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(54) **Packaging machine for producing sealed packages of pourable food products and featuring an improved fill conduit**

Verpackungsmaschine zum Herstellen von gesiegelten Verpackungen für flüssige Nahrungsmittel mit einem verbesserten Füllrohr

Machine d'emballage pour la fabrication d'emballages scellés pour produits alimentaires liquides comprenant une tuyére de remplissage améliorée

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(73) Proprietor: **Tetra Laval Holdings & Finance S.A.**
1009 Pully (CH)

(72) Inventor: **Paganelli, Francesco**
41100 Modena (IT)

(74) Representative: **Franzolin, Luigi et al**
STUDIO TORTA S.r.l.,
Via Viotti, 9
10121 Torino (IT)

(56) References cited:
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Description

[0001] The present invention relates to a packaging machine for continuously producing sealed packages of pourable food products.

[0002] Machines for packaging pourable food products, such as fruit juice, wine, tomato sauce, pasteurized or long-storage (UHT) milk, etc., are known, on which the packages are formed from a continuous tube of strip packaging material sealed longitudinally and fed downwards along a vertical path.

[0003] The packaging material has a multilayer structure comprising a layer of paper material covered on both sides with layers of heat-seal plastic material, e.g. polyethylene, and, in the case of aseptic packages for long-storage products, such as UHT milk, also comprises a layer of barrier material defined, for example, by an aluminium film, which is superimposed on a layer of heat-seal plastic material and is in turn covered with another layer of heat-seal plastic material eventually defining the inner face of the package contacting the food product.

[0004] To produce the packages, the strip of packaging material is unwound off a reel and fed through a sterilizing unit in which it is sterilized, for example, by immersion in a chamber containing a liquid sterilizing agent, normally a concentrated hydrogen peroxide and water solution.

[0005] Once the strip is sterilized, the sterilizing agent is removed, e.g. vaporized by heating, from the surfaces of the packaging material; and the strip of packaging material so sterilized is maintained in a closed sterile environment, and is folded and sealed longitudinally to form a tube.

[0006] The tube is filled with the sterilized or sterile-processed food product, and is gripped, sealed and cut at equally spaced cross sections to form pillow packs, which are then folded mechanically to form the finished, e.g. substantially parallelepiped-shaped, packages.

[0007] More specifically, the food product is fed into the tube of packaging material by means of a fill circuit having a fill conduit in turn having an open-bottomed vertical portion extending coaxially inside the tube.

[0008] To ensure a substantially constant food product level inside the tube of packaging material during formation of the packages, known packaging machines normally also comprise control devices for controlling food product flow along the fill conduit.

[0009] In one known solution, the control devices comprise a float mounted to slide axially along a bottom end portion of the vertical portion of the fill conduit, and connected by a lever connecting mechanism to a throttle valve for regulating flow along the fill conduit. More specifically, each time the tube of packaging material is gripped and sealed transversely, the level of the product fed into the tube rises, thus raising the float, which, over and above a predetermined level, closes the throttle valve by means of the lever connecting mechanism, thus cutting off food product flow into the tube of packaging material.

[0010] Alternatively, the control devices substantially comprise a flow-regulating solenoid valve fitted to a portion of the fill conduit upstream from the vertical portion; a level sensor for detecting the food product level inside the tube of packaging material; and a control unit for controlling the solenoid valve on the basis of a signal from the level sensor.

[0011] Known level sensors may be located either outside the tube of packaging material to determine the position of a float indicating the food product level inside the tube, or on the fill conduit to directly determine by contact a predetermined level of the food product inside the tube of packaging material.

[0012] To ensure correct filling of the package being formed, known fill conduits normally comprise, on the outside, close to the bottom end of the vertical downstream portion, a pressure flange for counteracting upsurge of the food product along the tube of packaging material when the tube is gripped transversely.

[0013] More specifically, the pressure flange is substantially annular, extends radially from the vertical portion of the fill conduit towards the inner surface of the tube of packaging material, and is normally located beneath the float or level sensor of the device controlling food product flow along the fill conduit.

[0014] Pressure flanges of the above type have the drawback of producing severe counterpressure peaks during formation of the package, and especially when the tube of packaging material is gripped transversely.

[0015] This results in wear of the fill circuit components, which is further aggravated by the high operating rate of the packaging machines described, and may also result in flexing of the tube of packaging material and the forming devices interacting with the tube, thus damaging the packaging material and the packets being formed.

[0016] It is an object of the present invention to provide a packaging machine for producing sealed packages of pourable food products, and designed to eliminate the aforementioned drawbacks typically associated with known machines.

[0017] According to the present invention, there is provided a packaging machine for producing sealed packages of a pourable food product from a tube of packaging material, which is sealed longitudinally, is fed along a vertical downward path, is filled continuously with said food product by means of a fill conduit, and is gripped under pressure and sealed along equally spaced cross sections; said fill conduit having an open-bottomed end portion extending inside said tube of packaging material and having, externally, a pressure flange for counteracting upsurge of the food product along said tube when the tube is gripped transversely; characterized in that said pressure flange comprises at least one break region defining at least two adjacent tab portions, which are flexible by the pressure inside said

tube to define, for the food product, a respective passage increasing gradually in section alongside an increase in said pressure.

[0018] A preferred, non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a view in perspective, with parts removed for clarity, of a packaging machine for producing sealed packages of pourable food products from a tube of packaging material;

Figure 2 shows a larger-scale view in perspective of a portion of the tube of packaging material housing a fill conduit having a pressure flange in accordance with the present invention;

Figure 3 shows a larger-scale top plan view of the Figure 2 pressure flange.

[0019] Number 1 in Figure 1 indicates as a whole a packaging machine for producing sealed packages 2 of a pourable food product, such as pasteurized or UHT milk, fruit juice, wine, etc., from a tube 3 of packaging material sealed longitudinally and having an axis A.

[0020] The packaging material has a multilayer structure (not shown), and comprises a layer of fibrous material, normally paper, covered on both sides with respective layers of heat-seal plastic material, e.g. polyethylene. In the case of aseptic packages for long-storage products, such as UHT milk, the packaging material also comprises a layer of barrier material, defined for example by an aluminium film, which is superimposed on a layer of heat-seal plastic material and is in turn covered with another layer of heat-seal plastic material eventually contacting the food product.

[0021] Tube 3 is formed in known manner - therefore not described in detail - by longitudinally folding and sealing a strip 4 of heat-seal sheet material, is filled with the sterilized or sterile-processed food product by means of a fill conduit 5 extending partly inside tube 3 and forming part of a known fill circuit (not shown), and is fed by known devices along a vertical downward path, coincident with axis A, to a forming station 6, where it is gripped and sealed at equally spaced cross sections by respective pairs of jaws 7.

[0022] At successive known stations (not shown) on machine 1, tube 3 is cut along said cross sections to form a number of sealed pillow packs 8, which are later subjected to mechanical folding operations (not shown by not forming part of the present invention) to form the finished packages 2.

[0023] With reference to Figures 1 and 2, fill conduit 5 is upside-down-L-shaped and comprises a flow-regulating valve 9. More specifically, fill conduit 5 comprises a substantially horizontal upstream portion 10 fitted with valve 9; and a vertical downstream portion 11 extending coaxially inside tube 3 of packaging material and having an open bottom end 12.

[0024] Packaging machine 1 also comprises a device 15 for controlling the pourable food product level inside tube 3 and of the type comprising, for example, a float 16 fitted to slide axially on downstream portion 11 of fill conduit 5 and supporting a number of magnetic elements (not shown), and a Hall-effect sensor 17 located outside tube 3 and which interacts with float 16 to generate a level signal by which to regulate inflow of the pourable food product into tube 3. More specifically, sensor 17 is located upstream from forming station 6 and supported by an arm not shown.

[0025] Alternatively, the pourable food product level inside tube 3 may be controlled and regulated by control devices other than device 15, e.g. by those described in the introduction to the present description.

[0026] With particular reference to Figures 2 and 3, fill conduit 5 is provided, on the outside, close to bottom end 12, with a pressure flange 20 for counteracting upsurge of the food product along tube 3 of packaging material, when tube 3 is gripped transversely between pairs of jaws 7.

[0027] Flange 20 is substantially defined by a thin disk of flexible material, having a central hole and fitted, e.g. welded, to downstream portion 11 of fill conduit 5, has a circular, radially outer, peripheral edge 21, and is housed with a certain amount of radial clearance inside tube 3 of packaging material.

[0028] An important aspect of the present invention is that flange 20 comprises a number of - in the example shown, three - transverse slits 22 extending towards fill conduit 5 from outer peripheral edge 21, and dividing flange 20 into a number of tab portions 23, which are flexible in a direction substantially parallel to axis A by the pressure of the food product inside tube 3, so as to define, for the food product, respective passages increasing gradually in section alongside an increase in pressure.

[0029] More specifically, slits 22 are equally spaced angularly about axis A, are substantially upside-down-L-shaped, and each comprise a straight, radial first portion 24 extending from peripheral edge 21, and a straight second portion 25, which extends perpendicularly from one end of portion 24 substantially along an intermediate circumferential strip of flange 20, is separated radially from fill conduit 5, and terminates in a through hole 26 having an axis parallel to axis A and of a diameter larger than the width of slit 22.

[0030] Portions 25 extend from one side of respective portions 24, and are all oriented in the same direction - anticlockwise in Figure 3 - about axis A.

[0031] Each tab portion 23 comprises a radially inner, annular portion fixed to fill conduit 5 and extending between fill conduit 5 and portions 25 of slits 22; and a flexible, radially outer, annular portion defined laterally by portions 24 of respective slits 22.

[0032] In actual use, each time tube 3 of packaging material is gripped and sealed between a pair of jaws 7, the food product inside tube 3 surges upwards; which upsurge is counteracted by flange 20, which provides

for slowing down upflow of the food product along axis A in the interim between two successive gripping and sealing operations, so as to ensure correct filling of packets 8 being formed.

[0033] The thrust exerted by the food product on flange 20 flexes tab portions 23 in a direction parallel to axis A, and gradually increases the passage sections defined by slits 22, thus increasing food product flow through flange 20.

[0034] This therefore provides for absorbing the counterpressure peaks which tend to be produced inside fill conduit 5 during formation of packets 8, and which are the main cause of tube 3 of packaging material flexing. In other words, the flexibility of tab portions 23 provides for maintaining a substantially constant food product pressure inside tube 3 of packaging material during operation of jaws 7.

[0035] It should be pointed out that holes 26 and portions 25 of slits 22 provide for preventing fatigue failure of flange 20, which would occur at the inner ends of straight radial slits.

[0036] Clearly, changes may be made to machine 1 as described and illustrated herein without, however, departing from the scope of the present invention.

[0037] In particular, tab portions 23 may overlap slightly laterally, and be separated by respective variously shaped regions defining breaks in the material of flange 20.

Claims

1. A packaging machine (1) for producing sealed packages (2) of a pourable food product from a tube (3) of packaging material, which is sealed longitudinally, is fed along a vertical downward path (A), is filled continuously with said food product by means of a fill conduit (5), and is gripped under pressure and sealed along equally spaced cross sections; said fill conduit (5) having an open-bottomed end portion (11) extending inside said tube (3) of packaging material and having, externally, a pressure flange (20) for counteracting upsurge of the food product along said tube (3) when the tube (3) is gripped transversely; **characterized in that** said pressure flange (20) comprises at least one break region (22) defining at least two adjacent tab portions (23), which are flexible by the pressure inside said tube (3) to define, for the food product, a respective passage increasing gradually in section alongside an increase in said pressure.

2. A machine as claimed in Claim 1, **characterized in that** said break region of said pressure flange (20) comprises a transverse slit (22) extending towards said fill conduit (5) from an outer peripheral edge (21) of the pressure flange (20).

3. A machine as claimed in Claim 2, **characterized in that** said pressure flange (20) comprises a number of said slits (22) equally spaced angularly about said fill conduit (5) and defining in between respective said tab portions (23).

4. A machine as claimed in Claim 3, **characterized in that** said slits (22) are substantially upside-down-L-shaped, and each comprise a straight radial first portion (24) extending from said outer peripheral edge (21) of said pressure flange (20), and a straight second portion (25) extending perpendicularly from one end of the first portion (24) and separated radially from said fill conduit (5).

5. A machine as claimed in Claim 4, **characterized in that** said second portion (25) of each said slit (22) terminates, at the opposite end to the respective said first portion (24), in a through hole (26) having an axis parallel to said path (A) and a diameter larger than the width of the slit (22).

6. A machine as claimed in Claim 4 or 5, **characterized in that** said second portions (25) of said slits (22) extend from one side of the respective said first portions (24), and are all oriented in the same direction about the axis (A) of said tube (3) of packaging material.

7. A machine as claimed in any one of the foregoing Claims, **characterized in that** said pressure flange (20) is substantially defined by a thin disk of flexible material having a central hole and fitted to said end portion (11) of said fill conduit (5).

Patentansprüche

1. Verpackungsmaschine (1) zum Herstellen von verbzw. gesiegelten. Verpackungen (2) für schüttfähige Nahrungsmittel aus einem längs gesiegelten Schlauch (3) aus Verpackungsmaterial, der entlang einem vertikalen Abwärtspfad (A) zugeführt, stetig mit dem Nahrungsmittel mittels eines Füllrohres (5) befüllt und unter Druck erfasst und entlang gleich beabstandeter Querschnitte gesiegelt wird; wobei das Füllrohr (5) einen unten offenen Endabschnitt (11) hat, der in den Schlauch (3) aus Verpackungsmaterial hineinragt und außen einen Druckflansch (20) aufweist, um dem Aufwallen des Nahrungsmittels entlang dem Schlauch (3) entgegenzuwirken, wenn der Schlauch (3) quer erfasst wird;
dadurch gekennzeichnet, dass
der Druckflansch (20) wenigstens einen Bruchbereich (22) aufweist, der wenigstens zwei benachbarte Klappbereiche (23) definiert, die durch den Druck innerhalb des Schlauches (3) biegbar bzw. flexibel sind, um für das Nahrungsmittel einen ent-

sprechenden Durchlass zu definieren, der mit einem Anstieg des Drucks im Schnitt allmählich größer wird.

2. Maschine nach Anspruch 1,
dadurch gekennzeichnet, dass
der Bruchbereich des Druckflansches (20) einen Querschlitz (22) aufweist, der sich von einem äußeren Umfangsrand (21) des Druckflansches (20) zum Füllrohr (5) hin erstreckt.

3. Maschine nach Anspruch 2,
dadurch gekennzeichnet, dass
der Druckflansch (20) eine Anzahl Schlitze (22) aufweist, die winkelig im gleichen Abstand voneinander um das Füllrohr (5) angeordnet sind und dazwischen entsprechende Klappbereiche (23) definieren.

4. Maschine nach Anspruch 3,
dadurch gekennzeichnet, dass
die Schlitze (22) im Wesentlichen umgedreht L-förmig sind und jeder einen geraden, radialen ersten Bereich (24) hat, der sich vom äußeren Umfangsrand (21) des Druckflansches (20) ausgehend erstreckt, und einen geraden zweiten Bereich (25) hat, der sich senkrecht von dem einen Ende des ersten Bereich (24) ausgehend erstreckt und von dem Füllrohr (5) radial getrennt ist.

5. Maschine nach Anspruch 4,
dadurch gekennzeichnet, dass
der zweite Bereich (25) jedes Schlitzes (22) an dem dem ersten Bereich (24) gegenüberliegenden Ende in einer Durchgangsbohrung (26) endet, wobei die Achse parallel zum Pfad (A) verläuft und der Durchmesser größer als die Breite des Schlitzes (22) ist.

6. Maschine nach einem der Ansprüche 4 oder 5,
dadurch gekennzeichnet, dass
die zweiten Bereiche (25) der Schlitze (22) sich von der einen Seite der entsprechenden ersten Abschnitte (24) erstrecken und alle in die gleiche Richtung um die Achse (A) des Schlauches (3) des Verpackungsmaterials ausgerichtet sind.

7. Maschine nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, dass
der Druckflansch (20) im Wesentlichen durch eine dünne Scheibe biegbar bzw. flexiblen Materials mit einer zentralen Durchbrechung definiert und an dem Endabschnitt (11) des Füllrohres (5) befestigt ist.

Revendications

1. Machine d'emballage (1) pour la production d'emballages scellés (2) d'un produit alimentaire liquide à partir d'un tube (3) de matériau d'emballage, qui est soudé longitudinalement, avancé le long d'un chemin vertical descendant (A), rempli de façon continue avec le dit produit alimentaire au moyen d'un conduit de remplissage (5) et serré sous pression et soudé le long de sections transversales équidistantes, le dit conduit de remplissage (5) ayant une partie d'extrémité inférieure ouverte (11) qui s'étend à l'intérieur du dit tube (3) de matériau d'emballage et comporte extérieurement une collerette de pression (20) pour s'opposer à la remontée brusque du produit alimentaire le long du dit tube (3) lorsque le tube (3) est serré transversalement, **caractérisée en ce que** la dite collerette de pression (20) comprend au moins une région d'interruption (22) définissant au moins deux segments adjacents (23) qui fléchissent, sous l'effet de la pression à l'intérieur du dit tube (3), de manière à définir pour le produit alimentaire un passage respectif augmentant progressivement de section au fur et à mesure que la dite pression augmente.

2. Machine selon la revendication 1, **caractérisée en ce que** la dite région d'interruption de la dite collerette de pression (20) comprend une fente transversale (22) s'étendant vers le dit conduit de remplissage (5) à partir d'un bord périphérique extérieur (21) de la collerette de pression (20).

3. Machine selon la revendication 2, **caractérisée en ce que** la dite collerette de pression (20) comprend plusieurs dites fentes (22) angulairement équidistantes autour du dit conduit de remplissage (5) et définissant entre elles les dits segments respectifs (23).

4. Machine selon la revendication 3, **caractérisée en ce que** les dites fentes (22) sont sensiblement en forme de L inversé et comprennent chacune une première partie radiale rectiligne (24) s'étendant à partir du dit bord périphérique extérieur (21) de la dite collerette de pression (20), et une deuxième partie rectiligne (25) s'étendant perpendiculairement à partir d'une extrémité de la première partie (24) et séparée radialement du dit conduit de remplissage (5).

5. Machine selon la revendication 4, **caractérisée en ce que** la dite deuxième partie (25) de chaque dite fente (22) se termine, à l'extrémité opposée à la dite première partie respective (24), dans un trou traversant (26) ayant un axe parallèle au dit chemin (A) et un diamètre plus grand que la largeur de la fente (22).

6. Machine selon la revendication 4 ou 5, **caractérisée en ce que** les dites deuxièmes parties (25) des dites fentes (22) s'étendent à partir d'un côté des dites premières parties respectives (24), et elles sont toutes orientées dans la même direction autour de l'axe (A) du dit tube (3) de matériau d'emballage.

7. Machine selon une quelconque des revendications précédentes, **caractérisée en ce que** la dite collerette de pression (20) est substantiellement définie par un disque mince de matière flexible ayant un trou central et fixé à la dite partie d'extrémité (11) du dit conduit de remplissage (5).

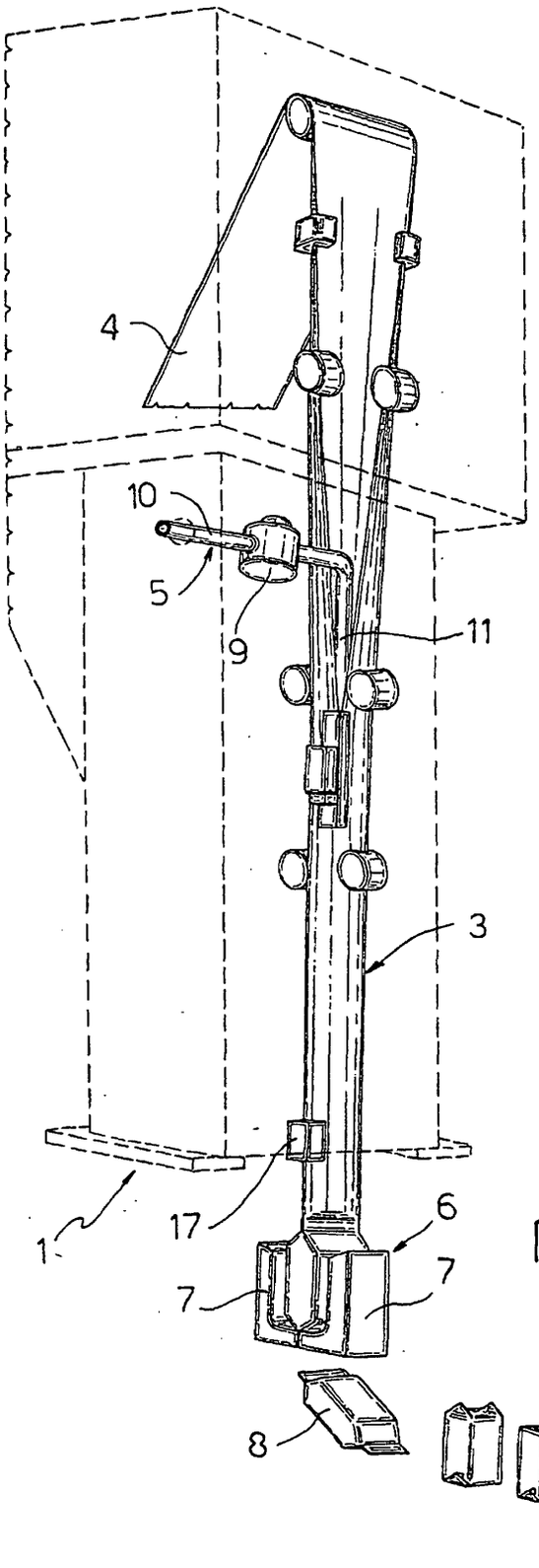


Fig.1

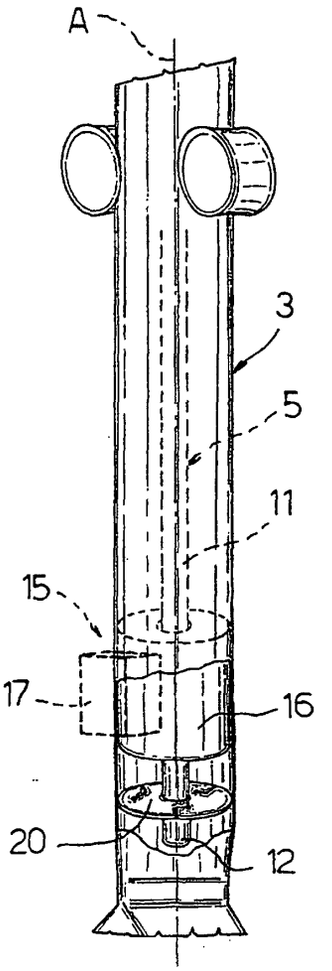


Fig.2

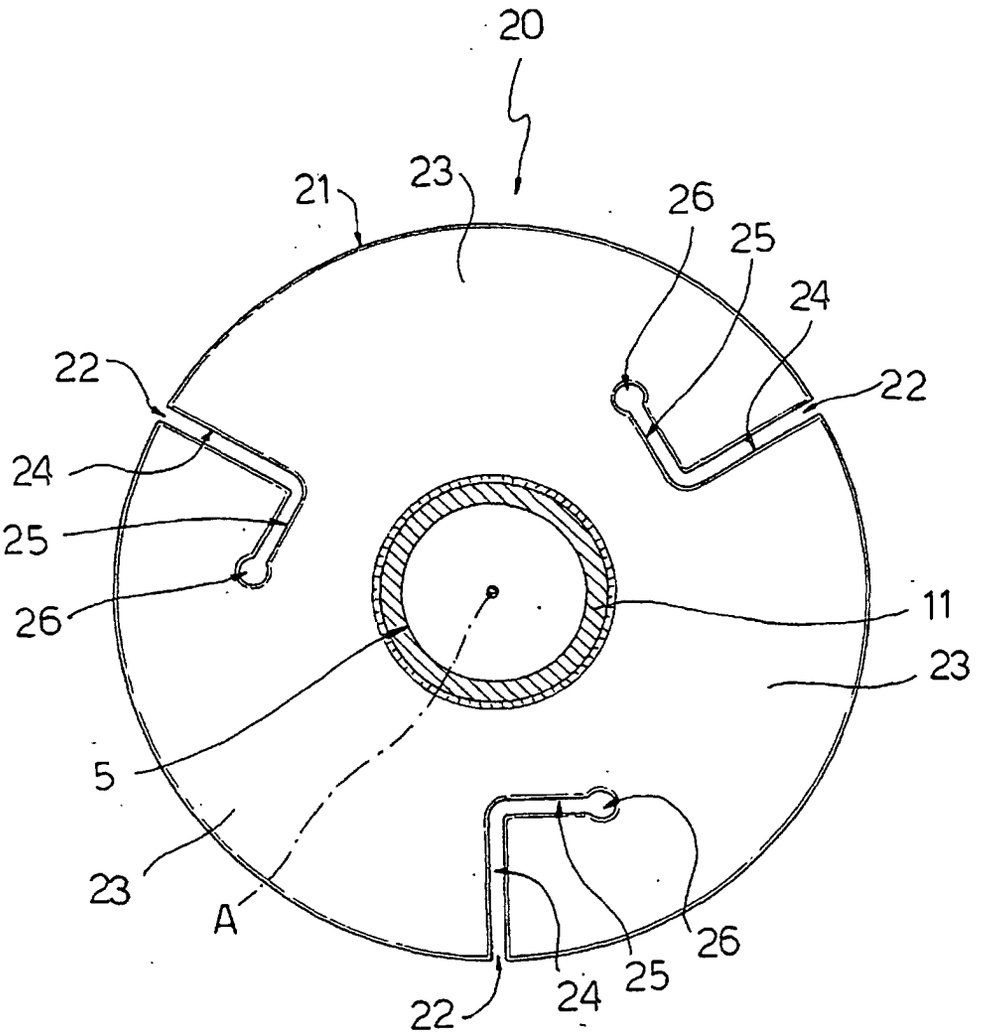


Fig.3