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(54) MACHINE FOR CORKING BOTTLES WITH CORKS OF DEFORMABLE MATERIAL

(57) Machine for corking bottles with corks of deformable material, which comprises a supporting structure (2), at least one corking head (4) susceptible of inserting the corks in the bottles along a corking direction (Y) and comprising tightening means (5) placed to intercept the corking direction (Y), configured to compress a cork in a compressed form and comprising at least one compression case (6) mechanically mounted on the supporting structure (2) and defining a housing seat, a compression unit (8) at least partially housed within the housing seat (9) and comprising at least two anchors actuatable to define a compression configuration in which the cork is compressed. In addition, the machine comprises at least one temperature sensor operatively associated with the tightening means (5) in order to detect a temperature measurement and send a first electrical signal containing at least such temperature measurement; the machine also comprises a logic control unit operatively connected to the temperature sensor and configured to receive the first electrical signal and generate a second electrical signal indicative of the operating state of the machine, on the basis of the first electrical signal.

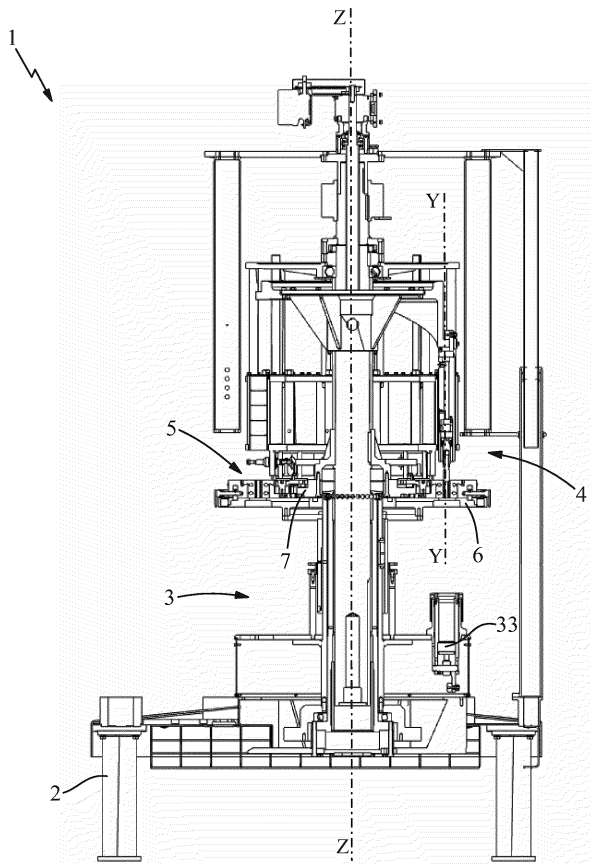

Fig. 1

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Description

Field of application

[0001] The present invention regards a machine for corking bottles with corks of deformable material and a method for operating said machine according to the preamble of the relative independent claims.

[0002] The present machine is advantageously intended to be used in the bottling industry, where it is necessary to carry out the corking of a considerable number of bottles/hour in an automatic manner.

[0003] The present invention is therefore inserted in the technical field of attaining industrial bottling plants for bottling drinks such as wine, whisky, mineral waters, juices or other items, for the purpose of closing the mouth of the bottles with both flush corks and sparkling wine corks, made of cork or of synthetic material, or with technical corks obtained with cork composites, or with mixed cork and synthetic material.

State of the art

[0004] The industrial bottling plants that are conventionally available on the market provide for moving the bottles to be bottled (by means of for example hollow wheels, augers or conveyor belts) through multiple operating machines placed in series, usually comprising at least one rinsing machine, a filling machine and a corking/capping machine.

[0005] Presently, as is known, the machines provide for making the automatic closure of the bottles by means of corks of at least partially deformable material, and for such purpose they can conventionally comprise a rotating carousel carrying, mounted thereon, in peripheral position, a plurality of corking heads equidistant from each other which carry out the closure of the bottles in the section where the latter rotate coupled with the heads around the carousel.

[0006] Around the carousel, thrust cams are concentrically mounted in a fixed manner in order to impart the necessary motion to the mechanical members set for corking, as indicated hereinbelow. Normally, a first cam is provided for moving support plates for supporting the bottles, a second cam is provided for moving 5 pusher elements of the corks and a third cam is provided for actuating tightening means for tightening the corks.

[0007] More in detail, each corking head comprises tightening members, which receive, from provided power supply means, the corks to be applied, and are provided with anchors actuated to be moved by the third cam in order to preliminarily compress the corks up to restricting the section thereof to a size slightly smaller than the mouth of the neck of the bottle, and vertical pusher elements that can be actuated downward by a second cam in order to push the corks compressed by the tightening members along a vertical corking axis, up to bringing the corks within the neck of the respective bottles.

[0008] The bottles to be corked are conducted by suitable support plates to follow the same circular trajectory as the corking heads, so as to always be maintained below the pusher elements, towards which they are lifted by a third cam.

[0009] More in detail, the support plates are actuated by the first cam to be lifted in order to bring the bottles, with the mouth thereof, up to abutting from below against tightening members in order to allow the pusher element to push the cork through the mouth of the bottle up to reaching the desired depth in the neck of the same bottle.

[0010] Once the corking has terminated, the tightening members are opened and the plates descend, actuated by the cams in order to move the corked bottle away from the corking head. Machines of the above-described known type are conventionally employed in particular for closing the bottles with corks of mushroom shape, i.e. with corks provided with an enlarged head intended to remain outside of the mouth of the bottle. Typically such corks are employed for sparkling wine bottles, in which the enlarged head of the cork is intended to be manually forced for the extraction of the stem of the cork from the neck of the bottle.

[0011] As is known, the tightening means of the machines of known type are subjected to repeated mechanical stresses, in particular sliding of suitable anchors configured to compress the cork, and they often require maintenance.

[0012] In order to prevent the frequent jamming of the machine of known type due to the considerable wear, and in some cases breakage, of the tightening means, various expedients are known in the field, such as in particular cyclic maintenance interventions and machine stops in order to carry out operations of lubrication and control, or substitution of several mechanical components of the tightening members, such as in particular the aforesaid anchors.

[0013] The corking/capping machine briefly described above has in practice shown that it does not lack drawbacks.

[0014] The main drawback lies in the fact that the programmed cyclic maintenance operations can lead to prolonged periods of continuous use of the machine of known type without the necessary maintenance operations being carried out, such as lubrication and cleaning. In this situation, the aforesaid machine of known type is subject to sudden blockage of the production cycle, due to damage of the tightening members, which involves a more difficult subsequent maintenance, with consequent slowdowns of the corking process and increased production and maintenance costs.

[0015] A further drawback due to a prolonged use without cleaning and maintenance of the machine of known type lies in the fact that there is the risk of imperfectly corking the bottles. It is in fact known that the repeated movement of the corks intended to cork the bottles against the tightening members removes the lubricant, increasing the insertion force and causing a partial cork-

ing of the bottle.

[0016] A further drawback lies in the fact that, in the absence of a timely cleaning and maintenance, the cork could be torn or crushed following the numerous sliding stresses to which it is subjected during its insertion path.

[0017] A further drawback lies in the fact that, otherwise, the aforesaid programmed maintenance interventions can be carried out at times that are too close to each other, leading to an unnecessary machine stoppage, uselessly increasing the management and maintenance costs.

[0018] The patent DE 102017111066 teaches employing, on a filling machine or on a corking/capping machine (for screw or crown caps), an acoustic sensor adapted to detect vibrations or oscillations of the components of the machine itself. The measurements detected by the acoustic sensor are compared with the reference parameters, in order to detect possible errors in the process executed by the machine. Such reference value can be determined on the basis of different process parameters, such as also the ambient temperature or the temperature of the liquid to be bottled. Also such solution, however, is susceptible of optimizations in terms of reliability and efficiency.

Presentation of the invention

[0019] In this situation, the problem underlying the present invention is therefore that of overcoming the drawbacks manifested by the corking/capping machines of known type by providing a machine for corking bottles and a method for operating such machine which allow controlling the operating state, wear and the need for maintenance and cleaning.

[0020] A further object of the present invention is to provide a corking/capping machine which allows reducing sudden and undesired stops of the machine due to an excessive state of wear or lack of cleaning of the tightening members.

[0021] Another object of the present invention is to attain a machine for corking bottles which allows acting promptly and beforehand in the event that there is a state of wear of the tightening members of the machine itself.

[0022] Another object of the present invention is to attain a machine for corking bottles which allows obtaining a corking.

[0023] Another object of the present invention is to attain a machine for corking bottles which is entirely reliable in operation.

[0024] These objects and still others are all achieved by the machine for corking bottles, object of the present invention, according to the below-reported claims.

Brief description of the drawings

[0025] The technical characteristics of the invention, according to the aforesaid objects, can be clearly seen in the content of the below-reported claims and the advantages thereof will be more evident in the following detailed description, made with reference to the enclosed drawings, which represent a merely exemplifying and non-limiting embodiment of the invention, in which:

- figure 1 shows a sectional side view of the machine, object of the present invention, partially in section and with several parts removed in order to better illustrate other parts;
- figure 2 shows a sectional side view of a detail of the machine, object of the present invention, regarding a compression case, tightening means and pusher means with several parts removed in order to better illustrate other parts;
- figure 3 shows a top view of a compression case and of tightening means of the machine, object of the present invention, with several parts removed in order to better illustrate other parts;
- figure 4 shows a sectional view of the tightening means, attained along the trace IV-IV of figure 3;
- figure 5 shows a sectional view of a sensor mechanically associated with the compression case of the machine, object of the present invention, attained along the trace V-V of figure 4;
- figure 6 shows an axonometric view of a detail of the machine, object of the present invention, regarding the tightening means and a sensor;
- figure 7 shows a sectional axonometric view of a detail of the machine, object of the present invention, regarding the tightening means, the pusher means and the sensor associated with the compression case.

Detailed description of a preferred embodiment

[0026] With reference to the enclosed drawings, reference number 1 overall indicates a machine for corking bottles with corks of deformable material according to the present invention.

[0027] In accordance with the characteristics of the machine 1, object of the present invention, the latter can be employed for closing the mouth of bottles with corks of flush type or of mushroom type, whether made of cork, of synthetic material or constituted by technical corks comprising parts made of cork and parts made of synthetic material.

[0028] The machine 1 is therefore intended to be employed in the final step of the industrial bottling processes for corking the bottles by means of corks of deformable material.

[0029] As is known, such bottling plants are generally composed of at least one rinsing machine, at least one filling machine and at least one corking/capping machine generally with rotating carousel, i.e. each provided with a plurality of operating heads mounted peripherally on the carousel thereof, respectively for rinsing, filling and corking the containers moving through the plant.

[0030] The present machine 1 for corking bottles com-

prises a supporting structure 2, which is preferably intended to be abutted against the ground.

[0031] The machine 1 also comprises at least one corking head 4 mechanically mounted on the supporting structure 2 and susceptible of inserting the corks in the bottles along a corking direction Y.

[0032] Advantageously, in accordance with the preferred embodiment illustrated in the enclosed figures, the corking direction Y is substantially vertical.

[0033] The corking head 4 comprises tightening means 5 placed to intercept the corking direction Y, configured to compress a cork in a compressed form.

[0034] Such tightening means 5 comprise at least one compression case 6 mechanically mounted on the supporting structure 2 and defining at least one housing seat 9.

[0035] The tightening means 5 of the machine 1 according to the invention also comprise a compression unit 8 at least partially housed within the housing seat 9 of the compression case 6 and comprising at least two anchors 10 operable in mutual approach and removable in order to define at least one compression configuration, in which the cork is compressed by the anchors 10 themselves and at least one open configuration in which the cork is insertable between the anchors 10.

[0036] Advantageously, in per se known manner, the machine 1 also comprises a rotating carousel 3 rotatably mounted on the supporting structure 2, advantageously rotatable around a central rotation axis Z that is substantially vertical, in accordance in particular with the example of the enclosed figure 1.

[0037] In particular, the rotation axis Z of the rotating carousel 3 is advantageously substantially parallel to the corking direction Y.

[0038] The machine 1 also preferably comprises a plurality of corking heads 4 mounted peripherally on the rotating carousel 3, placed in particular around the central rotation axis Z.

[0039] Preferably, the corking heads 4 are equidistant from each other and are suitably provided in a variable number as a function of the productivity in bottles/hour that the machine 1 must cork.

[0040] Advantageously, the corking heads 4 are operatively and mechanically associated during the rotation of the carousel 3 with the bottles to be corked for at least one operating section of their travel in which they attain the corking.

[0041] In accordance with the preferred embodiment illustrated in the enclosed figures, the compression case 6 of the tightening means 5 is common to each corking head 4 of the plurality of corking heads 4.

[0042] The compression case 6 is advantageously rotatably mounted on the supporting structure 2 of the machine 1 and peripherally houses a plurality of the aforesaid compression units 8, equidistant from each other.

[0043] In particular, the compression case 6 has substantially cylindrical shape and preferably substantially discoid and is extended between an upper face 6' which intercepts the corking direction Y directed towards the pusher means 11, with substantially circular shape, and an opposite lower face 6", also intercepting the corking direction 6" and with substantially circular shape.

[0044] The upper face 6' and the lower face 6" are perimetrically connected by a lateral face 6"' with substantially cylindrical shape on which access openings are made for the housing seats 9 for the compression units 8 of the tightening means 5.

[0045] Suitably, the tightening means 5 cyclically receive within a compression channel, by known feeding means (not illustrated in the enclosed figures), a cork (in particular with substantially cylindrical shape), which provide for compressing transverse to its longitudinal extension axis in order to modify the dimensions thereof from an enlarged shape, in which the cork is not subjected to compression forces, to a compressed shape, in which the cork has a reduced cross section and dimensions slightly smaller than a mouth of a bottle to be corked for the purpose of allowing the insertion thereof within the same mouth and up to a provided depth within the neck of the bottle itself.

[0046] The feeding means, per se known to the man skilled in the art and for this reason not described in detail hereinbelow, usually comprise a load hopper for the corks 8 which distributes the latter by means of vertical tubular ducts, in which the corks 8 are housed superimposed on each other. Such ducts each terminate on the lower part with an expulsion hole, placed at a corresponding corking head 4 where suitable gripping members, also not illustrated in detail since of per se already known type, provide for moving the single corks into a position correctly centered at the tightening means 5.

[0047] Advantageously, the compression unit 8 of the tightening means 5 normally comprises a fixed slider and a movable slider, which is actuatable with relative to-and-fro movement by a cam 7 with respect to the fixed slider. The two fixed and movable sliders comprise the aforesaid anchors 10 which, through the aforesaid relative to-and-fro movement, are cyclically moved between an open configuration, in which the aforesaid compression channel has width such to receive the cork in enlarged form, and a closed configuration, in which the compression channel is narrowed so as to compress the cork up to bringing it to take on a compressed form having a cross section slightly smaller than the mouth of the bottle in order to allow the insertion thereof at its interior.

[0048] Each corking head 4 also preferably comprises pusher means 11 mounted on top of the tightening means 5, actuatable to push the cork in compressed form through the compression channel of the tightening means 5 themselves, in order to at least partially insert the cork within the mouth of the bottle.

[0049] Advantageously, the pusher means 11 are actuatable to push the cork 8 in compressed form along the advantageously vertical corking axis Y.

[0050] The corking/capping machine 1, object of the present finding, also preferably comprises a plurality of

support plates 33, which are mounted peripherally on the rotating carousel 3 at the corking heads 4 and below the latter.

[0051] Each plate 33 is actuated by a second cam (not illustrated in the enclosed figures) to be moved between a lowered position, in which the bottle is separated by the corresponding corking head 4, and a raised position, in which the head of the bottle is brought close to the tightening means 5, in a substantially centered position with respect to the corking axis Y.

[0052] In operation, the aforesaid pusher means 11 are automatically actuatable to act on the cork from top to bottom in order to force the cork itself along a crossing path of the tightening means 5.

[0053] Advantageously, the pusher means 11 each comprise a punch 36, which is actuated to be moved vertically by a third cam (not illustrated in the enclosed figures and per se well known to the man skilled in the art) mounted fixed on the support structure 2 of the machine 1.

[0054] The aforesaid third cam comprises at least one descending portion, which drives the punch 36 to fall through the tightening means 5 in order to push the cork to cross the compression channel which remains defined between the anchors 10.

[0055] According to the idea underlying the present invention, the machine 1 comprises at least one temperature sensor 12, operatively associated with the tightening means 5, in order to detect at least one first temperature measurement and send a first electrical signal containing at least the first temperature measurement.

[0056] Advantageously, the machine 1 comprises a plurality of temperature sensors 12 each mechanically associated with the compression case 6 at a respective compression unit 8. In addition, according to the idea underlying the present invention, the machine 1 also comprises at least one logic control unit (not illustrated in the enclosed figures and per se well known to the man skilled in the art) operatively connected to the at least one temperature sensor 12 and configured to receive the first electrical signal and generate a second electrical signal indicative of the operating state of said machine, on the basis of the first electrical signal.

[0057] More in detail, on the basis of the first temperature measurement, the logic control unit is programmed to carry out a comparison with at least one preset threshold value indicative of a normal operating state of the machine.

[0058] Following the comparison of the first temperature measurement with the threshold value, if the first temperature measurement is higher than the threshold value itself, the machine 1, object of the present invention, requires maintenance, since the tightening means 5 are overheating due for example to a lack of maintenance, such as in particular a poor lubrication of the compression unit 8.

[0059] In this situation, the machine 1 can comprise at least one alarm device, electrically connected to the logic control unit and arranged for emitting an alarm signal if the first temperature measurement exceeds the aforesaid threshold value.

[0060] Advantageously, the alarm device can comprise a display, electrically connected to the logic control unit and configured to emit at least one visual signal in order to alert an operator of the need for maintenance.

[0061] Otherwise or together with the aforesaid display, the alarm device can comprise a speaker, electrically connected to the logic control unit and configured to emit at least one sound signal in order to alert an operator of the need for maintenance.

[0062] In particular, the temperature sensor 12 is adapted to detect the temperature at the tightening means 5, so as to detect a possible excessive heating generated for example by an excessive friction generated by the anchors 10 of the compression unit 8 and which therefore can be indicative of non-optimal operating conditions that may require maintenance operations.

[0063] Suitably, the temperature sensor 12 was selected from the group comprising thermistors, thermoresistors, thermocouples, pyrometers.

[0064] Of course, any type of temperature sensor known in the field and suitable for detecting the aforesaid first temperature measurement of the tightening means 5 of the machine 1 is to be intended as comprised within the protective scope of the present patent.

[0065] For example, the temperature sensor can comprise a heat camera associated with, and in particular directed towards, the tightening means 5 and arranged for detecting the aforesaid first temperature measurement.

[0066] In order to send the aforesaid first electrical signal, the temperature sensor 12 is provided with a first communication module and the logic control unit comprises a second communication module.

[0067] Advantageously, the first communication module is placed in data communication with the second communication module to exchange signals containing at least the first electrical signal.

[0068] Preferably, moreover, at least one between the first and the second communication module comprises a radio frequency wave generator and at least the other between said first and second communication module comprises a radio frequency wave receiver.

[0069] For example, the first and the second communication module can comprise a Bluetooth or Wi-Fi module, in a manner per se known to the man skilled in the art.

[0070] In accordance with the preferred embodiment illustrated in the enclosed figures, the temperature sensor 12 is mechanically associated with the compression case 6 in order to detect, by thermal conduction, a first quantity of heat and convert such first quantity of heat into the first temperature measurement.

[0071] Advantageously, in order to allow an optimal conduction of heat between the anchors 10 of the compression unit 8 and the compression case 6 on which the temperature sensor 12 is mounted, the compression

case 12 is made of metallic material, in particular steel.

[0072] The temperature sensor 12 is electrically connected to power supply means (not illustrated in the enclosed figures and per se well known to the man skilled in the art) configured to electrically power supply the temperature sensor 12 in a continuous manner.

[0073] In order to power supply the temperature sensor 12, the machine 1 comprises at least one electric power supply manifold provided with a first conduction element mechanically mounted on the rotating carousel 3 and electrically connected at least to the temperature sensor 12 and a second conduction element mechanically mounted on the supporting structure 2 intended to be electrically connected to an electric power supply source, in particular outside the machine 1.

[0074] The first conduction element is electrically coupled to the second conduction element to electrically power supply the temperature sensor (12).

[0075] Advantageously, the electric power supply manifold can for example be a rotary transformer.

[0076] Advantageously, the compression case 6 is provided with at least one cavity 13 obtained in proximity to the compression unit 8.

[0077] The temperature sensor 12 is advantageously at least partially housed within the cavity 13 of the compression case 6, and configured to detect, in particular by means of thermal conduction, the aforesaid first quantity of heat and convert such first quantity of heat into the first temperature measurement.

[0078] The sensor 12 is advantageously housed within a box-like body 14 housed within the cavity 13 of the compression case 6.

[0079] In order to obtain an optimal thermal conduction, also the box-like body 14 is made of metallic material.

[0080] The box-like body 14 comprises two lateral projections 14' housed within two corresponding undercut portions 13' of the cavity 13 so as to prevent the exit of the temperature sensor 12 from the cavity 13 of the compression case 6.

[0081] More in detail, the box-like body 14, which houses at its interior the temperature sensor 12, is provided with a main portion which at least partially projects from the cavity 13 of the compression case 6.

[0082] The box-like body 14 is advantageously provided with a front opening facing the compression case 6 of the tightening means 5, and from such front opening 14" the temperature sensor 12 at least partially projects and is placed in thermal contact with the compression case 6 in order to detect the aforesaid first temperature measurement thereof.

[0083] In order to lock the compression unit 8 within the housing seat 9 of the compression case 6, the machine 1 comprises locking means 15 placed to mechanically connect the compression unit 8 and the compression case 6.

[0084] More in detail, the locking means 15 comprise at least one eccentric element 16 housed within a seat 18 obtained within a perimeter body 19 of the compression unit 8 and actuatable to rotate between a locking position, in which it engages a groove 17 made on the compression case 6, preventing the outward exit of the compression unit 8, and a release position, in which the eccentric element 16 is housed within the seat 18 of the perimeter body 19 in order to release the compression unit 8 from the compression case 6.

[0085] In order to move the eccentric element 16 between the locking position and the release position, the locking means 15 comprise at least one handle 20 placed to cross through a peripheral face of the perimeter body 19, provided at the lateral face 6'" of the compression case 6 between an external end, grippable by an operator, and an end inside the compression unit 8 in which it advantageously engages the eccentric element 16.

[0086] In operation, with the rotation of the handle 20 by an operator gripping the external end, the eccentric element is driven in rotation between the locking position and the release position.

[0087] In this manner, with the handle 20 in the release position, the operator extracts the compression unit 8 from the housing seat 9 of the compression case 6, by pulling it radially with respect to the rotation axis X.

[0088] Once the compression unit 8 is extracted, the operator can extract the box-like body 14 which houses the temperature sensor 12, in particular moving it parallel to the rotation axis X (or parallel to the corking direction Y), advantageously upward, in order to free the lateral projections 14' from the undercut portions 13' of the cavity 13 of the compression case 6.

[0089] Advantageously, the groove 17 is in communication with the cavity 13 of the temperature sensor 12 and in particular they define a step between them.

[0090] More in detail, the groove 17 is partially delimited by a movable element 21 of the locking means 15, interposed between the eccentric element 16 and the temperature sensor 12, in particular provided counter-shaped and housed at the aforesaid step defined by the groove 17 and by the cavity 13.

[0091] In this manner, with the eccentric element 16 in locking position, it pushes against the sensor 12 by means of the movable element 21 interposed between the eccentric element 16 and the sensor 12 itself.

[0092] The locking of the box-like body 14 of the sensor 12 within the cavity 13 by means of the engagement with the undercut portions 13' prevents the compression unit 8 from being released from the compression case 6.

[0093] More in detail, the box-like body 14 constrained to the compression case 6 maintains the movable element 21 mechanically constrained with the eccentric element 16 of the locking means 15.

[0094] In accordance with a further embodiment of the machine 1 not illustrated in the enclosed figures, the temperature sensor 12 is mechanically associated with the compression unit 8 in order to detect, by thermal conduction, a first quantity of heat and convert said first quantity of heat into said first temperature measurement.

[0095] In this manner, the temperature sensor 12 directly detects the heat from the anchors 10 of the compression unit 8.

[0096] Advantageously, the machine 1, object of the present invention, comprises a force sensor placed in proximity to the temperature sensor 12 and configured to detect at least one force measurement, in particular the compression force of the anchors 10 of the compression unit 8.

[0097] Advantageously, the force sensor can comprise a load cell or, otherwise, any type of force sensor per se known in the field and suitable for detecting the aforesaid force measurement of compression of the anchors 10 of the tightening means 5.

[0098] In accordance with the preferred embodiment, the force sensor is mechanically associated with the movable element 21 of the locking means 15 and in particular it is placed in abutment against the movable element 21 of the locking means 15.

[0099] The force sensor is advantageously configured for sending a second electrical signal containing at least the aforesaid force measurement.

[0100] The logic control unit is advantageously operatively connected to the force sensor and is configured to receive the second electrical signal and generate a third electrical signal indicative of the operating state of said machine, on the basis of the second electrical signal. Such third electrical signal in particular is indicative of the compression capacity of the anchors 10 of the tightening means 5.

[0101] More in detail, the force sensor is housed within the box-like body 14, alongside the temperature sensor 12 and configured to detect at least the aforesaid force measurement, in particular the thrust force of the anchors 10 of the compression unit 8, through the compression case 6 of the tightening means 5.

[0102] In accordance with the preferred embodiment illustrated in the enclosed figures, the force sensor is placed in abutment against the movable element 21 of the locking means 15.

[0103] Preferably, the aforesaid temperature sensor 12 comprises at its interior also the force sensor. In this manner, the temperature sensor 12 and the force sensor are compact and easily installable.

[0104] Otherwise, the force sensor can for example be alongside the aforesaid temperature sensor 12, housed within the box-like body 14.

[0105] In operation, the force of the anchors 10 exerted during the compression of the corks is detected by the force sensor by means of the movement of the movable element 21.

[0106] More in detail, the force of the anchors 10 radially pushes the perimeter body 19 of the compression unit 8 and therefore radially also pushes the eccentric element 16 of the locking means 15 fixed to the perimeter body 19 itself.

[0107] The eccentric body 16 of the locking means 15 is placed in abutment against the movable element 21, which is in turn in abutment against the force sensor housed in the box-like body 14, transmitting at least one force pulse, detected by the force sensor itself.

[0108] Suitably, the machine 1, object of the present invention, can be provided with only the force sensor, advantageously housed within the box-like body 14, in particular without providing for the aforesaid temperature sensor 12, so as to only detect the force exerted by the anchors 10.

[0109] Also the force sensor, like the temperature sensor 12, is electrically connected to a logic control unit, and the power supply modes described above for the temperature sensor 12 are applied, mutatis mutandis, also to only the force sensor so as to warn an operator if the force of the anchors 10 should exceed a predetermined threshold value.

[0110] Therefore, all that described above regarding the electric power supply of the temperature sensor 12 and the alarm device is also equally employable for the force sensor, even if provided for on its own, in the absence of the aforesaid temperature sensor 12.

[0111] The finding thus conceived therefore achieves the provided-for objects.

[0112] In particular, the machine 1 for corking bottles, object of the present invention, allows controlling the operating state, wear and the need for maintenance and cleaning of the machine 1 itself, in a continuous, quick and simple manner.

Claims

1. Machine (1) for corking bottles with corks of deformable material, which comprises:

- a supporting structure (2);
- at least one corking head (4) mechanically mounted on said supporting structure (2) susceptible of inserting the corks into the bottles along a corking direction (Y) and comprising:

  - tightening means (5) placed to intercept said corking direction (Y), configured to compress a cork in a compressed form and comprising:

    - at least one compression case (6) mechanically mounted on said supporting structure (2) and defining at least one housing seat (9);
    - a compression unit (8) at least partially housed inside said housing seat (9) of said compression case (6) and comprising at least two anchors (10) operable in mutual approach and removal to define at least one compression configuration, in which the cork is compressed by said anchors (10), and at

least one open configuration, in which the cork is insertable between said anchors (10);

said machine (1) being **characterized in that** it comprises at least one temperature sensor (12), operatively associated with said tightening means (5), to detect at least a first temperature measurement and send a first electrical signal containing at least said first temperature measurement;
said machine (1) further comprising at least one logic control unit operatively connected to said at least one temperature sensor (12) and configured to receive said first electrical signal and generate a second electrical signal indicative of the operating state of said machine (1), on the basis of said first electrical signal.

2. Machine (1) for corking bottles with corks of deformable material according to claim 1, **characterized in that** said temperature sensor (12) is mechanically associated with said compression case (6) to detect, by thermal conduction, a first quantity of heat and convert said first quantity of heat into said first temperature measurement.

3. Machine (1) for corking bottles with corks of deformable material according to claim 2, **characterized in that** said compression case (6) is provided with at least one cavity (13) obtained in proximity to said compression unit (8);
said temperature sensor (12) being at least partially housed inside the cavity (13) of said compression case (6), and configured to detect, by thermal conduction, a first quantity of heat and to convert said first quantity of heat into said first temperature measurement.

4. Machine (1) for corking bottles with corks of deformable material according to claim 3, **characterized in that** said temperature sensor (12) is housed within a box-like body (14) housed within the cavity (13) of said compression case (6); wherein said box-like body (14) comprises two lateral projections (14') housed within two corresponding undercut portions (13') of said cavity (13) in order to prevent the exit of said temperature sensor (12) from the cavity (13) of said compression case (6).

5. Machine (1) for corking bottles with corks of deformable material according to claim 1, **characterized in that** said temperature sensor (12) is mechanically associated with said compression unit (8) to detect, by thermal conduction, a first quantity of heat and convert said first quantity of heat into said first temperature measurement.

6. Machine (1) for corking bottles with corks of deformable material according to any one of the preceding claims, **characterized in that** it comprises a rotating carousel (3) rotatably mounted on said supporting structure (2) and a plurality of said corking heads (4) mounted peripherally on said rotating carousel (2).

7. Machine (1) for corking bottles with corks of deformable material according to claim 6, **characterized in that** said compression case (6) of said tightening means (5) is common to each corking head (4) of said plurality of corking heads (4).

8. Machine (1) for corking bottles with corks of deformable material according to any one of the preceding claims, **characterized in that** it comprises at least one force sensor, placed in proximity to said temperature sensor (12) and configured to detect at least one force measurement indicative of the compression of the anchors (10) of the compression unit (8) of said tightening means (5).

9. Machine (1) for corking bottles with corks of deformable material according to any one of the preceding claims, **characterized in that** said temperature sensor (12) is provided with a first communication module and said logic control unit comprises a second communication module; said first communication module being placed in data communication with said second communication module to exchange signals containing at least said first electrical signal.

10. Machine (1) for corking bottles with corks of deformable material according to claim 9, **characterized in that** at least one of said first and second communication module comprises a radio frequency wave generator and at least the other between said first and second communication module includes a radio frequency wave receiver.

11. Machine (1) for corking bottles with corks of deformable material according to one of claim 6 or 7, **characterized in that** it comprises at least one electric power supply manifold provided with a first conduction element mechanically mounted on said rotating carousel (3) and electrically connected at least to said temperature sensor (12), and with a second conduction element mechanically mounted on said supporting structure (2) and intended to be electrically connected to an electric power supply source; said first conduction element being electrically coupled to said second conduction element to electrically power supply at least said temperature sensor (12).

12. Machine (1) for corking bottles with corks of deformable material according to any one of the preceding claims, **characterized in that** said logic control unit is programmed to carry out, on the basis of said first

temperature measurement, a comparison with at least one preset threshold value indicative of a normal operating state of said machine (1).

13. Machine (1) for corking bottles with corks of deformable material according to claim 12, **characterized in that** it comprises at least one alarm device, electrically connected to the logic control unit;
wherein, following said comparison of said first temperature measurement with said threshold value, said logic control unit is programmed to drive, with said first temperature measurement higher than said threshold value, said alarm device to emit an alarm signal.

14. Method for operating a machine (1) for corking bottles with corks of deformable material according to any one of the preceding claims, said method being **characterized in that**:

- said temperature sensor (12) detects at least one first temperature measurement associated with said tightening means (5) and sends a first electrical signal containing at least said first temperature measurement;
- said logic control unit receives said first electrical signal from said temperature sensor (12) and generates a second electrical signal indicative of the operating state of said machine (1), on the basis of said first electrical signal.

15. Method for operating according to claim 14, **characterized in that** said logic control unit carries out, on the basis of said first temperature measurement, a comparison with at least one preset threshold value indicative of a normal operating state of said machine (1).

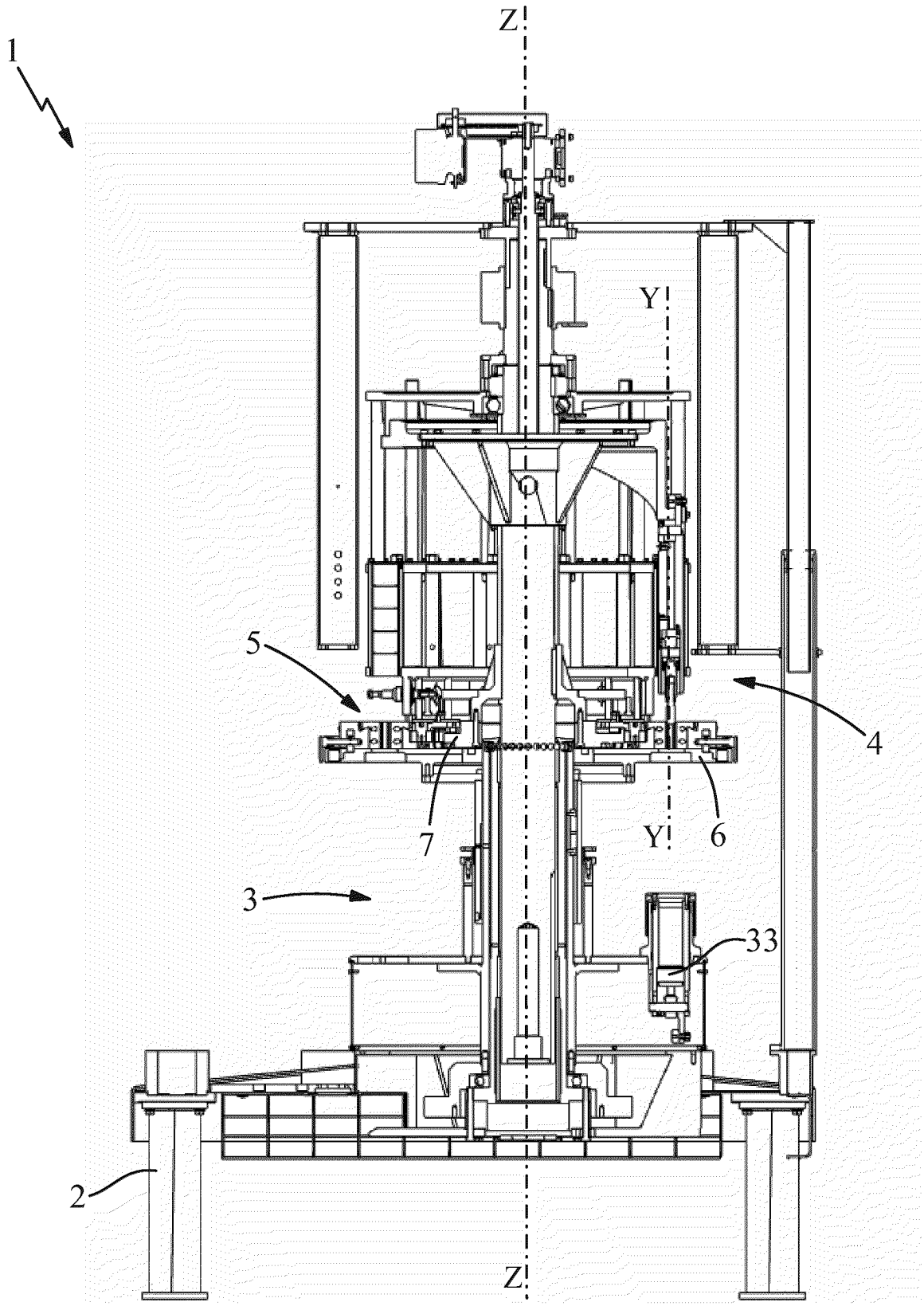

Fig. 1

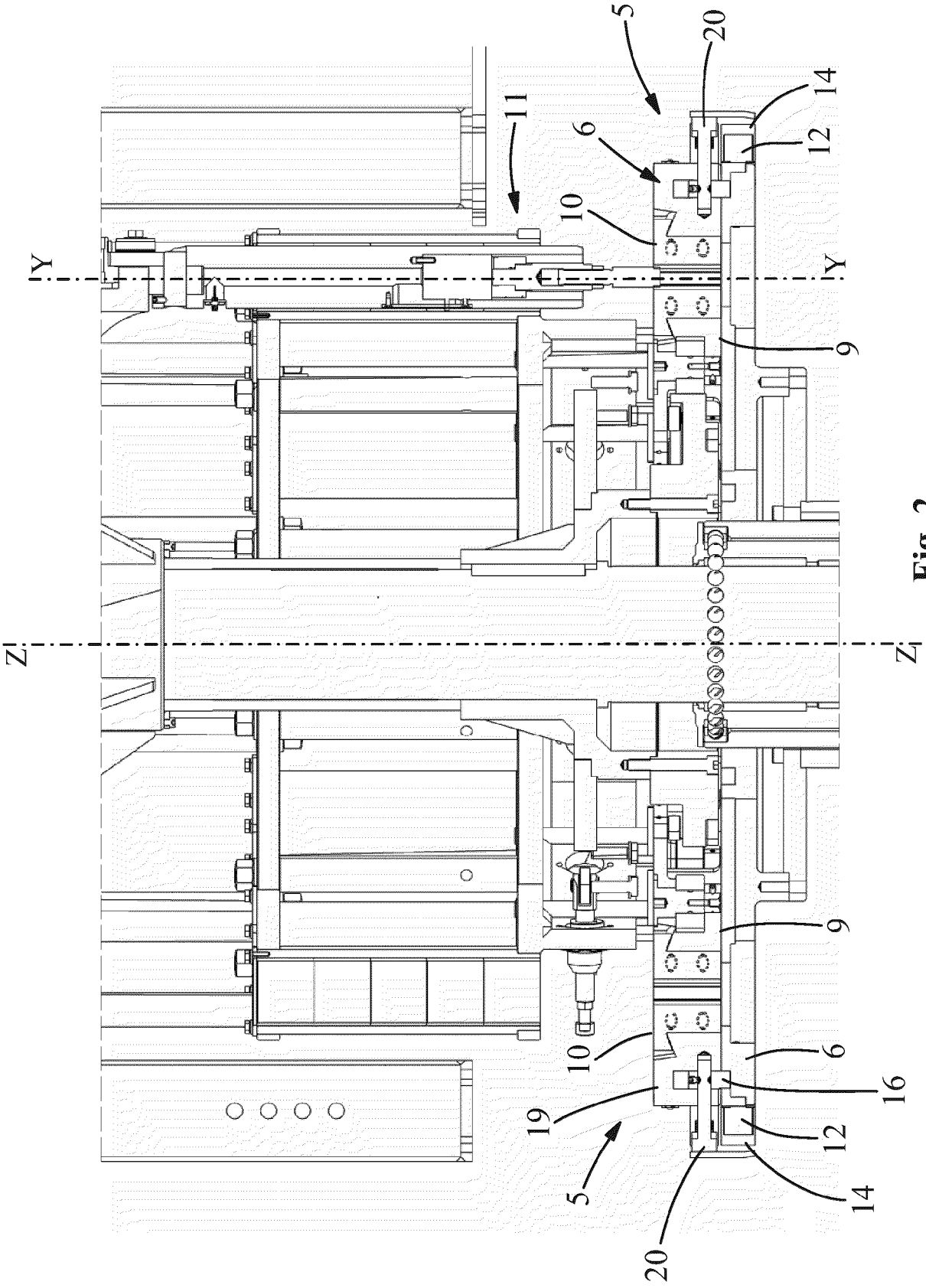

Fig. 2

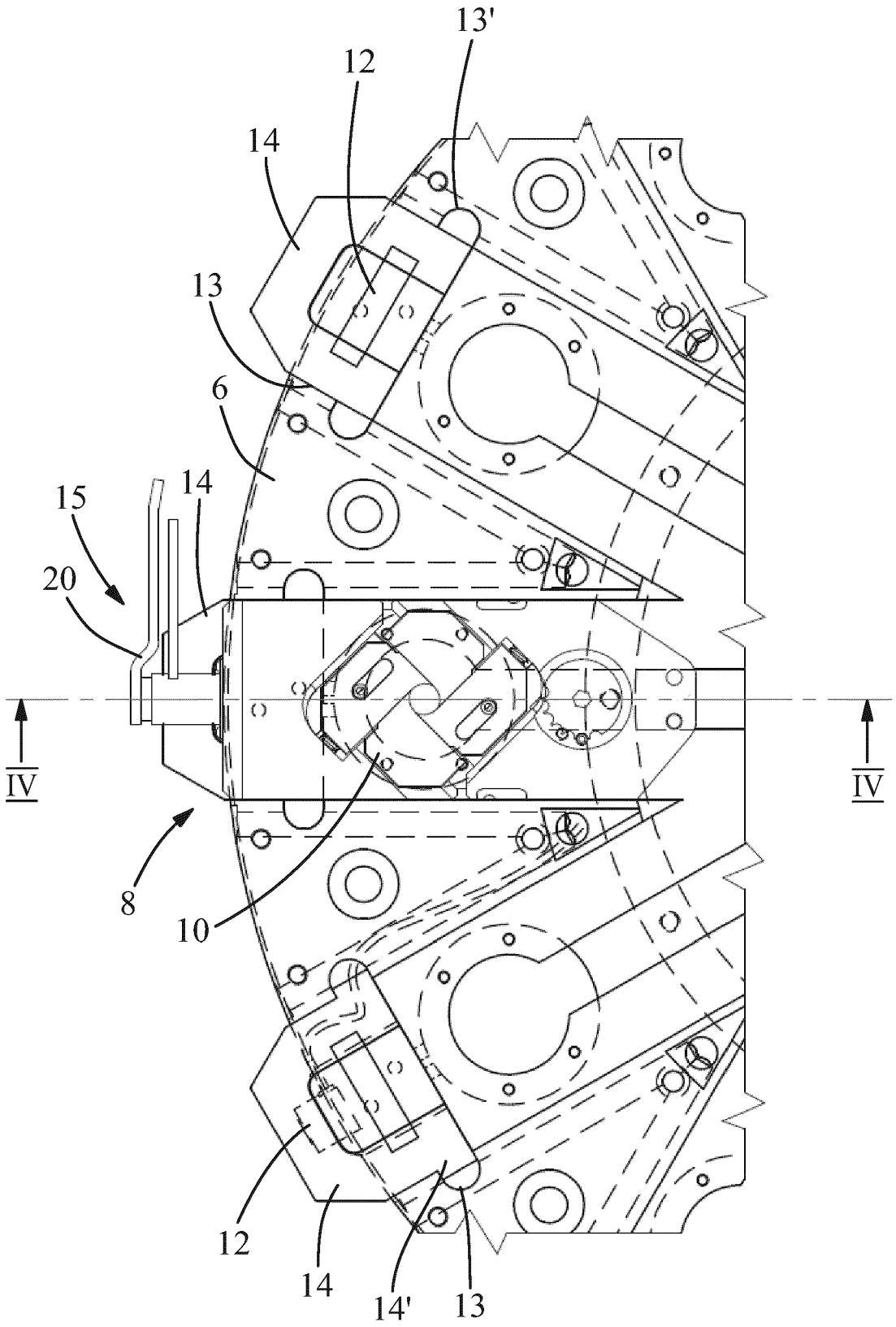

Fig. 3

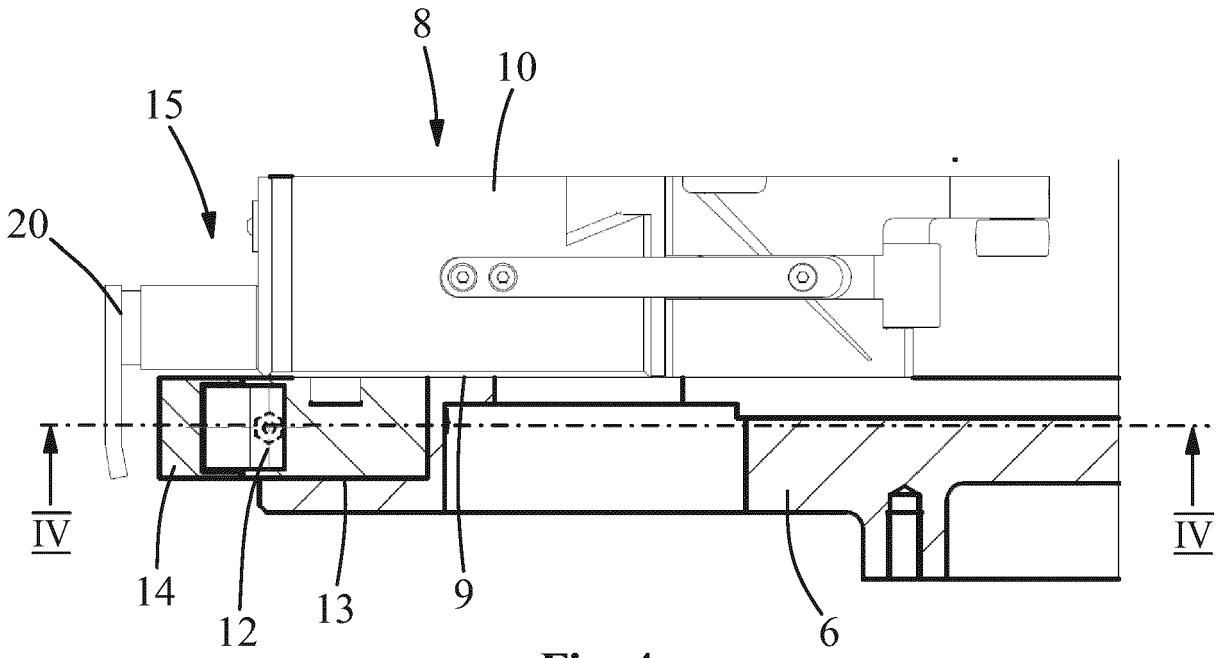

Fig. 4

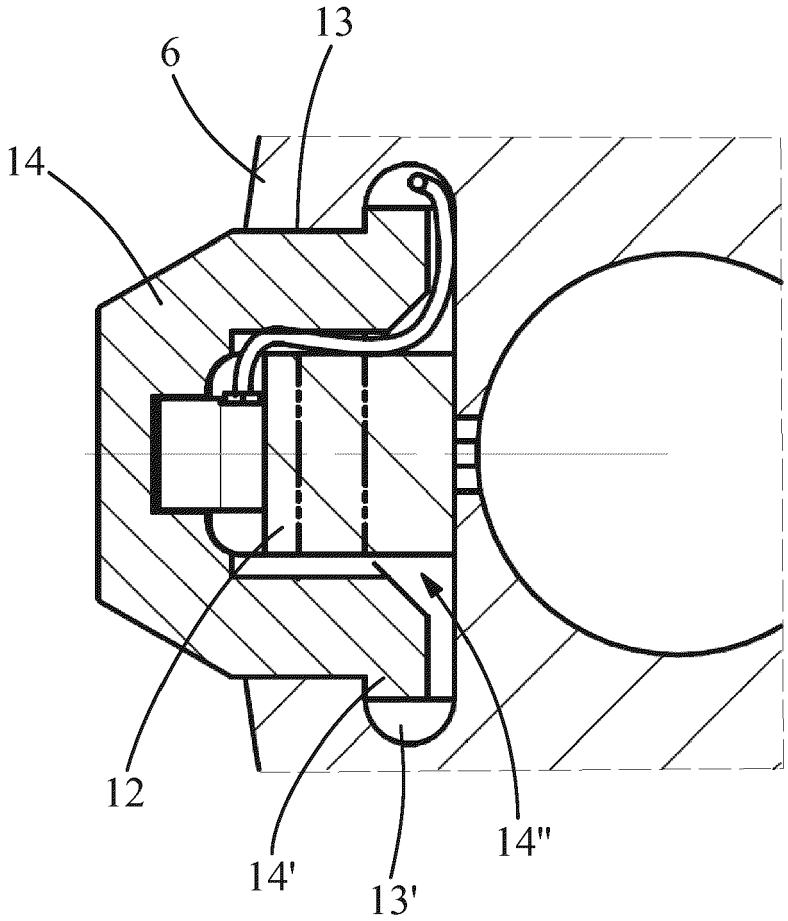

Fig. 5

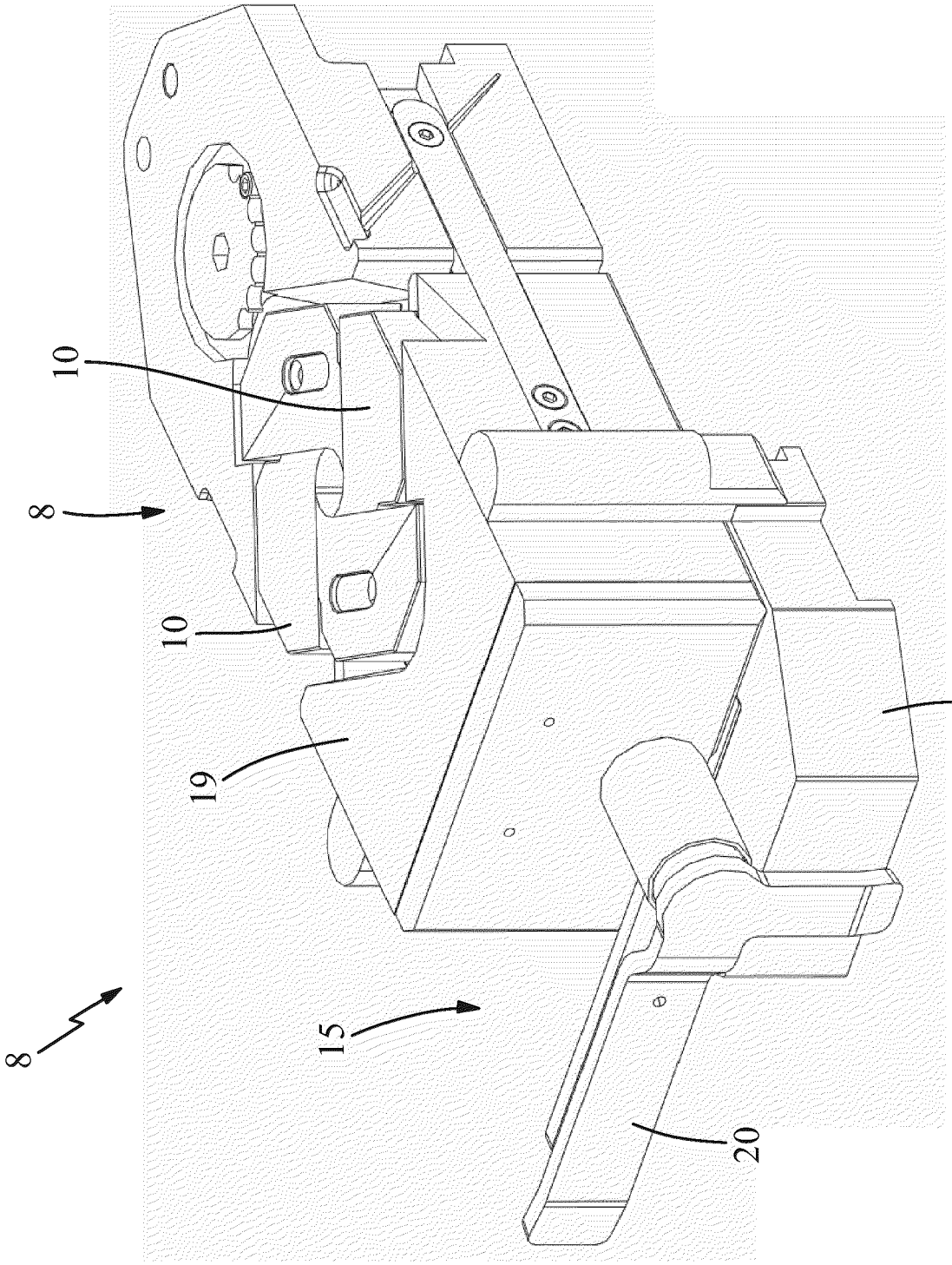

Fig. 6

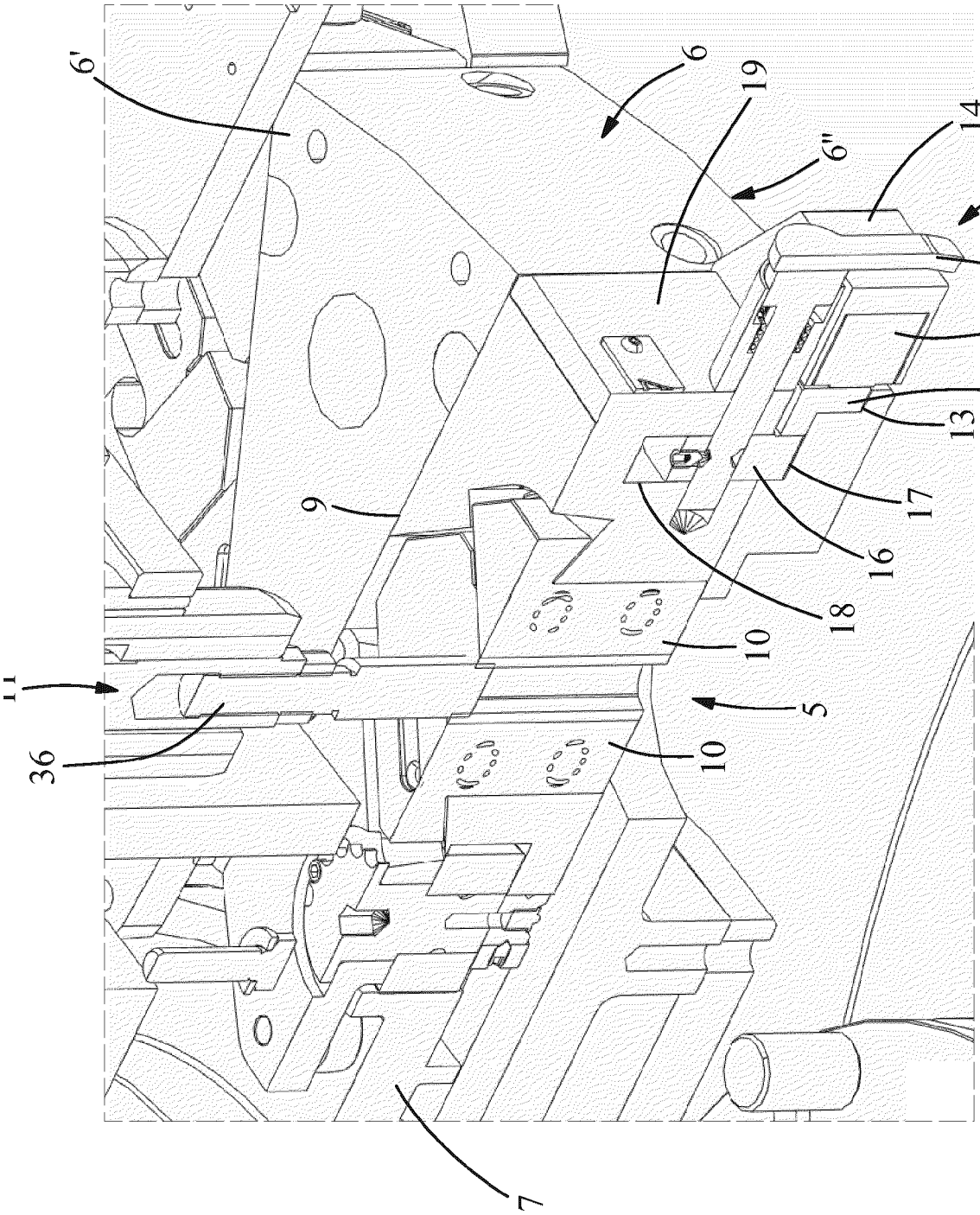

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 20 20 8672

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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B67B
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	1 April 2021	Luepke, Erik

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