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(54) Cup feeder

(57) A cup feeder (1), comprising a supporting element (2) for a plurality of substantially cylindrical cam elements (3) that are arranged, during use, below a column (10) of cups stacked along a stacking axis (102), the cam elements being rotatable on command about their own generating axis, which is substantially parallel to the stacking axis, and having a helical lateral profile (4) for engaging the upper rim (5a) of the cup (5) arranged at the bottom of the column (10) of stacked cups, the feeder being provided with actuation means (6) for the simultaneous rotation of the cam elements (3) about their respective generating axis and with means for the

simultaneous approach/spacing of the cam elements with respect to the stacking axis, and being characterized in that the spacing/approach means comprise a rotating supporting pivot (7) for each one of the cam elements (3) that can be moved angularly on command about an angular displacement axis (8), in order to move closer/away a respective cam element with respect to the stacking axis, the actuation means for simultaneous rotation comprising motor means (9) adapted to turn simultaneously first driving wheels (9a) about each angular displacement axis and means for kinematic connection between the first driving wheels (9a) and the respective cam element (3).

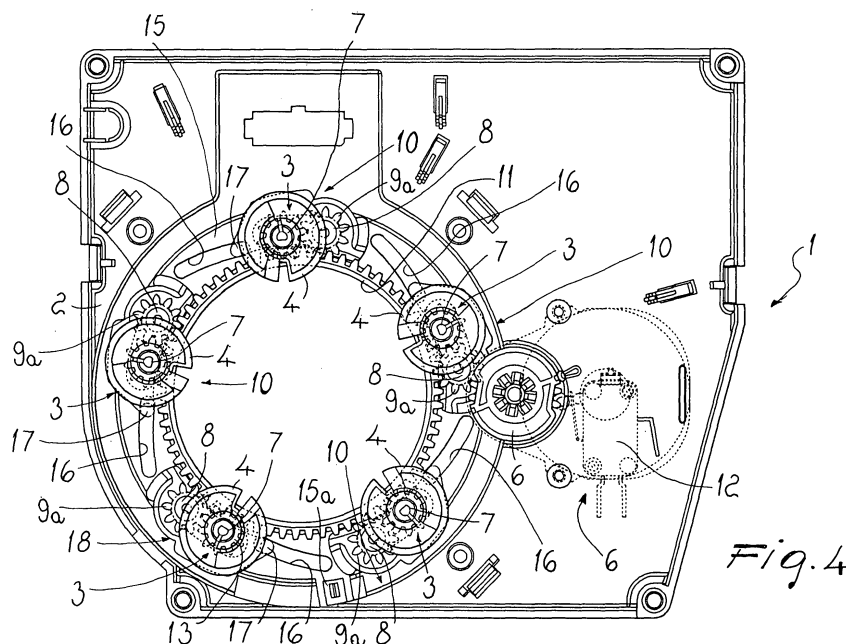


Fig. 4

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Description

[0001] The present invention relates to a cup feeder particularly suitable to be associated with beverage vending machines.

[0002] Vending machines for beverages such as tea, coffee, chocolate and the like are currently widely used.

[0003] These vending machines are generally provided with a device for feeding cups (which are usually stacked vertically), which in most cases feeds a cup to a dispensing and removal region. Once the cup has been fed by said feeder to the dispensing and removal region, the vending machine dispenses the beverage selected by the user into such cup, and once this operation has been completed the user can access the dispensing and removal region to take the cup that contains the dispensed beverage.

[0004] Currently, such cup feeders are constituted by a plurality of cam elements, which are arranged along a circumference whose axis lies substantially at the stacking axis of the column of cups to be fed.

[0005] The cam elements are usually angularly spaced so as to form a support for the upper perimetric rim of the cup that is arranged at the bottom of the vertical column of stacked cups.

[0006] Each one of the cam elements is substantially cylindrical and has, at its lateral surface, a helical or spiral shape that is designed to constitute the support for the upper perimetric rim of the cup that is arranged below.

[0007] If the cam elements are turned simultaneously about their own axis, the perimetric rim of the cup arranged below, by resting on the helical profile, is spaced from the vertical column of stacked cups, accordingly reaching the dispensing and removal region.

[0008] However, it has been found that a drawback of the feeders described above is that they can be used only to feed cups of a very specific diameter.

[0009] In order to obviate this drawback, feeders have been proposed in which the cam elements are associated with a supporting ring, which can be detachably anchored to the vending machine at the base of the column of stacked cups. By changing the supporting ring it is possible to use cups that have a different diameter.

[0010] However, this solution has drawbacks, as it has been found that replacing the rings is rather troublesome. Moreover, it is necessary to provide a plurality of rings, also in view of the fact that cups increasingly often have diameters that vary with respect to the nominal size.

[0011] Other types of cup feeders have also been proposed in which the cam elements can move toward/away from the stacking axis of the vertical column of cups. Such feeders are further provided with manual adjustment means, which are suitable to move, by way of lever systems or the like, the cam elements so as to allow adjustment according to the diameter of the upper rim of the cups to be fed.

[0012] However, these last devices, while being valid from a conceptual standpoint, have proved to be very complicated from a manufacturing standpoint as well as scarcely reliable and practical during operation.

[0013] The aim of the present invention is to eliminate or at least reduce drastically the drawbacks noted above in known types of currently commercially available cup feeders.

[0014] Within this aim, an object of the invention is to provide a cup feeder that can be used with cups having a different diameter.

[0015] Another object of the present invention is to provide a cup feeder that can offer higher reliability in operation.

[0016] Another object of the invention is to provide a cup feeder that can be adapted in a practical and straightforward manner to use with cups of different sizes.

[0017] Another object of the present invention is to provide a cup feeder that has a very simple structure, is highly durable and easy to use, and has a competitive production cost.

[0018] This aim and these and other objects that will become better apparent hereinafter are achieved by a cup feeder according to the invention, comprising a supporting element for a plurality of substantially cylindrical cam elements that are arranged, during use, below a column of cups stacked along a stacking axis, said cam elements being rotatable on command about their own generating axis, which is substantially parallel to said stacking axis, and having a helical lateral profile for engaging the upper rim of the cup arranged at the bottom of said column of stacked cups, said feeder being provided with actuation means for the simultaneous rotation of said cam elements about their respective generating axis and with means for the simultaneous approach/spacing of said cam elements with respect to said stacking axis, a feeder according to the invention being characterized in that the spacing/approach means comprise a rotating supporting pivot for each one of the cam elements that can be moved angularly on command about an angular displacement axis, in order to move closer/away a respective cam element with respect to the stacking axis, the actuation means for simultaneous rotation comprising motor means adapted to turn simultaneously first driving wheels about each angular displacement axis and means for kinematic connection between said first driving wheels and the respective cam element.

[0019] Advantageously, the feeder is characterized in that the motor means comprise a first movement ring, which is connected kinematically to a power take-off and is adapted to rotate simultaneously the first driving wheels.

[0020] Conveniently, the feeder is characterized in that the means for kinematic connection between said first driving wheels and the respective cam element comprise a second driven wheel, which is connected

kinematically to the first driving wheel and is associated with said respective cam element.

[0021] Further characteristics and advantages of the invention will become better apparent from the description of preferred but not exclusive embodiments of a cup feeder according to the present invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of the cup feeder according to the invention;

Figure 2 is an exploded view of the cup feeder of Figure 1;

Figure 3 is a top elevation view of said cup feeder;

Figure 4 is an elevation view, similar to Figure 3, in which some parts of the device have been omitted for the sake of clarity;

Figure 5 is a perspective view of the device with the cam elements arranged closer to the stacking axis; Figure 6 is a perspective view, similar to Figure 5, in which the cam elements are spaced from the stacking axis;

Figure 7 is a perspective view of a supporting frame for columns of cups; and

Figure 8 is a schematic sectional view of a feeder, illustrating the cam elements engaged with the upper rims of the stacked cups.

[0022] In the examples of embodiment that follow, individual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other examples of embodiment.

[0023] Moreover, it is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

[0024] With reference to the figures, a cup feeder, generally designated by the reference numeral 1, comprises a supporting element 2 for a plurality of cam elements 3.

[0025] Generally, said feeder is associated with a box-like body 100 that is provided with an access opening 101.

[0026] The box-like body 100, and accordingly the feeder 1, is arranged below a plurality of columns 10 of stacked cups. Such columns 10 of stacked cups are generally supported by a frame 11 that can move on command about a movement axis 110, so as to allow each one of the columns 10 of stacked cups to engage the feeder 1 through the access opening 101.

[0027] Advantageously, the columns 10 of cups are stacked along respective stacking axes 102, which are parallel to each other and, advantageously, to the movement axis 110. In the illustrated example of embodiment, said stacking axes 102 are substantially vertical.

[0028] In greater detail, the cam elements 3 are substantially cylindrical. In particular, said cam elements 3

are mounted so that they can rotate on command about the respective generating axis, which is parallel to the stacking axis 102.

[0029] Each one of the cam elements 3 has a helical or spiral lateral profile 4, which is designed to engage an upper rim 5a of a cup 5 arranged below the column of stacked cups 10 that passes through the access opening 101.

[0030] The feeder 1 is provided with actuation means 6, described in greater detail hereinafter, for the simultaneous rotation of the cam elements 3 about their respective axis.

[0031] The feeder 1 is further provided with approach/spacing means 18, which allow the simultaneous approach and spacing of the cam elements 3 with respect to the stacking axis 102.

[0032] According to the present invention, said approach/spacing means 18 comprise a rotary supporting pivot 7 for each one of the cam elements 3; each one of the rotary supporting pivots 7 can be moved angularly on command about an angular displacement axis 8, in order to move the cam element 3 that it supports toward or away from the stacking axis 102.

[0033] The actuation means 6 for the simultaneous rotation of the cam elements 3 comprise motor means 9, which are adapted to turn simultaneously first driving wheels 9a about each angular displacement axis 8, and means for kinematic connection between said first driving wheels 9a and the respective cam element 3.

[0034] Advantageously, as clearly shown in the embodiment shown in the figures, the motor means 9 comprise a first movement ring 11, which is connected kinematically to a power take-off 12 (constituted for example by an electric motor 11a), which is adapted to turn simultaneously the first driving wheels 9a.

[0035] Conveniently, the means for kinematic connection between the first driving wheels 9a and the respective cam element 3 can be constituted by a respective second driven wheel 13, which is connected kinematically to the first driving wheel 9 that is associated with the respective cam element 3.

[0036] According to the illustrated embodiment, the first driving wheels 9a and the respective second driven wheels 13 can both be constituted respectively by first and second gears.

[0037] Advantageously, the first movement ring 11 can be constituted, as clearly shown in the exploded view of Figure 2, by a ring gear, which is arranged coaxially to the stacking axis 102 and meshes with the first gears that constitute the first driving wheels 9.

[0038] With particular reference to the exploded view shown in Figure 2, the approach/spacing means 18 comprise an arm 14 for connection between the rotary supporting pivot 7 and the respective angular displacement axis 8.

[0039] According to a preferred embodiment, said approach/spacing means 18 may further be constituted by an angular displacement ring 15, which is arranged co-

axially to the stacking axis 102; advantageously, said angular displacement ring 15 can rotate about the stacking axis 102.

[0040] In particular, the angular displacement ring 15 forms a plurality of containment guides 16 for a respective sliding element 17, which is rigidly coupled to each one of the rotary supporting pivots 7.

[0041] The containment guides 16 are arranged along a longitudinal direction that has a radial component and a tangent component.

[0042] In this manner, as a consequence of the rotation of the angular displacement ring 15 about the stacking axis 102, the sliding elements 17 (and accordingly the cam elements 3 associated therewith) can move radially (and therefore closer or further away) with respect to the stacking axis 102.

[0043] Advantageously, the containment guides 16 can be substantially rectilinear and oblique with respect to the radial or tangent direction.

[0044] The angular displacement ring 15 is associated with an actuation element 15a, which is constituted for example by a knob that protrudes radially and outward from said angular displacement ring 15.

[0045] In particular, it is advantageous to associate said actuation element 15a with a graduated scale that indicates the cup diameters to be fed that are suitable to be used when the actuation element 16 (and accordingly the angular displacement ring 15) are in said position.

[0046] Conveniently, the power take-off 12 comprises a driving gear 12a, which meshes with one of said first gears.

[0047] Since said first gear meshes with the first movement ring 11 (which meshes with all the other first gears), it is evident that the rotation of the driving gear 12a can allow the simultaneous rotation of all the first gears and accordingly of all the cam elements 3.

[0048] Operation of the cup feeder according to the present invention is evident from what has been described above.

[0049] In particular, depending on the size (particularly on the diameter of the upper rim) of the cups to be fed to the feeder, one acts, by means of the actuation element 15a, on the approach/spacing means 18.

[0050] In practice, by rotating the angular displacement ring 15, the sliding elements 17 (and accordingly the cam elements 3 associated therewith) are forced to move radially with respect to the stacking axis 102.

[0051] In this manner, the cam elements 3 are moved simultaneously closer to, or further away from, the angular displacement axis 102.

[0052] The simultaneous rotation, during cup feeding, of the cam elements 3 about their own generating axis is ensured by the fact that the distance, and therefore the possibility to transmit rotation, between the first driving wheels 9a and the respective second driven wheels 13 remains unchanged, since the respective axes are connected by the respective connecting arm 14.

[0053] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0054] Thus, for example, the first driving wheels and the second driven wheels can be constituted not only by gears but also by different kinematic connection means.

[0055] All the characteristics of the invention described above as advantageous, convenient or the like may also be omitted or be replaced with equivalents.

[0056] In practice it has been found that the invention has achieved its intended aim and objects in all of its embodiments.

[0057] In practice, the materials used, as well as the contingent shapes and dimensions, may be any according to requirements.

[0058] All the details may further be replaced with other technically equivalent elements.

[0059] The disclosures in Italian Patent Application no. VR2004A000030, from which this application claims priority, are incorporated herein by reference.

[0060] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A cup feeder, comprising a supporting element for a plurality of substantially cylindrical cam elements that are arranged, during use, below a column of cups stacked along a stacking axis, said cam elements being rotatable on command about their own generating axis, which is substantially parallel to said stacking axis, and having a helical lateral profile for engaging the upper rim of the cup arranged at the bottom of said column of stacked cups, said feeder being provided with actuation means for the simultaneous rotation of said cam elements about their respective generating axis and with means for the simultaneous approach/spacing of said cam elements with respect to said stacking axis, **characterized in that** said spacing/approach means comprise a rotating supporting pivot for each one of said cam elements that can be moved angularly on command about an angular displacement axis, in order to move closer/away a respective cam element with respect to said stacking axis, said actuation means for simultaneous rotation comprising motor means adapted to turn simultaneously first driving wheels about each angular displacement axis and means for kinematic connection between said first driving wheels and the respective cam element.

2. The feeder according to claim 1, **characterized in**

that said motor means comprise a first movement ring, which is connected kinematically to a power take-off and is adapted to rotate simultaneously said first driving wheels.

off comprises a driving gear, which meshes with one of said first driving wheels.

3. The feeder according to one or more of the preceding claims, **characterized in that** said means for kinematic connection between said first driving wheels and the respective cam element comprise a second driven wheel, which is connected kinematically to the first driving wheel associated with said respective cam element.

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4. The feeder according to one or more of the preceding claims, **characterized in that** said first driving wheel and said second driven wheel comprise a first gear and a second gear.

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5. The feeder according to one or more of the preceding claims, **characterized in that** said first movement ring comprises a ring gear, which is arranged coaxially to said stacking axis and meshes with said first gears.

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6. The feeder according to one or more of the preceding claims, **characterized in that** said approach/spacing means comprise an arm for connection between the supporting pivot and the respective angular displacement axis.

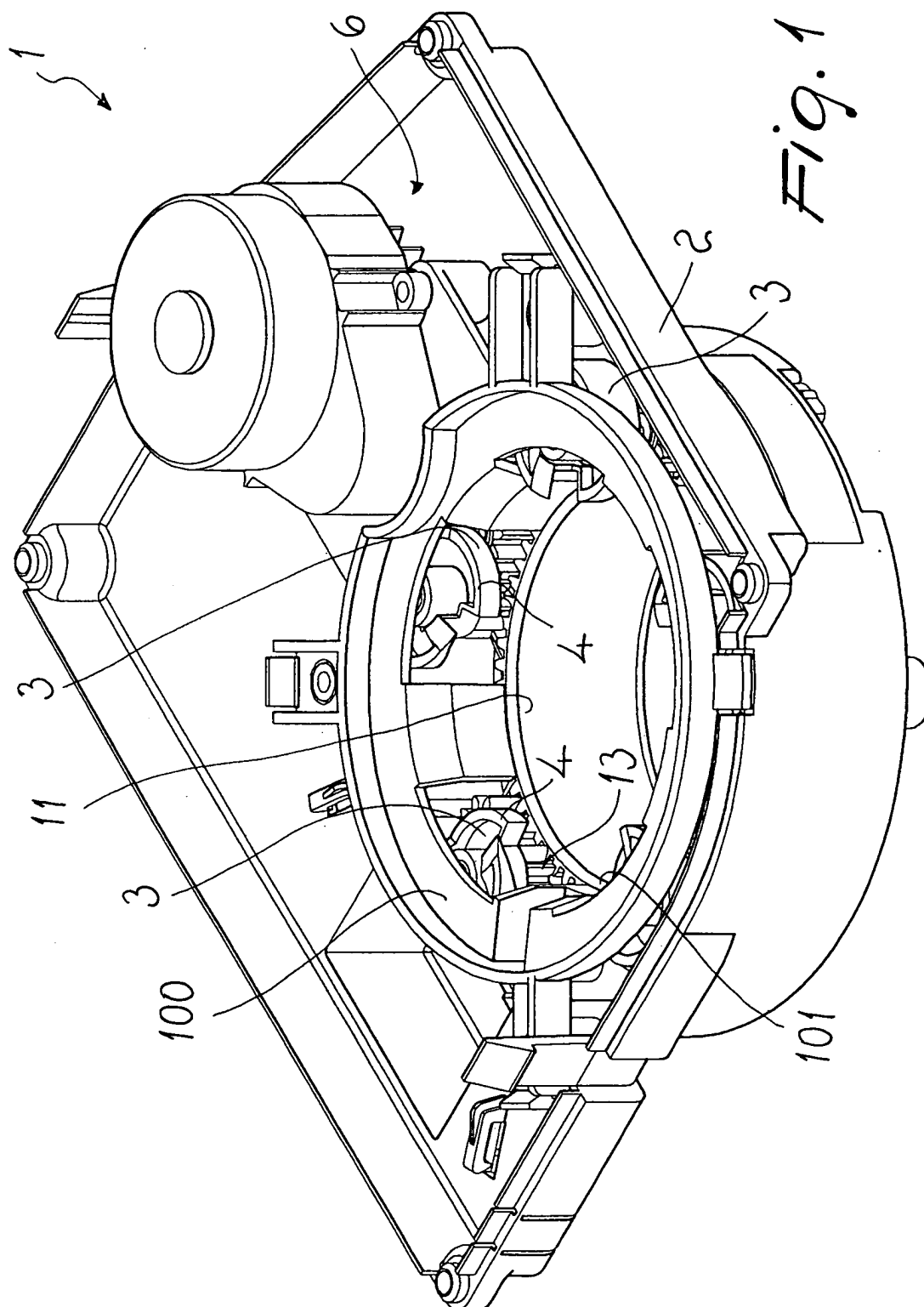
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7. The feeder according to one or more of the preceding claims, **characterized in that** said approach/spacing means comprise an angular displacement ring, which is arranged coaxially to said stacking axis and can rotate about said stacking axis, said angular displacement ring forming a plurality of containment guides for a respective sliding element that is rigidly coupled to each one of said pivots, said containment guides being arranged along a longitudinal direction that has a radial component.

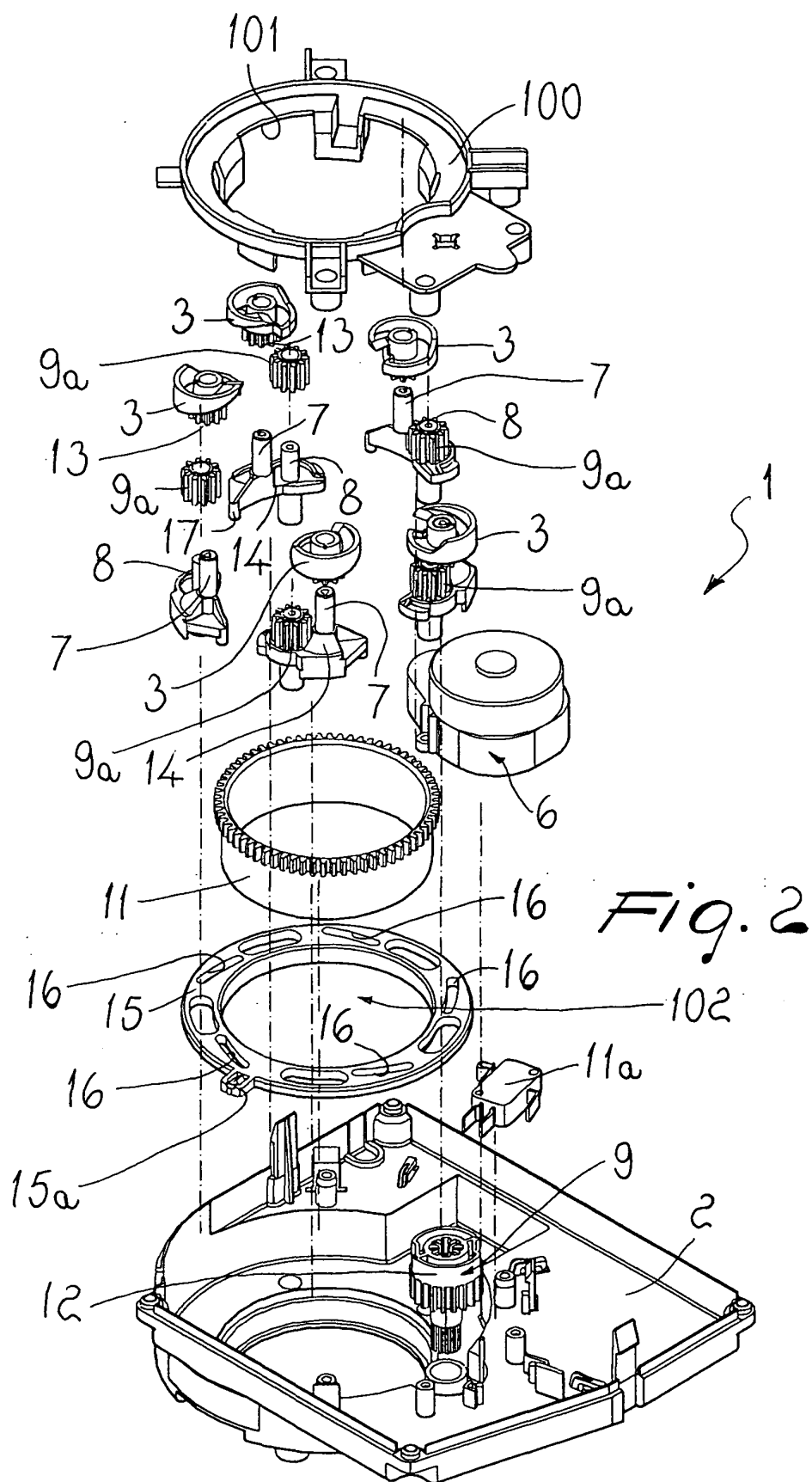
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8. The feeder according to one or more of the preceding claims, **characterized in that** said angular displacement ring comprises an element for actuating the angular displacement of said angular displacement ring about said stacking axis.

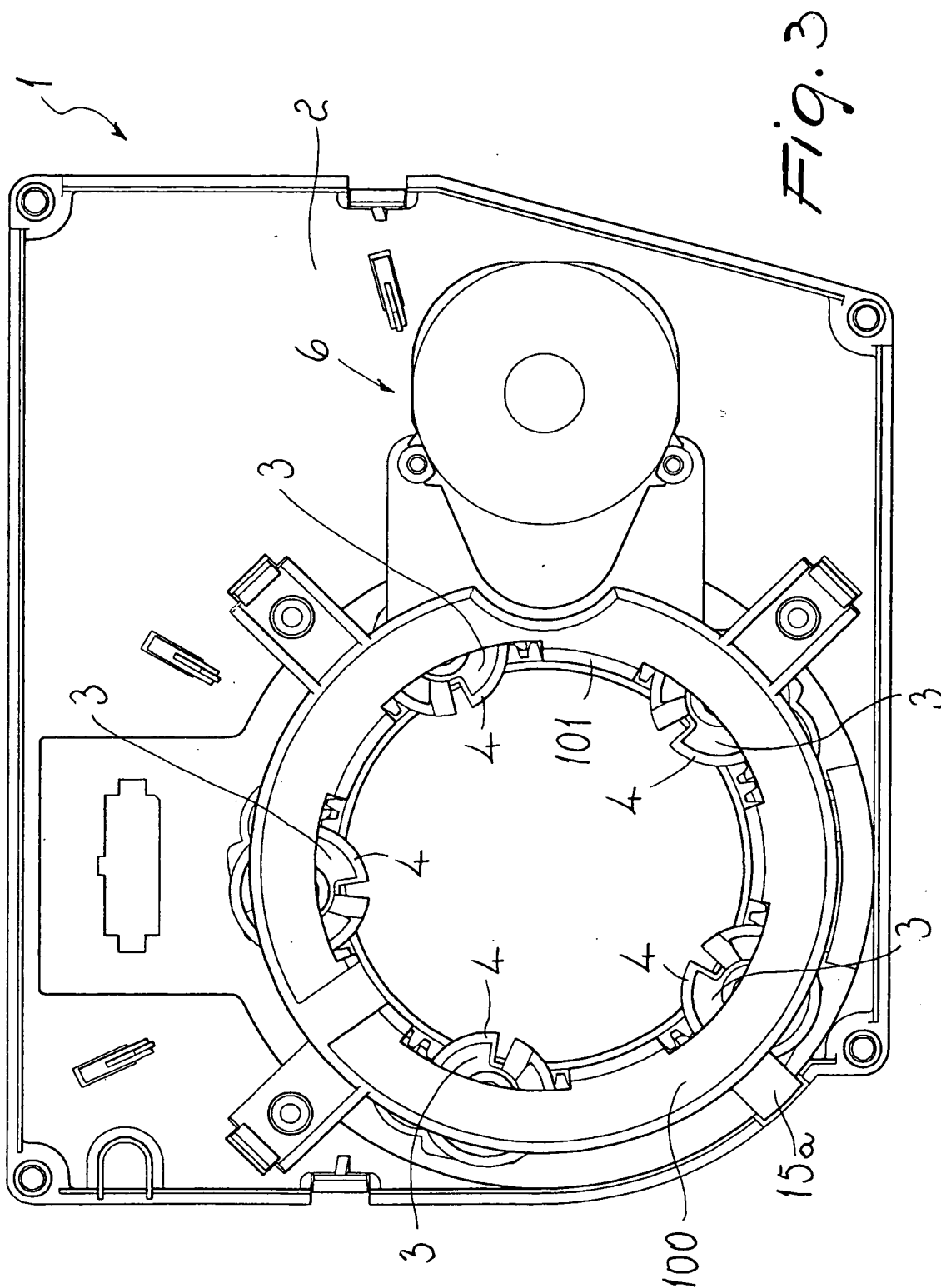
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9. The feeder according to one or more of the preceding claims, **characterized in that** said actuation element is associated with a graduated scale.

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10. The feeder according to one or more of the preceding claims, **characterized in that** said containment guides comprise a rectilinear guide arranged obliquely with respect to a radial direction.

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11. The feeder according to one or more of the preceding claims, **characterized in that** said power take-







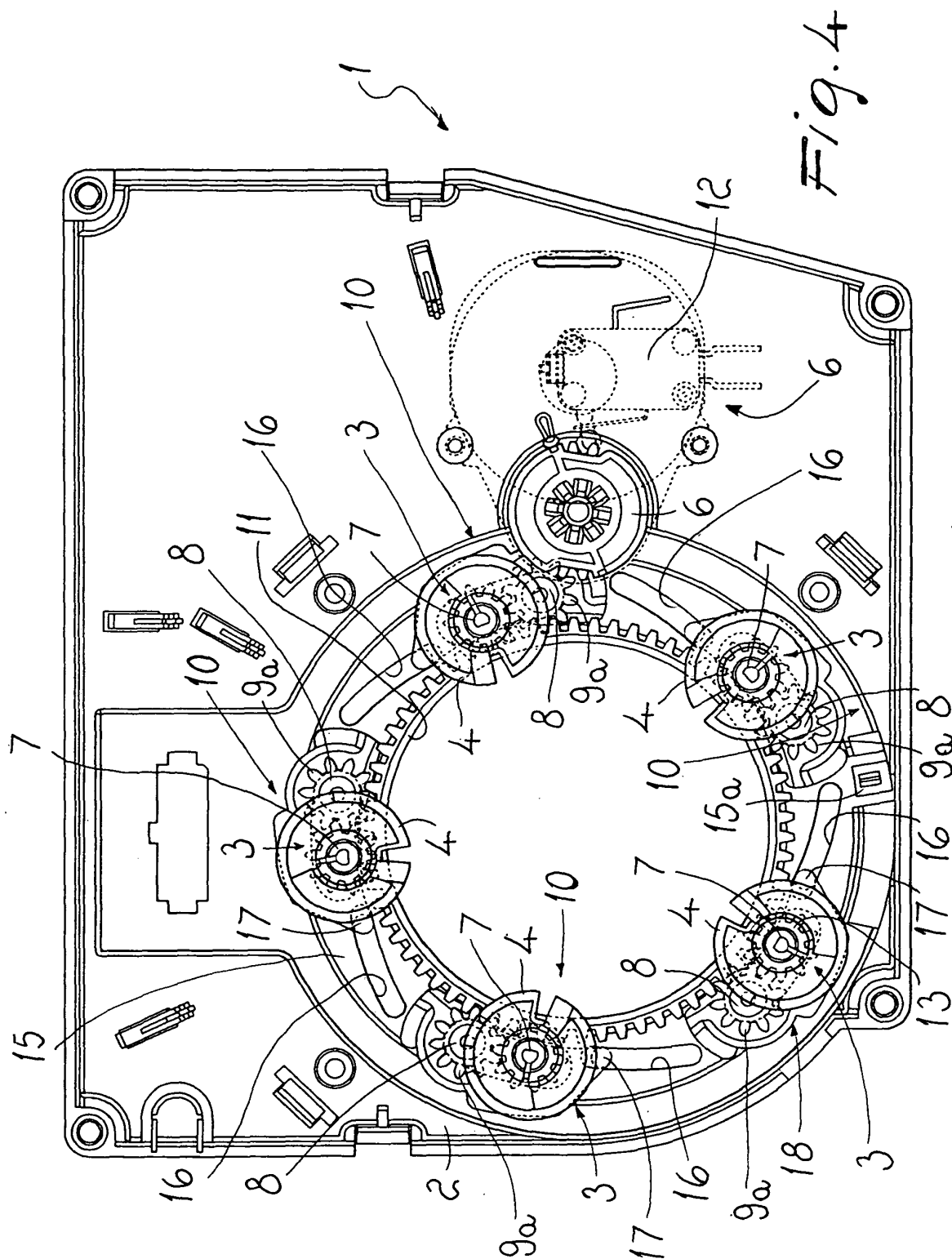


Fig. 5

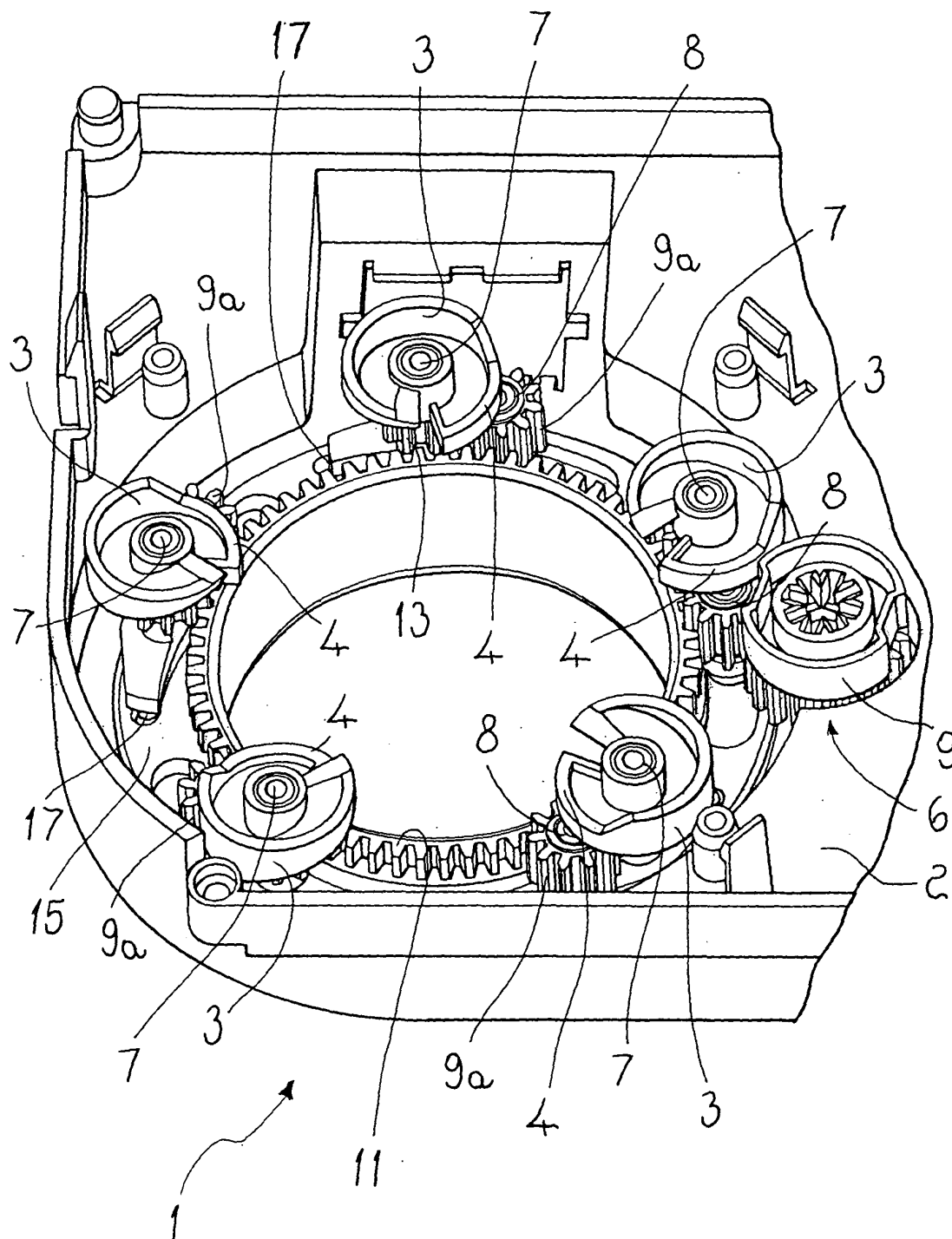


Fig. 6

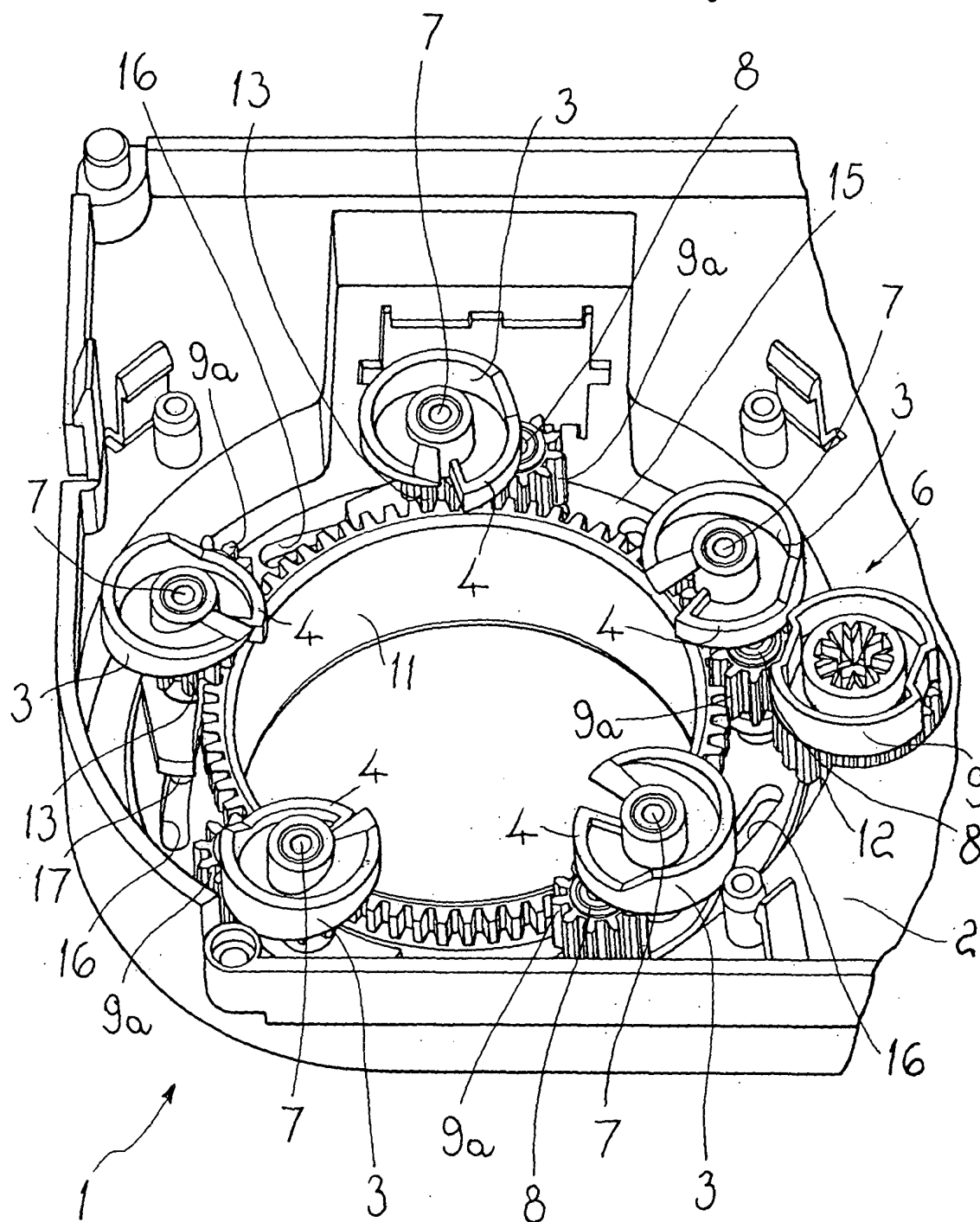


Fig. 7

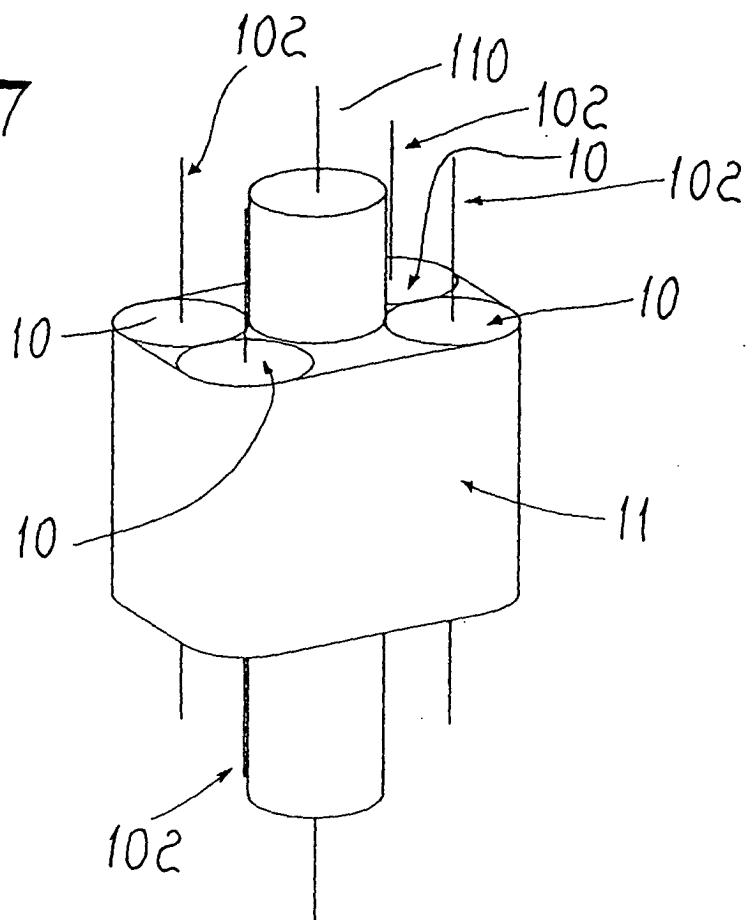
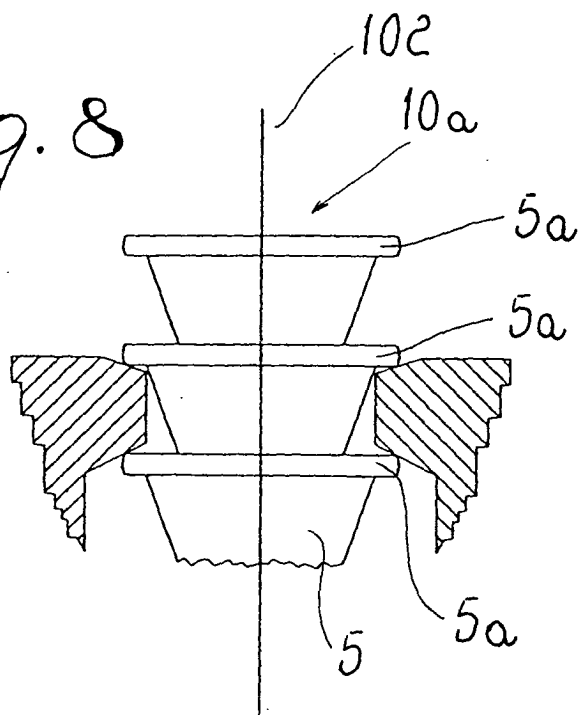


Fig. 8





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 04 01 7623

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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26 May 2005	Examiner Diepstraten, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 04 01 7623

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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