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(54) **Apparatus for filling bearing balls into containers**

(57) A device (1) for feeding rolling bodies (2) into containers (3) has a filling station (8) housing an inlet (9) through which a stream of rolling bodies flows by force of gravity; the device has a succession of supporting members (25a, 25b), each for supporting a relative container, and which are conveyed in steps by a powered table (14) about a vertical axis (15) under the control of a unit (50), to feed a further container into the filling station (8) when a preceding container (3) has been filled with a predetermined number of rolling bodies (2); and the stream of rolling bodies (2) is cut off as the table (14) is rotated and/or in the absence of an empty container at the filling station.

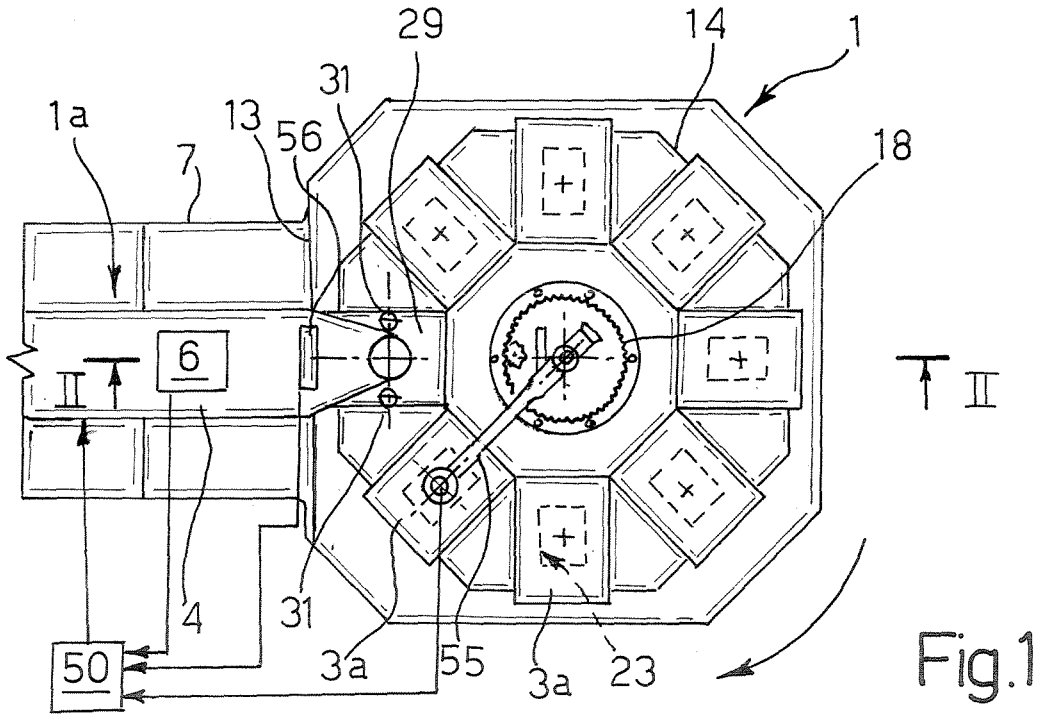

Fig.1

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Description

[0001] The present invention relates to a device for feeding rolling bodies into containers.

[0002] More specifically, the present invention relates to a device for feeding balls of rolling bearings into plastic bottles or cardboard boxes, which are then closed to form packages containing a predetermined number of balls.

[0003] To feed balls into containers, an actuating cylinder is known to be used to automatically push the empty containers successively to a fill outlet along a straight rolling track defined by a succession of idle rollers.

[0004] A machine upstream counts the balls to be dispensed, and, when the desired number is reached, the full container and the next empty container are fed in-line along the rolling track.

[0005] The above known solution is unsatisfactory, on account of travel of the containers being subject to frequent jamming, which, on the one hand, calls for manual intervention by the operator to restore normal in-line flow of the containers, and, on the other, results in deformation or breakage of the containers pushed along by the actuating cylinder.

[0006] Moreover, the containers are difficult to position accurately at the filling station, on account of the containers running along idle rollers.

[0007] It is an object of the present invention to provide a device for feeding rolling bodies into containers, designed to eliminate the aforementioned drawbacks simply and cheaply.

[0008] According to the present invention, there is provided a device for feeding rolling bodies into containers, as claimed in Claim 1.

[0009] A preferred, non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic plan view of a preferred embodiment of a device for feeding rolling bodies into containers in accordance with the present invention;

Figure 2 shows a section, with parts removed for clarity, along line II-II in Figure 1;

Figure 3 shows a top view in perspective of a detail of the Figure 1 device;

Figure 4 shows a side view, with parts removed for clarity, of the Figure 3 detail.

[0010] Number 1 in Figures 1 and 2 indicates a device for feeding rolling bodies - in particular, steel balls 2 of rolling bearings - into containers 3. Device 1 is located in-line with and downstream from a device 4 (shown partly and schematically), through which balls 2 are fed, e.g. by gravity, to an outlet 5, and are counted by a count unit 6 (shown schematically and not described in detail). The number of balls 2 is determined either directly, by counting the balls one by one or in groups, or indirectly by weighing balls 2 as a function of diameter.

[0011] Devices 1 and 4 are preferably mounted on the same bed 7, and form part of a single machine 1a possibly also comprising a ball washing device (not shown) upstream from device 4.

[0012] Device 1 comprises a filling station 8 having an inlet 9. In use, a stream of balls 2 drop by gravity from outlet 5, in single file or in bulk, through inlet 9, which is preferably defined by an elbow-shaped collar 10 (Figure 3) comprising a bottom portion 10a fitted to a perforated plate 11, and a top portion 10b surrounding at least part of outlet 5 to prevent balls 2 from falling out of inlet 9.

[0013] With reference to Figures 1 and 3, device 1 comprises a structure 12 fitted in a fixed position to bed 7 and in turn comprising a cell 13 housing station 8 and a table 14.

[0014] Table 14 is rotated about a vertical axis 15 by a motor reducer 16 located beneath table 14 and comprising: a vertical output pinion 17 meshing with internal teeth 18 formed directly on the circular edge of a central hole 19 in table 14; a motor 20 having an output shaft (not shown) with a horizontal axis 21; and a transmission 22 for transmitting rotation from the output shaft to pinion 17.

[0015] The topside face of table 14 has a succession of seats 23 equally spaced about axis 15 and associated with respective fastening devices 24 (Figure 4), which can be operated manually to clamp respective supporting members, and are releasable to assemble different types of supporting members for containers of different shapes, sizes, or types.

[0016] In the Figure 2 embodiment, the containers are defined by open-topped, parallelepiped-shaped cardboard boxes 3a, and the supporting members are defined by pedestals 25a, which are fixed at the base inside seats 23, and terminate at the top with respective horizontal supporting plates 27 having locating members 28 (shown schematically) to position boxes 3a coaxially with seats 23 on plates 27.

[0017] With reference to Figures 2 and 3, since boxes 3a have a top opening 26 larger than inlet 9, a horizontal guard plate 29 is provided at station 8 to prevent balls 2 issuing from inlet 9 from bouncing out of boxes 3a. Plate 29 has an intermediate opening 30, through which balls 2 issuing from inlet 9 flow, and is activated by two linear actuators 31, located on opposite sides of inlet 9, to translate from a raised rest position, adjacent to plate 11, to a lowered position, in which it rests on the edge of box 3a at station 8 to at least partly close opening 26 about inlet 9.

[0018] More specifically, actuators 31 are connected removably to structure 12 by respective brackets 32, and plate 29 is fitted with at least one upward-projecting wall 33 located along the edge of opening 30, i.e. adjacent to portion 10b, to laterally enclose the distance travelled downwards by plate 29 with respect to the rest position, i.e. with respect to plate 11.

[0019] In the Figure 3 and 4 embodiment, the whole defined by plate 29, actuators 31, and brackets 32 is elim-

inated (though shown in Figure 3 for the sake of clarity); the containers are defined by plastic bottles 3b; and the supporting members, indicated 25b, comprise respective bases 35 fixed inside seats 23, and respective cradles 36 supporting bottles 3b.

[0020] Each cradle 36 comprises a lateral wall 37 hinged to an upright 38, integral with relative base 35, to rock, about a horizontal axis 39 (Figure 4) tangential with respect to axis 15, between a lowered position, in which bottle 3b and wall 37 are vertical, and a raised position, in which bottle 3b is tilted, with the support of wall 37, to bring the bottom 40 of the bottle closer to inlet 9 at station 8. With reference to Figure 4, bottle 3b is raised at station 8 by an actuator 42 via a rocker arm 43 hinged to structure 12 about a fixed horizontal axis 44 tangential to axis 15. When operated, an arm 45 of rocker arm 43 moves towards axis 15, through passages formed in cell 13 and upright 38, to contact and push wall 37 at a point located beneath axis 39. More specifically, axis 39 extends on a level with the neck 46 of bottle 3b.

[0021] During operation of actuator 42, plate 11 rotates with respect to structure 12 about an axis 47 parallel to axis 44, together with rotation of cradle 36 about axis 39, in opposition to elastic members not shown, so that neck 46 and portion 10b are maintained contacting, or at least adjacent, at all times.

[0022] With reference to Figures 1 and 4, actuator 42 is controlled by a control unit 50 (shown schematically) to raise bottle 3b before it is filled, to reduce the dropdown height of balls 2 from inlet 9 with respect to bottom 40 and therefore impact, and to rotate bottle 3b gradually into the lowered position as it is being filled.

[0023] Unit 50 forms part of device 4, or of machine 1a when devices 1 and 4 are integrated, and also controls motor 20, on the basis of the count by unit 6, to rotate table 14 in steps about axis 15 and position another container 3 at station 8 when the previous container has been filled with a predetermined number of balls 2. Unit 50 also cuts off throughfeed of balls 2 through inlet 9, e.g. by stopping device 4, when table 14 is rotated.

[0024] With reference to Figure 1, device 1 also comprises two sensors 55, 56 for respectively determining the presence or absence of balls on the supporting member 25a, 25b preceding station 8, and determining the presence or absence of a container 3 at station 8. Sensors 55, 56 are preferably defined by a feeler and a photocell respectively, and supply unit 50 with a disabling signal to prevent throughfeed of balls 2 through inlet 9 when there is no container 3 at station 8 or when the container 3 at station 8 is full.

[0025] In actual use, an operator fixes a number of containers 3 to table 14 and starts the filling operation. With the consent of sensors 55, 56, balls 2 are fed through inlet 9, and, at the same time, unit 50 controls actuator 42 as described with reference to the filling of bottles 3b.

[0026] When one container is filled with the predetermined number of balls 2, throughfeed of balls 2 is disabled, and table 14 is rotated automatically one step to feed another container into station 8.

[0027] Once the table is rotated, and with the consent of sensors 55, 56, throughfeed of balls 2, and therefore the filling operation, are started up again automatically by unit 50.

[0028] When all the containers 3 are filled, cell 13 is opened, the full containers 3 are removed for packaging, and further empty containers 3 are loaded manually onto table 14.

[0029] Since containers 3 are set and conveyed in positions defined at all times by table 14, device 1 therefore provides for automatically filling a given number of containers 3 (in particular, 8 or more) with no risk of jamming. More specifically, each container 3 is positioned accurately at station 8 with no risk of damage to containers 3 or fallout of balls 2.

[0030] The only manual work involved is loading the empty containers 3 onto table 14 prior to filling, and removing the full containers 3 from cell 13 once they have all been filled automatically.

[0031] As will be clear, device 1 may easily be configured to fill both bottles 3b and boxes 3a; seats 23 on table 14 constitute an extremely straightforward positioning and conveying system; and table 14 and motor reducer 16 are extremely compact.

[0032] Clearly, changes may be made to device 1 as described and illustrated herein without, however, departing from the scope of the present invention as defined in the accompanying Claims.

[0033] In particular, throughfeed of balls 2 through inlet 9 may be disabled or cut off without stopping device 4, e.g. by providing a temporary storage device or a stop wall.

[0034] Device 1 may be used to fill containers with rollers as opposed to balls 2; and/or table 14 may be step-rotated by other than motor reducer 16 described by way of example; and/or supporting members 25a, 25b, and therefore containers 3, may be supported and rotated about axis 15 by an endless conveying system other than table 14.

Claims

1. A device (1) for feeding rolling bodies (2) into containers (3), the device comprising a filling station (8) housing an inlet (9) through which a stream of rolling bodies flows by force of gravity; and being **characterized by** comprising:

   - a succession of supporting members (23, 25a, 25b), each for supporting a relative container;
   - powered conveying means (14) for feeding the succession of supporting members (23, 25a, 25b) along an endless path about a vertical axis (15);
   - control means (50) for moving the succession of supporting members (23, 25a, 25b) in steps

about said vertical axis (15), and feeding another container into the filling station (8) once the preceding container (3) is filled with a predetermined number of rolling bodies (2); and
- disabling means (50) for cutting off throughfeed of the stream of rolling bodies (2) through said inlet as said supporting members (25a, 25b) are moved about said vertical axis.

2. A device as claimed in Claim 1, **characterized by** comprising sensor means (55, 56) for detecting a further empty container (8), and for disabling throughfeed of the stream of rolling bodies through said inlet (9) in the absence of a further empty container at said filling station.

3. A device as claimed in Claim 1 or 2, **characterized in that** said conveying means comprise a table (14) rotating about said vertical axis (15) and supporting said supporting members equally spaced.

4. A device as claimed in Claim 3, **characterized in that** said table (14) comprises a central hole, on the circular edge of which are formed teeth (18) set in motion by actuating means.

5. A device as claimed in Claim 4, **characterized in that** said actuating means (16) are located beneath said table (14), and comprise an electric motor (20) with a horizontal axis (21).

6. A device as claimed in any one of the foregoing Claims, **characterized in that** said conveying means (14) comprise coupling means (24), which can be fastened to clamp said supporting members (25a, 25b) in fixed relative positions, and are releasable to permit assembly of different types of supporting members (25a, 25b).

7. A device as claimed in any one of the foregoing Claims, **characterized by** comprising a guard plate (29), which is located at the outlet of said inlet (9), has an opening (30) through which said stream of balls (2) flows, and is movable between a raised rest position, and a lowered position at least partly closing said containers about said inlet.

8. A device as claimed in Claim 7, **characterized in that** said guard plate (29) is fitted with at least one upward-projecting lateral guard wall (33) along said opening (30).

9. A device as claimed in Claim 7 or 8, **characterized in that** each supporting member (25a) is defined by a pedestal terminating with a top supporting wall having locating means (28) for positioning a parallelepiped-shaped container.

10. A device as claimed in any one of Claims 1 to 8, **characterized by** comprising adjusting means (36, 42, 50) for lowering a bottom wall (40) of a container (3b), located at said filling station, with respect to said inlet (9) as the rolling bodies (2) are fed into the container.

11. A device as claimed in Claim 10, **characterized in that** said adjusting means (36, 42, 50) comprise first hinge means by which the container at the filling station (8) rotates about a first horizontal axis (39); and actuating means (42) for rotating said container downwards as the rolling bodies (2) are fed in.

12. A device as claimed in Claim 11, **characterized in that** said first hinge means are carried by said supporting members (25b).

13. A device as claimed in Claim 11 or 12, **characterized in that** said adjusting means comprise second hinge means by which said inlet rotates about a second axis (47) parallel to the first axis (39); said inlet rotating together with the container at the filling station.

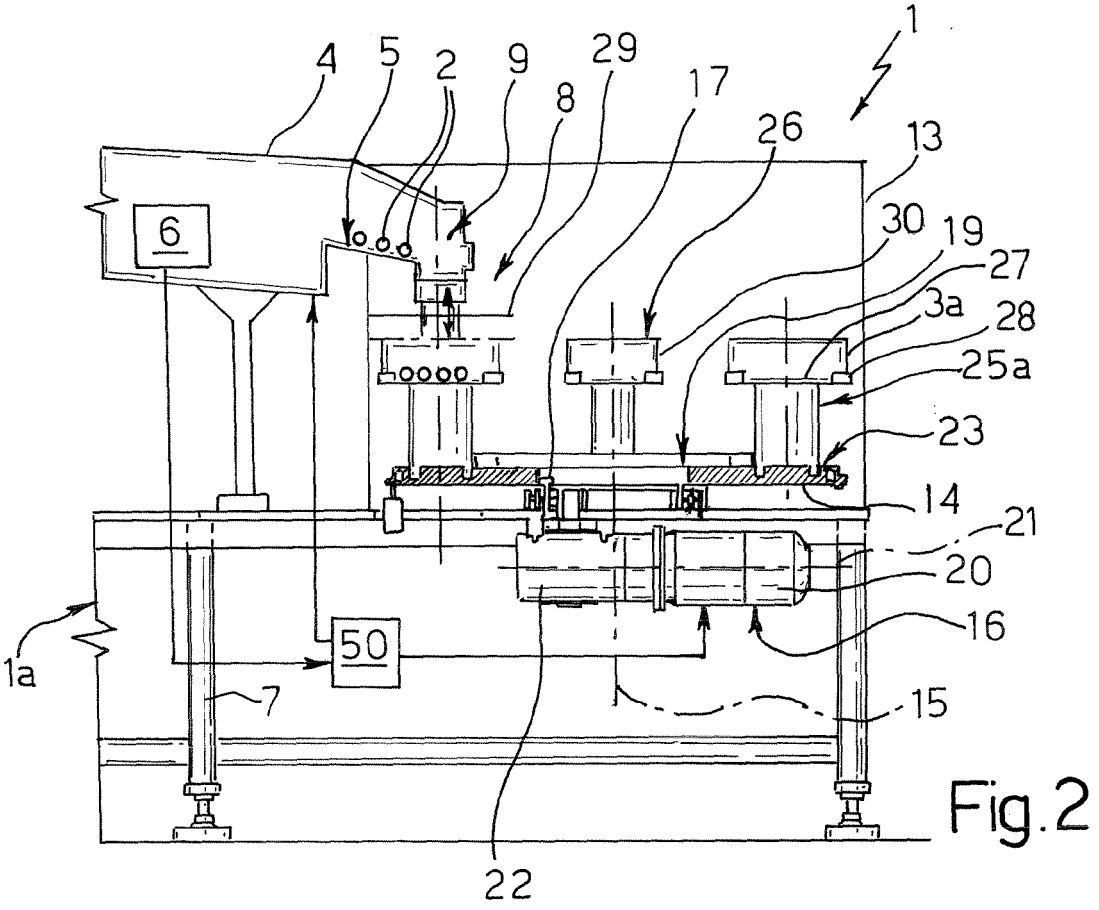
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Fig.2

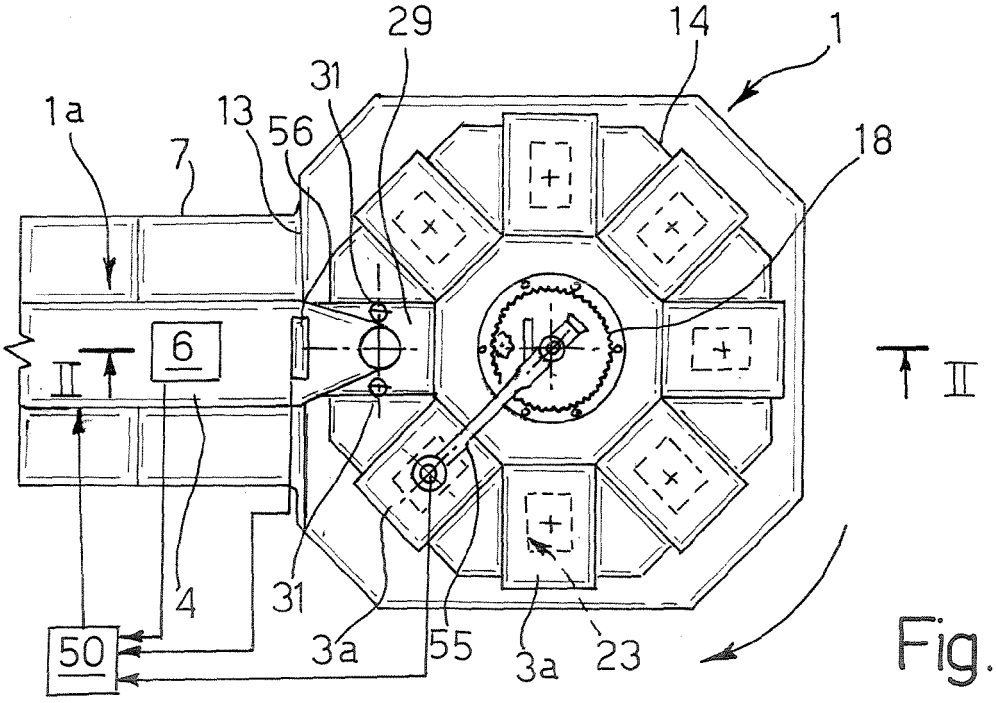
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Fig.1

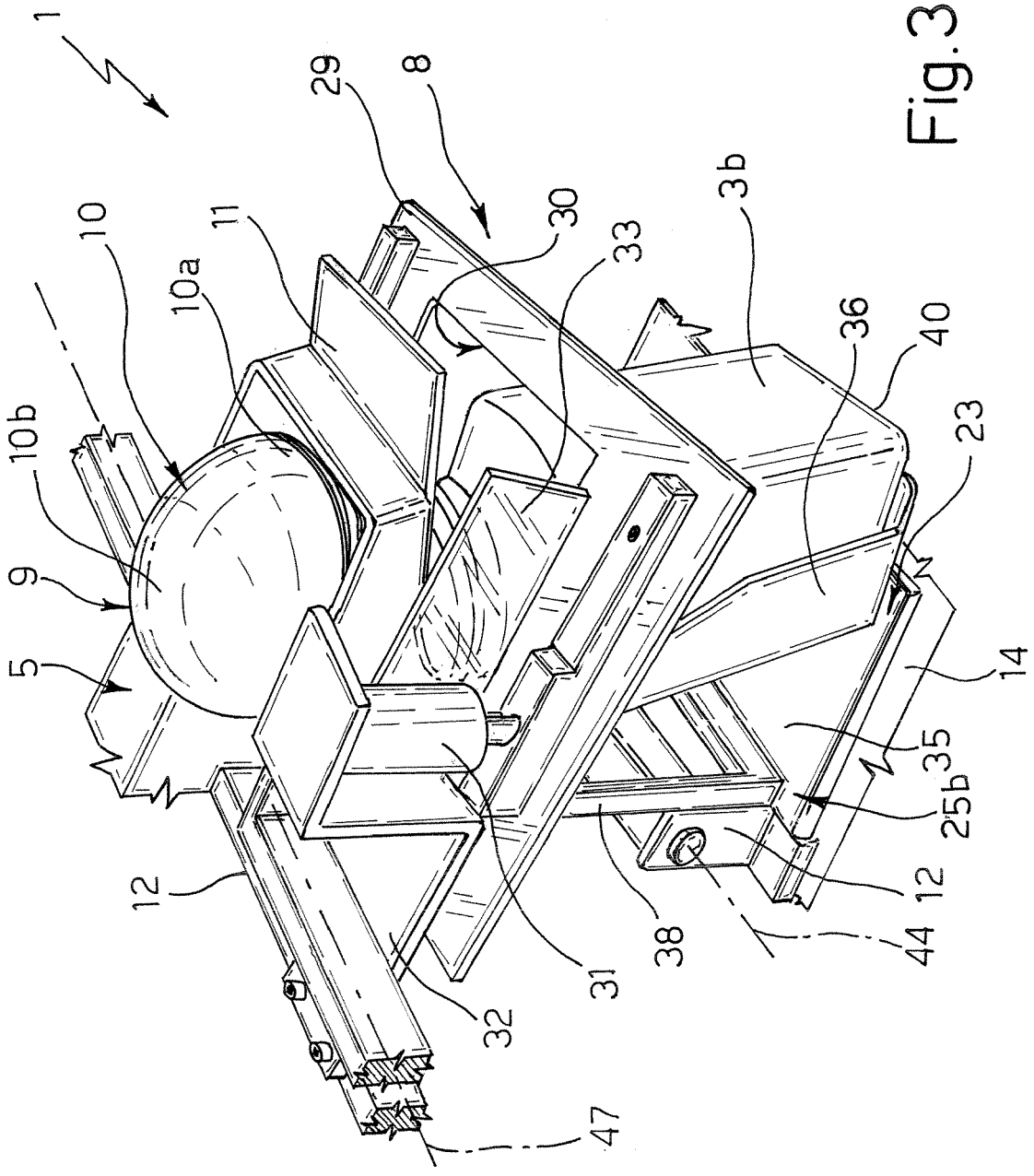

Fig.3

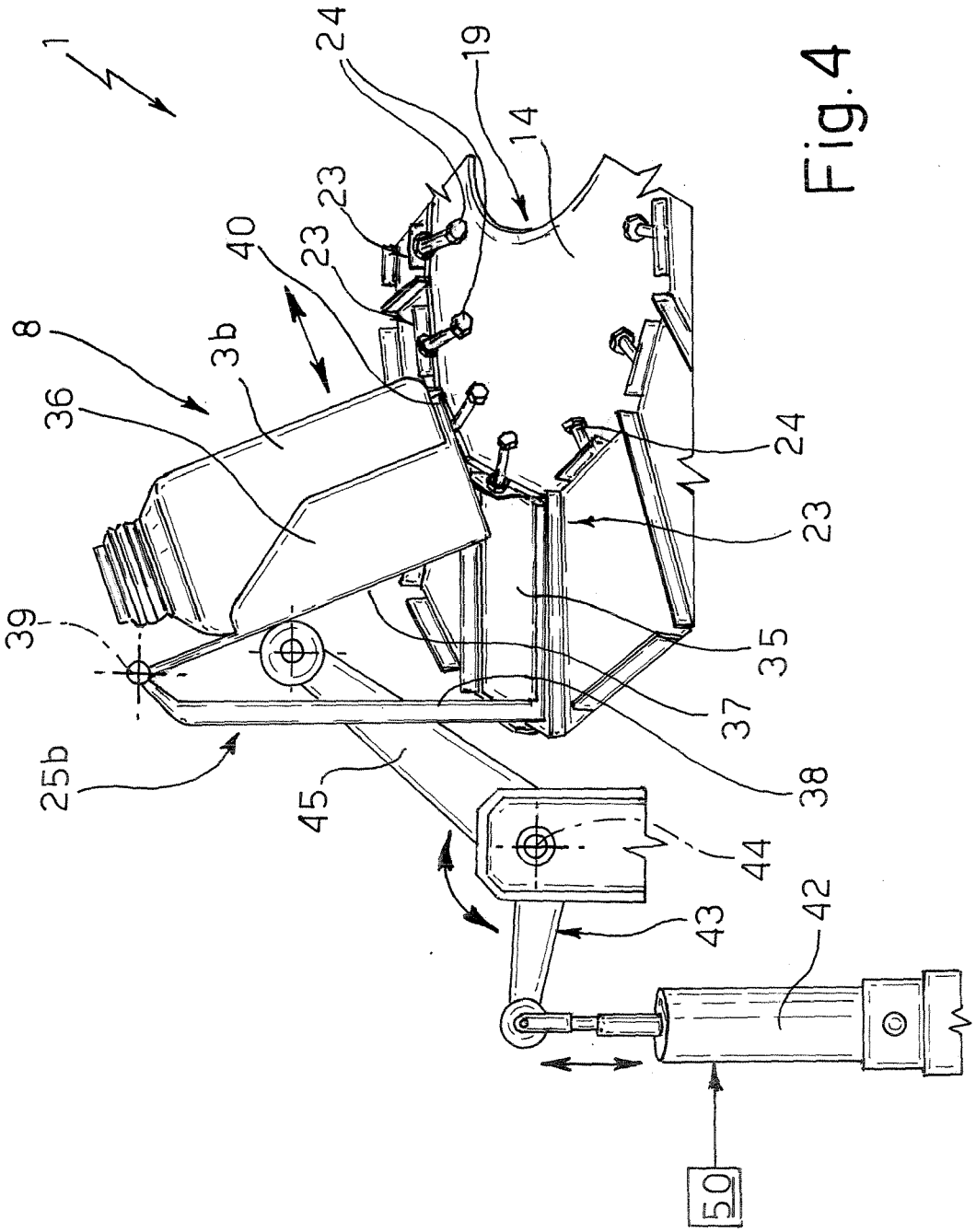

Fig.4

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EUROPEAN SEARCH REPORT

Application Number
EP 05 42 5469

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X	US 2 661 881 A (KASPER CASS S) 8 December 1953 (1953-12-08) * column 8, line 31 - column 9, line 17; figure 1 * -----	1-3	B65B43/50 B65B57/20
Y	US 4 778 045 A (GRUENE ET AL) 18 October 1988 (1988-10-18) * abstract; figure 4 * -----	6	

TECHNICAL FIELDS SEARCHED (IPC)

B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 November 2005	Grentzius, W

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 05 42 5469

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