(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 923 996 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
**09.11.2016 Bulletin 2016/45**

(51) Int Cl.:
***B67B 3/10*** *(2006.01)* ***B21D 51/32*** *(2006.01)*
***B65B 7/28*** *(2006.01)* ***B67B 3/26*** *(2006.01)*

(21) Application number: **15160412.1**

(22) Date of filing: **23.03.2015**

# (54) CRIMPING DEVICE FOR A MACHINE FOR CLOSING CONTAINERS

CRIMPVORRICHTUNG FÜR EINE MASCHINE ZUM VERSCHLIESSEN VON BEHÄLTERN

DISPOSITIF DE SERTISSAGE POUR UNE MACHINE DE FERMETURE DE RÉCIPIENTS

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

(30) Priority: **25.03.2014 IT BO20140159**

(43) Date of publication of application:
**30.09.2015 Bulletin 2015/40**

(73) Proprietor: **Romaco S.R.L.**
**40067 Pianoro Fraz. Rastignano (BO) (IT)**

(72) Inventor: **Bonarelli, Maurizio**
**40067 Pianoro (BO) (IT)**

(74) Representative: **Manzella & Associati**
**Via dell'Indipendenza, 13**
**40121 Bologna (IT)**

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## Description

### Technical Field

**[0001]** The present invention concerns a crimping device for use in a machine for closing containers of the type of bottles and the like.

### Background Art

**[0002]** It is currently known the use of machines that provide to automatically close bottles filled with a predetermined liquid product or powder, for example intended for use in the pharmaceutical field. In particular, it is widespread in the specific field the use of bottles hermetically closed by means of a cap of material such as silicon rubber on which a metal cap is applied, commonly known as ring nut, predisposed to ensure the seal of the closure until the bottle is opened. This cap or ring nut has an annular crown that is suitably marginally clamped on the neck of the bottle.

**[0003]** Production lines of the above mentioned bottle products therefore provide, downstream of the crimping station, a crimping machine which applies and clamps the above mentioned metal capsule on the neck of the bottle. Known crimping machines generally comprise a line for feeding the bottles to a crimping device comprising a turret rotatable about a vertical axis, peripherally bearing a plurality of support means for the bottles to be closed by means of a relative ring nut. During the feed step to the crimping turret, the bottles are provided with a respective closure cap.

**[0004]** At said support means of the bottles, the crimping turret respectively has a corresponding plurality of crimping heads, each carrying a crimping blade that is tilting between a disengagement position and a working position approached to the capsule. Handling means, which allow to drive in rotation the same bottles according to their own axis, are associated with the support means of the bottles. The axial rotation of the bottles ensures that the action of the crimping blade is exerted on the whole circumference of the capsule, to create the ring nut; in fact, the blade bends the rim of the cap against the lower surface of an annular projection of the neck of the bottles.

**[0005]** A crimping device of this type is illustrated for example in US 6,367,301 and in EP 2144841.

**[0006]** US 6,367,301 discloses a crimping device according to the preamble of claim 1 and a corresponding method.

**[0007]** A problem of the devices here considered is the control of preload pressure during the crimping step. On the capsules inserted on the bottles a suitable pressure is exerted, for example by pushing up the bottles against a fixed abutment or vice versa by pushing down on the relative capsule; in the second case, the support surface of the bottles has a fixed height. In this way, at the end of the crimping, a residual compression force between the ring nut and the bottle is created, thus ensuring the sealing achieved through the underlying rubber cap.

**[0008]** To control the crimping pressure, it has been known the use of sensor means predisposed to detect the force exerted on the ring nut of the bottles carried in rotation by the crimping turret. EP 2144841 discloses for example a control system of the crimping pressure that provides the use of a force transducer associated with a pressure member disposed in axis to each of the bottles carried in rotation by the crimping turret.

**[0009]** DE 4442035 discloses a device for the closure of bottles by crimping in which the bottles are held between a lower lift device and a centering head of the cap, coaxial therewith, movable in axial direction. The centering head and/or the lift device are submitted to a force that axially compresses the cap and the bottle against each other. The force with which the cap and the bottle are mutually axially compressed during the crimping is detected by a force sensor disposed above the centering head.

**[0010]** The crimping pressure measured in the known devices is subject to errors that cannot be foreseen, for example due to friction phenomena, jams, anomalous thrusts and the like. For example, the crimping blade may determine, in use, a thrust in vertical direction of not expected amount, which alters the value of the measured crimping force. Moreover, the feature of providing separate sensors for each bottle involves the need to individually calibrate these instruments, with an evident functional and constructive complication.

### Disclosure

**[0011]** The task of the present invention is that of solving the aforementioned problems, devising a device that allows to carry out in an optimal way the crimping of the containers in a machine for closing containers of the type of bottles and the like.

**[0012]** Within such task, it is a further scope of the invention to provide a crimping device that allows to exactly measure the pressure exerted through the ring nut.

**[0013]** Another scope of the invention is to provide a crimping device provided with great versatility, in particular being able to be used to crimp any kind of container fed in line.

**[0014]** Another scope of the invention is to provide a crimping device of simple constructive and functional conception, having surely reliable functioning, as well as relatively economic cost.

**[0015]** The cited scopes are reached, according to the present invention, by the crimping device for containers according to claim 1.

**[0016]** The crimping device comprises a plurality of abutment members predisposed to be upper abutments for the closure cap of the containers, carried in rotation according to their axis on respective support means associated with a turret rotatable according to a vertical axis, and means predisposed to transmit the clamping

force of said cap, detected by said abutment members, to transducer means for the measurement of the force, for the control of the crimping force.

**[0017]** The transducer means for the measurement of the crimping force are associated with a fixed structure of the machine.

**[0018]** Preferably, the crimping device comprises means predisposed to operate in axial direction said containers in support on said support means, to bring them in abutment against said abutment members with a prefixed clamping force of said cap.

**[0019]** Advantageously, said transducer means comprise a load cell that is arranged at the top of sustain means constrained to the fixed structure, in position substantially coaxial to said turret.

**[0020]** Preferably, said load cell is arranged at the upper part of said turret.

**[0021]** Advantageously, said means predisposed to transmit the clamping force of the cap comprise revolving means associated with said abutment members and predisposed to engage, in a measurement step, said transducer means.

**[0022]** Advantageously, said transducer means are associated with a radial element, which is inserted in a corresponding opening of an annular cam, integral with the fixed structure and coaxial to said turret, so as to restore the continuity of a surface of said annular cam, said revolving means being predisposed to engage in said measurement step said radial element.

**[0023]** Preferably, said abutment members comprise respectively an end element associated in interchangeable manner with an arm overhanging from a stem having vertical axis, driven in rotation by an upper drum of said turret, which is vertically mobile for the vertical adjustment of the same abutment members with respect to said bottles.

**[0024]** Preferably, said stem of the abutment members carries said revolving means, freely rotatable, predisposed to engage said transducer means.

**[0025]** Preferably, said stem of the abutment members bears further revolving means, freely rotatable, predisposed to engage a seat of a crown coaxially joined to said turret to ensure the alignment between said support means of the containers and the same abutment members.

**[0026]** Advantageously, said transducer means comprise a load cell, which has changeable angular position for adjusting the measuring point of said clamping force.

**[0027]** Advantageously, said crimping heads are associated with an intermediate drum of said turret having angular position adjustable with respect to the vertical axis of the same turret, for adjusting the approaching point of said crimping blade towards said closure cap.

**[0028]** Advantageously, said intermediate drum is vertically mobile so as to allow the vertical adjustment of said crimping blades with respect to said containers.

**[0029]** The present invention also concerns a crimping method which can be applied in a machine for closing containers, which provides to prearrange in succession the containers, provided with a closure cap, on respective support means; to operate in axial direction, upwards, said support means, for bringing said containers in abutment against respective abutment members predisposed to act as upper abutment for said closure cap for the containers, with a predetermined clamping force of said closure cap; to transmit said clamping force of said closure cap, detected by said abutment members, to said transducer means for measuring an applied force associated with a fixed structure.

Description of Drawings

**[0030]** Details of the invention shall be more apparent from the detailed description of a preferred embodiment of the crimping device in a machine for closing containers according to the invention, illustrated for indicative purpose in the attached drawings, wherein:

figure 1 shows a schematic plant view of a machine for closing containers provided with the crimping device according to the invention;
figure 2 shows a corresponding front view;
figures 3 and 4 show a schematic perspective view of the crimping device according to the invention from different viewpoints;
figure 5 shows a vertical cross-section view of a part of the crimping device;
figure 6 shows a detailed perspective view of the crimping device, partially in cross-section in order to show inner parts of the same device.

Best Mode

**[0031]** With particular reference to such figures, a crimping machine predisposed to carry out the closure of containers 2 of the type of the bottles with a cap or ring nut 3 has been indicated in its entirety with 1. The machine 1 is provided with the crimping device 20 according to the present invention; the crimping device 20 provides to fasten the closure cap 3 on the neck of the bottles 2 with a prefixed crimping force.

**[0032]** The machine 1 comprises a feed line 4 for the containers 2, made up of, for example, a conveyor belt. At the exit zone from the feed line 4, a separation device 5, made up, for example, of a screw element operated in rotation according to an axis parallel to the same feed line 4, spaces the containers 2 one another in regular manner. The containers 2, so spaced, are inserted in suitable seats of an inlet star-shaped distributor 6, rotatable according to a vertical axis to bring the same containers 2 to the crimping device 20. During the transfer step to the crimping device, the containers 2 are provided with a respective closure cap 3, in known manner, through a supply member 7 fed by a vibrating container 8.

**[0033]** At the end of the crimping step, the closed containers 2 are transferred in order to the corresponding

seats of an outlet star-shaped distributor 9, rotatable according to a vertical axis to bring the same containers 2 to an exit line 10, made up, for example, of a conveyor belt. The passage of the containers 2 to the exit line 10 is possibly carried out by a second screw element 11 operated in rotation according to an axis parallel to the same exit line 10.

**[0034]** Preferably, the crimping machine is provided at its entry with a first waste device 12 for the containers 2 and at its exit with a second waste device 13 for the containers. The waste devices 12, 13 are made up of respective star-shaped distribution members, which are predisposed to convey the wasted containers to relative waste paths 14, 15. The passage of the wasted containers from the inlet distributor 6 to the entry waste device 12 and from the outlet distributor 9 to the exit waste device 15 is operated by the commutation of selection means with void connected with the above mentioned seats of the distribution members.

**[0035]** The crimping device 20 comprises a turret 21 rotatable according to an axis vertical with respect to the fixed structure 16 of the machine. The turret 21 peripherally carries a plurality of support means 22 for the containers 2, respectively made up of plates carried by a lower drum 23 of the same turret 21; the drum 23 is fixed to the motor shaft 24 of the turret 21. The plates 22 are predisposed to be operated in rotation according to their own axis, with respect to the lower drum 23 of the turret 21, by respective operation means known per se. The plates 22 are as well predisposed to be operated in axial direction by respective operation means, not represented, to bring the containers 2 in abutment against corresponding abutment members 25 with a prefixed clamping force. More precisely, the abutment members 25 are predisposed to act as upper abutment for the closure cap 3 of the containers 2.

**[0036]** The abutment members 25 comprise respectively an end element 26 associated with an arm 27 overhanging from a stem 28 having vertical axis (see in particular figure 5); the end element 26 is interchangeable according to the size of the cap 3 of the containers 2. The stem 28 is driven in rotation by an upper drum 29 of the turret 21, integral with the rotation of the motor shaft 24. In particular, the upper drum 29 is vertically mobile with respect to the motor shaft 24 of the turret 21 to allow the vertical adjustment of the abutment member 25 with respect to the container 2.

**[0037]** Moreover, the crimping device 20 comprises a plurality of crimping heads 30 carried by the turret 21 respectively at said support means 22. The crimping heads 30 respectively comprise a crimping blade 31, having circular shape, which is carried in rotatable manner according to a vertical axis by a rod 32 overhanging from a relative vertical stem 33. The crimping blade 31 is tilting, by means of an angular rotation of the stem 33, between a disengagement position and a working position, approached to the cap 3 of the relative container 2. The stem 33 is operated in rotation by an intermediate drum 34 of the turret 21, integral with the rotation of the motor shaft 24. As a matter of facts, the intermediate drum 34 has an angular position $\alpha$ adjustable with respect to the motor shaft 24 of the turret 21, so as to adjust the rapprochement point of the forward stroke of the blade 31 towards the cap 3, the largeness of the movement being fixed. Moreover, the intermediate drum 34 is mobile vertically with respect to the motor shaft 24 of the turret 21 to allow the vertical adjustment of the crimping blade 31 with respect to the container 2.

**[0038]** According to the present invention, the crimping device 20 comprises transducer means 40 of measurement of an applied force, which are predisposed to carry out the control of the crimping force, detected by the abutment members 25. The transducer means 40 comprise a load cell 41, which is associated with the fixed framework 16 of the machine. More in particular, the load cell 41 is mounted at the top of a column 42 arranged coaxially inside the motor shaft 24 of the turret 21 and inferiorly fixed to the fixed framework 16 of the machine; the motor shaft 24 of the turret 21 has for this purpose a tubular shape.

**[0039]** A radial tooth 43 is associated with the load cell 41, the radial tooth 43 being inserted in a corresponding opening of an annular cam 44, the annular cam 44 being constrained to the fixed framework 16 of the machine. Therefore, the tooth 43 is predisposed to restore the continuity of the upper surface of the annular cam 44, arranged on a horizontal plane and coaxial to the vertical axis of the turret 21.

**[0040]** The annular cam 44 is engaged by a roller 35 carried, freely rotatable, by each stem 28 of the abutment members 25, on a respective pin 36, according to an axis radial to the same stem 28. As it is stated in the following, the roller 35 is predisposed to transmit to the load cell 41 the tightening force of the cap 3 detected by the abutment members 25, to control the crimping force.

**[0041]** On each stem 28 of the abutment members 25, a further roller 38 having axis radial to the same stem 28 is also carried rotatable on a respective pin 37. The further roller 38 engages a corresponding seat shaped by a crown 39 which is coaxially joined to the upper drum 29, to ensure the alignment of the arm 27 and consequently of the end element 26 of the abutment members 25 with the corresponding support plate 22 of the bottles 2. It is to be observed that the crown 39 does not prevent the displacement in vertical direction of the stem 28.

**[0042]** The functioning of the crimping apparatus for the containers according to the invention is described in the following.

**[0043]** The bottles 2, provided with a respective closure cap 3, are fed in succession from the inlet distributor 6 onto plates 22 that support the bottles 2 on the turret 21 of the crimping device. The turret 21 is rotatable according to an axis vertical with respect to the fixed framework 16 of the machine, to bring the same bottles 2 to the outlet distributor 9.

**[0044]** The bottles 2 arranged in support on the plates

22 are driven in rotation according to their own axis, by effect of the rotation imposed to the same plates 22 by the respective operation means. The plates 22 are also operated in axial direction to bring the bottles 2 with their respective closure cap 3 in abutment against the corresponding upper abutment means 25.

**[0045]** It is to be observed that the axial thrust given by the plates 22 to the bottles 2 allows to bring the same bottles in abutment against respective abutment members 25 with a prefixed tightening force F, so as to give the caps 3 a suitable preload pressure during the crimping step.

**[0046]** The stem 33 of each crimping head 30 is operated in angular rotation to bring the crimping blade 31 in the working position approached to the cap 3. The axial rotation of the bottles 2 causes the crimping blade 31 to bend the rim of the cap 3 against the lower surface of the annular projection shaped by the neck of the bottles 2, along the whole circumference of the same cap 3, so as to create the ring nut.

**[0047]** To control the crimping force, that is the preload pressure exerted on the cap 3 during the crimping step, according to the present invention, the device provides to transmit the clamping force detected by the end element 26 of the abutment members 25 to the overhanging, freely rotatable, roller 35 of the corresponding stem 28. The roller 35 moves on the annular path shaped by the cam 44, coaxial to the turret 21 but integral with the fixed structure 16 of the machine. When the roller 35 engages the radial tooth 43, inserted in a corresponding opening of the annular cam 44, the load cell 41 measures the applied force.

**[0048]** Suitably, the measurement point of the crimping force is adjusted so as to detect the tightening force after the plates 22 have completed the vertical compression stroke of the containers 2, that is when such force has reached the working value, but before the crimping head 30 is operated in angular rotation to bring the crimping blade 31 in the working position. In such way, the measurement performed by the load cell 41 is not affected by the disturbances caused by the components of the forces that arise during the crimping step. It is to be observed that the stem 28 of the contrast means 25, which carries the roller 35, is held in its position by a plurality of revolving contacts, which have a limited starting friction and consequently do not affect in significant manner the measurement.

**[0049]** More in particular, the cited measurement point of the clamping force is adjustable by suitably varying the angular position $\beta$ of the load cell 41 with respect to the turret 21 (see fig 6).

**[0050]** At the end of the crimping step, a residual compression force is created between the cap 3 and the bottle 2, which ensures the sealing closure through the underlying rubber cap.

**[0051]** The device according to the invention reaches therefore the scope of performing in an optimal way the crimping of containers such as bottles for medical use and the like. In particular, the crimping device according to the invention allows to measure exactly the pressure exerted trough the ring nut, so as to make safe the sealing closure of the bottles.

**[0052]** In fact, the disclosed apparatus allows to exactly carry out the measurement of the force which has crossed the bottle, the cap and the ring nut, such force being detected on the upper abutment members and transmitted by them to the load cell.

**[0053]** A feature of the invention is to carry out the measurement of the crimping force through the passage of suitable detection members of such force on a single load cell fixed to the structure of the machine and arranged at the upper zone of the turret carrying the bottles. In particular, the displacement of the load cell at the top of a column arranged coaxial inside a tubular shaft for the handling of the turret allows to ease the insertion of electrical cables linking the electrical control means.

**[0054]** In practice, the embodiment of the invention, the materials used, as well as the shape and dimensions, may vary depending on the requirements.

**[0055]** Should the technical characteristics mentioned in each claim be followed by reference signs, such reference signs were included strictly with the aim of enhancing the understanding the claims and hence they shall not be deemed restrictive in any manner whatsoever on the scope of each element identified for exemplifying purposes by such reference signs.

## Claims

1. Crimping device for a machine for closing containers, comprising a turret (21) rotatable about a vertical axis peripherally bearing a plurality of support means (22) for containers (2) provided with a closure cap (3); handling means for said support means (22) for driving in rotation said containers (2) according to their axis; a corresponding plurality of crimping heads (30) carried by said turret (21) respectively at said support means (22) and each bearing a crimping blade (31) which is tilting between a disengaged position and a working position adjacent to said closure cap (3); a plurality of abutment members (25) carried by said turret (21), predisposed to act as an upper abutment for said closure cap (3) for the containers (2); **characterised by** means predisposed to operate in axial direction said containers (2) in support on said container support means (22), for bringing them in abutment against said abutment members (25) with a predetermined force (F) for clamping said closure cap (3); transducer means (40) for measuring an applied force associated with a structure (16) fixed with respect to said turret (21), means (35) predisposed to transmit the clamping force (F) of said closure cap (3) detected by said abutment members (25) to said transducer means (40), for controlling the crimping force; said transducer means (40) comprising a load

cell (41) which is arranged at the top of support means (42) integral with said fixed structure (16), in a position substantially coaxial to said turret (21).

2. Device according to claim 1, **characterized in that** said load cell (41) is arranged at the upper part of the said turret (21).

3. Device according to claim 1 or 2, **characterized in that** said means (35) predisposed to transmit the clamping force of said cap (3) comprise revolving means (35) associated with said abutment members (25) and predisposed to engage, in a measuring step, said transducer means (40).

4. Device according to claim 3, **characterized in that** said transducer means (40) are associated with a radial element (43) which is inserted in a corresponding opening of an annular cam (44), integral with said fixed structure (16) and coaxial to said turret (21), so as to restore the continuity of a surface of said annular cam (44), said revolving means (35) being predisposed to engage in said measuring step said radial element (43).

5. Device according to one of the preceding claims, **characterized in that** said abutment members (25) respectively comprise an end element (26) associated in interchangeable manner with an arm (27) overhanging from a stem (28) having vertical axis, driven in rotation by an upper drum (29) of said turret (21), which is vertically mobile for the vertical adjustment of the same abutment members (25) with respect to the containers (2).

6. Device according to claims 4 and 5, **characterized in that** said stem (28) of the abutment members (25) bears, freely rotatable, said revolving means (35) predisposed to engage said transducer means (40) and further revolving means (38) predisposed to engage a seat of a crown (39) coaxially fixed to said turret (21) to ensure the alignment between said support means (22) for the containers (2) and the same abutment members (25).

7. Device according to one of the preceding claims, **characterized in that** said transducer means (40) comprise a load cell (41) which has variable angular position ($\beta$) for adjusting the measuring point of said clamping force (F).

8. Device according to one of the preceding claims, **characterized in that** said crimping heads (33) are associated with an intermediate drum (34) of said turret (21) having angular position ($\alpha$) adjustable with respect to the vertical axis of the same turret (21), for adjusting the approaching point of said crimping blade (31) towards said closure cap (3).

9. Device according to claim 8, **characterized in that** said intermediate drum (34) is vertically mobile so as to allow the vertical adjustment of said crimping blades (31) with respect to said containers (2).

10. Crimping method for a machine for closing containers, **characterized in that** it provides the steps of:

    a. prearranging in succession the containers (2) provided with a closure cap (3) on respective support means (22) carried peripherally by a turret (21) rotatable according to a vertical axis;
    b. operating in axial direction, upwards, said support means (22), for bringing said containers (2) in abutment with respective abutment members (25) predisposed to act as upper abutment for said closure cap (3) of the containers (2), with a predetermined force (F) for clamping said closure cap (3);
    c. transmitting said clamping force (F) of said closure cap (3), detected by said abutment members (25), to transducer means (40) comprising a load cell (41) arranged at the top of support means (42) fixed to a fixed structure (16), in a position substantially coaxial to said turret (21).

11. Method according to claim 10, **characterized in that** said clamping force (F) is predisposed to provide said cap (3) a preload pressure during the crimping step.

12. Method according to claim 10 or 11, characterized on that it provides to detect said clamping force (F) when said support means (22) have completed the vertical stroke of compression of said containers (2), that is when such force has reached the working value, but before starting said crimping step.

**Patentansprüche**

1. Crimpvorrichtung in einer Maschine zum Verschließen von Behältern, die Folgendes umfasst: ein Karussell (21), das um eine vertikale Achse gedreht werden kann, die peripherisch eine Mehrzahl an Stützmitteln (22) der mit einer Verschlusskapsel (3) ausgestatteten Behälter (2) trägt; Beförderungsmittel der genannten Stützmittel (22), um genannte Behälter (2) um ihre Achse zur Drehung zu bringen; eine entsprechende Mehrzahl an Crimpköpfen (30), die auf genanntem Karussell (21) jeweils auf die genannten Stützmittel (22) angebracht und jeweils mit einer Crimpklinge (31) versehen sind, die zwischen einer ausgerasteten Position und einer an genannte Kapsel (3) angenäherten Arbeitsposition schwenkt; eine Mehrzahl an von genanntem Karussell (21) getragenen Kontrastelementen (25), die geeignet sind,

als oberer Anschlag für genannte Verschlusskapsel (3) der Behälter (2) zu dienen; **dadurch gekennzeichnet dass**, sie Mittel umfasst, die geeignet sind, genannte auf die genannten Stützmittel (22) gestützten Behälter (2) in axialer Richtung zu betätigen, um sie mit einer vorbestimmten Spannkraft (F) genannter Kapsel (3) bis zum Anschlag an die genannten Kontrastelemente (25) zu bringen; Wandlermittel (40) zur Messung einer angewandten Kraft, die mit einer zu genanntem Karussell (21) fixen Struktur (16) verbunden sind; Mittel (35), die geeignet sind, die von genannten Kontrastelementen (25) erfasste Spannkraft (F) genannter Kapsel (3) zur Kontrolle der Crimpkraft an genannte Wandlermittel (40) zu übertragen; wobei die genannte Wandlermittel (40) eine Ladezelle (41) umfassen, die an der Spitze genannter einteilig mit genannter fixer Struktur (16) verbundenen Auflagemittel (42) in einer im Wesentlichen zum genanntem Karussell (21) koaxialen Position angeordnet ist.

**2.** Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** genannte Ladezelle (41) auf das Oberteil des genannten Karussells (21) angeordnet ist.

**3.** Vorrichtung nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** genannte für die Übertragung der Spannkraft der genannten Kapsel (3) geeignete Mittel (35) Drehmittel (35) umfassen, die mit genannten Kontrastelementen (25) verbunden und geeignet sind, in einer Messphase die genannten Wandlermittel (40) anzugreifen.

**4.** Vorrichtung nach Anspruch 3, **dadurch gekennzeichnet, dass** genannte Wandlermittel (40) mit einem radialen Element (43) verbunden sind, das in eine entsprechende Öffnung einer ringförmigen Nocke (44) eingefügt ist, einteilig mit genannter fixer Struktur (16) und koaxial zu genanntem Karussell (21), sodass die Kontinuität einer Oberfläche der genannten ringförmigen Nocke (44) wiederhergestellt wird, wobei genannte Drehmittel (35) geeignet sind, in genannter Messphase das genannte radiale Element (43) anzugreifen.

**5.** Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** genannte Kontrastelemente (25) jeweils ein Endglied (26) umfassen, das auf austauschbare Weise mit einem von einem Ständer (28) vorspringenden Arm (27) mit einer vertikalen Achse verbunden ist, die von einer oberen Trommel (29) des genannten Karussells (21) in Drehung gebracht wird, die für die vertikale Regulierung der gleichen Kontrastelemente (25) zu genanntem Behälter (2) vertikal beweglich ist.

**6.** Vorrichtung nach Ansprüche 4 und 5, **dadurch gekennzeichnet, dass** genannter Ständer (28) der Kontrastelemente (25) frei drehbar genannte Drehmittel (35) trägt, die geeignet sind, die genannten Wandlermittel (40) und weitere Drehmittel (38) anzugreifen, die geeignet sind, einen Sitz einer koaxial einteilig mit genanntem Karussell (21) verbundenen Krone anzugreifen, um die Ausrichtung zwischen den genannten Stützmitteln (22) der Behälter (2) und den Kontrastelementen (25) zu garantieren.

**7.** Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** genannte Wandlermittel (40) eine Ladezelle (41) umfassen, die eine veränderliche Winkelposition ($\beta$) hat, um die Messstelle der genannten Spannkraft (F) zu regeln.

**8.** Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** genannte Crimpfköpfe (33) mit einer Zwischentrommel (34) des genannten Karussells (21) verbunden sind, deren Winkelposition ($\alpha$) zur vertikale Achse dieses Karussells (21) verstellbar ist, um den Annährungspunkt genannter Crimpklinge (31) an genannte Kapsel (3) zu regeln.

**9.** Vorrichtung nach Anspruch 8, **dadurch gekennzeichnet, dass** genannte Zwischentrommel (34) vertikal beweglich ist, sodass die vertikale Regulierung genannter Crimpklingen (31) zu den genannten Behältern (2) ermöglicht wird.

**10.** Crimpverfahren in einer Maschine zum Verschließen von Behältern, **dadurch gekennzeichnet, dass** folgende Schritte vorgesehen sind:

a. die mit einer Verschlusskapsel (3) versehenen Behälter (2) nacheinander auf jeweiligen Stützmitteln (22) anzuordnen, die peripherisch von einem um eine vertikale Achse drehbaren Karussell (21) getragen werden;
b. genannte Stützmittel (22) in axialer Richtung nach oben zu betätigen, um genannte Behälter (2) mit einer vorbestimmten Spannkraft (F) der Kapsel (3) bis zum Anschlag an die jeweiligen Kontrastelemente (25) zu bringen, die geeignet sind, genannter Verschlusskapsel (3) der Behälter (2) als oberer Anschlag zu dienen;
c. genannte von den genannten Kontrastelementen (25) erfasste Spannkraft (F) der genannten Kapsel (3) an Wandlermittel (40), die eine Ladezelle (41) umfassen, die an der Spitze genannter einteilig mit genannter fixer Struktur (16) verbundenen Auflagemittel (42) in einer im Wesentlichen zum genanntem Karussell (21) koaxialen Position angeordnet ist, zu übertragen.

**11.** Verfahren nach Anspruch 10, **dadurch gekenn-**

**zeichnet, dass** genannte Spannkraft (F) geeignet ist, während einer Crimpphase einen Vorladedruck auf genannte Kapsel (3) zu liefern.

**12.** Verfahren nach Anspruch 10 oder 11, **dadurch gekennzeichnet, dass** vorgesehen ist, dass genannte Spannkraft (F) gemessen wird, wenn die genannten Stützmittel (22) den Vertikalhub zur Pressung der genannten Behälter (2) abgeschlossen haben, das heißt, nachdem diese Kraft den Betriebswert erreicht hat, aber vor Beginn der genannten Crimpphase.

**Revendications**

**1.** Dispositif de sertissage pour une machine de fermeture de récipients, comprenant un carrousel (21) tournant sur un axe vertical portant de façon périphérique plusieurs moyens de support (22) des récipients (2) munis d'une capsule de fermeture (3) ; des moyens de manutention desdits moyens de support (22) pour mettre en rotation lesdits récipients (2) selon leur axe ; une correspondante pluralité de têtes de sertissage (30) soutenues par ledit carrousel (21) au niveau respectivement desdits moyens de support (22) et portant chacune une lame de sertissage (31) qui est oscillante entre une position de dégagement et une position de travail située à proximité de ladite capsule (3) ; une pluralité d'organes de contraste (25) soutenus par ledit carrousel (21), aptes à faire fonction de butée supérieure de ladite capsule de fermeture (3) des récipients (2) ; **caractérisé en ce qu'**il comprend des moyens aptes à actionner en direction axiale lesdits récipients (2), en appui sur lesdits moyens de support (22), pour les porter en butée desdits organes de contraste (25) avec une force (F) de serrage préfixée de ladite capsule (3) ; des moyens transducteurs (40) de mesure d'une force appliquée associés à une structure fixe (16) par rapport audit carrousel (21) ; des moyens (35) aptes à transmettre la force de serrage (F) de ladite capsule (3) relevée par lesdits organes de contraste (25) auxdits moyens transducteurs (40), pour le contrôle de la force de sertissage ; lesdits moyens transducteurs (40) comprenant une cellule de chargement (41) qui est disposée au sommet des moyens de soutien (42) solidaires à ladite structure fixe (16), en position sensiblement coaxiale audit carrousel (21).

**2.** Dispositif selon la revendication 1, **caractérisé en ce que** ladite cellule de chargement (41) est disposée au niveau de la partie supérieure dudit carrousel (21).

**3.** Dispositif selon la revendication 1 ou 2, **caractérisé en ce que** lesdits moyens (35) aptes à transmettre la force de serrage de ladite capsule (3) comprennent des moyens à roulement (35) associés auxdits organes de contraste (25) et aptes à engager, pendant une phase de mesure, lesdits moyens transducteurs (40).

**4.** Dispositif selon la revendication 3, **caractérisé en ce que** lesdits moyens transducteurs (40) sont associés à un élément radial (43) qui est inséré dans une correspondante ouverture d'une came annulaire (44), solidaire à ladite structure fixe (16) et coaxiale audit carrousel (21), de façon à rétablir la continuité d'une surface de ladite came annulaire (44), lesdits moyens à roulement (35) étant aptes à engager dans ladite phase de mesure ledit élément radial (43).

**5.** Dispositif selon l'une des revendications précédentes, **caractérisé en ce que** lesdits organes de contraste (25) comprennent respectivement un élément terminal (26) associé de façon interchangeable à un bras (27) saillant en porte-à-faux d'une tige (28) ayant un axe vertical, porté en rotation par un tambour supérieur (29) dudit carrousel (21) qui est mobile verticalement pour le réglage vertical de ces mêmes organes de contraste (25) par rapport auxdits récipients (2).

**6.** Dispositif selon les revendications 4 et 5, **caractérisé en ce que** ladite tige (28) des organes de contraste (25) soutient librement tournants lesdits moyens à roulement (35) aptes à engager lesdits moyens transducteurs (40) et d'autres moyens à roulement (38) aptes à engager un siège d'une couronne (39) coaxialement solidaire audit carrousel (21) pour garantir l'alignement entre lesdits moyens de support (22) des récipients (2) et ces mêmes organes de contraste (25).

**7.** Dispositif selon l'une des revendications précédentes, **caractérisé en ce que** lesdits moyens transducteurs (40) comprennent une cellule de chargement (41) ayant une position angulaire ($\beta$) variable pour régler le point de mesure de ladite force de serrage (F).

**8.** Dispositif selon l'une des revendications précédentes, **caractérisé en ce que** lesdites têtes de sertissage (33) sont associées à un tambour intermédiaire (34) dudit carrousel (21) ayant une position angulaire ($\alpha$) réglable par rapport à l'axe vertical du carrousel lui-même (21), pour régler le point d'approche de ladite lame de sertissage (31) à ladite capsule (3).

**9.** Dispositif selon la revendication 8, **caractérisé en ce que** ledit tambour intermédiaire (34) est mobile à la verticale de façon à permettre le réglage vertical desdites lames de sertissage (31) par rapport auxdits récipients (2).

**10.** Méthode de sertissage pour une machine de fermeture de récipients, **caractérisée en ce qu'**elle prévoit de :

a. prédisposer en succession les récipients (2) munis d'une capsule de fermeture (3) sur les moyens de support (22) respectifs, portés de façon périphérique par un carrousel (21) pivotant sur un axe vertical ;
b. actionner en direction axiale, vers le haut, lesdits moyens de support (22), pour porter lesdits récipients (2) en butée des organes de contraste (25) respectifs, aptes à faire fonction de butée supérieure de ladite capsule de fermeture (3) des récipients (2), avec une force (F) de serrage préfixé de cette même capsule (3) ;
c. transmettre ladite force de serrage (F) de ladite capsule (3), relevée par lesdits organes de contraste (25), aux moyens transducteurs (40) comprenant une cellule de chargement (41) disposée au sommet des moyens de soutien (42) solidaires à une structure fixe (16), en position sensiblement coaxiale audit carrousel (21).

**11.** Méthode selon la revendication 10, **caractérisée en ce que** ladite force de serrage (F) est apte à fournir une pression de précharge sur ladite capsule (3) pendant une phase de sertissage.

**12.** Méthode selon la revendication 10 ou 11, **caractérisée en ce qu'**elle prévoit de relever ladite force de serrage (F) quand lesdits moyens de support (22) ont complété la course verticale de compression desdits récipients (2), c'est-à-dire quand cette force a atteint la valeur de régime, mais avant de commencer ladite phase de sertissage.

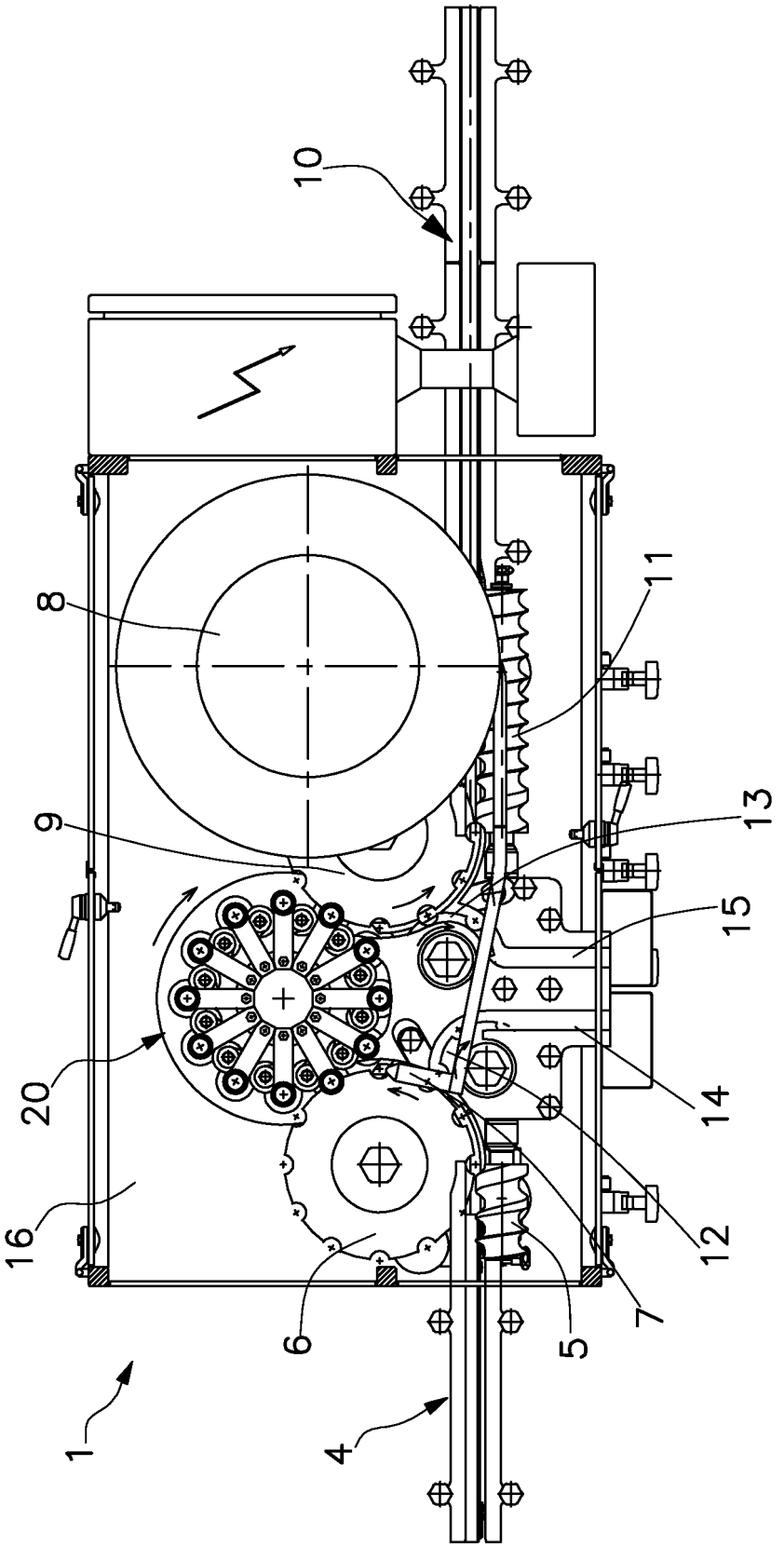


Fig.1

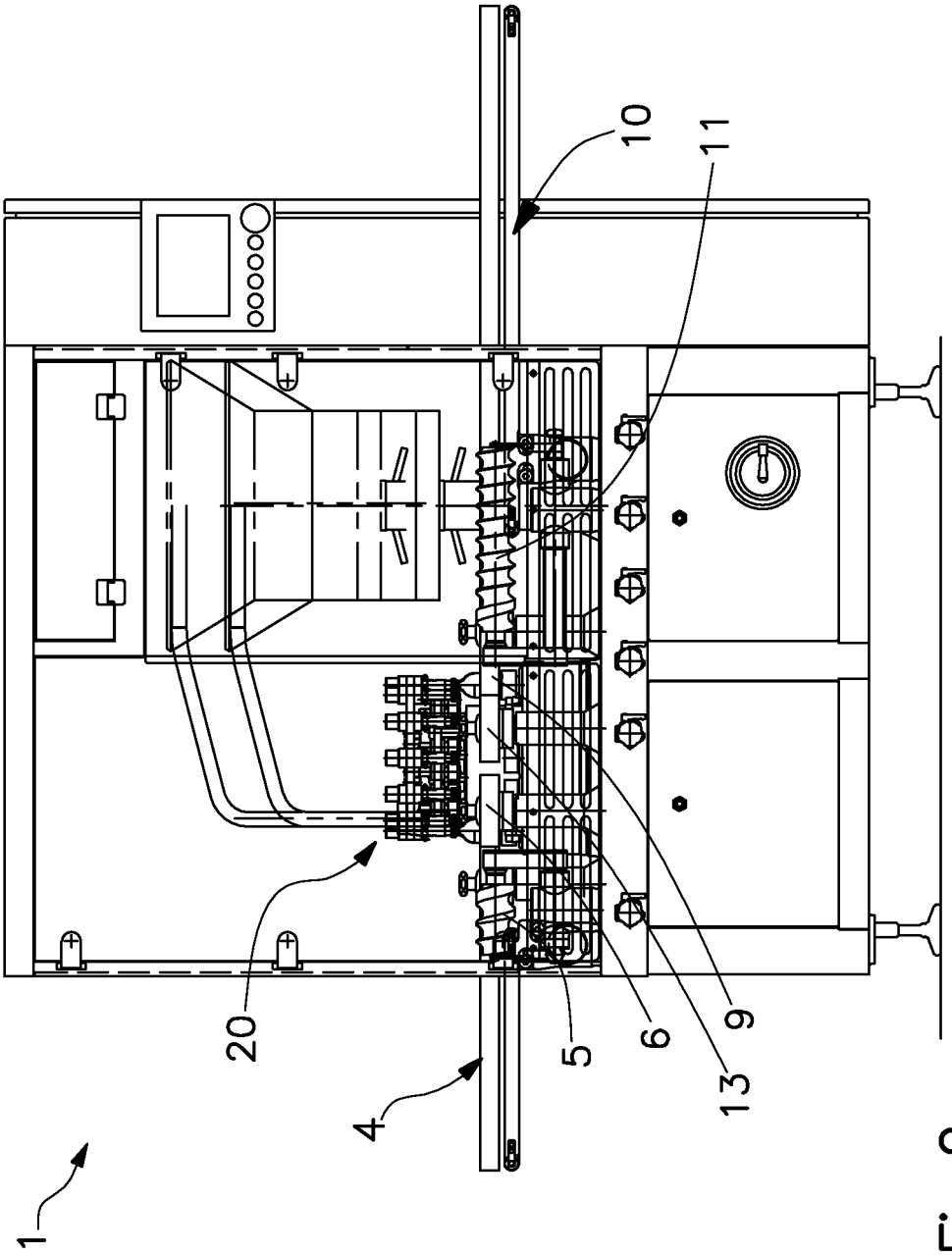


Fig.2

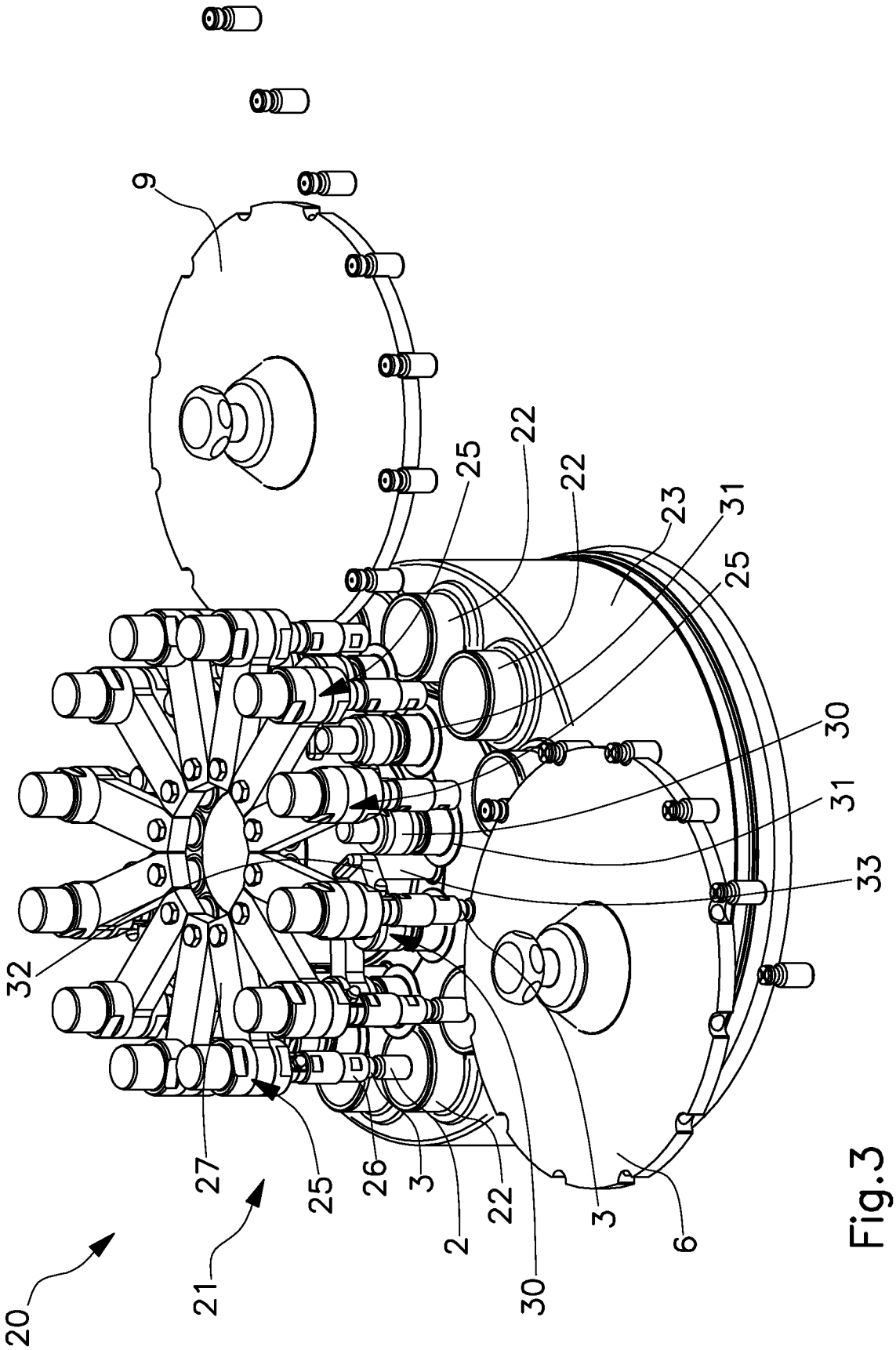


Fig.3

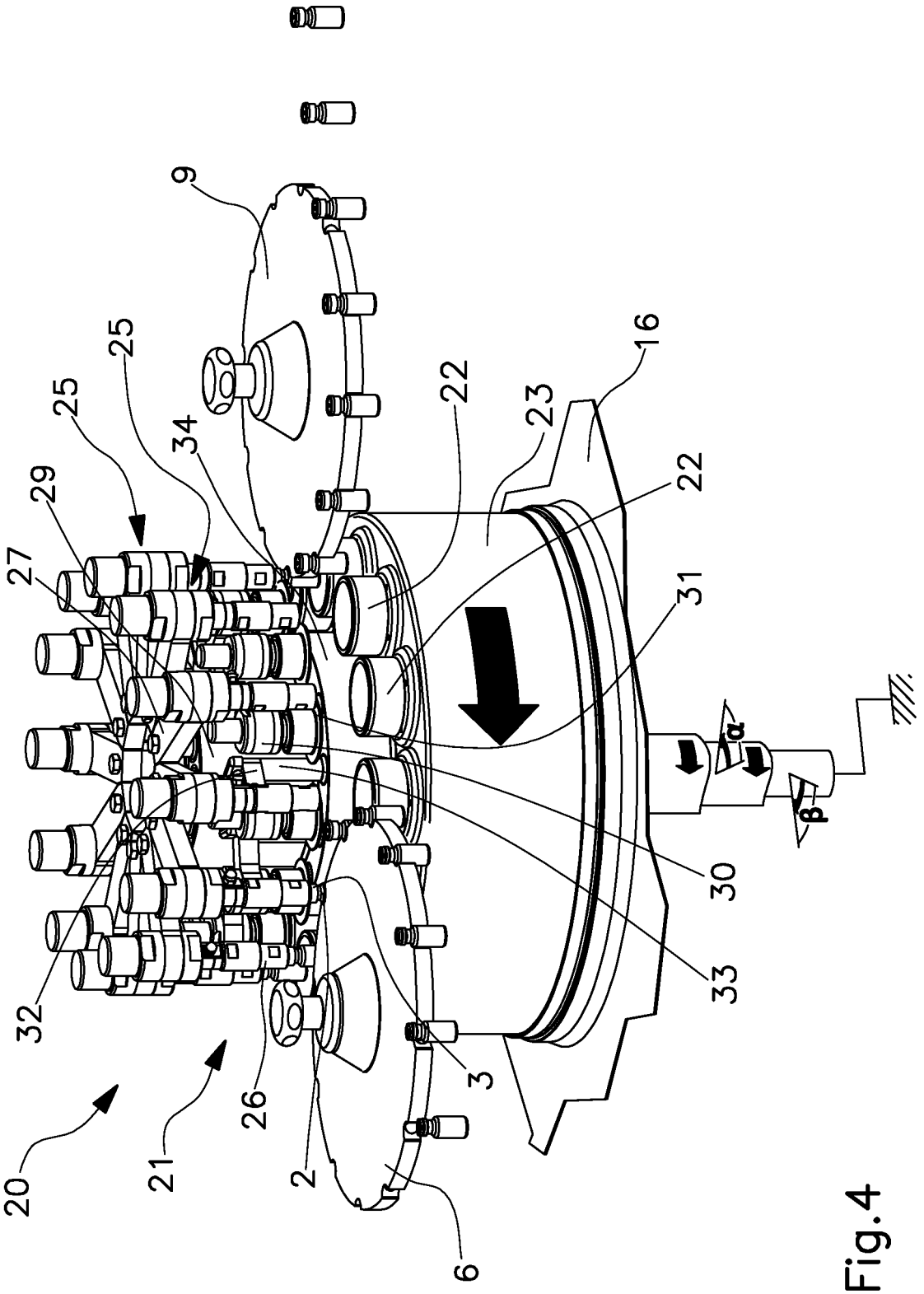


Fig.4

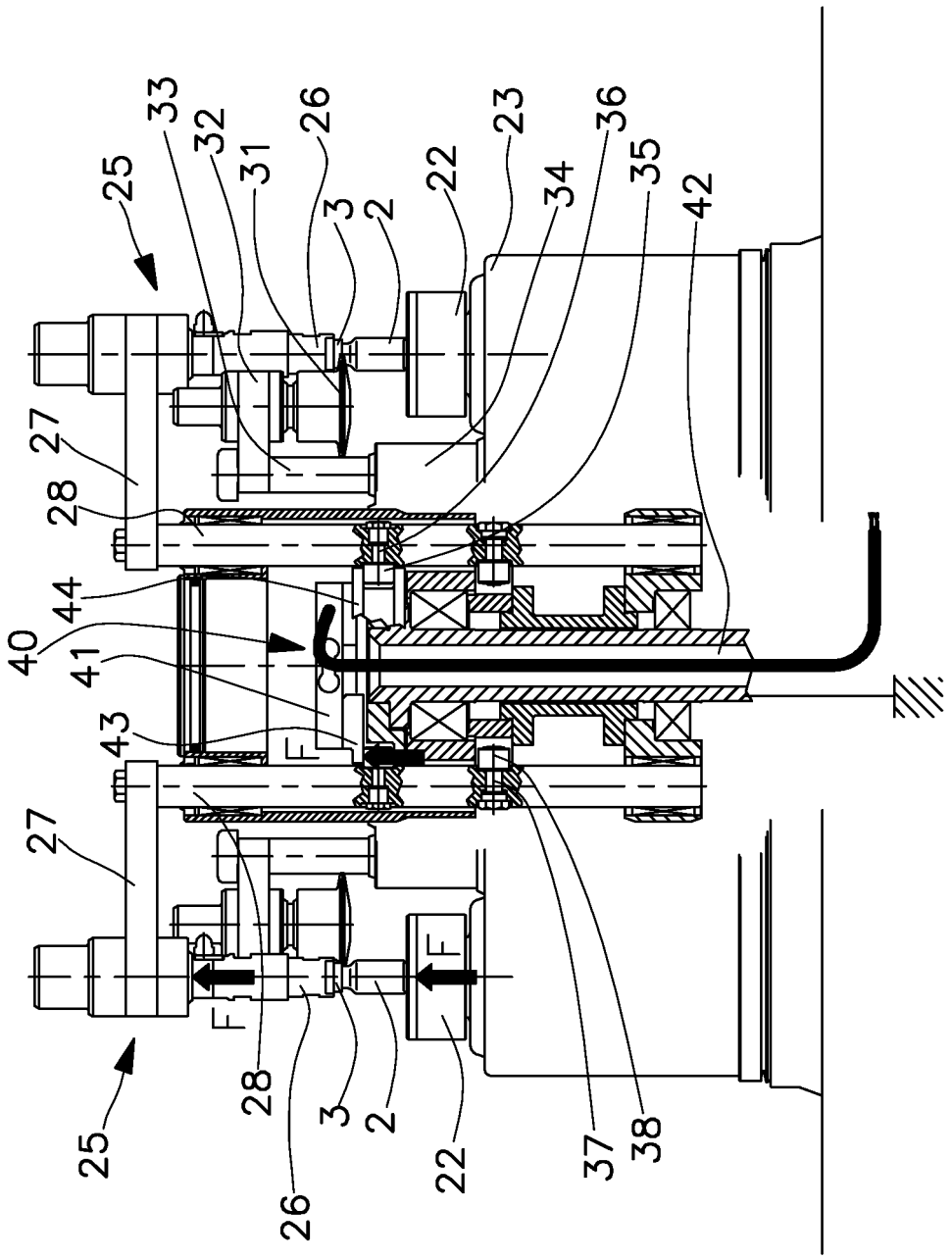
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Fig.5

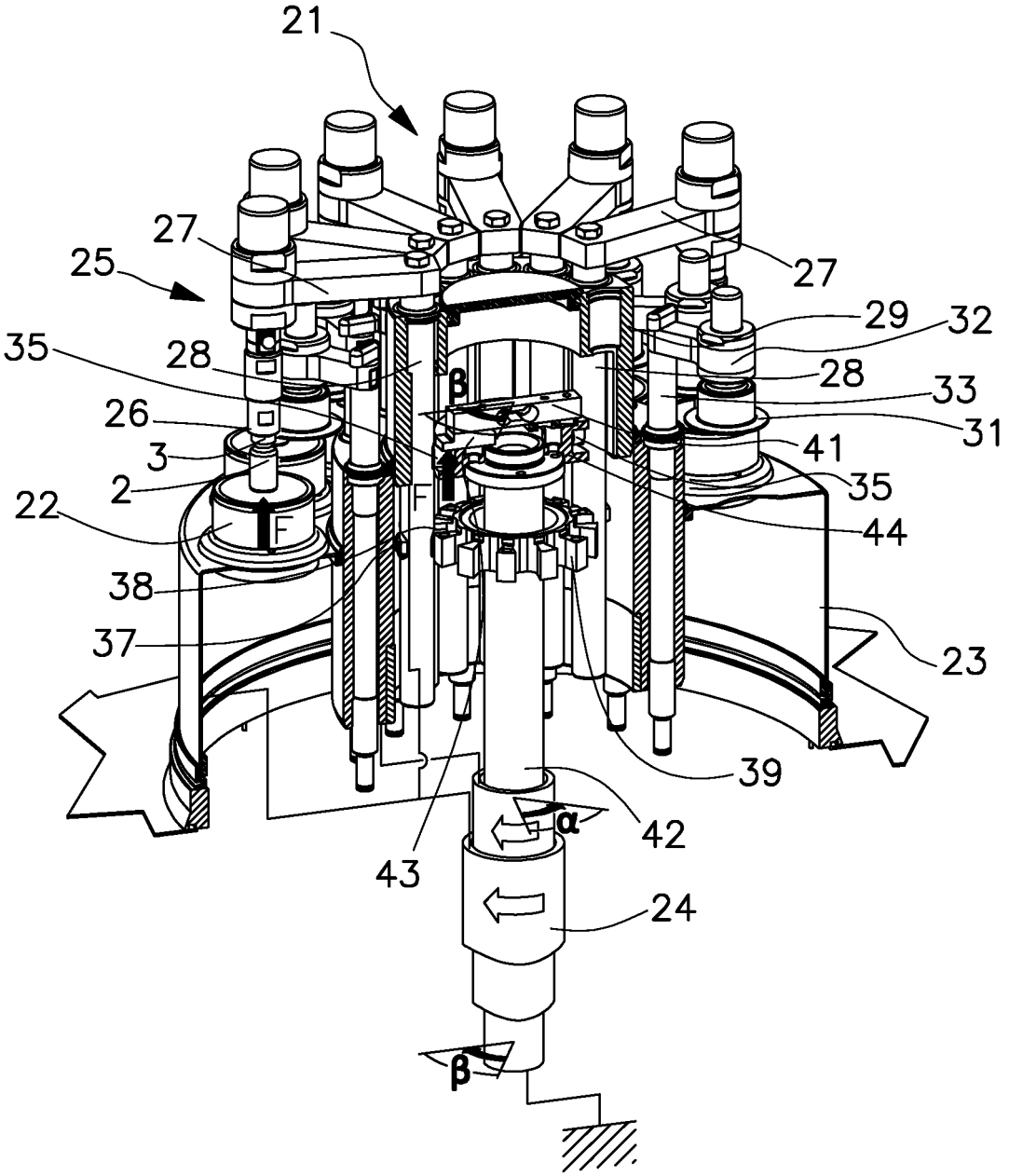
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Fig.6

## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


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