramp, segment for the rise of the pistons previous to the action of the precompression roller and comprising a further guide which connects with the compression roller, after which a last ramp segment provokes the final rise of the pistons for the expulsion of the detergent portions.

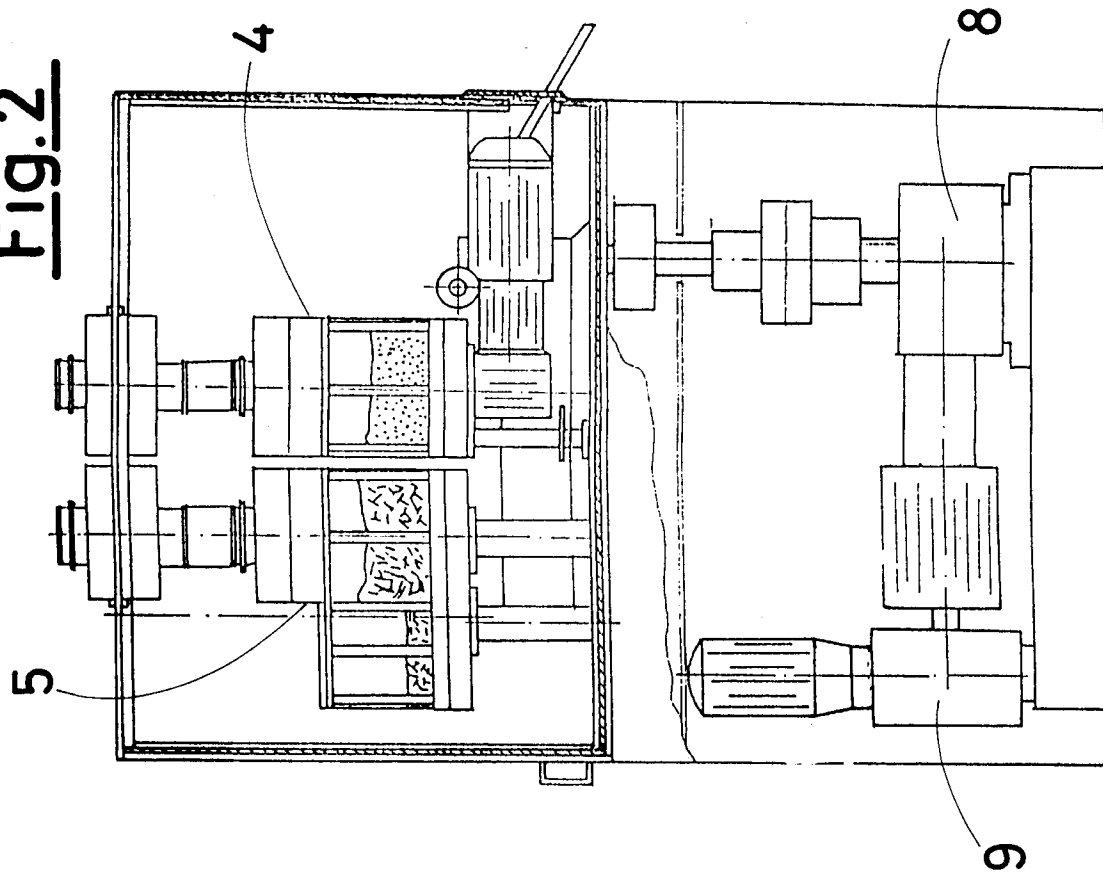
5. Machine for the manufacture of powder based detergent dose portions according to claim 4, characterized in that the compression and precompression rollers are of rotating type and may be adjusted in height.

6. Machine for the manufacture of powder based detergent dose portions according to claim 4, characterized in that the compression and precompression rollers are mounted on sup-

ports which rest on hydraulic shock absorbing damping units.

- |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 7.  | Machine for the manufacture of powder based detergent dose portions according to claim 1, characterized in that the hoppers for the feeding of the powder detergents have respective paddle wheels close to the corresponding upper inlet opening, above a screening grid, having as well a second paddle wheel located on the base of the recipient containing the powder detergent, which second paddle wheel is aimed at enhancing the feeding of the different moulds. | 5<br>10<br>15 |
| 8.  | Machine for the manufacture of powder based detergent dose portions according to claim 7, characterized in that the driving of the paddle wheels of each feeding hopper is carried out in a synchronized way from the main shaft of the machine.                                                                                                                                                                                                                           | 20            |
| 9.  | Machine for the manufacture of powder based detergent dose portions according to claim 7, characterized in that the driving of the paddle wheel of each of the hoppers is carried out by means of individual motor units.                                                                                                                                                                                                                                                  | 25            |
| 10. | Machine for the manufacture of powder based detergent dose portions according to claim 1, characterized in that a curved ramp provides the guidance of the compacted dose portions at the end of its manufacture towards an outgoing discharge ramp.                                                                                                                                                                                                                       | 30<br>35      |
| 11. | Machine for the manufacture of powder based detergent dose portions according to claim 10, characterized in that the curved ramp has the form of an Archimedean spiral.                                                                                                                                                                                                                                                                                                    | 40            |
| 12. | Machine for the manufacture of powder based detergent dose portions according to claim 11, characterized in that in the discharge ramp for the finished portions a selection unit is capable to derive faulty portions towards and alternative discharge ramp.                                                                                                                                                                                                             | 45            |
| 13. | Machine for the manufacture of powder based detergent dose portions according to claim 1, characterized by a cleaning unit capable to operate on the upper face of the pistons and the upper part of the corresponding moulds, after the expulsion of, the finished detergent portions.                                                                                                                                                                                    | 50<br>55      |

**Fig. 2**



**Fig. 1**

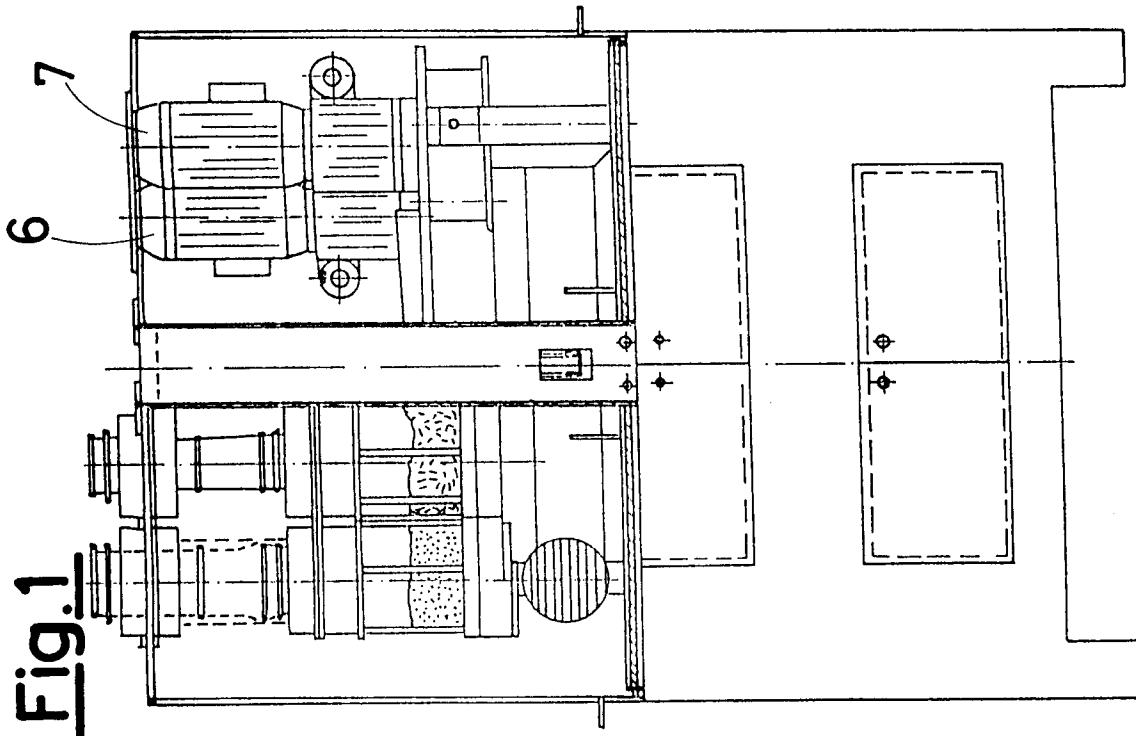
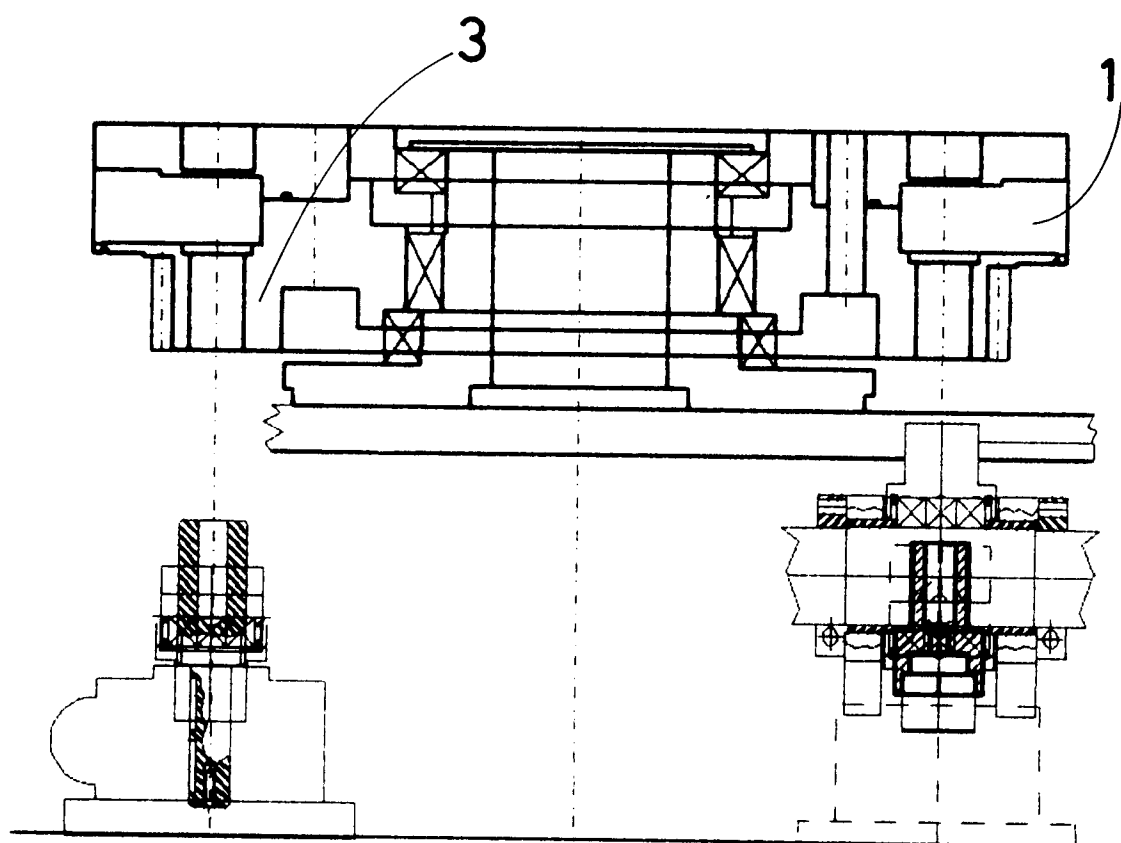
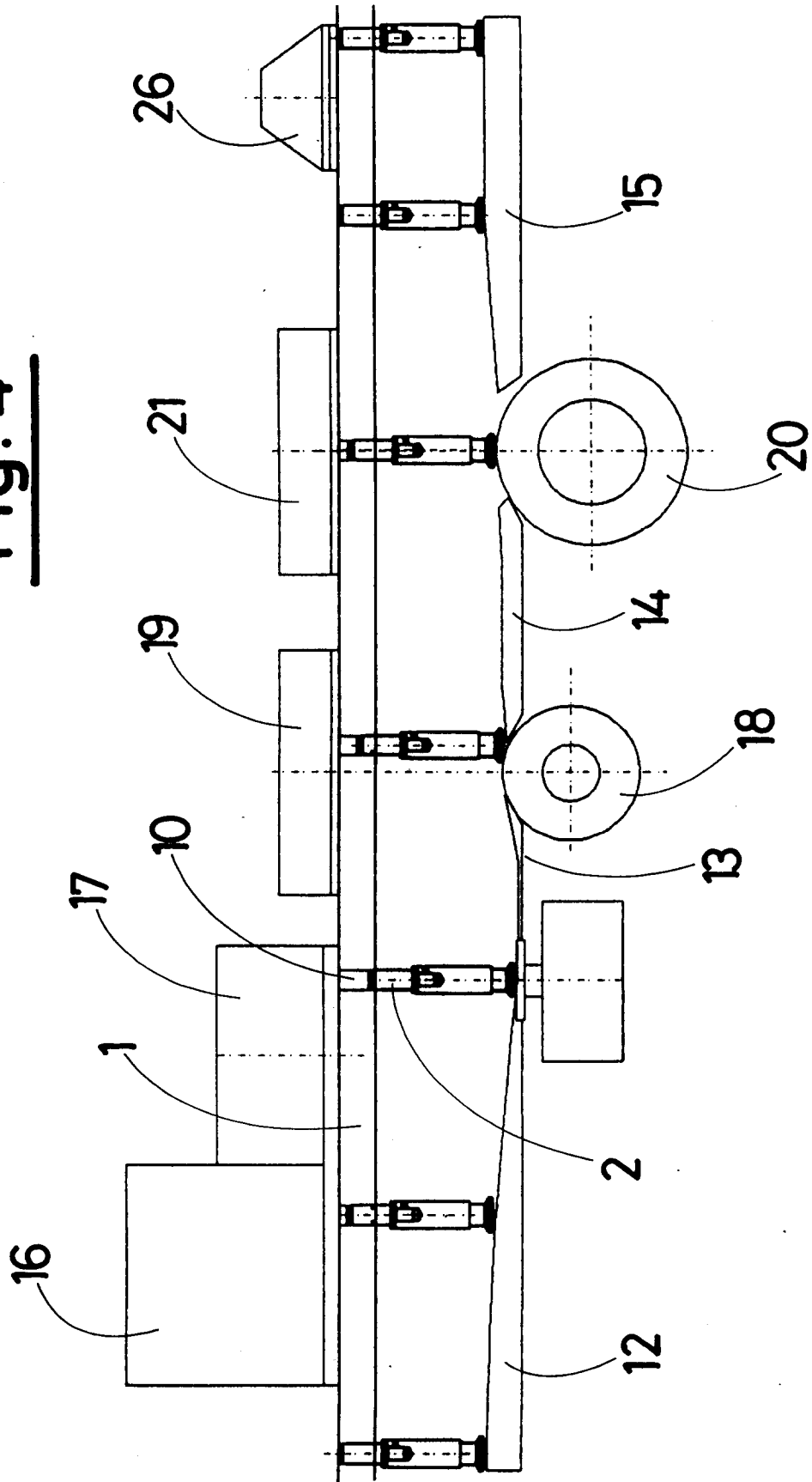


Fig. 3

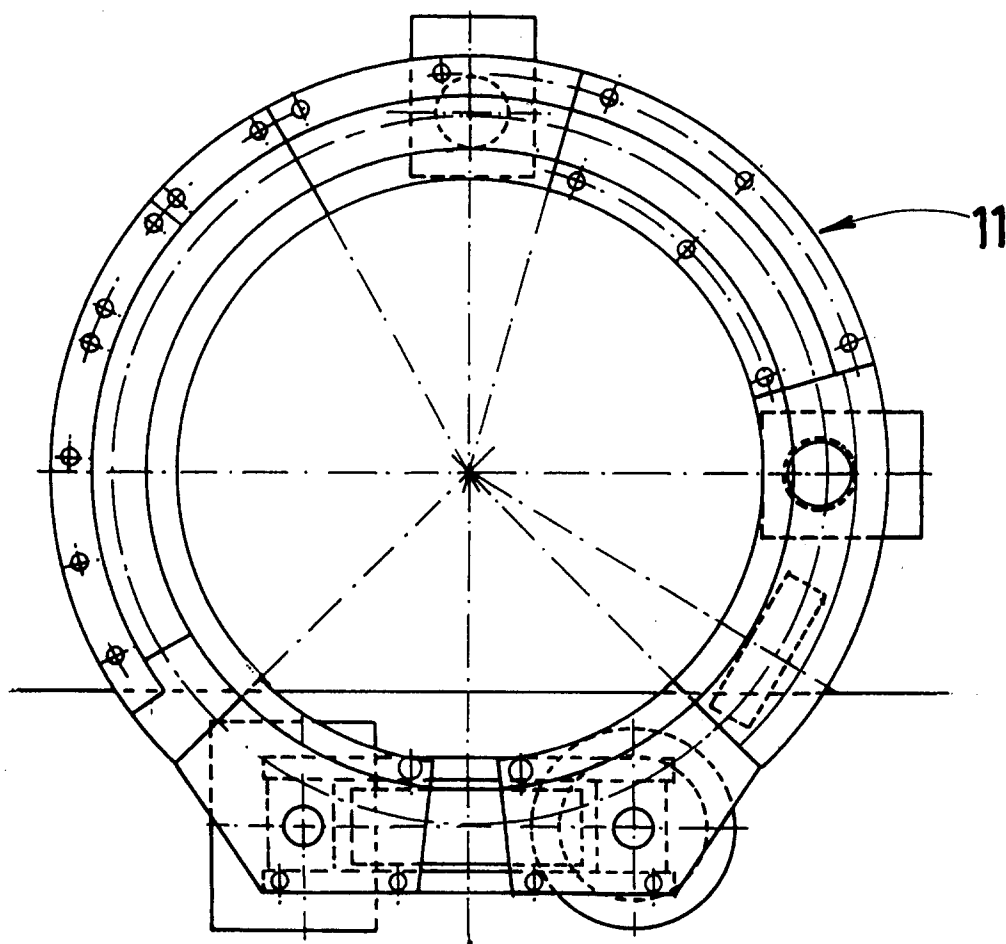


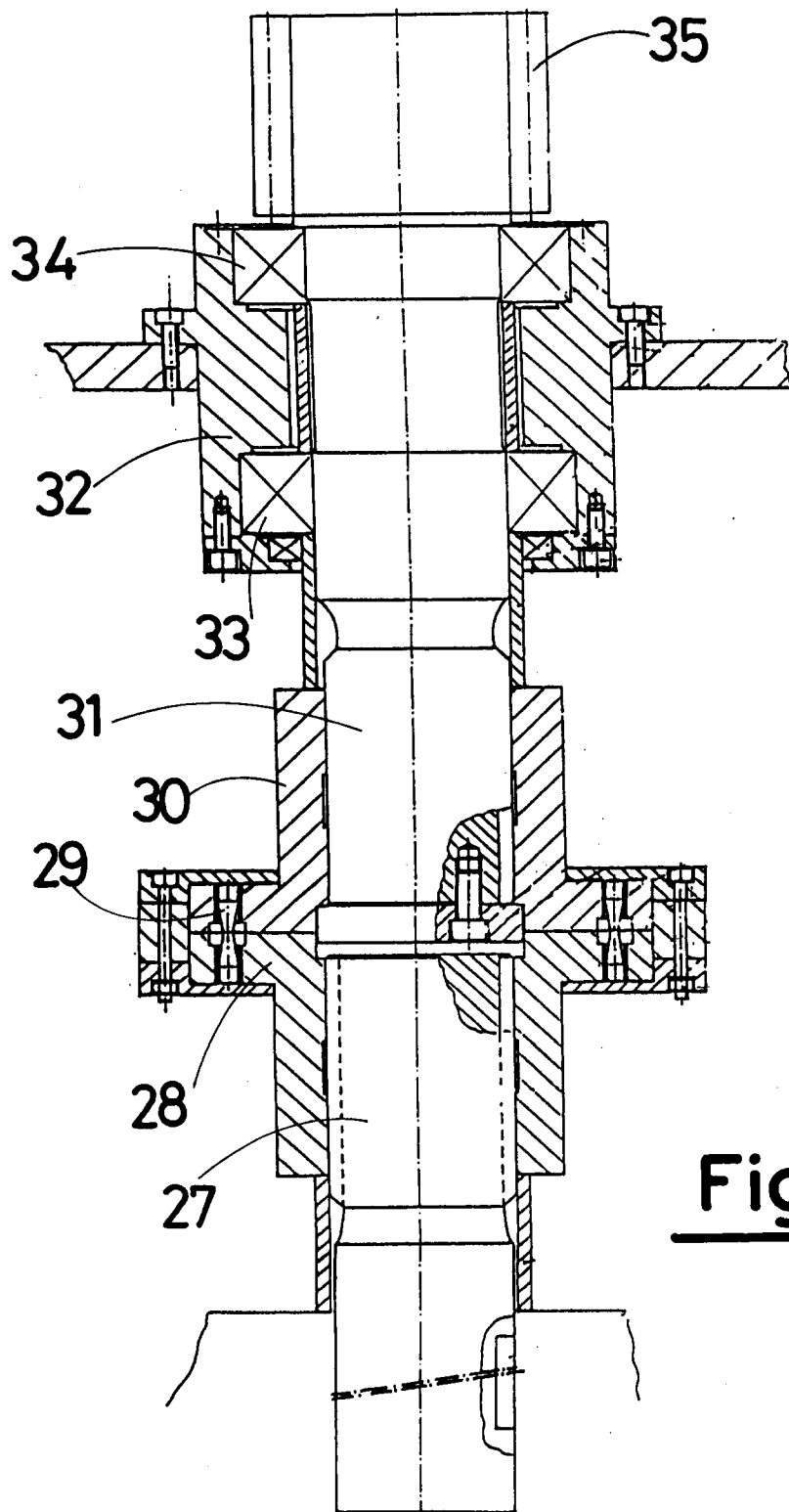
**Fig. 4**



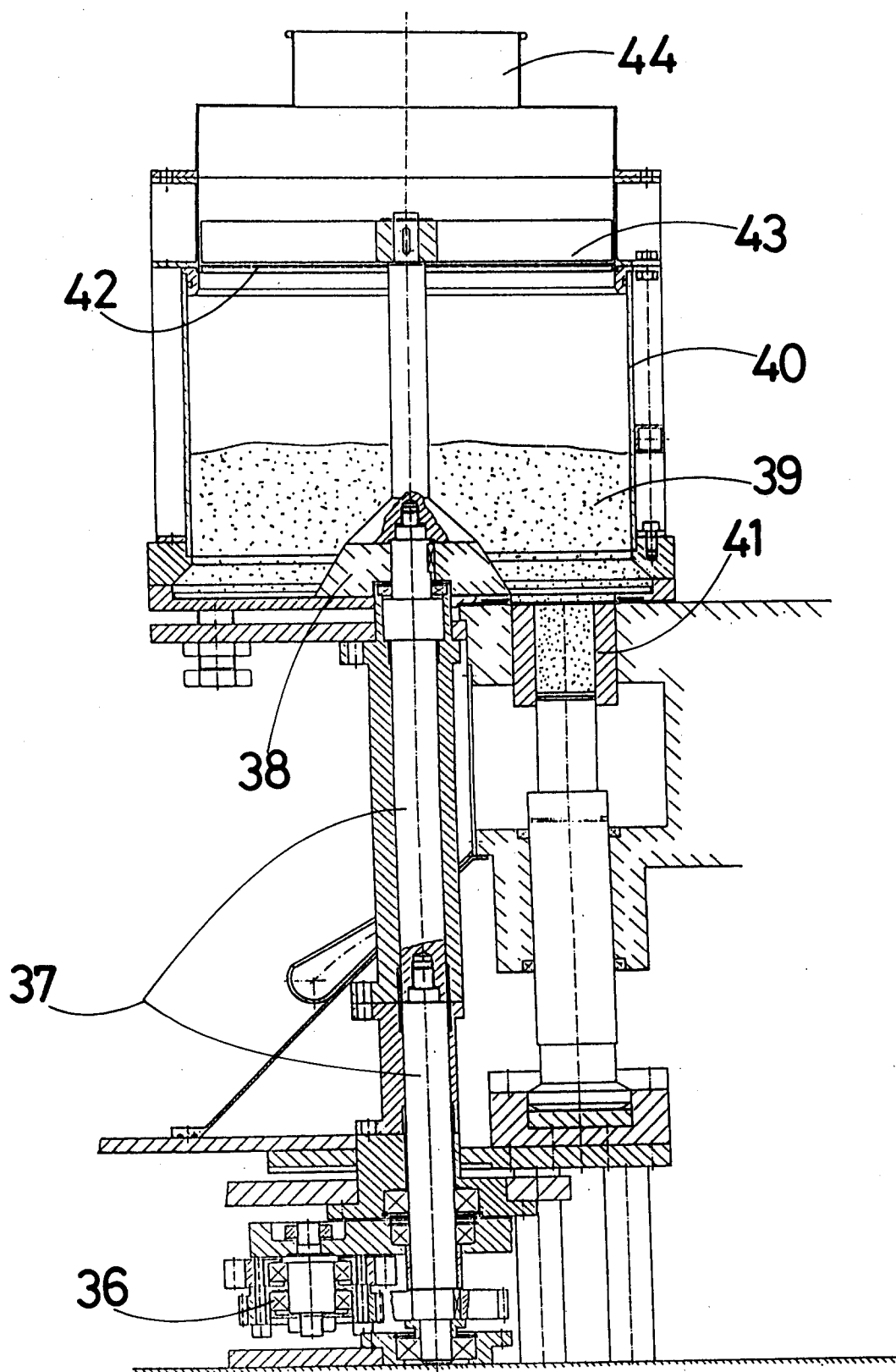


**Fig. 5**

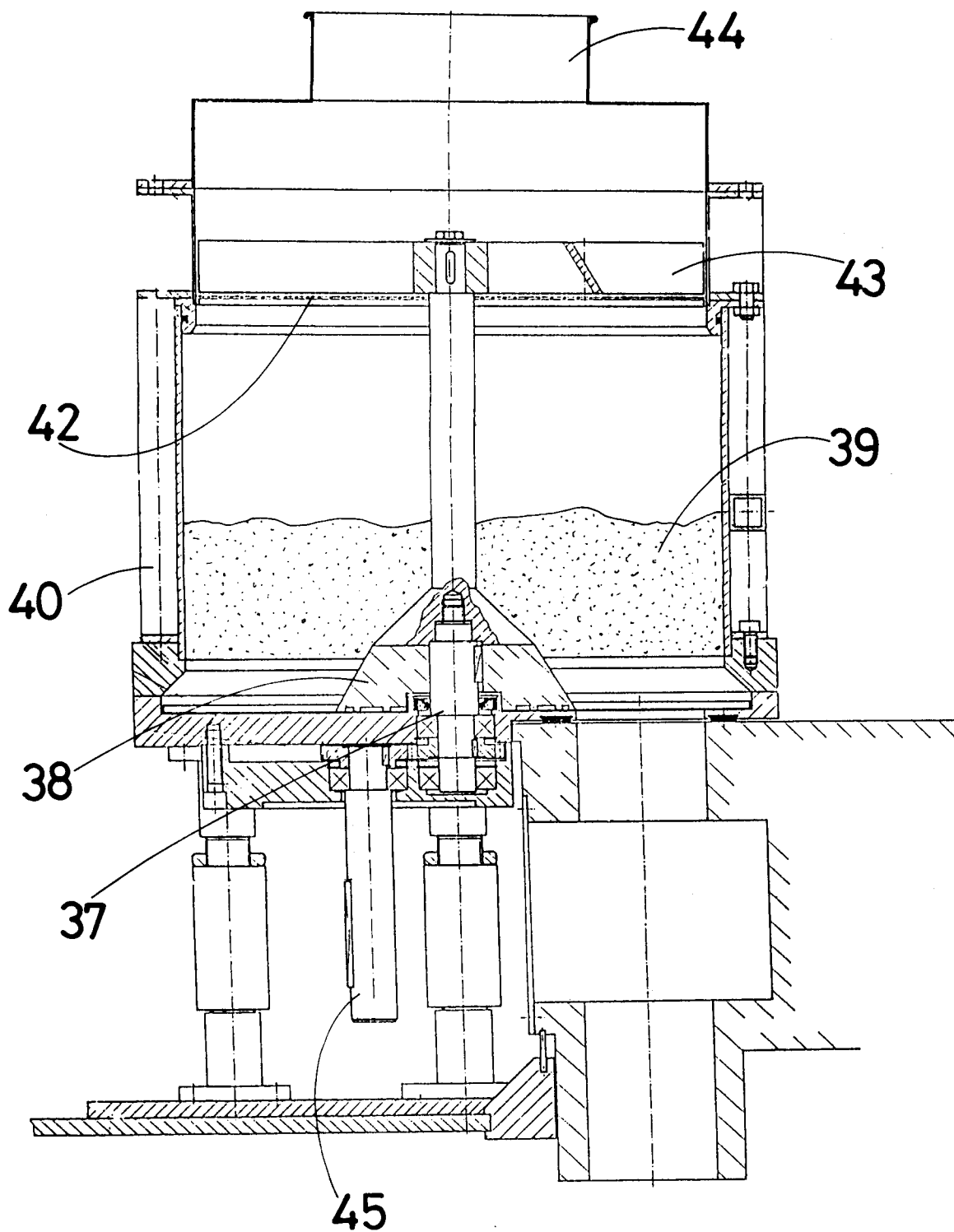




**Fig. 6**



**Fig. 7**



**Fig. 8**

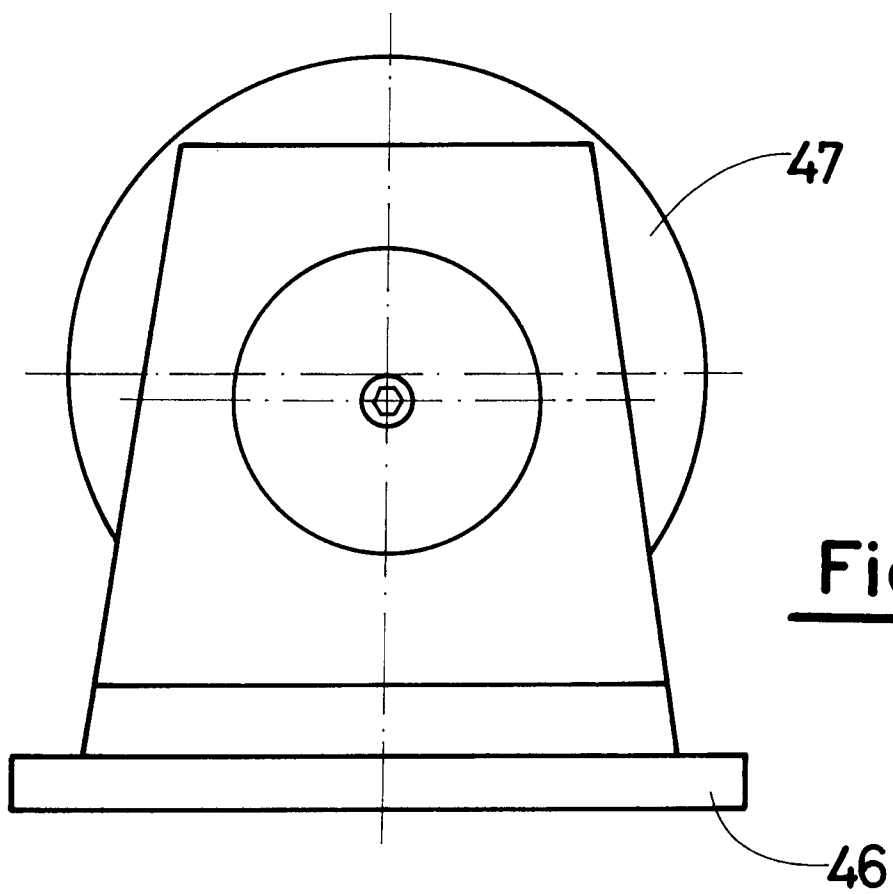


Fig. 9

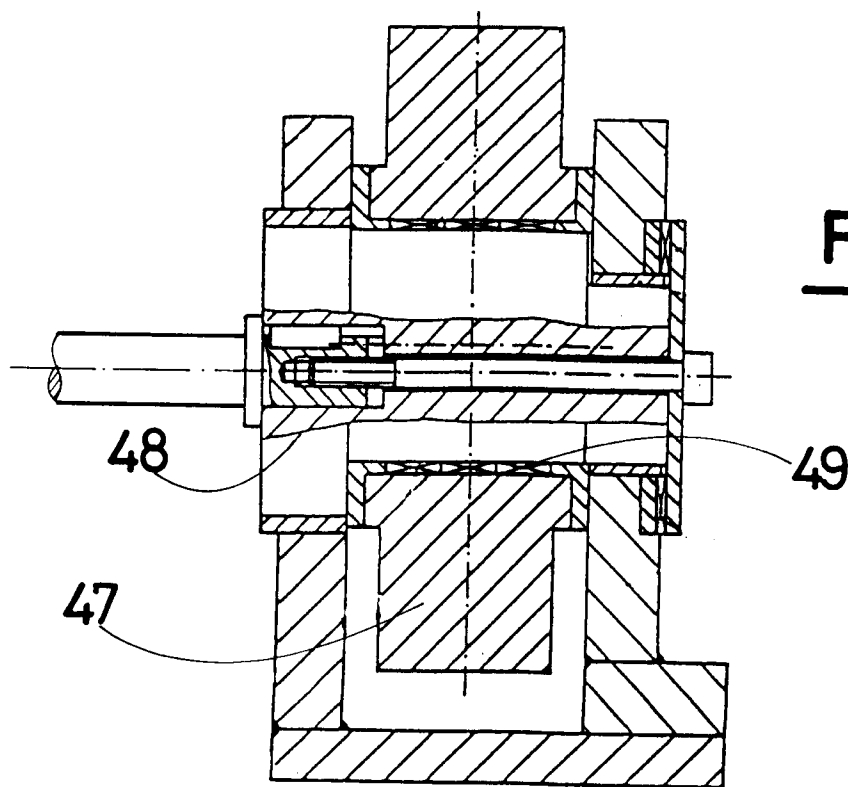


Fig. 10

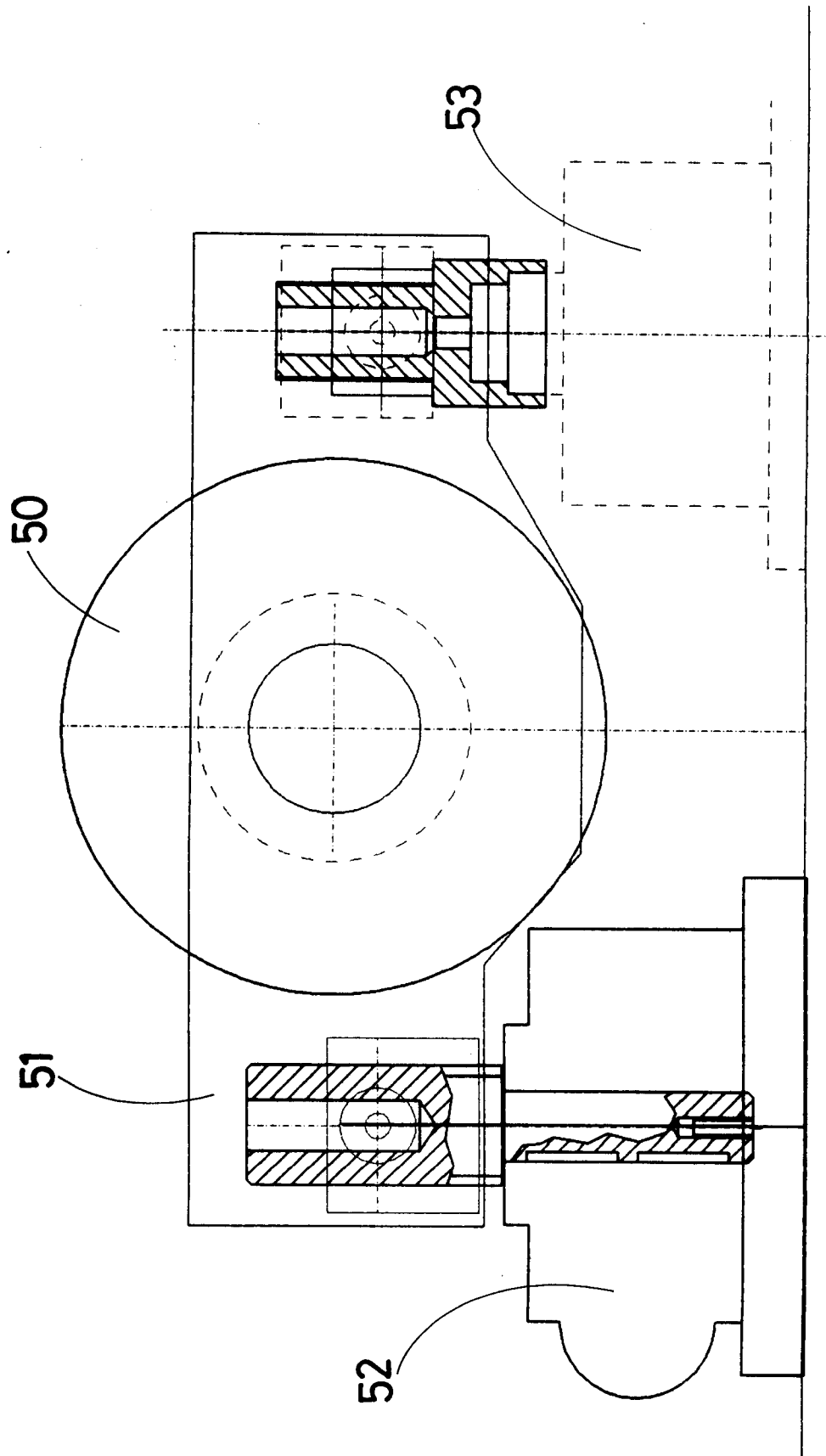


Fig. 11

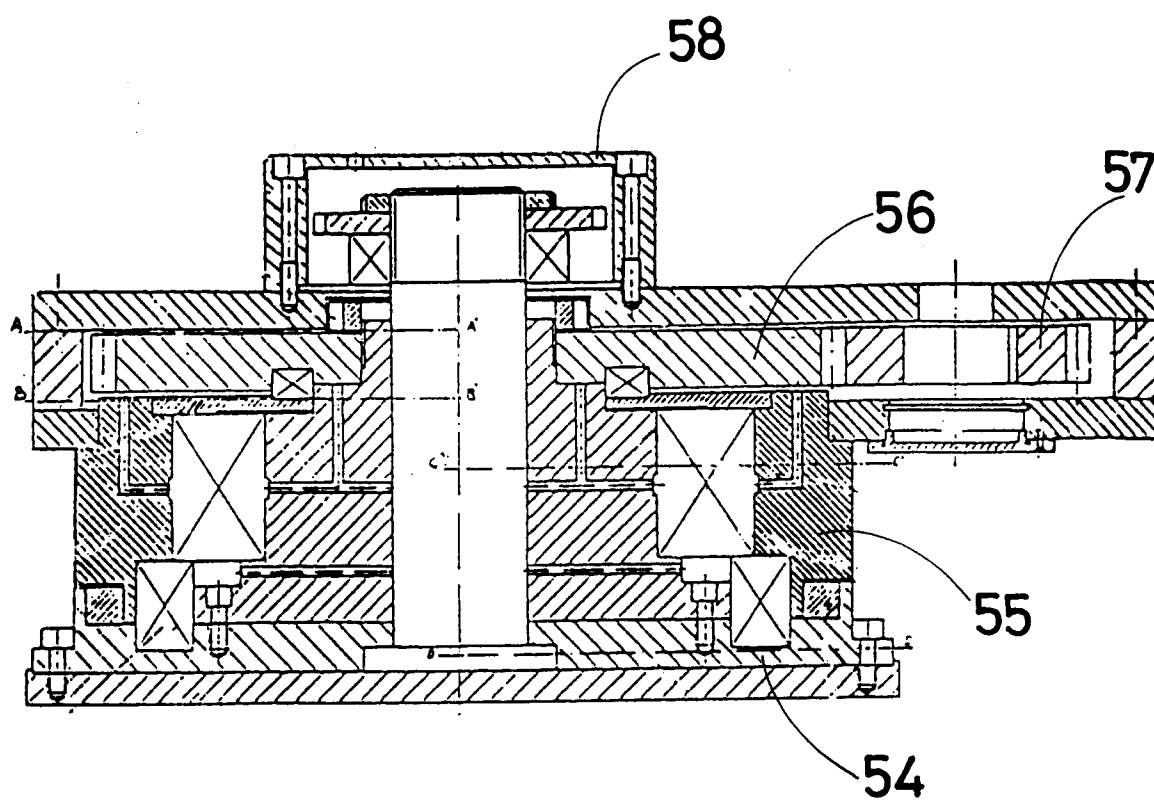


Fig. 12

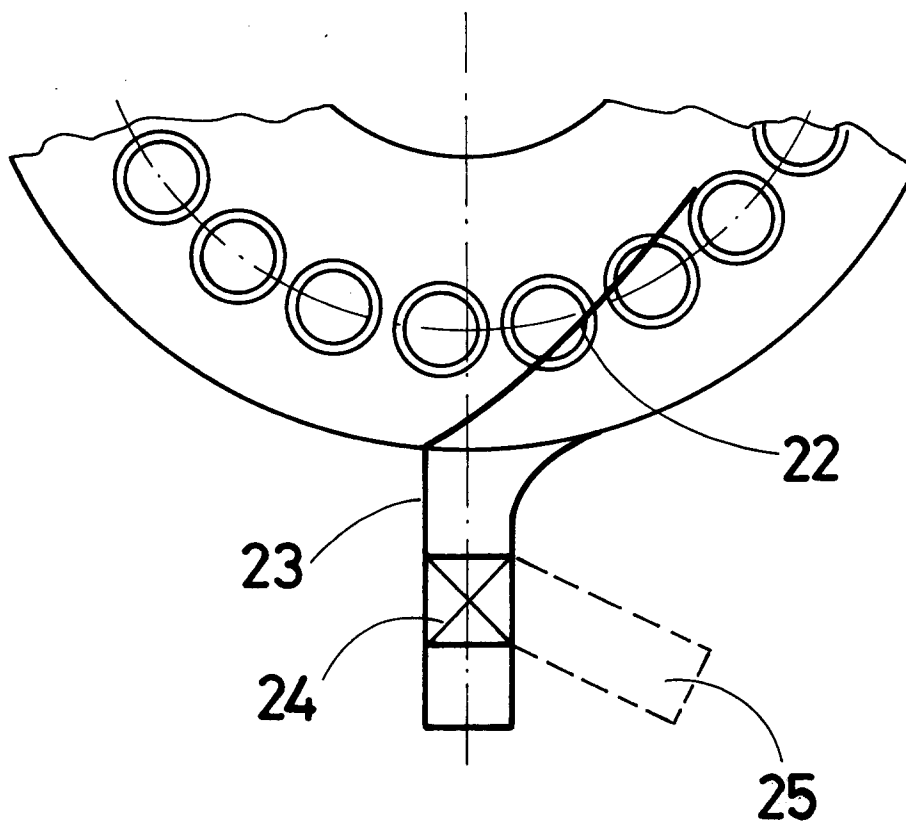


Fig. 13





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## EUROPEAN SEARCH REPORT

Application Number

EP 91 50 0148

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                     |                                                                               |                                                                                                                                                                                                                                                                                       |                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| Category                                                                                                                                                                                                                | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim                                                                                                                                                                                                                                                                     | CLASSIFICATION OF THE APPLICATION (Int. Cl.5) |
| X                                                                                                                                                                                                                       | ES-A-2 007 812 (J. BONALS)<br>* the whole document *                          | 1-2                                                                                                                                                                                                                                                                                   | B30B11/08<br>B28B5/06                         |
| Y                                                                                                                                                                                                                       | ---                                                                           | 10-12                                                                                                                                                                                                                                                                                 |                                               |
| X                                                                                                                                                                                                                       | ES-A-2 012 428 (J. BONALS)<br>* the whole document *                          | 1-2                                                                                                                                                                                                                                                                                   |                                               |
| X                                                                                                                                                                                                                       | GB-A-1 391 621 (K. WATTS)<br>* claims; figures *                              | 1, 4                                                                                                                                                                                                                                                                                  |                                               |
| Y                                                                                                                                                                                                                       | ---                                                                           | 2, 7-9                                                                                                                                                                                                                                                                                |                                               |
| X                                                                                                                                                                                                                       | US-A-1 803 814 (P. SPENGLER ET AL.)<br>* the whole document *                 | 1, 5-6, 13                                                                                                                                                                                                                                                                            |                                               |
| Y                                                                                                                                                                                                                       | DE-C-824 541 (B. LINSTEDT)<br>* claim 1; figure 1 *                           | 2                                                                                                                                                                                                                                                                                     |                                               |
| Y                                                                                                                                                                                                                       | ES-A-8 705 751 (J. BONALS)<br>* page 3, line 41 - page 4, line 1; figure 1 *  | 7-9                                                                                                                                                                                                                                                                                   |                                               |
| A                                                                                                                                                                                                                       | ---                                                                           | 1                                                                                                                                                                                                                                                                                     |                                               |
| Y                                                                                                                                                                                                                       | GB-A-2 021 978 (WILHELM FETTE GMBH)<br>* abstract; figures 1-2 *              | 10-12                                                                                                                                                                                                                                                                                 | TECHNICAL FIELDS<br>SEARCHED (Int. Cl.5)      |
| A                                                                                                                                                                                                                       | DE-C-204 824 (F. KILIAN)<br>* claim; figures *                                | 1, 4                                                                                                                                                                                                                                                                                  | B28B<br>B30B                                  |
| The present search report has been drawn up for all claims                                                                                                                                                              |                                                                               |                                                                                                                                                                                                                                                                                       |                                               |
| Place of search<br>THE HAGUE                                                                                                                                                                                            |                                                                               | Date of completion of the search<br>07 AUGUST 1992                                                                                                                                                                                                                                    | Examiner<br>VOUTSADOPOULOS K.                 |
| <b>CATEGORY OF CITED DOCUMENTS</b>                                                                                                                                                                                      |                                                                               |                                                                                                                                                                                                                                                                                       |                                               |
| X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                               | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>-----<br>& : member of the same patent family, corresponding document |                                               |