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(54) Device for closing bottles and the like with screw plugs

Vorrichtung zum Verschliessen von Flaschen und dergleichen mit Schraubverschlüssen

Dispositif pour la fermeture de bouteilles ou analogue avec des capuchons à vis

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(72) Inventor: **Monti, Giuseppe**
Pianoro (Bologna) (IT)

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(74) Representative:
Dall'Olio, Giancarlo
c/o INVENTION s.a.s.,
Via delle Armi, 1
40137 Bologna (IT)

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(73) Proprietor:
MARCHESINI GROUP S.p.A.
I-40065 Pian di Macina Pianoro (Bologna) (IT)

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Description

The present invention relates to closing bottles and the like by screw plugs.

Automatic machines are known, which carry out subsequent steps for packaging various articles, e.g. pharmaceuticals, marketed in bottles or the like.

These machines usually feature a series of carousels that during rotation carry the bottles to be packed from one working station to another. Obviously, the final step of the packaging includes closing the bottles with special caps, in particular screw plugs.

In the known machines, the high level of productivity, and therefore high working speed, have been favoured for a long time.

At present, a special attention is paid to high and constant quality. In particular, in many cases a guarantee certificate of the articles quality is required.

According to the current trend, the working steps of the machines must be properly coordinated and controlled by processing electronic means.

These processing means are aimed at checking the products characteristics that can be modified and commanding suitable operations if these characteristics vary from the programmed ones.

In the case of closing the bottles, the most obvious problem is checking the tight sealing of screw plugs, in particular checking if a predetermined tightening torque has been reached.

Actually, the product conservation can be guaranteed only if the bottle plug seals in the requested way.

This is particularly important for the products like pharmaceuticals, which are subjected to a precise expire date.

Devices equipped with special friction means subjected to suitable elastic means, acting substantially as torque reducers, have been proposed for bottles closing control.

Of course, the above mentioned elastic means of these devices must be suitably calibrated, in relation with the desired tightening torque. However, the aforementioned devices cannot certificate the correspondence of closing of all the bottles to fixed parameters.

As a matter of fact, the system is not precise enough and little reliable, and allows only for sampling based check.

The publication US-A-2760391 describes a bottle capping device in which a bottle is kept stationary while capping means are lowered to screw a cap onto the neck of the bottle. The device includes an upper drive shaft, an upper jaw mounted to the shaft for longitudinal movement thereon, means for biasing the jaw towards the lower end of the shaft, a driven shaft, a lower jaw mounted on the driven shaft, means for suspending the driven shaft from the drive shaft, thus permitting longitudinal movement between the shafts to engage and disengage the jaws. Means for engaging the caps are mounted on the driven shaft while means for adjusting

the position of the driven shaft are mounted on the suspension means. With this configuration it is possible to vary the amount of torque necessary to urge the upper jaw against the biasing means, thus disengaging the upper jaw from the lower jaw. The capping device does not screw the cap onto a bottle with an excess of torque, and the amount of torque can be adjusted from outside of the structure.

The object of the present invention is to propose a device that allows bottles and the like to be closed by screw plugs in the best way, and to effectively check the tight sealing of these bottles.

Another object of the invention is to propose a closing device that allows to adjust, in a simple way, the tightening torque of the above mentioned screw plugs, as well as to measure continuously this tightening torque, so as to permit to give a guarantee certificate about the products quality.

The above mentioned objects are obtained in accordance with the contents of claims.

The characteristic features of the present invention are pointed out in the following description with reference to the enclosed drawings, in which:

- figure 1 shows a longitudinal sectional view of the subject closing device;
- figure 2 shows the same longitudinal sectional view of the closing device, during tightening of the screw plug on a relative bottle;
- figures 3 and 4 show a detailed view of one particular of the device, respectively from the side indicated with X1 and X2 in figures 1 and 2;
- figure 5 shows a lateral view of an upper part of the device;
- figure 6 shows a correspondent sectional view, taken along the plane VI-VI of figure 5.

With reference to the figures, the reference numeral 1 indicates the device closing bottles and the like by relative screw plugs 2.

The device 1 features a sleeve 3 that is rotatably carried, about a vertical axis, by a pair of horizontal and superimposed plates 4 and 5, by means of rolling bearings 6 and 7.

The plates 4, 5 are elements of a carousel, made to rotate about a vertical axis, in a known way. The outer part of the sleeve 3 forms a toothed wheel 8 connected with a toothed ring 9 which is integral with the fixed support structure of the above mentioned carousel.

Therefore, when the carousel is rotating, rolling of the sleeve 3 around the toothed ring 9, caused by its connection with the toothed wheel 8, makes the same sleeve 3 to rotate axially.

A tubular shaft 10, extending considerably over the upper plate 4 of the carousel, passes through the sleeve 3. The tubular shaft 10 is connected for rotation with the sleeve 3, through a suitable tang 11 which engages a longitudinal groove 12 made on the internal surface of

the sleeve 3.

In its lower part, the tubular shaft 10 features a threaded section 10a for screwing another sleeve 13, coaxial with the shaft 10. A cylindrical chamber 14 is formed inside the tubular shaft 10, in its lower part, substantially in correspondence with the connection with the sleeve 3.

The chamber 14 houses an escapement means 100 that transmits the screwing motion for the plug 2. The escapement coupling means 100 includes two coaxial cylindrical members 15, 16, upper and lower respectively, having the same outer diameter.

The members 15, 16 are coupled to each other, during the screwing motion transmission, at respective facing planes, equally inclined with respect to the longitudinal axis of the device.

As a matter of fact, the two members 15, 16 match with each other and due to their mutual positioning, they cooperate to define a continuous cylindrical element.

The upper member 15 of the escapement coupling means carries a pair of rollers 17, idling about a radial axis and situated in diametrically opposed positions.

The rollers 17 engage respective longitudinal slots 18 made on the tubular shaft 10. Therefore, the member 15 is connected for rotation with the tubular shaft 10 and is driven in rotation thereby.

The lower member 16 of the escapement means is rotatably carried by an axial bearing 19 situated inside the sleeve 13. In its lower part, the member 16 extends into a rod 20 that passes axially through the sleeve 13, and below the said sleeve 13, it is made integral with the case 21 of known gripping means 22.

The jaws 23, gripping the plug 2 to be screwed, protrude out from the lower part of the case 21 of the means 22. A tube 25, set longitudinally inside the tubular shaft 10, is aimed at urging, via an axial bearing 24, the upper member 15 of the escapement means.

The top of the tube 25 can be connected to known means for delivery of compressed air, which are not shown in the drawings. The compressed air is supplied to the gripping means 22 through a pipe 26 that extends from the lower part of the tube 25 and passes freely through the cylindrical members 15, 16 of the escapement means.

The tube 25 is pushed in axial direction by the pressure present inside a cylindrical chamber 27 defined by a jacket 30, that forms a kind of bell, and delimited by suitable tight seals 28, 29.

The tube 25 passes axially through the jacket 30 that, in its lower part, partially covers the tubular shaft 10.

The chamber 27 is supplied with compressed air by a pipe 31. The thrust exerts its action on the tube 25 by means of a ring 32 that strikes against a suitable shoulder formed outside the same tube.

Outside, the jacket 30 carries rolling means, indicated with sketched line 33, on a radial axis. The rolling means 33 engage a ring-like cam 34, concentric with

the carousel axis and integral with the fixed structure thereof.

The cam 34 controls the axial approach of the device to the bottle to be closed. A radial arm 36, guided by a vertical shaft 37 extending from the jacket 30, is bound, by means of a transversal pin 35, to the tube 25, over the jacket 30.

The arm 36 carries a vertical bar 38 designed to operate suitable sensor means for checking closure of the bottles.

As seen in figures 5 and 6, the device is equipped with a first sensor means 39 and a second sensor means 40, constituted by e.g. conventional proximity sensors, situated on the same horizontal plane and suitably spaced apart along to the direction A of the carousel rotation.

The sensors means 39, 40 are supported by the fixed support structure of the carousel. The sensors means 39, 40 are designed to detect passage of a flag-shaped tab 41 secured to the top of the bar 38, by a radial transverse bar 42.

The tab 41 is formed by e.g. a plate that extends for a suitable length in the carousel circumferential direction.

Operation of the device will be described, beginning from screwing the plug onto the bottle to be closed, partially seen in figure 2 and indicated by 200.

The bottle is carried by the carousel, while it rotates, below the closing device. In fact, the carousel, carries a plurality of closing devices, spaced apart along its periphery, with respective bottles to be closed aligned therebelow.

The plug 2 is held by the jaws 23 of the gripping means 22 that is driven into rotation by the tubular shaft 10 through the transmission escapement coupling means 100.

As has already been said, the shaft 10 is rotated by the sleeve 3 that is in gear engagement with the ring 9 by means of the toothed wheel 8.

Consequently, the upper member 15 of the escapement means 100, that is connected for rotation to the tubular shaft 10 by means of the rollers 17 running in the slots 18, drives the lower member 16, integral with the gripping means 22.

The upper member 15 is pushed axially due to the force applied by the tube 25, whereas the tube 25 is pressed by the pressure of the compressed air inside the cylindrical chamber 27.

It will be understood that the upper member 15 transmits tightening torque to the lower member 16 by means of the inclined opposed surfaces, in correspondence with which the members 15, 16 are coupled.

In fact, the thrust force that pushes the upper body 15, causes a transverse component force in correspondence with the above mentioned inclined surfaces, and this transverse component force gives rise to the screwing torque.

It will also be understood that the entity of the trans-

verse component force depends on the inclination of the above mentioned connection surfaces of the cylindrical members 15, 16.

Therefore, the plug 2 carried by the gripping means 21 is screwed onto the bottle 200. After having screwed the plug 2 to the bottle 200, i.e. when a pre-established tightening torque for the plug 2 has been reached, the lower member 16 of the escapement coupling means 100 stops, while the upper member 15 continues to rotate, still driven by the tubular shaft 10.

Consequently, the upper member 15 is shifted vertically upwards, against the elastic thrust of the compressed air inside the chamber 27 (see figure 2).

In fact, the upper inclined surface of the lower cylindrical member 16 acts as a fixed cam on the correspondent lower inclined surface of the upper cylindrical member 15 that, while rotating, slides thereonto.

When the plug 2 is screwed, the upper member 15 reciprocates upwards and downwards every turn thereof. This reciprocating movement of the member 15 of the escapement means is transmitted to the tube 25, that is supported on the same member 15 by the bearing 24; in its turn, the tube 25 drives the vertical bar 38 aimed at operating proximity sensors 39 and 40.

More precisely, the first sensor 39 detects the passage of the tab 41, carried by the bar 38 of the device, as indicated with the sketched line 41a in figure 6.

The sensor 39 supplies a reference signal, automatically compared with the signal supplied by the second sensor 40, situated downstream of the previous one, in the carousel rotation direction.

Since the vertical bar 38 does not move vertically during the plug 2 screwing step, the sensors 39, 40 detect constant signals.

After the said tightening torque has been reached, the lower member 16 of the escapement means 100 stops and causes vertical reciprocating movement of the bar 38.

Therefore, at this step, the top of the bar 38, carrying the tab 41, moves over the sensors 39,40, as the sketched line 38a in figure 5 shows.

In practice, the sensors 39, 40 detect an alternate signal which indicates that the pre-determined tightening torque for the plug has been reached, i.e. the bottle 200 has been tightly closed.

Obviously, the sensors 39, 40 allow for detaching possible failure during the plug screwing.

In particular, if the constant signal, determined by the immediate alternate movement of the bar 38, is not received, it means that the plug has not been screwed regularly, e.g. because the plug has jammed.

Lacking of the alternate signal means that the bottle 200 has not been completely closed e.g. because of plug defect.

Obviously, under these conditions, the faulty closed bottle is discarded, so as to choose only the products corresponding to the predetermined characteristics.

Consequently, the described device allows to check

the bottles real tight seal closing operation in which screw plugs are applied thereto, immediately rejecting possible defective bottles.

It is to be pointed out that all the bottles packaged by the machine are checked, so that it is possible to attest the correspondence of the closing characteristics of all the bottles to the predetermined parameters.

Moreover, the device also allows to suitably adjust the value of the plug tightening torque. For this purpose, it is made possible to change the value of the pressure inside the chamber 27, that determines the value of the axial thrust acting elastically on the escapement coupling means 100 transmitting the tightening torque for the plug.

It is obvious that this pressure can be controlled by suitable sensors, so as to have an indirect measure of the tightening torque value.

The subject device allows to close the bottles with screw plugs in best way, permitting in particular to check the actual tight seal closure of the bottles.

Moreover, the closing device allows the plugs tightening torque to be adjusted in a simple way and to be measured continuously.

All this makes it possible to issue a guarantee certificate attesting the packaged products characteristics.

Finally, the closing device is simple in its construction and versatile to be adapted in accordance with the features of the bottles to be closed.

Claims

1. Device for closing bottles and the like by means of screw plugs, comprising :

a sleeve (3) rotating about a vertical axis coincident with the axis of the bottle (200) to be closed;

a tubular shaft (10) driven into rotation by the said sleeve (3) and mounted coaxially within said sleeve with possibility to slide axially relative to the same sleeve (3);

a chamber (14) defined by the said tubular shaft (10);

an escapement coupling means (100) situated inside the said chamber (14) for transmitting a tightening torque from the said tubular shaft (10) to means (22) for gripping a plug (2) to be screwed onto the said bottle (200), said escapement means (100) including an upper cylindrical member (15) connected for rotation with the said tubular shaft (10), the upper cylindrical member (15) slidably mounted with respect to said tubular shaft (10) and urged elastically by an axial force in downwards direction, and a lower cylindrical member (16) bound axially to the said gripping means (22), said cylindrical members (15,16) being in coaxial relation with each other, and aimed at being

coupled with each other for transmission of the tightening torque to the said plug, the coupling occurring at respective surfaces inclined with respect to the said longitudinal axis and facing each other, in such a way that the said lower cylindrical member (16) of the escapement coupling means (100) stops when the plug (2) on the said bottle (200) has reached a pre-determined tightening torque, while the said upper member (15) continues to rotate, driven by the said tubular shaft (10) so that the sliding of the inclined surface of the upper cylindrical member (15) onto the inclined surface of the lower cylindrical member (16) causes an upwards and downwards reciprocating movement of the upper member (15) every turn thereof ; and

sensor means (39,40) aimed at checking closing operation of the said bottle (200) by detecting said upwards and downwards reciprocating movement.

2. Device according to claim 1, characterised in that the said upper cylindrical member (15) of the escapement coupling means (100) is urged axially, via bearings (24), by a tube (25) introduced longitudinally inside the said tubular shaft (10) and pushed elastically by a pressure present inside a cylindrical chamber (27) defined by a jacket (30), through which the same tube (25) passes.
3. Device according to claim 2, characterised in that the said tube (25) carries a vertical bar (38) designed to activate the said sensor means (39,40) for checking the bottle (200) closing operation.
4. Device according to claim 1, characterised in that the said sensor means includes a first sensor (39) and a second sensor (40), arranged stationary on the same horizontal plane and suitably spaced apart along the rotation direction (A) of a carousel carrying the device.
5. Device according to claim 1, characterised in that the said sensor means (39,40) detect the passage and vertical movement of tabs (41) carried by means (25,38) aimed at following the movement of the said upper cylindrical member (15) of the escapement coupling means (100).
6. Device according to claim 1, characterised in that the said sensors (39,40) are aimed at detecting the passage, at a stationary axial position, of the said tabs (41) during the plug (2) screwing step, and at detecting reciprocating vertical movement of the same tabs (41) when the pre-determined tightening torque has been reached.

7. Device according to claim 1, characterised in that the said upper cylindrical member (15) of the escapement coupling means (100) has diametrically opposed rollers (17) rotating about a radial axis and aimed at engaging respective longitudinal slots (18) made in correspondent positions on the said tubular shaft (10), so that the said upper cylindrical member (15) can slide vertically with respect to the same shaft (10), against the said axial force, when the pre-determined tightening torque has been reached.

8. Device according to claim 1, characterised in that the said lower cylindrical member (16) of the escapement coupling means (100) is rotatably supported on rolling means (19) housed inside a further sleeve (13) secured to the lower end of the said tubular shaft (10), and extends axially into a rod (20) that is made integral with the said gripping means (22).

9. Device according to claim 1, characterised in that the said cylindrical members (15,16) of the escapement coupling means (100) have cylindrical shape and are axially crossed by a tube (25) situated inside the said tubular shaft (10) and connected at the top with means for delivering compressed air used to feed said gripping means (22), the said tube being also designed to transmit the axial thrust to the said upper cylindrical member (15).

Patentansprüche

1. Vorrichtung zum Verschließen von Flaschen und ähnlichen Behältern mittels von Schraubverschlüssen, die folgende Merkmale aufweist:

eine Hülse (3), die relativ zu einer vertikalen Achse rotationsfähig ist, die mit einer Achse der zu verschließenden Flasche (200) zusammenfällt;

einem tubusförmigen Schaft (10), der durch die Hülse (2) in Rotation versetzt wird und der koaxial innerhalb der Hülse angeordnet ist und der relativ zur Hülse (3) axial gleitfähig geführt ist,

eine Kammer (14), die durch den tubusförmigen Schaft (10) begrenzt ist;

ein Überlast-Kupplungselement (100), das innerhalb der Kammer (14) angeordnet ist, um ein anpressendes Drehmoment vom tubusförmigen Schaft (10) zu einer Greifeinrichtung (22) zu übertragen, die dafür vorgesehen ist, einen Verschuß (2) auf die Flasche (200) aufzuschrauben, wobei das Überlast-Kupplungselement (100) ein oberes Zylinderteil (15) umfaßt, das zur Durchführung einer Drehbewegung mit dem tubusförmigen Schaft (10) ver-

bunden ist, wobei das obere Zylinderteil (15) gleitfähig relativ zum tubusförmigen Schaft (10) angeordnet sowie elastisch von einer axialen Kraft in eine abwärtsweisende Richtung angetrieben ist, sowie bei der ein unteres Zylinderteil (16) axial mit der Greifeinrichtung (22) verbunden ist, wobei die Zylinderteile (15,16) in einer koaxialen Zuordnung relativ zueinander angeordnet sind und dafür vorgesehen sind, miteinander gekoppelt zu werden, um das anpressende Drehmoment auf den Verschuß zu übertragen, wobei die Kopplung im Bereich von Oberflächen erfolgt, die relativ zur Längsachse geneigt und einander zugewandt orientiert sind, in einer Art und Weise, daß das untere Zylinderteil (16) der Überlast-Kopplungselemente (100) anhält, wenn der Verschuß (2) auf der Flasche (200) eine vorbestimmte anpressende Kraft erreicht hat, während das obere Zylinderteil (15) seine Rotationsbewegung fortsetzt und durch den tubusförmigen Schaft (10) angetrieben wird, so daß das Gleiten der angewinkelten Oberflächen des oberen Zylinderteils (15) auf den angewinkelten Oberflächen des unteren Zylinderteils (16) eine entsprechende Aufwärts- und Abwärtsbewegung des oberen Zylinderteils (15) bei jeder Drehung verursacht;

Sensoreinrichtungen (39,40), die dafür vorgesehen sind, den Verschußvorgang der Flasche (200) dadurch zu überwachen, daß die einander entsprechenden Aufwärts- und Abwärtsbewegungen erfaßt werden.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das obere Zylinderteil (15) der Überlast-Kopplungselemente (100) axial angetrieben ist von Führungen (24), wobei ein Tubus (25) in Längsrichtung in den tubusförmigen Schaft (10) eingeführt wird und elastisch von einem Druck beaufschlagt wird, der innerhalb einer zylindrischen Kammer (27) herrscht, die von einer Ummantelung (10) begrenzt ist, durch die der Tubus (25) hindurchführt.
3. Vorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß der Tubus (25) eine vertikale Stange (38) trägt, die dafür vorgesehen ist, die Sensoreinrichtungen (39,40) zu aktivieren, um den Verschußvorgang für die Flasche (200) zu überwachen.
4. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Sensoreinrichtungen einen ersten Sensor (39) und einen zweiten Sensor (40) umfassen, die stationär auf einer gemeinsamen horizontalen Ebene angeordnet sind und die einen angemessenen Abstand entlang einer Rotations-

richtung (A) einer Dreheinrichtung aufweisen, die die Vorrichtung trägt.

5. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Sensoreinrichtungen (39,40) eine Vorbeiführung und vertikale Bewegung von plattenförmigen Elementen (41) erfassen, die von Teilen (25,38) getragen sind und die dafür vorgesehen sind, der Bewegung des oberen Zylinderteils (15) der Überlast-Kopplungselemente (100) zu folgen.
6. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Sensoreinrichtungen (39,40) dafür vorgesehen sind, die Vorbeiführung auf einer stationären axialen Position der plattenförmigen Elemente (41) zu erfassen, während der aufschraubungsartige Verschußvorgang (2) durchgeführt wird und die dafür vorgesehen sind, eine entsprechende vertikale Bewegung der gleichen plattenförmigen Elemente (41) zu erfassen, wenn ein vorgegebenes andrückendes Drehmoment erreicht ist.
7. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das obere Zylinderteil (15) der Überlast-Kopplungselemente (100) einander gegenüberliegende Rollen (17) aufweist, die entlang einer radialen Achse abrollen und die dafür vorgesehen sind, in longitudinale Schächte eingeführt zu werden, die in entsprechenden Positionierungen des tubusförmigen Schaftes angeordnet sind, so daß das obere Zylinderteil (15) in vertikaler Richtung relativ zum Schaft (10) gleiten kann und entgegen der axialen Kraft positionierbar ist, wenn das vorgegebene anpressende Drehmoment erreicht ist.
8. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das untere Zylinderteil (16) der Überlast-Kopplungsmittel (100) rotationsfähig von Rollen (19) gestützt ist, die innerhalb einer weiteren Hülse (13) angeordnet sind und die im unteren Ende des tubusförmigen Schaftes gehalten sind, und sich in axialer Richtung in eine Stange (10) hinein erstreckt, welche einteilig mit der Greifeinrichtung (22) gefertigt ist.
9. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Zylinderteile (15,16) der Überlast-Kopplungsmittel (100) eine zylinderartige Gestaltung aufweisen und in axialer Richtung von einem Tubus (25) überdeckt werden, der innerhalb des tubusförmigen Schaftes (10) angeordnet ist und die im oberen Bereich mit Einrichtungen verbunden sind, die komprimierte Luft bereitstellen, die zum Antrieb der Greifeinrichtung (22) vorgesehen ist, wobei das tubusförmige Element gleichfalls dafür vorgesehen ist, die axiale Druckkraft auf das obere

Zylinderteil (15) zu übertragen.

Revendications

1. Appareil de fermeture de bouteilles ou analogues à l'aide de bouchons vissés, comprenant :
 - un manchon (3) tournant autour d'un axe vertical qui coïncide avec l'axe de la bouteille (200) à boucher,
 - un arbre tubulaire (10) entraîné en rotation par le manchon (3) et monté coaxialement dans le manchon avec une possibilité de coulissement axial par rapport à ce manchon (3),
 - une chambre (14) délimitée par l'arbre tubulaire (10),
 - un dispositif (100) d'accouplement d'échappement situé à l'intérieur de la chambre (14) et destiné à transmettre un couple de serrage de l'arbre tubulaire (10) au dispositif (22) de saisie d'un bouchon (2) à visser sur la bouteille (200), le dispositif d'échappement (100) comprenant un organe cylindrique supérieur (15) raccordé afin qu'il tourne avec l'arbre tubulaire (10), l'organe cylindrique supérieur (15) étant monté de façon coulissante par rapport à l'arbre tubulaire (10) et étant rappelé élastiquement par une force axiale vers le bas, et un organe cylindrique inférieur (16) délimité axialement par le dispositif de saisie (22), les organes cylindriques (15, 16) étant en position relative coaxiale et étant destinés à être couplés l'un à l'autre pour la transmission du couple de serrage au bouchon, l'accouplement se produisant par des surfaces respectives inclinées par rapport à l'axe longitudinal et tournées l'une vers l'autre d'une manière telle que l'organe cylindrique inférieur (16) du dispositif (100) d'accouplement d'échappement s'arrête lorsque le bouchon (2) placé sur la bouteille (200) a atteint un couple prédéterminé de serrage, alors que l'organe supérieur (15) continue à tourner en étant entraîné par l'arbre tubulaire (10) si bien que le coulissement de la surface inclinée de l'organe cylindrique supérieur (15) sur la surface inclinée de l'organe cylindrique inférieur (16) provoque un mouvement alternatif vers le haut et vers le bas de l'organe supérieur (15) à chaque tour, et
 - un dispositif capteur (39, 40) ayant pour objet la vérification de l'opération de bouchage de la bouteille (200) par détection du mouvement alternatif vers le haut et vers le bas.
2. Appareil selon la revendication 1, caractérisé en ce que l'organe cylindrique supérieur (15) du dispositif d'accouplement d'échappement (100) est rappelé axialement par l'intermédiaire de paliers (24) par un tube (25) introduit longitudinalement dans l'arbre tubulaire (10) et poussé élastiquement par une pression présente dans la chambre cylindrique (27) délimitée par une enveloppe (30) et dans laquelle passe le tube (25).
3. Appareil selon la revendication 2, caractérisé en ce que le tube (25) porte une barre verticale (38) destinée à activer le dispositif capteur (39, 40) pour la vérification de l'opération de bouchage de la bouteille (200).
4. Appareil selon la revendication 1, caractérisé en ce que le dispositif capteur comprend un premier capteur (39) et un second capteur (40) qui sont disposés de manière fixe dans le même plan horizontal et espacés convenablement dans le sens de rotation (A) d'un carrousel portant l'appareil.
5. Appareil selon la revendication 1, caractérisé en ce que le dispositif capteur (39, 40) détecte le passage et le déplacement vertical de pattes (41) portées par un dispositif (25, 38) destiné à suivre le mouvement de l'organe cylindrique supérieur (15) du dispositif d'accouplement d'échappement (100).
6. Appareil selon la revendication 1, caractérisé en ce que les capteurs (39, 40) sont destinés à détecter le passage, à une position axiale fixe, des pattes (41) pendant l'étape de vissage du bouchon (2), et à détecter le mouvement vertical alternatif de ces mêmes pattes (41) lorsque le couple prédéterminé de serrage a été atteint.
7. Appareil selon la revendication 1, caractérisé en ce que l'organe cylindrique supérieur (15) du dispositif (100) d'accouplement d'échappement a des rouleaux diamétralement opposés (17) qui tournent autour d'un axe radial et qui sont destinés à coopérer avec des fentes longitudinales respectives (18) formées à des positions correspondantes sur l'arbre tubulaire (10), afin que l'organe cylindrique supérieur (15) puisse coulisser verticalement par rapport à cet arbre (10) malgré la force axiale, lorsque le couple prédéterminé de serrage a été atteint.
8. Appareil selon la revendication 1, caractérisé en ce que l'organe cylindrique inférieur (16) du dispositif (100) d'accouplement d'échappement est supporté en rotation sur un dispositif roulant (19) logé dans un manchon supplémentaire (13) fixé à l'extrémité inférieure de l'arbre tubulaire (10) et s'étend axialement dans une tige (20) qui est rendue solidaire du dispositif de saisie (22).
9. Appareil selon la revendication 1, caractérisé en ce que les organes cylindriques (15, 16) du dispositif

(100) d'accouplement d'échappement ont une forme cylindrique et sont recoupés axialement par un tube (25) placé à l'intérieur de l'arbre tubulaire (10) et raccordé à la partie supérieure à un dispositif de distribution d'air comprimé utilisé pour l'alimentation du dispositif de saisie (22), le tube étant aussi destiné à transmettre la poussée axiale à l'organe cylindrique supérieur (15).

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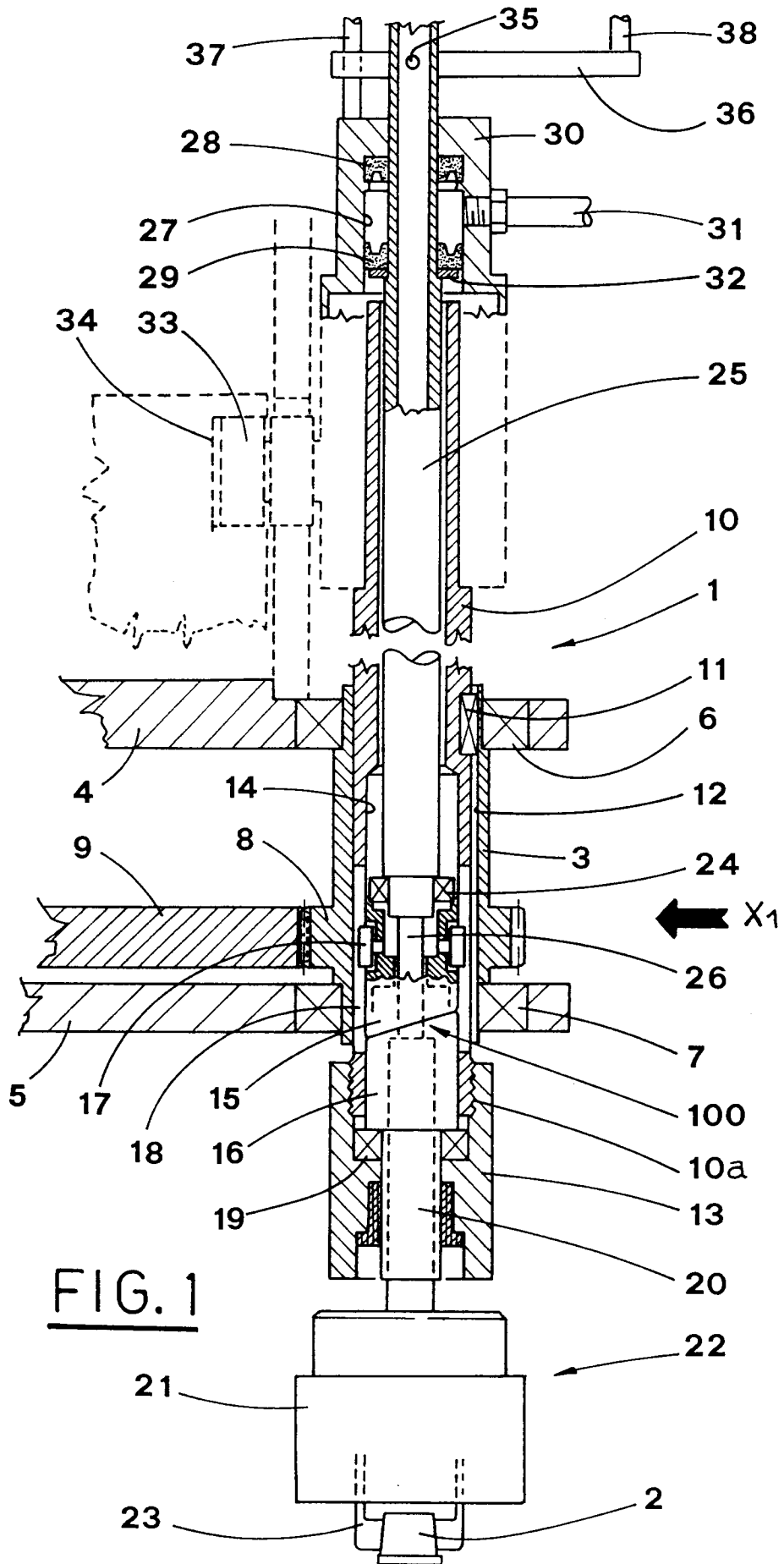


FIG. 3

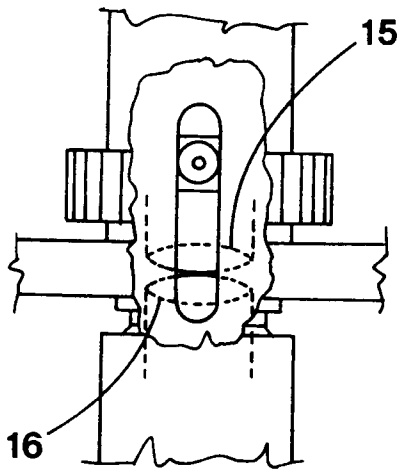
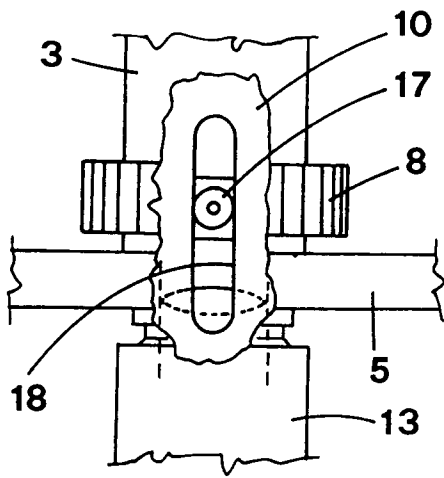


FIG. 4

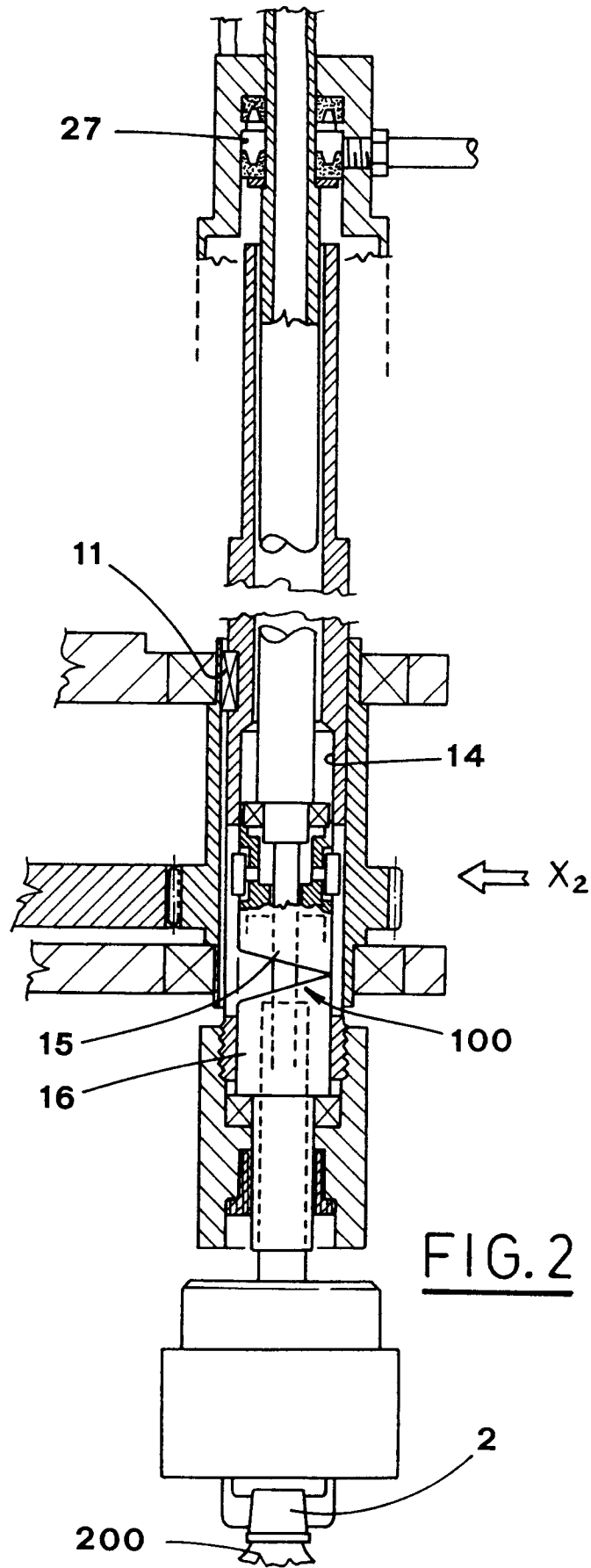


FIG. 2

