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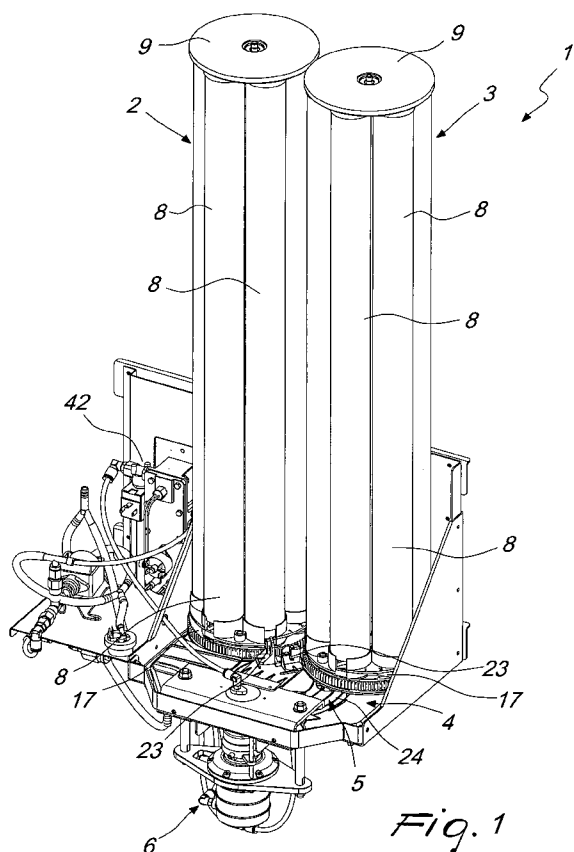
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[Continued on next page]

(54) Title: APPARATUS FOR PREPARING AND DISPENSING BEVERAGES FROM A POWDER CONTAINED IN CAPSULES



(57) Abstract: An apparatus (1) for preparing and dispensing beverages from a powder contained in capsules, includes a plurality of magazines (2, 3) containing stacks of capsules (7) which contain a powder suitable to produce a beverage, a feeder adapted to remove a capsule from the magazine and move it to an injection position, an injector (6) adapted to inject water into the capsule to produce a beverage, the feeder also moving the capsule to a discharge position; the feeder has a rotating disk (24) provided with a contact portion and with a means (25) for temporary engagement of a capsule.



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APPARATUS FOR PREPARING AND DISPENSING BEVERAGES FROM A POWDER CONTAINED IN CAPSULES

The present invention relates to an apparatus for preparing and dispensing beverages from a powder contained in capsules.

5 In the field of vending, automatic machines capable of dispensing beverages starting from differentiated or multi-product pods or capsules are currently not known.

The aim of the present invention is to provide an apparatus which can be applied to automatic machines for dispensing beverages capable of dispensing beverages prepared starting from capsules, pods or single-dose containers in general.

10 Within this aim, an object of the invention is to provide an apparatus which is capable of using capsules or pods of various types both in terms of shape and in terms of dimensions.

Another object of the invention is to provide an apparatus which is reliable in use and economically operated.

15 This aim and these and other objects which will become better apparent hereinafter are achieved by an apparatus for preparing and dispensing beverages from a powder contained in capsules, comprising at least one magazine which is adapted to contain at least one stack of capsules which contain a powder suitable to produce a beverage, a feeder adapted to remove a capsule from said magazine and move it to an injection
20 position; an injector which injects water into said capsule to produce a beverage, said feeder being adapted to move said capsule to a discharge position, characterized in that said feeder comprises a rotating disk provided with a contact portion and with at least one means for temporary engagement of a capsule.

Further characteristics and advantages of the invention will become better apparent
25 from the following detailed description of preferred but not exclusive embodiments thereof, illustrated by way of non-limiting example in the accompanying drawings, wherein:

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

Figure 2 is a plan view of the apparatus of Figure 1;

30 Figure 3 is a front view of the apparatus;

Figure 4 is a sectional front view, in enlarged scale with respect to the preceding figures, of the injection station of the apparatus;

Figure 5 is a view, similar to the preceding one, which illustrates the infusion step;

Figure 6 is a sectional side view, taken along the line VI-VI of Figure 3;

5 Figure 7 is a sectional side view, taken along the line VII-VII of Figure 3;

Figure 8 is a bottom view of a magazine with the cartridge retention means in the retention position;

Figure 9 is a view, similar to the preceding one, showing the magazine with the retention means in the open position;

10 Figure 10 is a partial plan view of the apparatus, illustrating the step for removing a cartridge from the magazine;

Figure 11 is a view, similar to the preceding one, which shows a subsequent step for the fall of the cartridge into the feeder;

15 Figure 12 is a view, similar to the preceding one, of a subsequent step of counter-rotation of the feeder to acquire the cartridge;

Figure 13 is a view, similar to the preceding one, of the feeder in the position in which the cartridge is in the injection step;

Figure 14 is a view, similar to the preceding one, of the feeder in the position for expelling the cartridge.

20 With reference to the cited figures, an apparatus according to the invention, generally designated by the reference numeral 1, comprises two magazines 2 and 3, which are detachably associated with a frame 4 which supports a feeder 5 and an injector 6.

The magazines 2 and 3 are suitable to contain a plurality of cartridges 7, which contain coffee powder or any other substance suitable for preparing an infusion
25 beverage.

Each magazine 2, 3 is constituted by a plurality of cylinders 8, preferably made of transparent plastics, which are suitable to contain a stack of cartridges 7 and are closed in an upper region by a lid 9 and in a lower region by a perforated base 10.

The base 10 has holes 11, which correspond to the cylinders 8, so that the cartridges
30 contained therein can descend and exit from the holes to be picked up by the feeder 5,

in the manner described hereinafter.

Each magazine 2, 3 has a cartridge retention means which retains the cartridges inside the magazine when the magazine is not inserted in the apparatus.

The magazine is in fact supplied filled with cartridges and is inserted in the apparatus
5 in replacement of a depleted magazine.

The cartridge retention means comprises a pair of coaxial contoured plates 12 and 13 provided with tabs 14 adapted to interfere with the holes 11 of the base 10 of the magazine.

The contoured plates 12 and 13 can rotate in mutually opposite directions in order to
10 define at least two positions: a retention position, shown in Figure 8, in which the tabs 14 interfere with the holes 11, preventing the cartridges 7 from exiting, and an open position, shown in Figure 9, in which the tabs 14 clear the holes 11, allowing the cartridges 7 to descend.

The contoured plates are kept in the retention position by elastic members, which are
15 not shown in the figures.

The contoured plates open automatically upon insertion of the magazine 2, 3 in the apparatus by means of contoured notches 15, which are provided within the plates and are entered by teeth 16 provided on respective rotating supports 17 of the magazines.

The rotating supports 17 are constituted by gears which are actuated by a pinion 18.

20 The respective magazines 2 and 3 are applied to such rotating supports 17.

Each rotating support 17 comprises passage holes 19, which correspond to the cylinders 8 of the magazine 2 or 3, and pins 20, which are arranged asymmetrically on the support so as to engage respective holes of the base 10 of the magazine so that the magazine can be applied to the support only in one preset position.

25 Each passage hole 19 comprises a guiding tooth 47 which facilitates the fall of the cartridge into the feeder as described hereinafter.

Each rotating support 17 is adapted to receive a stack of cartridges 7 contained in a cylinder 8 in a respective removal position, designated by the reference numerals 21 and 22, in which a cartridge is removed from the feeder.

30 There are two removal positions, one for each magazine, arranged asymmetrically

with respect to the feeder.

Removal and feeding of a cartridge occurs first in a removal position 21, until the cartridges in the respective magazine 2 are depleted, and then in the second removal position 22, in order to remove cartridges from the second magazine 3.

5 The magazines 2 and 3 provide in succession the various stacks of cartridges contained in the cylinders 8 by the rotation of the pinion 18, which actuates the rotation of the rotating support 17 through a preset angle.

The rotation of the pinion and therefore of the rotating support 17 is actuated by the electronic control circuit of the apparatus, which receives a depleted stack signal from
10 optical sensors 23 which read the presence or absence of the cartridges in the respective cylinders 8 at the respective removal positions.

The feeder 5 comprises a rotating disk 24, which is provided with a radial opening provided with a means for temporary engagement of a cartridge 7.

The temporary engagement means is constituted by a fork having elastic arms 25
15 which retain the capsule or cartridge below its upper edge 26.

The elastic arms 25 are rod-like members hinged to a frame 27 with the interposition of springs 28.

The frame 27 is associated with the rotating disk 24 by means of screws 29.

The frame 27 is interchangeable in order to use the apparatus with cartridges or pods
20 of different dimensions and shapes.

In the normal position, the elastic arms 25 are pushed by the respective springs 28 towards the center of the radial opening and in this manner the upper edge 26 of the cartridge 7 rests against the arms, as shown in Figure 4.

The rotating disk 24 moves the cartridge 7 from the removal position 21 to the
25 injection position 30, shown in Figure 13, which corresponds to the position of the injector 6.

The injector 6 comprises a cartridge holder 31 which is actuated by a double hydraulic piston constituted by a power piston 32 inserted within a cylinder 33.

The power piston 32 is hollow and receives internally a stem 34. The stem 34 is
30 provided with an axial passage 35 which is supplied by a pressurized fluid which arrives

from a first duct 36.

The power piston 32 forms an annular cavity 37 together with the cylinder 33. The annular cavity 37 is fed with pressurized fluid by means of a second duct 38.

The pressurized fluid fed by the first duct 36 produces an upward movement of the
5 cartridge holder 31, which takes the cartridge 7 and moves it to the injection position, shown in Figure 5, in which it abuts against a piercing means 39 associated with a head 40 constituted by a metallic plate which is associated with the frame.

In that position, fluid is fed from the second duct so as to lock the cartridge against the head 40 with greater force.

10 The double hydraulic piston allows a first quick movement of the cartridge from the lower position to the injection position and a subsequent firmer locking during the injection step.

The piercing means is constituted by a plurality of triangular teeth 39, which are circumferentially arranged in the lower surface of the head 40 so as to pierce the upper
15 membrane of the cartridge 7 which is forced by the cartridge holder 31 against the head.

The head 40 comprises an injector 41 which receives hot water from a heater 42, for performing the infusion.

An elastic member 43 is provided at the triangular teeth 39. The elastic member is constituted by a blade 43 which moves the cartridge 7 away from the head 40 when the
20 cartridge holder 31 descends, in order to prevent the cartridge from jamming in the triangular teeth and returning to the transport position between the arms 25 of the fork.

Once infusion has ended, the rotating disk 24 turns clockwise in order to move the cartridge to an expulsion position, designated by the reference numeral 44, in which an inclined plane 45, provided below the rotating disk, lifts the cartridge 7, which
25 disengages from the fork and falls laterally in order to end in a collection container, not shown in the figures.

Depending on the type of cartridge 7 used, the dimensions and shape of the arms 25 of the fork of the temporary engagement means and dimensions and shape of the cartridge holder 31 may vary.

30 Also, for some types of cartridge, lower piercing members 46 are arranged inside the

cartridge holder 31 in order to pierce the base of the cartridge at the time of infusion.

The operation of the apparatus according to the present invention is as follows.

When inactive, the apparatus has a stack of cartridges 7 contained in a cylinder 8 of the magazine 2 at the removal position 21 in which the first cartridge of the stack, i.e.,
5 the lowest one, rests on the plane of the rotating disk 24.

When the apparatus receives the dispensing command, the rotating disk 24 is turned until the fork 25 lies below the removal position 21, so that the cartridge 7 falls into the fork.

In its fall, the cartridge is guided by the guiding tooth 47, which acts as a temporary
10 support for the cartridge so that it is arranged in a slightly oblique position partially in the passage hole 19 and in the fork 25.

At this point, the rotating disk 24 performs a small rotation in the opposite direction, i.e., counterclockwise, thus causing the cartridge 7 to fall in a perfectly horizontal position onto the fork 25.

15 The rotating disk 24 then resumes the clockwise rotation and moves the cartridge 7 into the injection position 30.

In the injection position, the cartridge 7 is taken by the cartridge holder 31, by the action of the double hydraulic piston, and is locked against the head 40, while the cartridge is pierced simultaneously by the piercing teeth 39.

20 As better seen in Figure 5, in the injection position the elastic arms 25 are moved mutually apart by the cartridge holder by the elastic deformation of the springs 28.

With the cartridge 7 firmly coupled to the head 40, hot water is fed through the injector 41. The hot water passes through the cartridge, and the beverage thus formed is sent to a dispensing duct in order to be poured into a container, such as a glass or cup in
25 an appropriate receptacle of the machine, which is not visible in the figures.

Once infusion has ended, the double hydraulic piston retracts the cartridge holder, and the cartridge, assisted by the blade 43, returns into the fork 25.

A new clockwise rotation of the rotating disk 24 moves the cartridge 7 at the expulsion position 44 in which the inclined plane 45 lifts the cartridge 7, which
30 disengages from the fork and falls laterally in order to end in a collection container, which

is not visible in the figures.

The apparatus stops in this position until a new dispensing command.

When the stack of cartridges in the cylinder 8 is depleted, the lack of cartridges is detected by the respective optical sensor 23, which sends a signal to the control system
5 of the machine.

The control system actuates a rotation of the pinion 18, which turns the rotating support 17 in order to move a new cylinder 8 at the removal position 21.

When all the cylinders 8 of the first magazine 2 are empty, the rotation of the rotating support 17 of the second cartridge 3 is actuated so that a cylinder 8 of this second
10 magazine is positioned at the second removal position 22, so that cartridge feeding continues from the second magazine.

When the magazines are empty, they are replaced with new magazines already filled with cartridges.

During the handling of the full magazines, the retention means constituted by the pair
15 of contoured plates 12 and 13 prevents the cartridges from exiting the cylinders 8.

When the magazines are arranged on the respective rotating supports, the retention means is opened automatically as described above.

Also, the feeder system allows to load cartridges of different types, i.e., to provide the user with different types of beverages, since at each request the magazines can be
20 rotated in order to bring into the removal position the stack of cartridges with the chosen type of beverage.

The apparatus according to the present invention is particularly useful for preparing and dispensing espresso coffee.

The cartridges or pods 7 can in any case contain any other powder for producing
25 other types of beverage with water under pressure.

The apparatus according to the present invention, by virtue of its compactness, can be inserted in a machine for dispensing hot soluble beverages in general.

In practice it has been found that the invention achieves the intended aim and objects, an apparatus having been provided which is capable of dispensing
30 automatically, rapidly and efficiently a beverage prepared by means of prepackaged

cartridges or pods.

A particular advantage of the present invention is constituted by the fact that the apparatus allows to dispense up to 12 pods of different products, one type for each cylinder of the two magazines.

5 An important advantage of the present invention resides in the very high reliability of its operation.

The present invention also brilliantly solves the problem of using cartridges of different types, in terms of both shape and dimensions: it is in fact sufficient to replace the cartridge holder and the fork.

10 This application claims the priority of Italian Patent Application No. MI2007A000571, filed on March 22, 2007, the subject matter of which is incorporated herein by reference.

CLAIMS

1. An apparatus for preparing and dispensing beverages from a powder contained in capsules, comprising at least one magazine which is adapted to contain at least one stack of capsules which contain a powder suitable to produce a beverage, a feeder
5 adapted to remove a capsule from said magazine and move it to an injection position; an injector which injects water into said capsule to produce a beverage, said feeder being adapted to move said capsule to a discharge position, characterized in that said feeder comprises a rotating disk provided with a contact portion and with at least one means for temporary engagement of a capsule.
- 10 2. The apparatus according to claim 1, characterized in that it comprises two magazines detachably associated with a frame which supports said feeder and said injector.
3. The apparatus according to claim 1 or 2, characterized in that said magazine is constituted by a plurality of cylinders made of transparent material, said cylinders contain
15 a stack of capsules or cartridges and are closed in an upper region by a lid and in a lower region by a base; said base comprises a plurality of holes which correspond to said cylinders, so that the cartridges contained therein can descend and exit from the holes to be taken by said feeder.
4. The apparatus according to one or more of the preceding claims, characterized in
20 that said magazine comprises a cartridge retention means which retains the cartridges inside said magazine when it is not applied to the apparatus.
5. The apparatus according to one or more of the preceding claims, characterized in that said cartridge retention means comprises a pair of coaxial contoured plates which are provided with tabs adapted to interfere with the holes of said base of the magazine;
25 said contoured plates being able to turn in the opposite direction with respect to each other in order to define at least two positions: a retention position, in which said tabs interfere with the holes of said base, preventing the cartridges from exiting, and an open position, in which said tabs clear the holes, allowing the cartridges to descend; said contoured plates comprising elastic members that keep said plates in the retention
30 position, and contoured notches engaged by teeth provided on respective rotating

supports, upon insertion of the magazine in the apparatus, in order to automatically open said contoured plates.

6. The apparatus according to one or more of the preceding claims, characterized in that said rotating supports are constituted by gears actuated by a pinion; each of said
5 rotating supports supporting a respective magazine.

7. The apparatus according to one or more of the preceding claims, characterized in that each rotating support comprises passage holes, which correspond to the cylinders of the magazine, and pins, which are arranged asymmetrically on said support so as to engage respective holes of the base of the magazine so that said magazine can be
10 applied to the support only in one preset position.

8. The apparatus according to one or more of the preceding claims, characterized in that each passage hole comprises a guiding tooth which facilitates the fall of the cartridge into the feeder.

9. The apparatus according to one or more of the preceding claims, characterized in
15 that each rotating support presents a stack of cartridges contained in a cylinder in a respective removal position, in which a cartridge is removed from the feeder.

10. The apparatus according to one or more of the preceding claims, characterized in that said removal positions are two, one for each magazine, and are arranged asymmetrically with respect to the feeder.

20 11. The apparatus according to one or more of the preceding claims, characterized in that the removal and feeding of a cartridge occurs first in a removal position, until the cartridges are depleted in the respective magazine, and then in the second removal position in order to remove cartridges from the second magazine.

12. The apparatus according to one or more of the preceding claims, characterized in
25 that said magazines have the various stacks of cartridges contained in the cylinders in succession by means of the rotation of said pinion which actuates the rotation of the rotating support through a preset angle.

13. The apparatus according to one or more of the preceding claims, characterized in that the rotation of the pinion, and therefore of the rotating support, is actuated by a
30 control system of the apparatus, which receives a depleted stack signal from optical

sensors which detect the presence or absence of the cartridges in the respective cylinders at the respective removal positions.

14. The apparatus according to one or more of the preceding claims, characterized in that said rotating disk of said feeder comprises a radial opening provided with a means
5 for temporary engagement of a cartridge.

15. The apparatus according to one or more of the preceding claims, characterized in that said temporary engagement means is constituted by a fork which comprises elastic arms which retain the capsule below its lower edge; said elastic arms being rod-like members which are pivoted to a frame with the interposition of springs, said frame being
10 associated with said rotating disk.

16. The apparatus according to one or more of the preceding claims, characterized in that said frame is interchangeable in order to use the apparatus with cartridges or pods having different dimensions and shapes.

17. The apparatus according to one or more of the preceding claims, characterized in that, in a normal position, said elastic arms are pushed by the respective springs toward
15 the center of the radial opening and in this manner the upper edge of the cartridge rests on them.

18. The apparatus according to one or more of the preceding claims, characterized in that said injector comprises a cartridge holder which is actuated by a double hydraulic
20 piston.

19. The apparatus according to one or more of the preceding claims, characterized in that said double piston comprises a power piston which is inserted in a cylinder; said power piston being hollow and receiving internally a stem; said stem being provided with an axial passage which is fed by a pressurized fluid which arrives from a first duct; said
25 power piston forming an annular cavity with said cylinder; said annular cavity being fed with fluid under pressure by means of a second duct; said pressurized fluid fed by the first duct causing the upward movement of the cartridge holder, which takes the cartridge and moves it into the injection position, in which it abuts against a piercing means which is associated with a head constituted by a metallic plate which is associated with the
30 frame; fluid being fed, in this position, from the second duct so as to lock with greater

force the cartridge against the head.

20. The apparatus according to one or more of the preceding claims, characterized in that said double hydraulic piston allows a first rapid movement of the cartridge from the lower position to the injection position and a subsequent firmer locking during the injection step.

21. The apparatus according to one or more of the preceding claims, characterized in that said piercing means is constituted by a plurality of triangular teeth which are arranged circumferentially in the lower surface of the head so as to pierce the upper membrane of the cartridge when it is forced by the cartridge holder against said head.

22. The apparatus according to one or more of the preceding claims, characterized in that said head comprises an injector which receives hot water from a heater, in order to perform infusion.

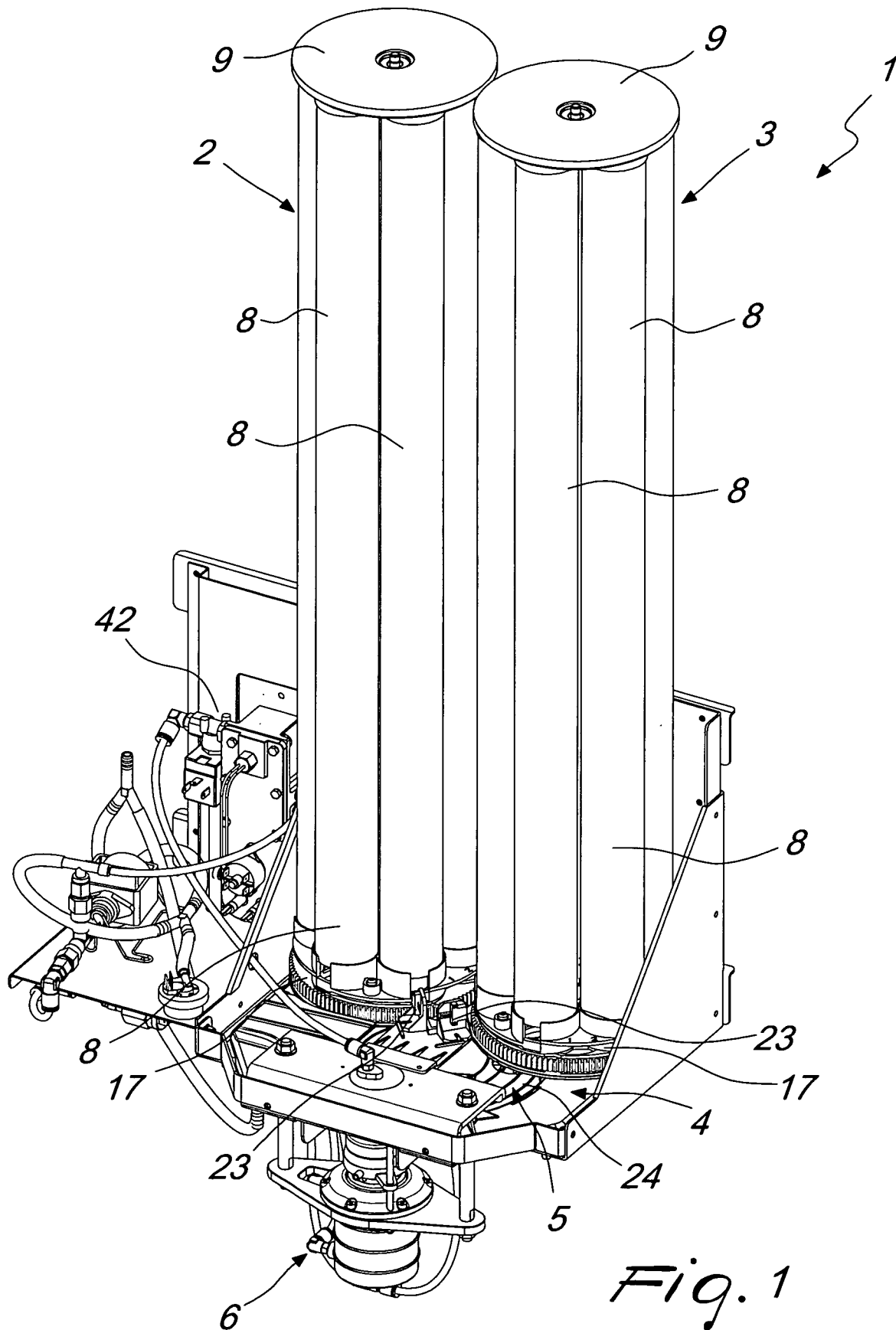
23. The apparatus according to one or more of the preceding claims, characterized in that an elastic member is provided at said triangular teeth, said elastic member being constituted by a blade which moves the cartridge away from the head when the cartridge holder descends, in order to prevent the cartridge from remaining jammed in the triangular teeth and returning to the position for transport between the arms of the fork.

24. The apparatus according to one or more of the preceding claims, characterized in that, once infusion has ended, the rotating disk turns clockwise in order to move the cartridge to an expulsion position, in which an inclined plane, provided below the rotating disk, lifts the cartridge, which disengages from the fork and falls laterally in order to end in a collection container.

25. The apparatus according to one or more of the preceding claims, characterized in that when it is inactive, the apparatus has a stack of cartridges contained in a cylinder of the magazine at the removal position in which the first cartridge of the stack, i.e., the lowermost one, rests on the plane of the rotating disk; when the apparatus receives the dispensing command, the rotating disk is turned until the fork lies below the removal position, so that the cartridge falls into said fork; in its fall, the cartridge is guided by said guiding tooth, which acts as a temporary support for said cartridge so that it is arranged in a slightly oblique position partially in the passage hole and in the fork; the rotating disk

performs a small rotation in the opposite direction, i.e., counterclockwise, thus making the cartridge fall in a perfectly horizontal position onto the fork; the rotating disk then resumes clockwise rotation and moves the cartridge to the injection position; in the injection position, the cartridge is taken by the cartridge holder, by the action of the double hydraulic piston, and is locked against the head while simultaneously piercing said cartridge by means of the piercing teeth; in the injection position, the elastic arms are moved mutually apart by the cartridge holder by the elastic deformation of the springs; with the cartridge firmly coupled to the head, hot water is fed through the injector; the hot water passes through the cartridge and the beverage thus formed is sent to a dispensing duct to be poured into a container, such as a cup, in a receptacle of the machine; once infusion has ended, the double hydraulic piston retracts the cartridge holder and the cartridge, assisted by the blade, returns into the fork; a new clockwise rotation of the rotating disk moves the cartridge at the expulsion position, in which the inclined plane lifts the cartridge, which disengages from the fork and falls laterally in order to end in a collection container.

26. The apparatus according to one or more of the preceding claims, characterized in that when the stack of cartridges in the cylinder is depleted, the lack of cartridges is detected by the respective optical sensor, which sends a signal to the control system of the machine; the control system actuates a rotation of the pinion, which turns the rotating support to move a new cylinder at the removal position; when the cylinders of the first magazine are empty, the rotation of the rotating support of the second magazine is actuated so that a cylinder of this second magazine is arranged at the second removal position, so that the feeding of cartridges continues from the second magazine; when the magazines are empty, they are replaced with new magazines already filled with cartridges.



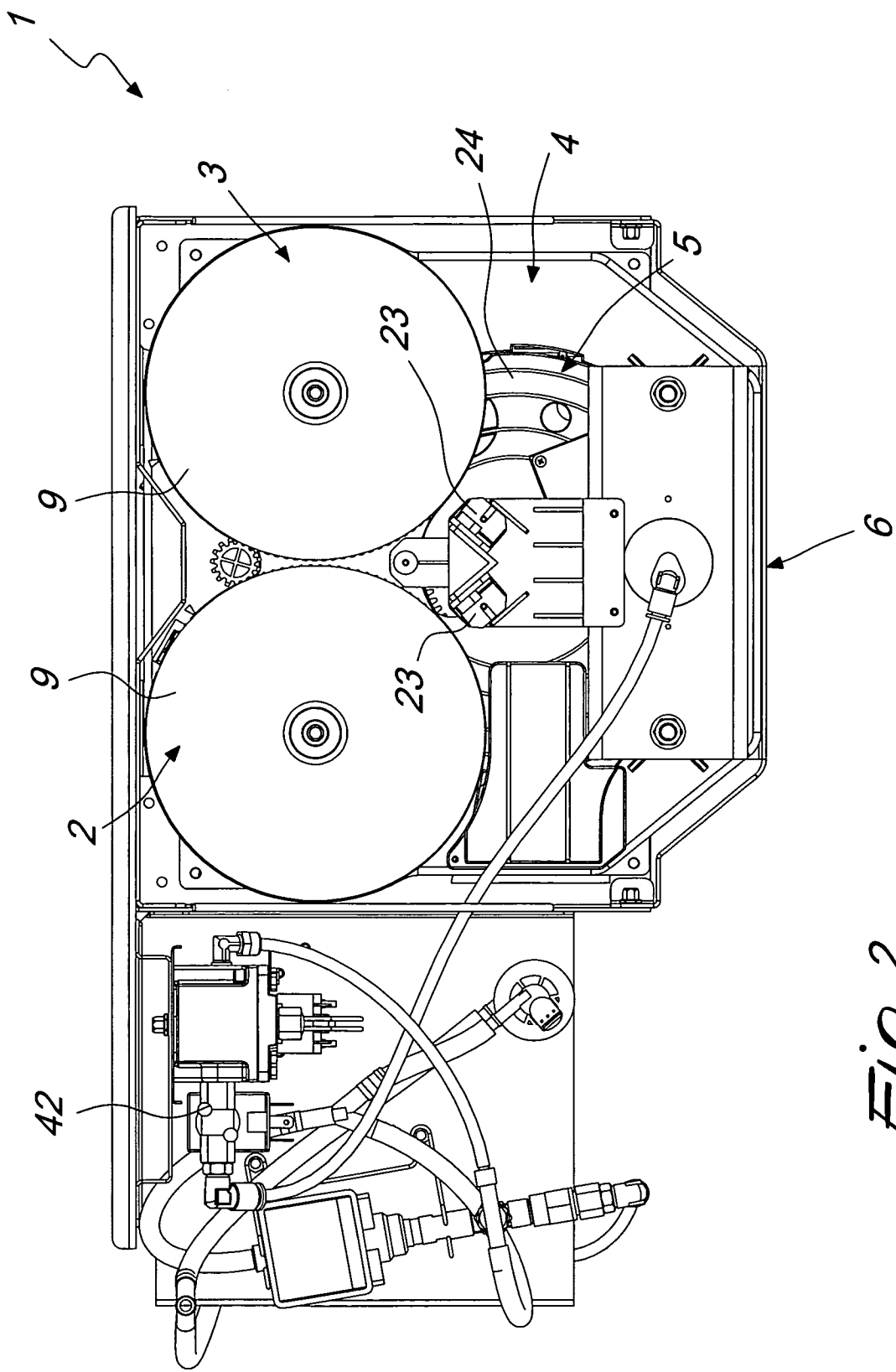
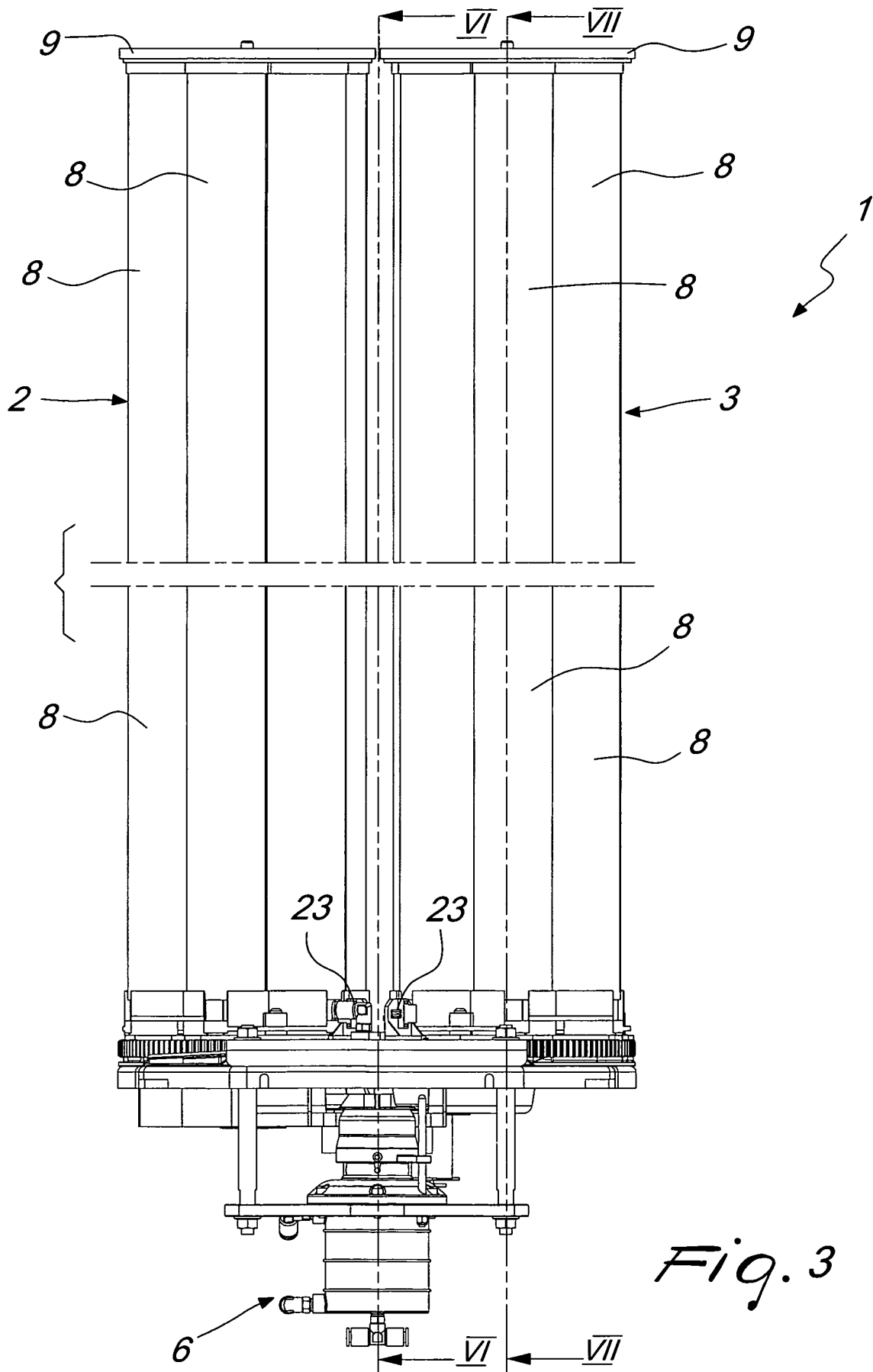
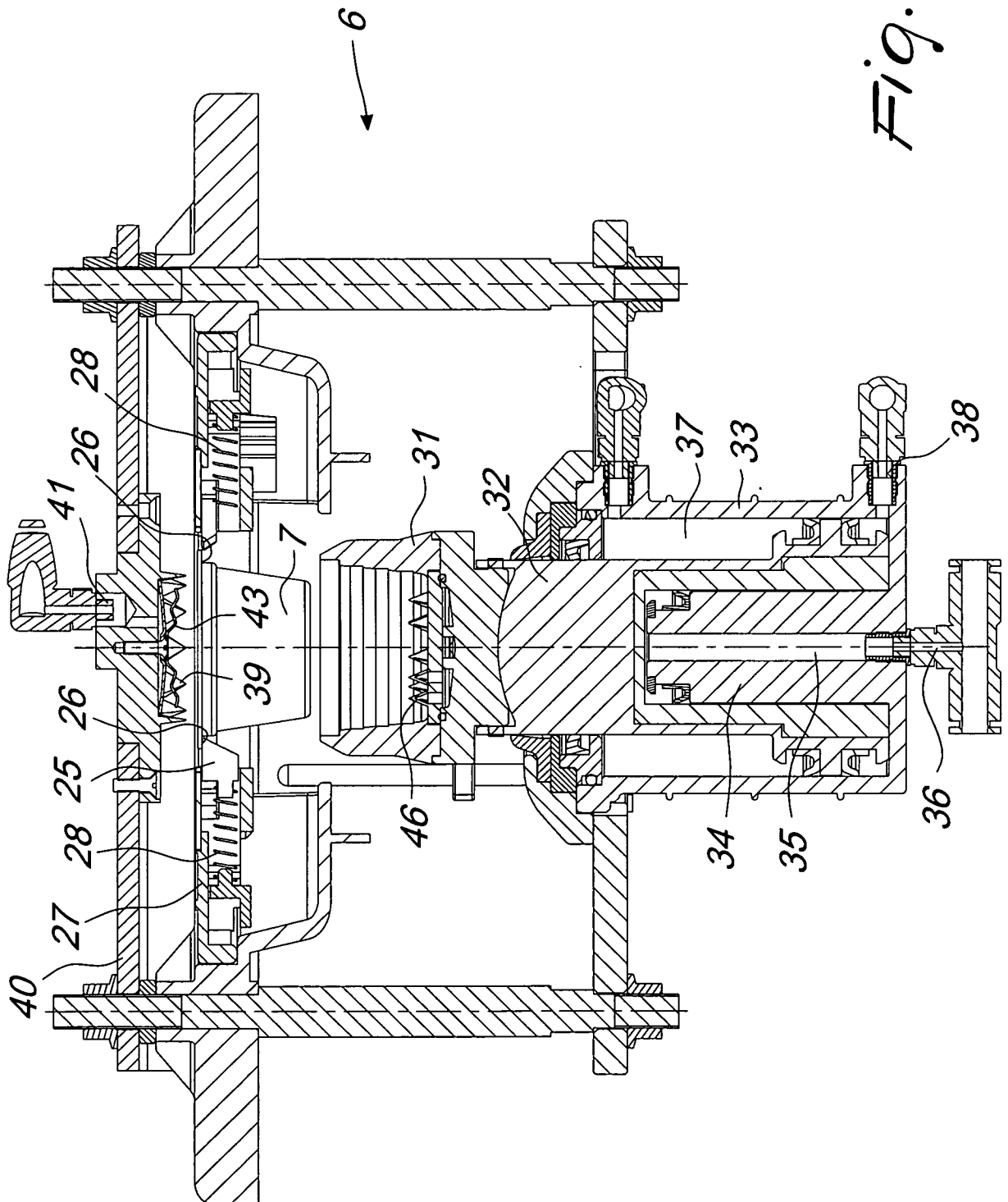
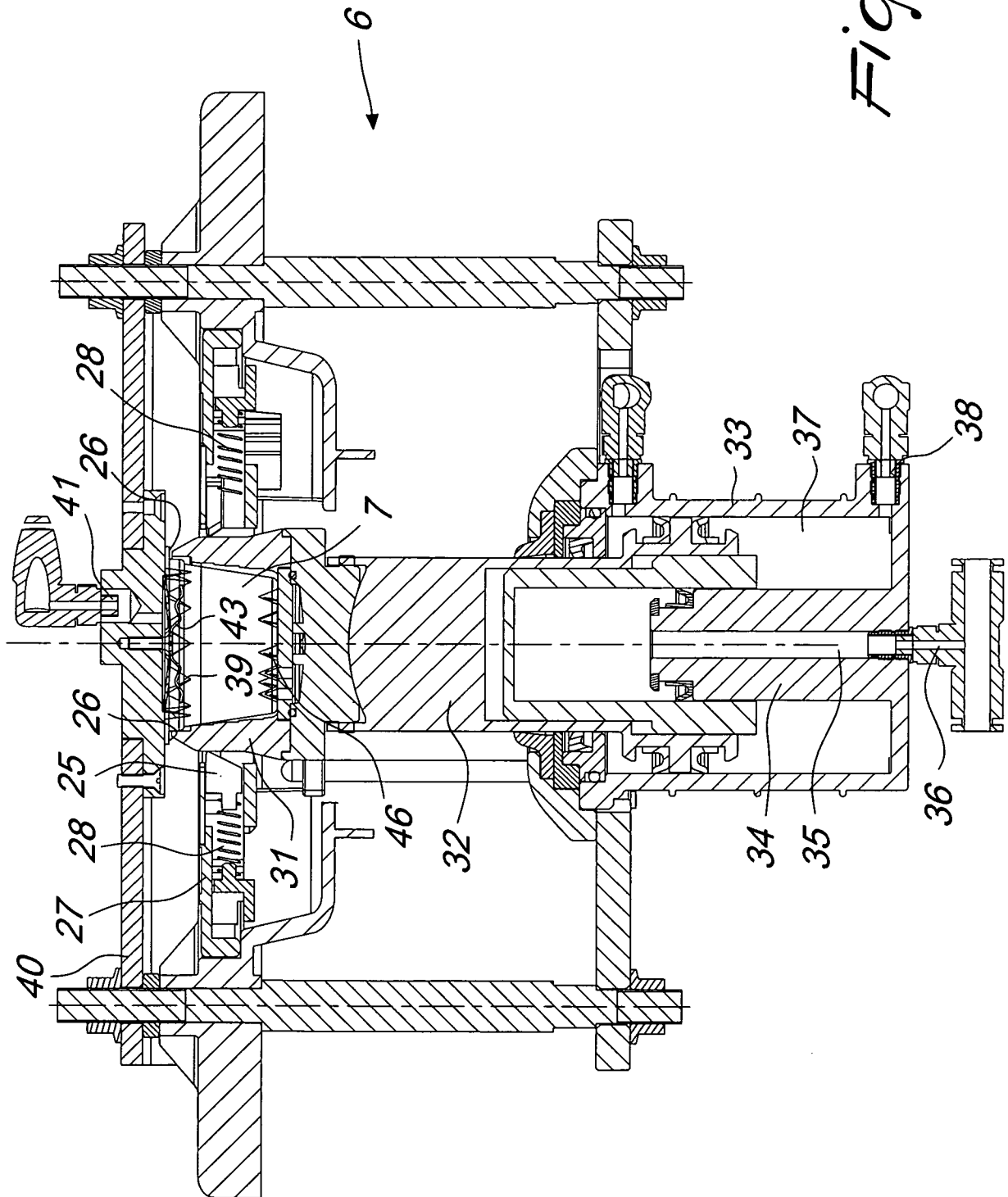
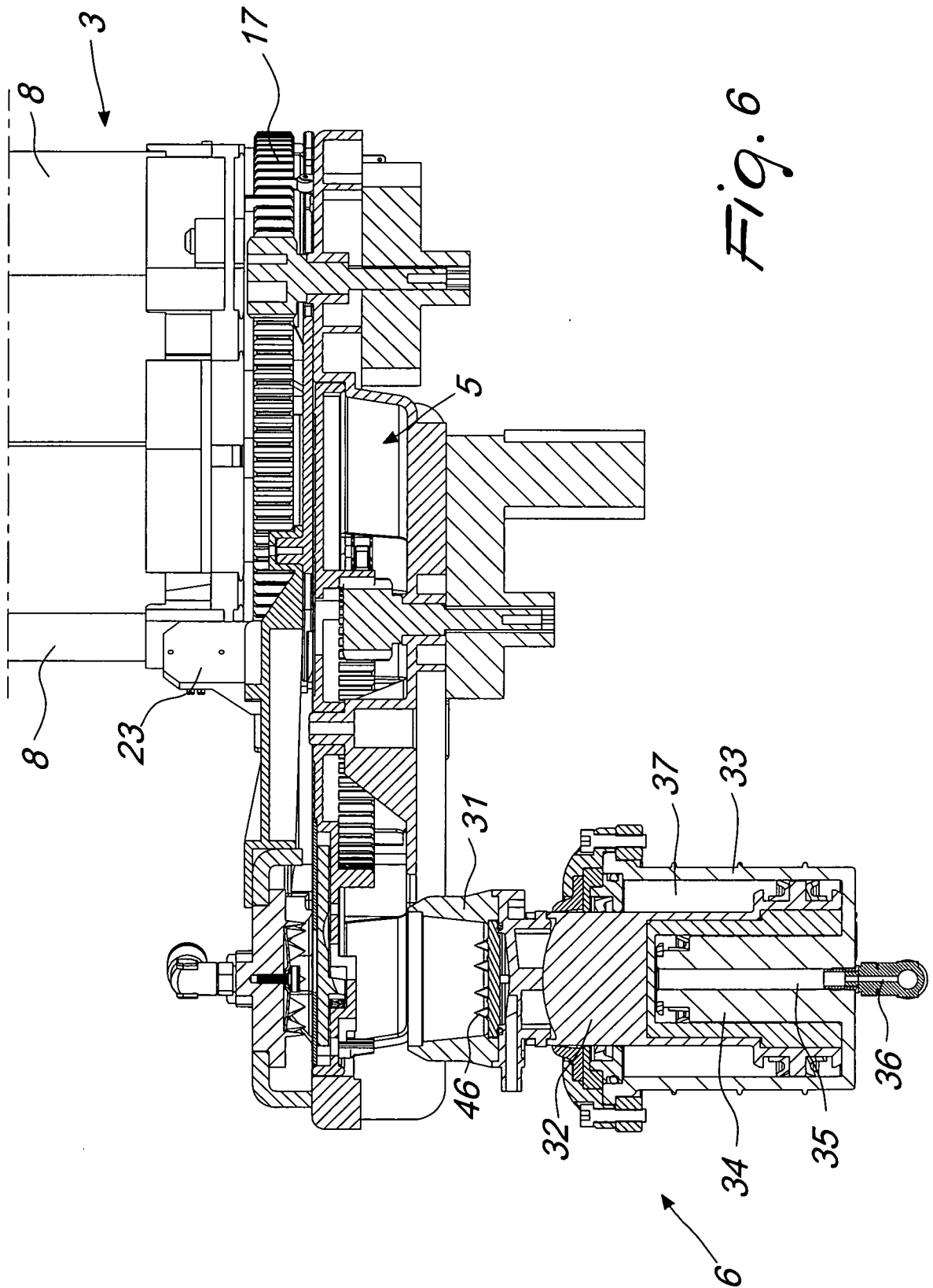


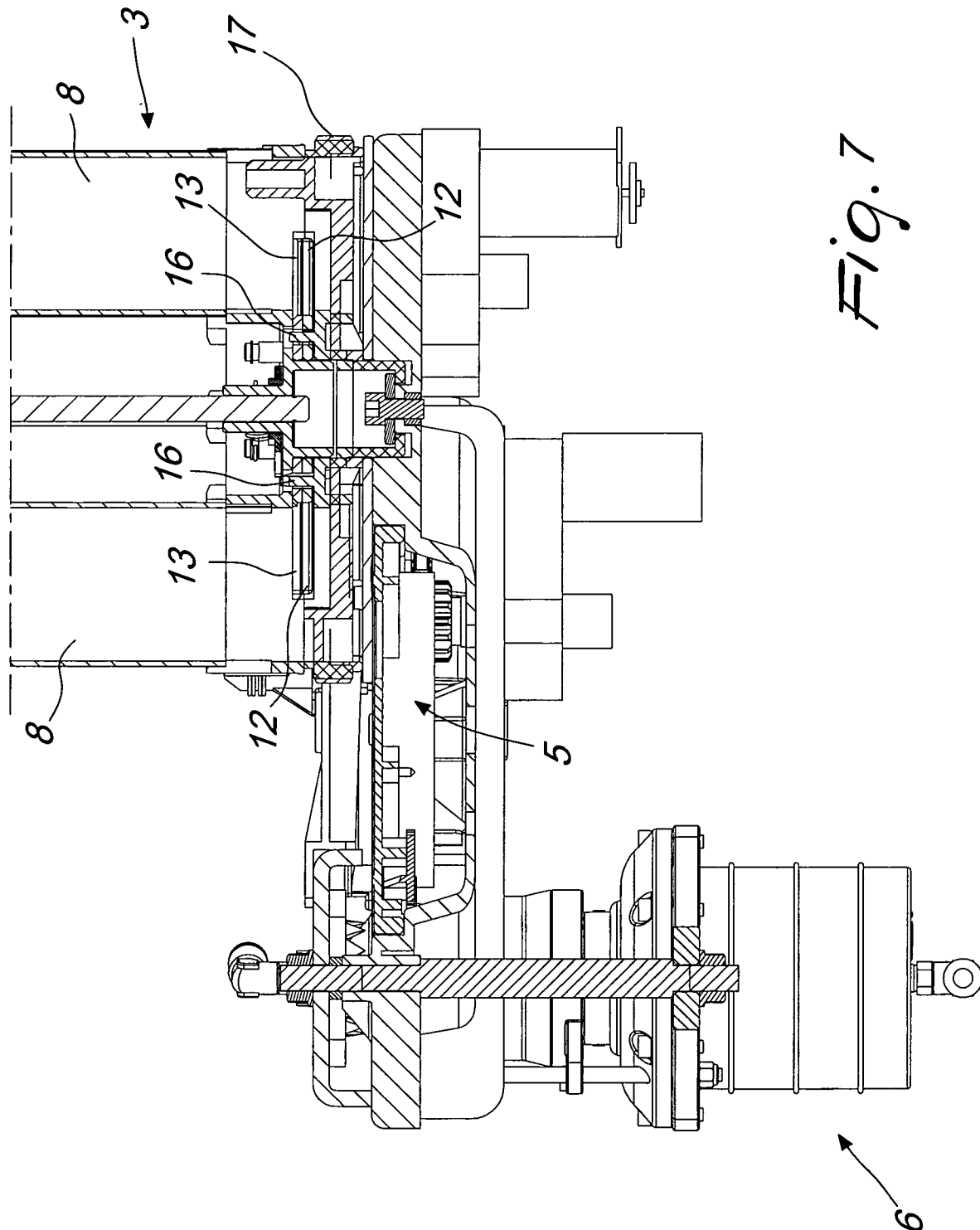
Fig. 2

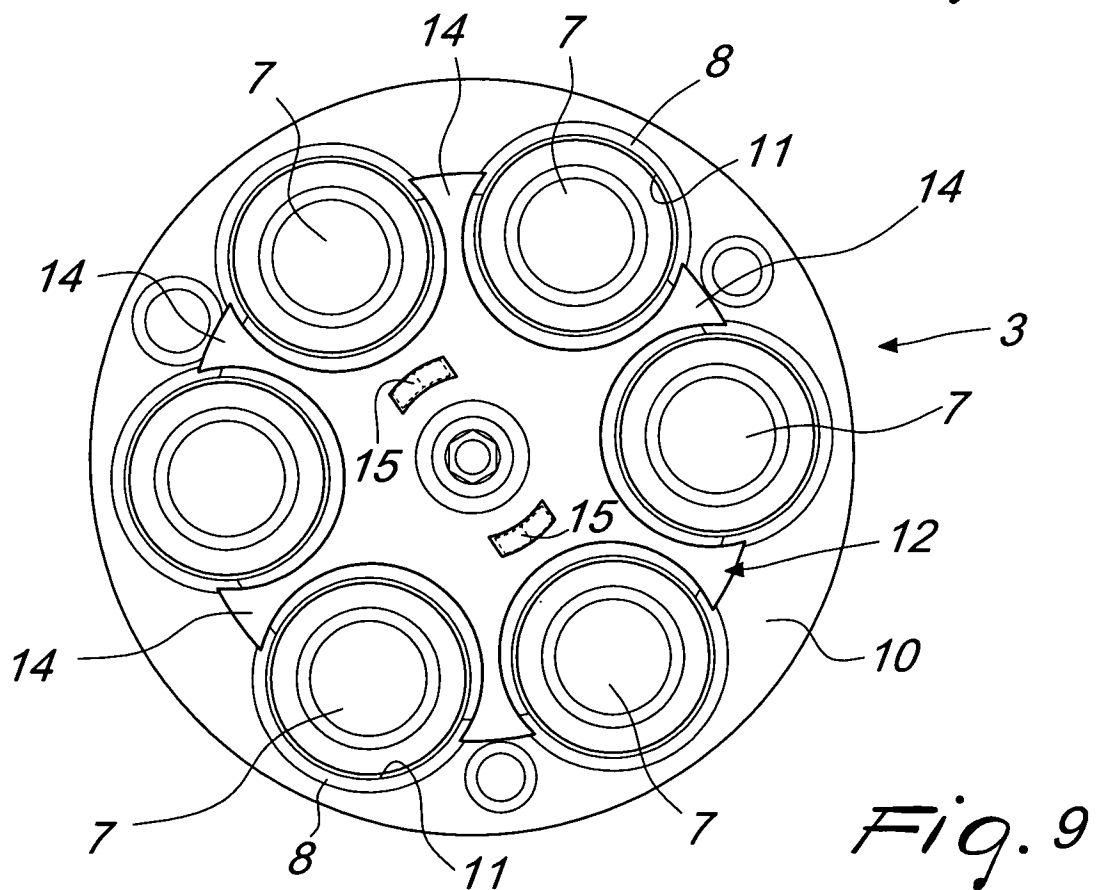
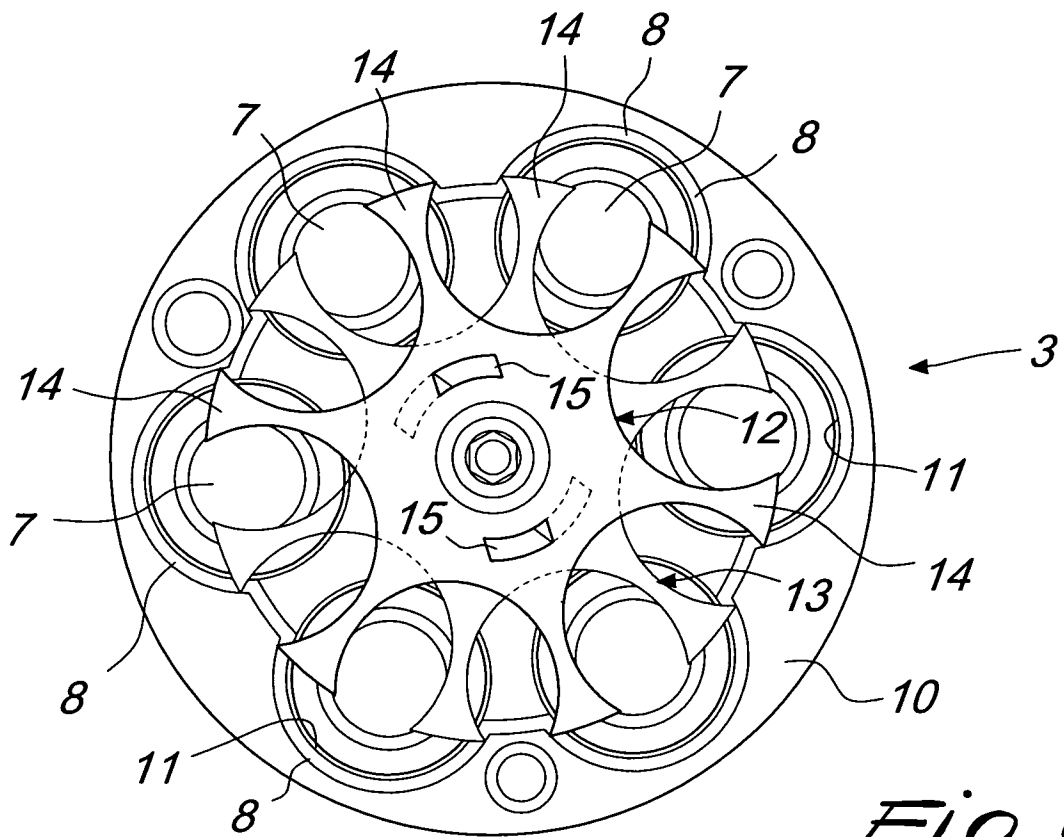












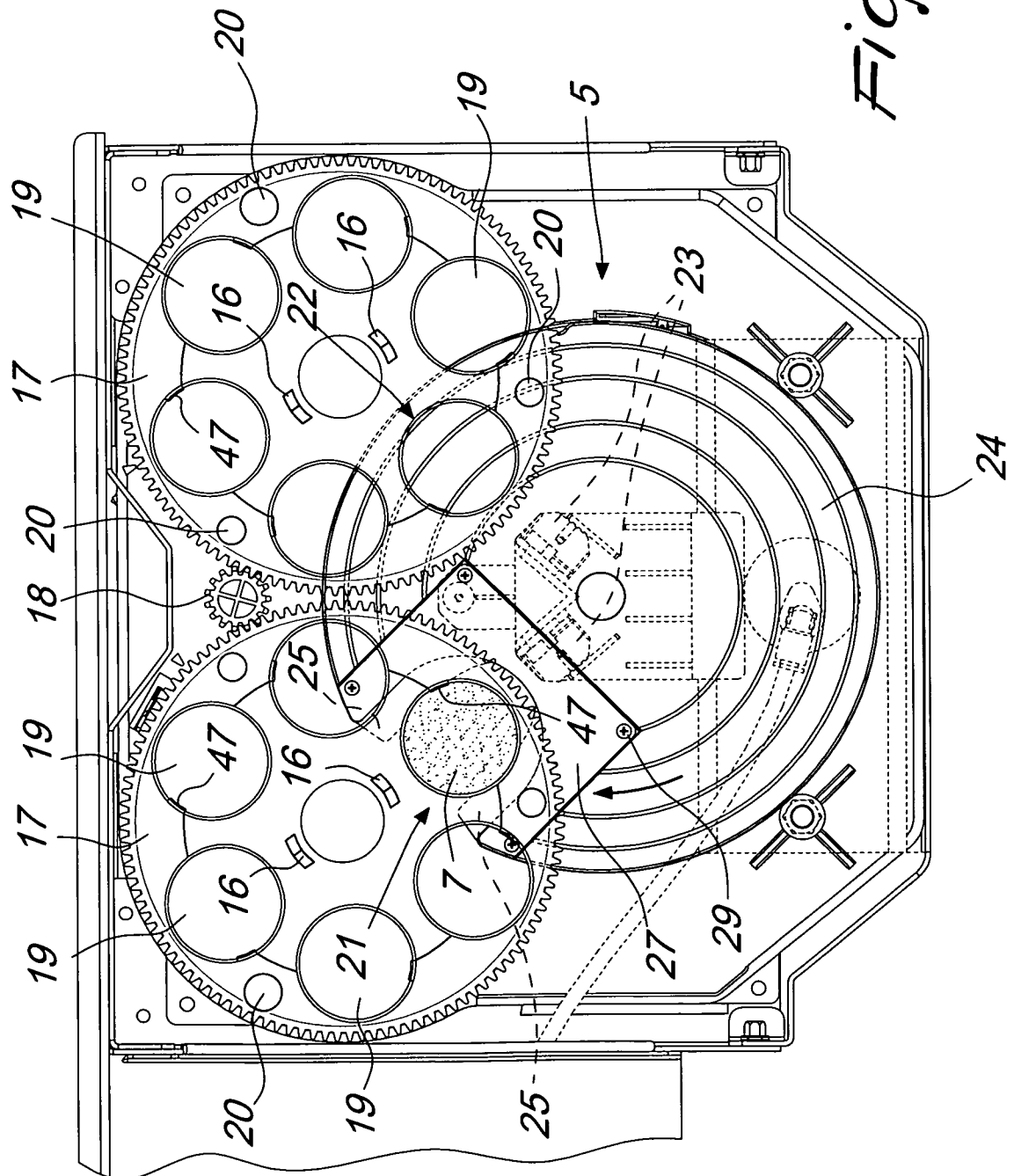


Fig. 10

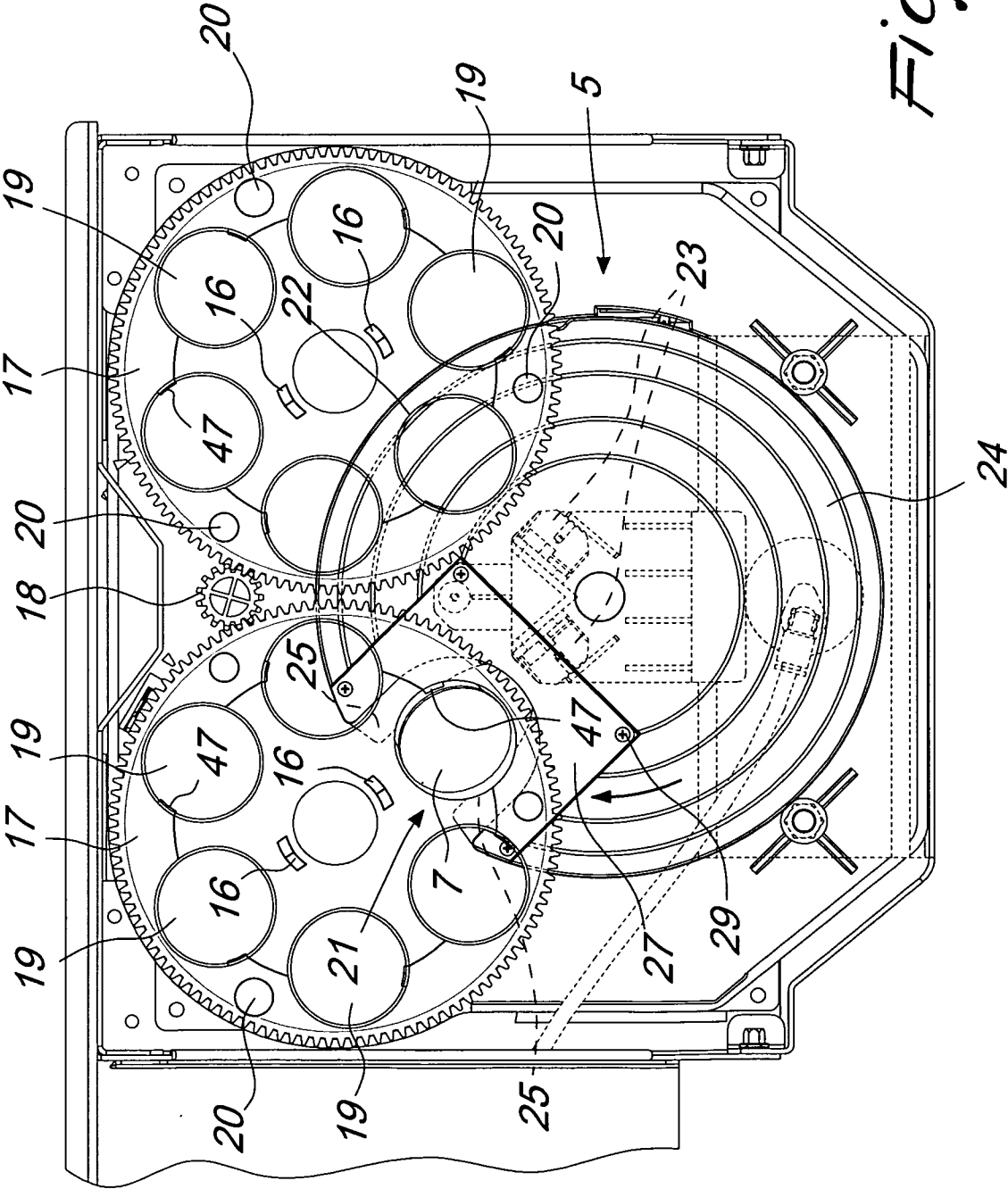


Fig. 11

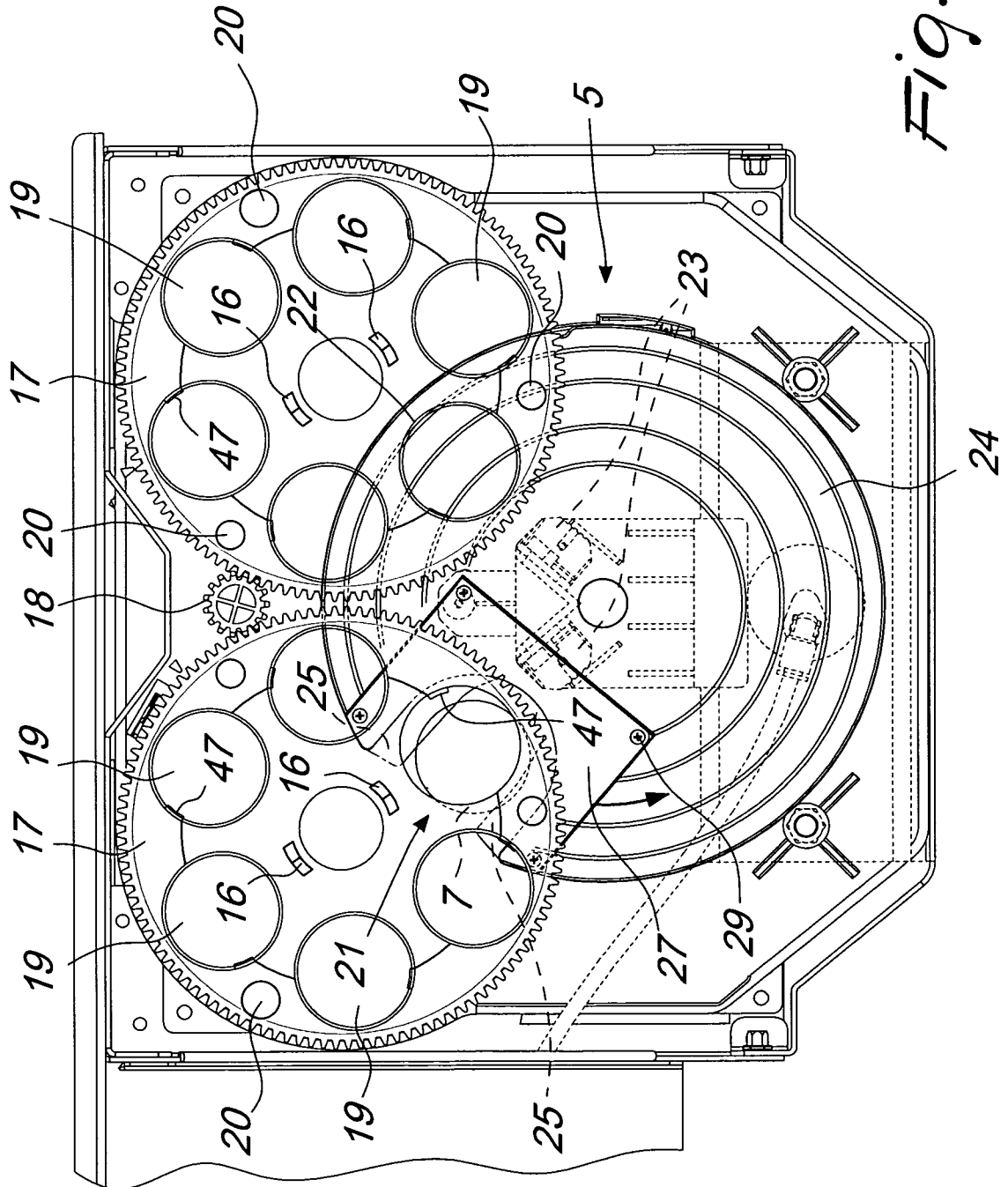


Fig. 12

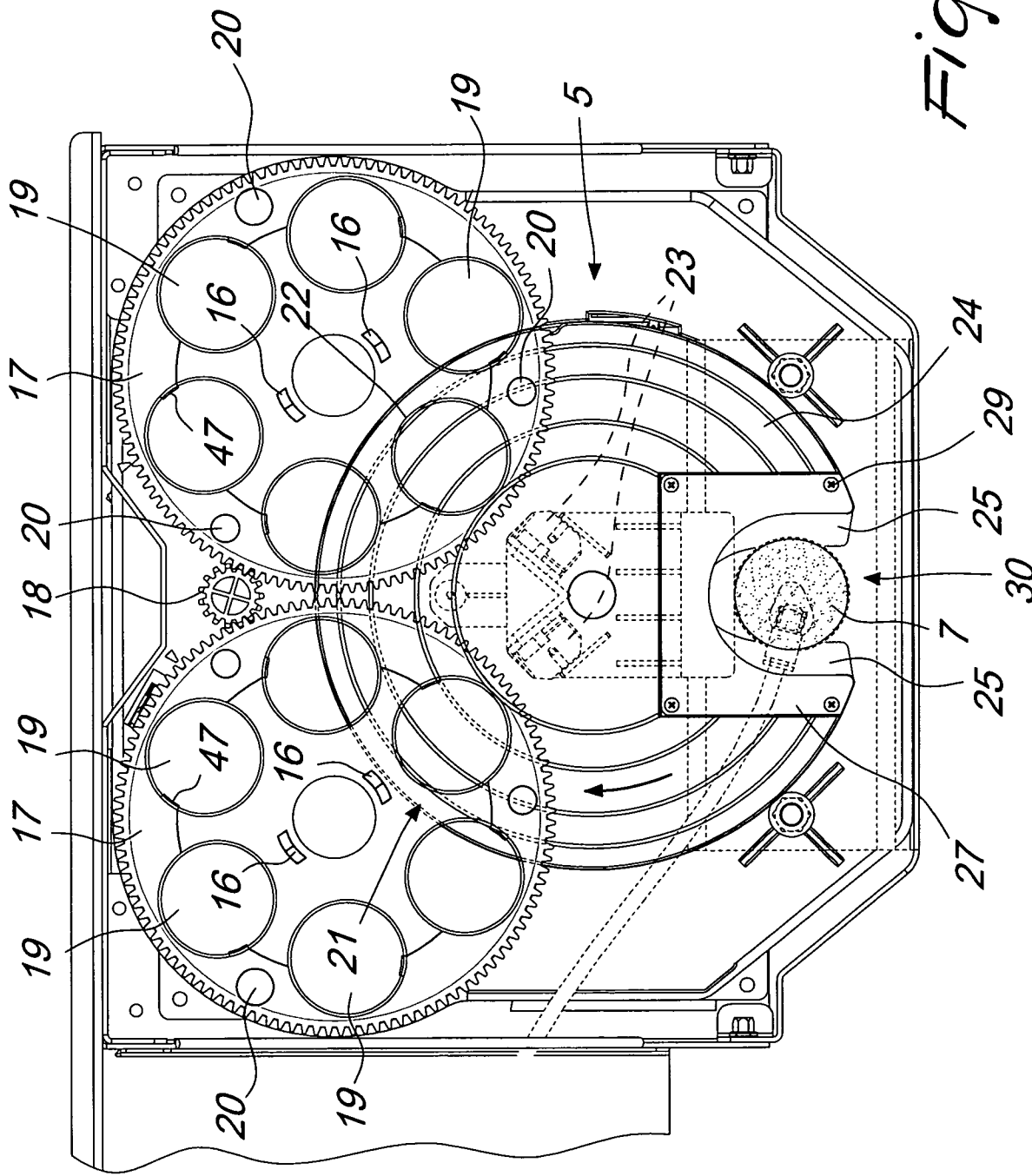


Fig. 13

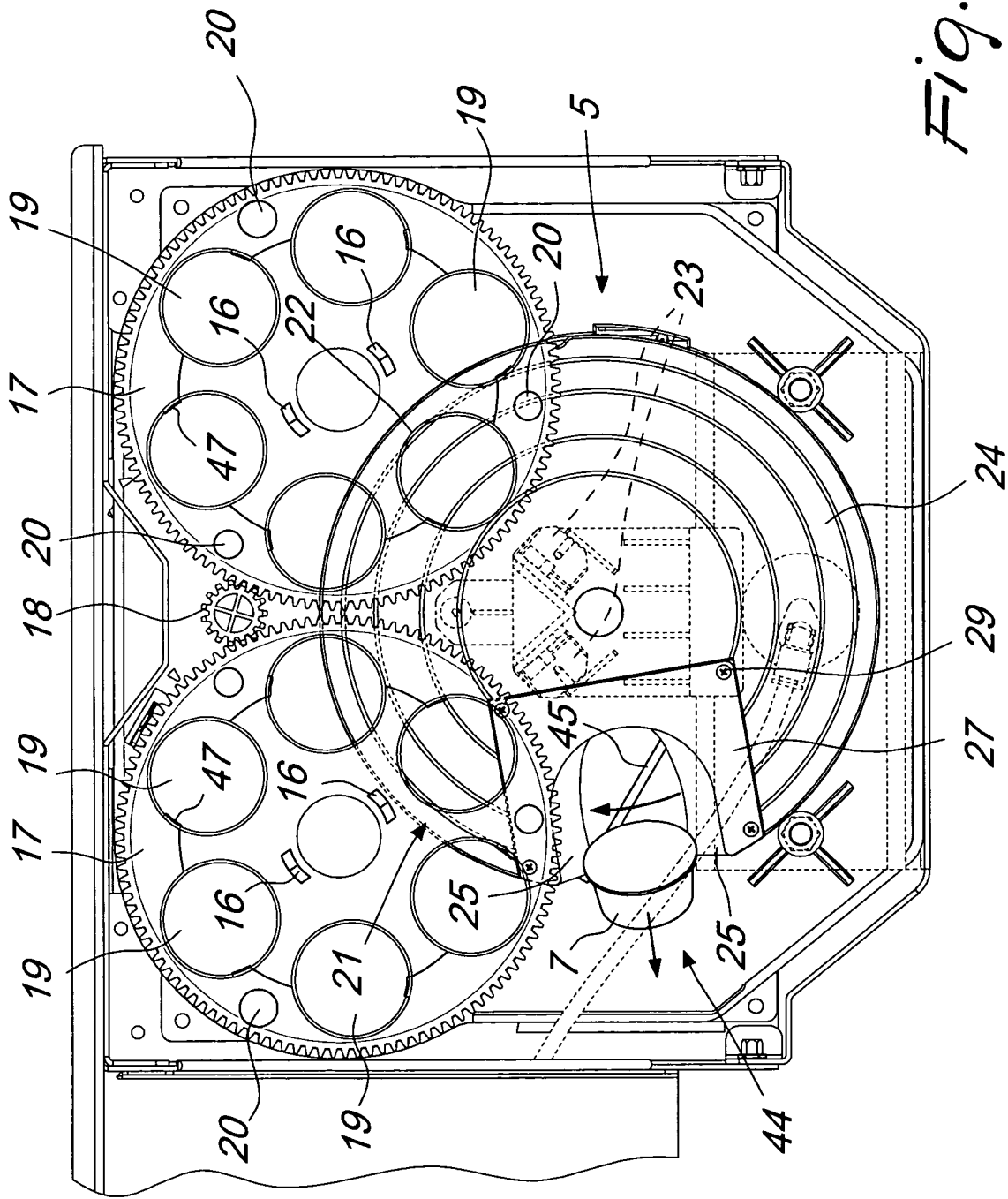


Fig. 14

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2008/001536

A. CLASSIFICATION OF SUBJECT MATTER

INV. A47J31/36

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47J

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 310 199 A (NESTLE SA [CH]) 14 May 2003 (2003-05-14)	1-3, 9, 10, 14-22, 25 23
Y	paragraphs [0022] - [0044]; figures	
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☒ Further documents are listed in the continuation of Box C.

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