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(54) **UNIT FOR FILLING PACKAGES AND CORRESPONDING METHOD**

(57) The invention concerns a filling unit (10) for filling packages (100) in a packaging machine, wherein the unit (10) comprises an assembly (12) for filling the package (100) and an assembly (13) for feeding the substance (S) to be inserted into the package (100), the filling assembly (12) and the feeding assembly (13) cooperating to insert a predefined quantity of substance (S) inside the package (100) simultaneously with the formation of

said package (100), wherein said filling assembly (12) comprises one or more support members (21) able to support and prepare the shape of the sheet material (101) for the formation of the package (100). The invention also concerns a corresponding method for filling a package (100) by means of the filling unit (10) as above and a packaging machine comprising this unit (10).

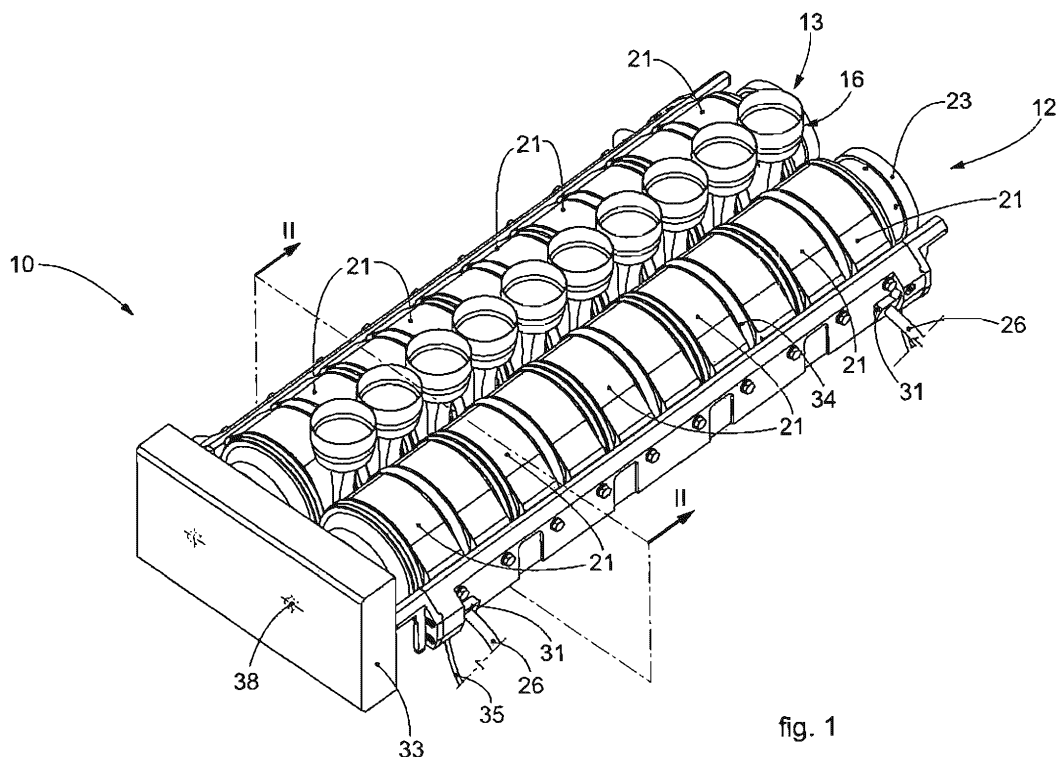


fig. 1

Description

FIELD OF THE INVENTION

[0001] The present invention concerns a filling unit of a packaging machine for filling packages, such as for example sachets, double sachets, bags.

[0002] In particular, the packages are suitable to contain solid substances in powder, granule or tablet form.

[0003] The filling unit is able to support, shield and fill said packages, and is suitable in particular to support the material intended to form the package and to shield the volume in which the packages are filled with these substances.

[0004] The substances may be, by way of non-restrictive example, drugs, supplements, food preparations, for both human and animal use, cosmetics, substances for washing and disinfection, chemical or biological substances, whether dangerous or not, and suchlike.

[0005] The present invention also concerns a method for filling a package by means of the filling unit according to the present invention, and a packaging machine comprising said filling unit.

BACKGROUND OF THE INVENTION

[0006] Automated packaging machines or lines for forming and filling flexible packages are known in the state of the art.

[0007] These known machines or lines usually comprise a processing machine or station located upstream, for example a filling station in which the packages to be packaged are filled.

[0008] The packages coming out of said processing machine or station are sent to one or more movement lines, said lines being typically conformed as transport belts or chains of a known type.

[0009] The movement lines transport the packages to a processing machine or station located downstream, for example a packaging station where the packages to be packaged are disposed in an orderly manner inside boxes or cartons or flexible packages.

[0010] The filling station is usually suitable to load or form a package inside which the substances with which the package has to be filled are put, using a filling unit. The filling unit receives the material to form the package in the form of a pair of sheets or films, generally unwound from respective reels. Alternatively, the material can be in the form of a tubular sheet or film.

[0011] The filling unit comprises shaped guides on which the sheets of material slide and having a shape such as to allow to join the pair of sheets at least along some of their perimeter edges, at the same time defining an internal chamber having a certain volume, intended to accommodate the substances as above.

[0012] The filling unit generally heat-seals the sheets first along the longitudinal edges of greater extension, and subsequently along a transverse edge intended to

define the bottom of the package. If the material is already in tubular form, it is sufficient to heat-seal the bottom of the package.

[0013] By doing so, the filling unit heat-seals three perimeter edges of the package, leaving a fourth edge open, in correspondence with which the opening is defined through which the package is filled; this fourth edge is heat-sealed after filling is completed.

[0014] The filling units known in the state of the art usually comprise high temperature rolls, through which the sheets of material to be joined to form the package are made to pass. The rolls provide high-temperature sealing elements in suitable positions such as to compress and heat the sheets of material at least in correspondence with the perimeter edges as above.

[0015] Often these packages are filled with food, pharmaceutical or cosmetic products that can undergo alterations if subjected to excessive temperatures. Exposure to excessive temperatures could, for example, determine changes of a chemical-physical nature for these substances or lead to the formation of compounds, which could cause possible reductions in the efficacy of the substance itself and/or danger to human, animal health and/or damage for the environment in which they are to be used.

[0016] One disadvantage of filling units known in the state of the art is that generally, due to the high temperature of some elements of the filling unit, such as the heat-sealing elements, the motors and suchlike, the substances can be subjected to said excessive temperatures.

[0017] Another disadvantage of known filling units lies in the formation of condensation on certain components of the unit in contact with the sheets of material intended to form the package.

[0018] In particular, it has been observed that condensation usually forms first on the external wall of support members configured to support said sheets of material and subsequently also on the internal wall of said support members which is exposed to the sheets of material.

[0019] In the field of filling units as above, condensation is generated due to the thermal gradient between the hot parts, such as the heat sealing rolls or the motors, and the components in the vicinity of the package to be filled and/or with the substances to be inserted into it, such as for example the support members, which must instead be kept cold in order not to alter the properties of said substances due to an unwanted heating thereof.

[0020] Specifically, the thermal gradients mentioned above can lead any evaporated moisture to migrate toward the cold components, where it condenses, forming drops of water.

[0021] The drops of water can, for example by gravity, descend toward the bottom of the components, for example toward the bottom of the support guides of the sheets that form the package, also in correspondence with the lateral walls of the support guides and the front wall, at least in its outermost areas. The drops of water

can therefore, in this way, be conveyed inside the package to be filled and come into contact with the substances that are inserted into it.

[0022] The water that accidentally enters the package together with the substances can cause the formation of mold and/or alter the composition, state, taste or other characteristics of the substance inside the package.

[0023] Another disadvantage is that, in the presence of possible other elements used during the various processes in the filling unit, such as for example oils, fats, chemical substances and mixtures thereof with water or other, these elements can also cause contamination and alterations of the substances contained in the package, if they form condensation in the vicinity of the package.

[0024] Drops of water condensation and/or other elements that are deposited in correspondence with the perimeter edges of the package can also reduce the effectiveness of the heat sealing, generating unwanted apertures/micro-apertures in the perimeter edges, and/or points with an attachment that is superficial and weak in correspondence with which the package can lose its hermetic seal.

[0025] Document US2759308 shows a plant for packaging slices of cheese in individual wrappers comprising a filling unit equipped with one or more cooling channels in which the passage of a cooling fluid is provided. However, these cooling channels are not configured to lap a surface which then comes into direct contact with the film in which the individual wrappers are made.

[0026] US6058680 also shows a plant for packaging cheese, in which after a station for filling individual cheese packages and compressing them, a cooling station is provided in which the packaged cheese is made to pass through a bath of cooling liquid.

[0027] GB1137649 instead shows a plant for filling bags with asphalt, which provides cooling means but without providing any details on them, nor on how they are installed in the plant.

[0028] US3930350 shows an apparatus for packaging products in hermetically sealed packages, comprising a plurality of channels for the passage of a heated fluid (water vapor), so as to heat and thus dry the thermoplastic film used to make the packages. However, heating the thermoplastic film does not prevent the subsequent formation of condensation on it.

[0029] EP0119957 describes a device for forming a packaging material initially in the form of a strip, to form a tube of packaging material with it. For this purpose, the forming device comprises an arch-shaped support member. No drying mean is provided in this forming device.

[0030] There is therefore a need to perfect a filling unit, and a corresponding filling method, which can overcome at least one of the disadvantages of the state of the art.

[0031] In particular, one purpose of the present invention is to keep support members of the material for the formation of the package at an acceptable temperature for the substances to be inserted into the package, in order not to alter their properties due to unwanted heat-

ing.

[0032] Another purpose of the present invention is to prevent water condensation, or other elements, from entering into the packages to be filled.

[0033] Yet another purpose is to limit the risk of condensation forming in correspondence with the heat-sealing areas.

[0034] Another purpose of the present invention is to provide a packaging machine comprising a filling unit able to achieve the purposes as above, and to implement the corresponding filling method.

[0035] Another purpose is to perfect a method for filling a package by means of the filling unit according to the present invention.

[0036] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

20 SUMMARY OF THE INVENTION

[0037] The present invention is set forth and characterized in the independent claims. The dependent claims describe other characteristics of the present invention or variants to the main inventive idea.

[0038] In accordance with the above purposes, some embodiments described here concern a unit for filling packages and a packaging machine that comprises it, which overcome the limits of the state of the art and eliminate the defects present therein.

[0039] Some embodiments described here also concern a method for filling a package by means of the filling unit according to the invention.

[0040] In accordance with some embodiments, a filling unit is provided comprising an assembly for feeding the substance to be inserted into the package and an assembly for filling the package.

[0041] According to some embodiments, the feeding assembly meters and/or controls a flow, continuous or not, of substance to be inserted into the single package.

[0042] According to some embodiments, the feeding assembly cooperates with the filling assembly in order to insert a predefined quantity of substance inside the package.

[0043] According to some embodiments, the filling assembly comprises one or more attachment elements, to attach the edges of the package and to close the package after the substance has been inserted.

[0044] According to some embodiments, the filling assembly comprises one or more shaped support members to support the sheet material with which the package is to be made. The support members can be able to confer on the sheet material a desired arched shape intended to define one of the lateral walls of the package, so as to define an internal volume for the passage of the substance to be inserted into the package.

[0045] According to the invention, the one or more support members comprise one or more cooling conduits

able to allow the passage of a cooling fluid.

[0046] According to some embodiments, the one or more cooling conduits are provided with attachments for coupling pipes through which the cooling fluid respectively enters and exits the conduit, wherein the pipes as above can be in fluidic connection with actuator means suitable to generate a flow of the cooling fluid in order to make it circulate in the at least one cooling conduit.

[0047] According to some embodiments, the one or more support members comprise an internal wall provided with an internal surface, concave in shape and intended to be exposed to the sheet material as above, and adjacent to the substance to be introduced into the package. The internal wall as above is disposed on the opposite side with respect to an external wall, the external wall being provided with an external surface, convex in shape.

[0048] Advantageously, the one or more cooling conduits are configured to allow the cooling fluid to lap at least the internal wall of the support members.

[0049] In this way, it is possible to control the temperature of the support members, at least in the proximity of the substance that is inserted into the package, at values that are acceptable for the substance itself.

[0050] The one or more support members also comprise one or more internal cavities able to allow the passage of a drying fluid.

[0051] According to some embodiments, the one or more internal cavities are configured as a conduit provided with an inlet hole and an outlet hole through which the drying fluid respectively enters and exits the conduit, wherein the inlet hole can be in fluidic connection with actuator means suitable to generate a flow of the drying fluid, in order to make it circulate in the at least one internal cavity.

[0052] Advantageously, the means for the passage of the drying fluid defined by the internal cavity are configured to allow the drying fluid to lap at least the external wall of the support members, on the opposite side with respect to the internal surface which is intended to be exposed to the sheet material, and therefore in the vicinity of the substance to be introduced into the package.

[0053] In this way, the formation of condensation, potentially capable of damaging the contents of the packages themselves if the condensation were able to enter inside the package, is significantly reduced or even eliminated. The one or more internal cavities can in fact be able to thermally isolate the one or more guides and provide an insulated wall, eliminating the formation of condensation.

[0054] According to one aspect of the invention, a method for filling a package is provided, which provides that the cooling fluid is at a lower temperature than that of the support members due to the proximity to some elements of the filling unit, such as the heat-sealing means, the motors and suchlike. In particular, the cooling fluid can be at room temperature or lower.

[0055] The filling method also provides that the drying

fluid is at room temperature or heated. The fact that the drying fluid is heated means that the temperature of the external wall can be higher than room temperature. The formation of condensation is thus reduced even more easily.

[0056] In this way, the drying fluid, at room temperature or heated, allows to keep the external wall at a temperature higher than that of the cooling fluid and possibly than room temperature, once again allowing to reduce or prevent the formation of condensation on the external wall of the support members.

[0057] Since condensation does not form in correspondence with the components as above, it is therefore impossible for drops of water to fall by gravity inside the package during the filling step.

[0058] Furthermore, during the heat-sealing of the package, condensation is also prevented from reaching the ends of the flaps, in correspondence with the parts to be sealed. This is advantageous because it is evident that the presence of condensation can compromise the correct sealing of the flaps, and therefore damage the hermetic seal of the package.

ILLUSTRATION OF THE DRAWINGS

[0059] These and other aspects, characteristics and advantages of the present invention will become apparent from the following description of some embodiments, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a perspective view of a filling unit according to embodiments described here;
- fig. 2 is a section view of the unit of fig. 1 according to plane II-II;
- fig. 3 is a section view like the one of fig. 2 of a filling unit according to alternative embodiments described here;
- fig. 4 is a cross-section view of the unit of fig. 2 and 3 according to plane IV-IV; and
- fig. 4a is an enlarged detail of the cross-section of the unit of fig. 4, according to possible embodiments.

[0060] To facilitate comprehension, the same reference numbers have been used, where possible, to identify identical common elements in the drawings. It is understood that elements and characteristics of one embodiment can conveniently be incorporated into other embodiments without further clarifications.

DESCRIPTION OF SOME EMBODIMENTS

[0061] We will now refer in detail to the possible embodiments of the invention, of which one or more examples are shown in the attached drawings. Each example is supplied by way of illustration of the invention and shall not be understood as a limitation thereof. For example, one or more characteristics shown or described inso-

much as they are part of one embodiment can be varied or adopted on, or in association with, other embodiments to produce another embodiment. It is understood that the present invention shall include all such modifications and variants.

[0062] With reference to the attached drawings, a unit 10 is described for filling packages 100 for a packaging machine, hereafter referred to as unit 10, which can be seen as a whole in fig. 1.

[0063] The sealed packages 100 are able to contain substances S, for example substances in powder, granules, tablets, typically of a food, pharmaceutical or cosmetic nature (fig. 2 or 3).

[0064] The unit 10 comprises a filling assembly 12 and a feeding assembly 13.

[0065] According to some embodiments, the filling assembly 12 is able to remove the sheet material 101 with which the package 100 will be formed (fig. 4), supports it and arranges it according to the shape that the package 100 will need to have. At the end of the filling, the package 100 can be sealed, in particular hermetically.

[0066] According to some embodiments, the feeding assembly 13 is able to remove the substances S in order to insert them into the package 100.

[0067] The filling assembly 12 and the feeding assembly 13 are able to cooperate with each other in order to feed the substance S into the package 100 while this is being formed and before it is sealed.

[0068] The feed of this substance can occur continuously or discontinuously, interrupting, on each occasion, the pouring of the substance S into the package 100 when a predefined quantity has been reached.

[0069] The feeding assembly 13 can comprise one or more conduits 16 for transporting the substance S.

[0070] These one or more transport conduits 16 are able to allow the outflow of the substance S and to insert it inside the package 100. The one or more transport conduits 16 can for example be configured as hollow conduits inside which there are provided means 18 for moving the substance.

[0071] As shown in figs. 2 and 3, these movement means 18 can be able to transport the substance S toward the package 100, and can be of various types known in the state of the art.

[0072] For example, the movement means 18 can be configured as volumetric pumps, augers, gears, worm screws, funnel elements and suchlike.

[0073] The transport conduits 16 can end in the form of a nozzle 19 (fig. 2), able to insert the substance S into the package 100 being formed without the substance S being poured outside. The nozzle 19 can be shaped as a funnel ending with a small tube 19a, for example a capillary, or according to similar configurations.

[0074] The filling assembly 12 can comprise one or more support members 21 on which the sheet material 101 intended to form the package 100 flows (fig. 1-3).

[0075] The sheet material 101 can be a heat-sealable material. For example, it can be a polymeric sheet ma-

terial, such as a polymer/paper or paper/aluminum composite foil material, a metallic material such as aluminum foil or suchlike, or a combination thereof. For example, it can be a transparent, or non-transparent, plastic film.

[0076] The support members 21 can be shaped in order to confer on the sheet material 101 a desired arched shape intended to define one of the lateral walls 103 of the package 100.

[0077] In this way, the support members 21 can define an internal volume 43 for the passage of the substance S to be inserted into the package 100.

[0078] According to a preferred configuration, the filling assembly 12 comprises at least one pair of support members 21 for each transport conduit 16, each support member 21 being intended to support a respective sheet of sheet material 101 (fig. 1). In other embodiments, all included within the scope of the present invention, a number of support members 21 greater than two can also be provided.

[0079] With reference to figs. 2 and 3, each support member 21 has, at least in its upper part, an arched shape.

[0080] As reported in fig. 4, each support member 21 can comprise an internal concave surface 28, intended to be exposed to a respective sheet material 101, and a convex external surface 29.

[0081] This internal surface 28 is defined as the surface of an internal wall 32 of the support member 21. Similarly, in a specular manner, the external surface 29 is defined as the surface of an external wall 39 disposed on the opposite side with respect to a respective feed conduit 16, at the end of which the package 100 is being formed and filled.

[0082] According to a variant not shown in the drawings, the support member 21 can be a hollow element, inside which the substance S can pass and on the outside of which the sheet material 101 can pass, pre-formed as a thin and flexible tube or casing.

[0083] The concave shape of the internal surfaces 28 can limit and shield the internal volume 43 for the passage of the substance S, this volume 43 being delimited by the sheet material 101, in particular by the pair of sheet materials 101 intended to cooperate in order to form the package 100. Inside the internal volume 43, there can be inserted, or not, the nozzle 19, or an end part thereof, such as the small tube 19a shown in fig. 2.

[0084] According to the invention, the one or more support members 21 can have one or more cooling channels 25 for the passage of a cooling fluid.

[0085] This cooling fluid is able to protect the substances S from excessive heat. Such cooling fluids can be liquid or gaseous, for example they can be water or refrigerant liquids/gasses.

[0086] The cooling fluid is advantageously at a lower temperature than that of the support members 21, which reach even high temperatures due to some elements of the unit 10, such as the elements that perform the heat-sealing, the drive motors and others still. In particular,

the cooling fluid can be a fluid at room temperature or at a temperature below room temperature.

[0087] For example, with reference to figs. 3 and 4a, the cooling channels 25 are integrated in the support members 21, at least in the proximity of their internal surface 28, so that the cooling fluid can lap at least one internal part 32 of the support members 21.

[0088] The filling assembly 12 can comprise special attachments 31 for the connection to pipes 26 for the cooling fluids to enter and exit the support members 21 (fig. 1).

[0089] The pipes 26 can be in fluidic connection with actuator means 40 suitable to generate a flow of the cooling fluid in order to make it circulate in the one or more cooling channels 25.

[0090] The actuator means 40 can comprise a compressor, a pump, movement conduits and suchlike.

[0091] According to some embodiments, the cooling channels 25 are in hydraulic connection with each other, and the filling assembly 12 is provided with two attachments 31, respectively for the cooling fluid to enter and exit (fig. 1). However, it is possible to provide a plurality of cooling channels 25, for example in correspondence with each of the support members 21, fed independently of the others.

[0092] According to the invention, the one or more support members 21 also have at least one internal cavity 27 defining means for the passage of a drying fluid configured to lap at least one external wall 39 of the support members 21. Such drying fluid can be liquid or gaseous, for example it can be water or air.

[0093] This at least one internal cavity 27 can be able to reduce or prevent the formation of condensation on components of the unit in contact with the sheets of material intended to form the package. In particular, it has been observed that condensation usually forms first on the external surface 29 of the support members 21 and subsequently also on their internal surface 28.

[0094] This condensation can form due to the thermal gradient between the components in contact with the package 100 being formed and/or with the substances S to be inserted therein, kept cold so as not to alter the properties of the substances, and the hot parts, such as the heat-sealing rollers or the motors, and/or the environment heated by the latter.

[0095] Drops of water of said condensation can fall, for example by gravity, inside the package 100 which is being filled, causing alterations of the substance contained in the package and/or the formation of molds, microorganisms, which can cause possible reductions in the efficacy of the substance itself and/or danger to human and animal health, and/or damage to the environment in which they are to be used.

[0096] The internal cavities 27 can in fact be able to supply an insulated wall, isolating the cooling channels 25 from the external surface 29, allowing to reduce or eliminate the formation of condensation.

[0097] Furthermore, the drying fluid, favorably at room

temperature or heated, can keep the external surface 29 at a higher temperature than that of the cooling fluid, once again allowing to reduce or prevent such formation of condensation.

[0098] The at least one internal cavity 27 can be positioned adjacent to the external wall 39 of the support member 21, as shown in figs. from 2 to 4a.

[0099] The cooling channels 25 can therefore be positioned between the internal cavities 27 and the internal wall 32, as shown in fig. 4a.

[0100] According to some embodiments, the at least one internal cavity 27 is configured as a conduit provided with an inlet hole 41 and an outlet hole 42, through which the drying fluid respectively enters and exits the conduit.

[0101] The inlet hole 41 can be in fluidic connection with actuator means 40 suitable to generate a flow of the drying fluid in order to make it circulate in the at least one internal cavity 27. Such actuator means 40 can comprise a compressor, a pump, hydraulic or pneumatic members or other similar actuators.

[0102] The inlet hole 41 can have coupling means for coupling conduits 35 for the introduction and extraction of the drying fluid.

[0103] According to some embodiments, the internal cavities 27 of the different support members 21 may or may not be hydraulically communicating with each other.

[0104] The filling assembly 12 can be configured to cooperate with one or more attachment elements 22 able to attach the flaps 102 of the material to each other in order to close the package 100, in a known manner, by means of heat-sealing (fig. 4).

[0105] The attachment elements 22 can be comprised in the filling unit 10 or in an attachment unit outside the filling unit 10 and able to cooperate with the filling unit 10.

[0106] The attachment elements 22 are able to attach the material on two or more edges 104, 105 of the package 100, for example on four edges.

[0107] The attachment elements 22 can be able, for example, to attach the lateral edges 105, then the lower edge 104, and finally seal the package 100 by attaching the upper edge. As a further example, if the material is fed in tubular form, the attachment elements 22 can be able to attach only the lower edge 104 and the upper edge.

[0108] According to some embodiments, the attachment elements 22 can comprise heating elements of a type known in the state of the art, for example electric resistances, for carrying out the heat-sealing.

[0109] According to some embodiments, the attachment elements 22 can comprise some compression elements, such as for example rollers or foils or suchlike, heated by the heating elements, able to compress the flaps 102 of the material in order to attach them to each other.

[0110] Advantageously, the cooling fluid allows to keep the temperature low in correspondence with the internal surface 28 of the support members 21, and therefore of the sheet material 101 and of the substance S. The tem-

perature in correspondence with this zone would otherwise rise due to the proximity with the heated attachment elements 22.

[0111] The filling assembly 12 can also cooperate with one or more elements 23 for moving the material.

[0112] The movement elements 23 can be comprised in the filling unit 10 or in an attachment unit outside the filling unit 10 and able to cooperate with the filling unit 10.

[0113] According to some embodiments, the movement elements 23 are drawing rollers. Alternatively, the movement elements 23 can coincide with the attachment elements 22, suitable to perform both an attachment action by means of heat-sealing and also a drawing action.

[0114] For example, in the case of an at least partly polymeric material and as shown in fig. 4, the attachment elements 22 of the lateral edges can be high temperature drawing rollers which move the material downward (relative to the representation of figs. 2 and 3) and at the same time heat-seal the flaps 102 of the material to each other in order to form the lateral edges.

[0115] As a further example and as shown in figs. from 1 to 3, the movement elements 23 can be rollers, moved by one or more motors.

[0116] For example, in fig. 1, such movement elements 23 are constrained on a support element 33 able to hold the unit 10 in position (fig. 1).

[0117] These movement elements 23 rotate around a transmission shaft 38, which transmits the motion from the motor to the corresponding movement element 23.

[0118] The movement elements 23 can transmit the movement to the sheet material intended to form the package by means of one or more cantilevered elements 34, positioned interposed between the support members 21 (fig. 1).

[0119] Some embodiments described here also concern a method for filling a package 100 by means of the filling unit 10 according to the invention.

[0120] The method can provide to remove the sheet material 101 with which to form the package 100, to form at least a first edge of the package 100, to insert the substance S inside the package 100 and to seal the package 100 forming at least a second edge.

[0121] For example, in the event the sheet material 101 is in tubular form, the first edge of the package can be a lower edge 104. In this way, a small bag is formed, closed on three sides, into which the substance S can be inserted, in which there is defined a mouth in correspondence with the second upper edge, that is, opposite the first edge 104.

[0122] The method can also provide to form one or more lateral edges 105, for example in the event the sheet material 101 is in the form of strips or sheets, and the forming of the package 100 occurs by coupling two or more strips or sheets.

[0123] For example, in the event the sheet material 101 is in the form of strips or sheets, the method can provide to form two or more lateral edges 105 and one lower edge 104 of the package 100, for each package

100 that is being filled. The method can provide to insert the substance inside the package 100 when the lateral edges 105 and one lower edge 104 are formed, so as not to cause the substance to pour out of the package 100.

[0124] The method can provide, at the end of the insertion of the predefined quantity of the substance S, to seal the package 100 forming at least one upper edge.

[0125] According to the invention, the method provides that, during the filling of the package 100, a cooling fluid is fed into one or more cooling channels 25 integrated in support members 21, on which the sheet material 101 intended to form the package 100 flows, so as to lap at least one internal wall 32 intended to be exposed, in an internal surface 28 thereof, to the sheet material 101. In this way, the method prevents undesired temperature rises which can affect the sheet material 101 and/or the substance S.

[0126] According to some embodiments, the method provides that this cooling fluid is at room temperature and/or in any case at a lower temperature than that of the support members 21, the temperature of which can rise due to elements of the unit 10, such as heat-sealing elements, motors and suchlike. In particular, the cooling fluid can be at or below room temperature.

[0127] The method further provides to make a drying fluid circulate in at least one internal cavity 27 comprised in the members 21 for supporting the sheet material 101.

[0128] According to some embodiments, the method provides that the drying fluid laps at least one external wall 39 of the support members 21, the external wall 39 facing toward the opposite side with respect to the internal surface 28.

[0129] In accordance with some embodiments, a packaging machine is also provided comprising a unit 10 for filling packages 100 as described above, able to carry out the method for filling a package 100 according to the present invention.

[0130] It is clear that modifications and/or additions of parts and/or steps may be made to the filling unit 10, to the packaging machine that comprises it and to the corresponding method as described heretofore, without departing from the field and scope of the present invention as defined by the claims.

[0131] It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of unit, machine and method, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

[0132] In the following claims, the sole purpose of the references in brackets is to facilitate reading: they must not be considered as restrictive factors with regard to the field of protection claimed in the specific claims.

Claims

1. Unit (10) for filling sealed packages (100), formed starting from a heat-sealable sheet material (101) and intended to be filled with a substance (S), in particular a solid substance in powder or granules, said unit comprising an assembly (12) for filling the package (100) and an assembly (13) for feeding the substance (S), said filling assembly (12) and feeding assembly (13) cooperating to insert a predefined quantity of substance (S) inside said package (100), wherein said filling assembly (12) comprises shaped support members (21), able to support the sheet material (101) in order to confer on the latter a desired arched shape intended to define one of the lateral walls (103) of the package (100), so as to define an internal volume (43) for the passage of the substance (S) to be inserted into the package (100), said unit being **characterized in that** said support members (21) have one or more cooling channels (25) for the passage of a cooling fluid configured to lap at least one internal wall (32) of said support members (21), said internal wall (32) being intended to be exposed, on its internal surface (28), to said sheet material (101), so that said support members (21) allow to prevent undesired temperature rises which can affect the sheet material (101) and/or the substance (S), and that said support members (21) have at least one internal cavity (27) defining means for the passage of a drying fluid configured to lap at least one external wall (39) of said support members (21).
2. Unit (10) as in claim 1, **characterized in that** said internal surface (28) is concave in shape and that said internal wall (32) is disposed on the opposite side with respect to an external wall (39) of said support members (21), said external wall (39) being provided with an external surface (29), convex in shape.
3. Unit (10) as in any claim hereinbefore, **characterized in that** said one or more cooling channels (25) provide attachments (31) for coupling pipes (26) for the introduction and extraction of said cooling fluid from said one or more cooling channels (25), said pipes (26) being in fluidic connection with actuator means (40) suitable to generate a flow of said cooling fluid in said one or more cooling channels (25).
4. Unit (10) as in claim 1, **characterized in that** said cooling channels (25) are positioned between the at least one internal cavity (27) and the internal wall (32) of said support members (21).
5. Unit (10) as in any claim hereinbefore, **characterized in that** said at least one internal cavity (27) is disposed adjacent to said external wall (39) of said support members (21) and said cooling channels (25) are disposed adjacent to said internal wall (32) of said support members (21).
6. Unit (10) as in any claim hereinbefore, **characterized in that** said at least one internal cavity (27) is configured as a conduit provided with an inlet hole (41) and an outlet hole (42) through which the drying fluid respectively enters and exits the conduit, said inlet hole (41) being in fluidic connection with actuator means (40) suitable to generate a flow of said drying fluid in order to make it circulate in said at least one internal cavity (27).
7. Unit (10) as in claim 6, **characterized in that** said inlet hole (41) provides coupling means for coupling conduits (35) for the introduction and/or the extraction of said drying fluid from said internal cavities (27).
8. Unit (10) as in any claim hereinbefore, **characterized in that** the filling assembly (12) is configured to cooperate with one or more attachment elements (22) chosen from a group comprising rollers, sheets, plates or walls, heated by heating elements, able to compress the flaps (102) of the sheet material (101) in order to attach them to each other.
9. Unit (10) as in any claim hereinbefore, **characterized in that** the filling assembly (12) is configured to cooperate with one or more elements (23) for moving the sheet material (101) configured as drawings rollers.
10. Method for filling a package (100) by means of a filling unit (10), said method providing to remove the sheet material (101) with which to form the package (100), to form at least a first edge of the package (100), to insert the substance (S) inside the package (100) and to seal the package (100) forming at least a second edge, said method being **characterized in that** it provides, during the filling of the package (100), to make a cooling fluid circulate in one or more cooling channels (25) comprised in shaped support members (21), able to support the sheet material (101), the cooling fluid lapping at least an internal wall (32) of said support members (21), **and in that** it provides that a drying fluid is fed into at least one internal cavity (27) comprised in said support members (21), the drying fluid lapping at least one external wall (39) of said support members (21).
11. Method as in claim 10, **characterized in that** it provides that the cooling fluid is a fluid at room temperature or with a temperature below the temperature of the support members (21).
12. Method as in claim 10 or 11, **characterized in that** it provides that the drying fluid is at room temperature or heated.

13. Packaging machine comprising a unit (10) for filling packages (100) as in any claim from 1 to 9, able to carry out the method for filling a package (100) as in any claim from 10 to 12.

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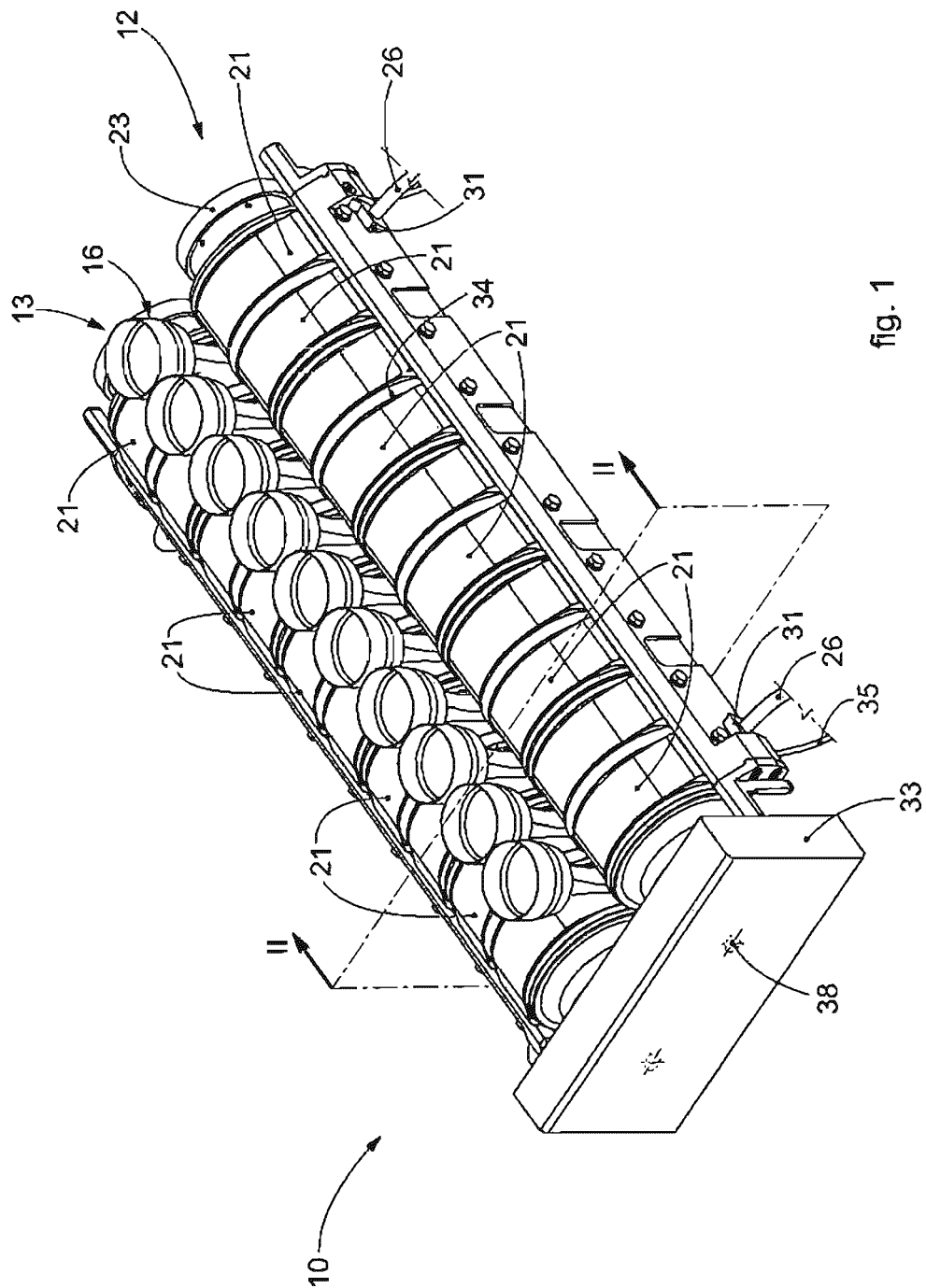
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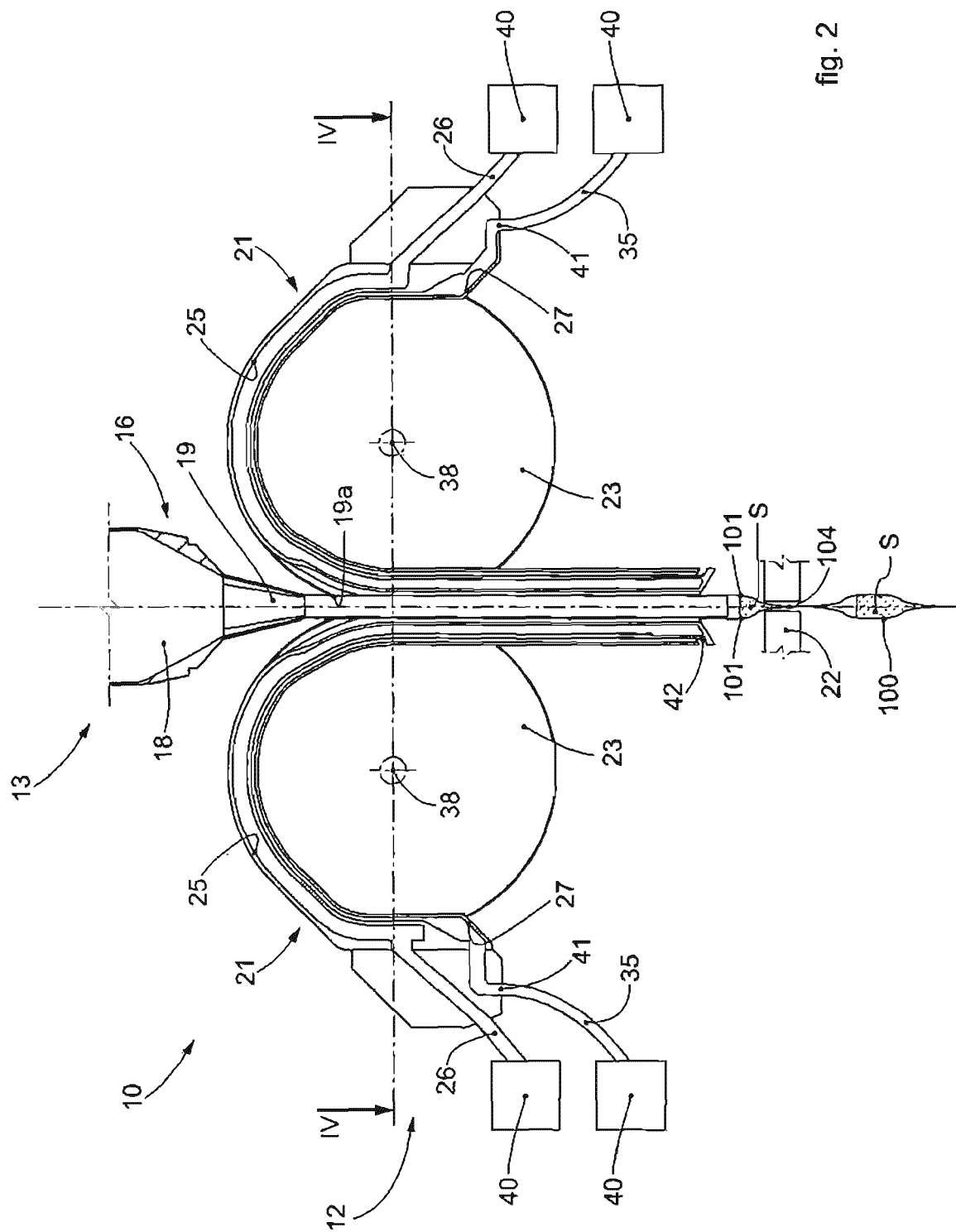


fig. 2

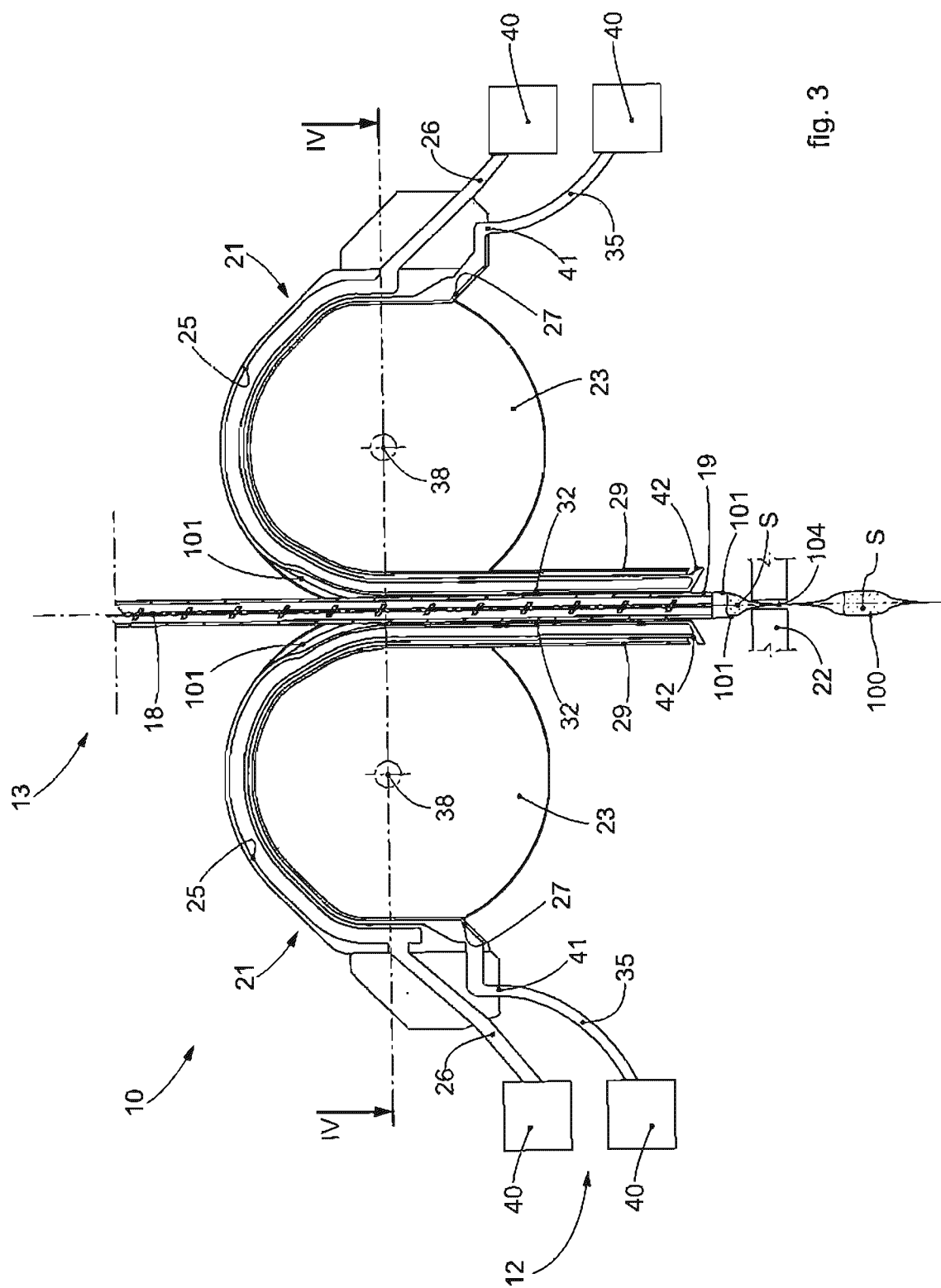
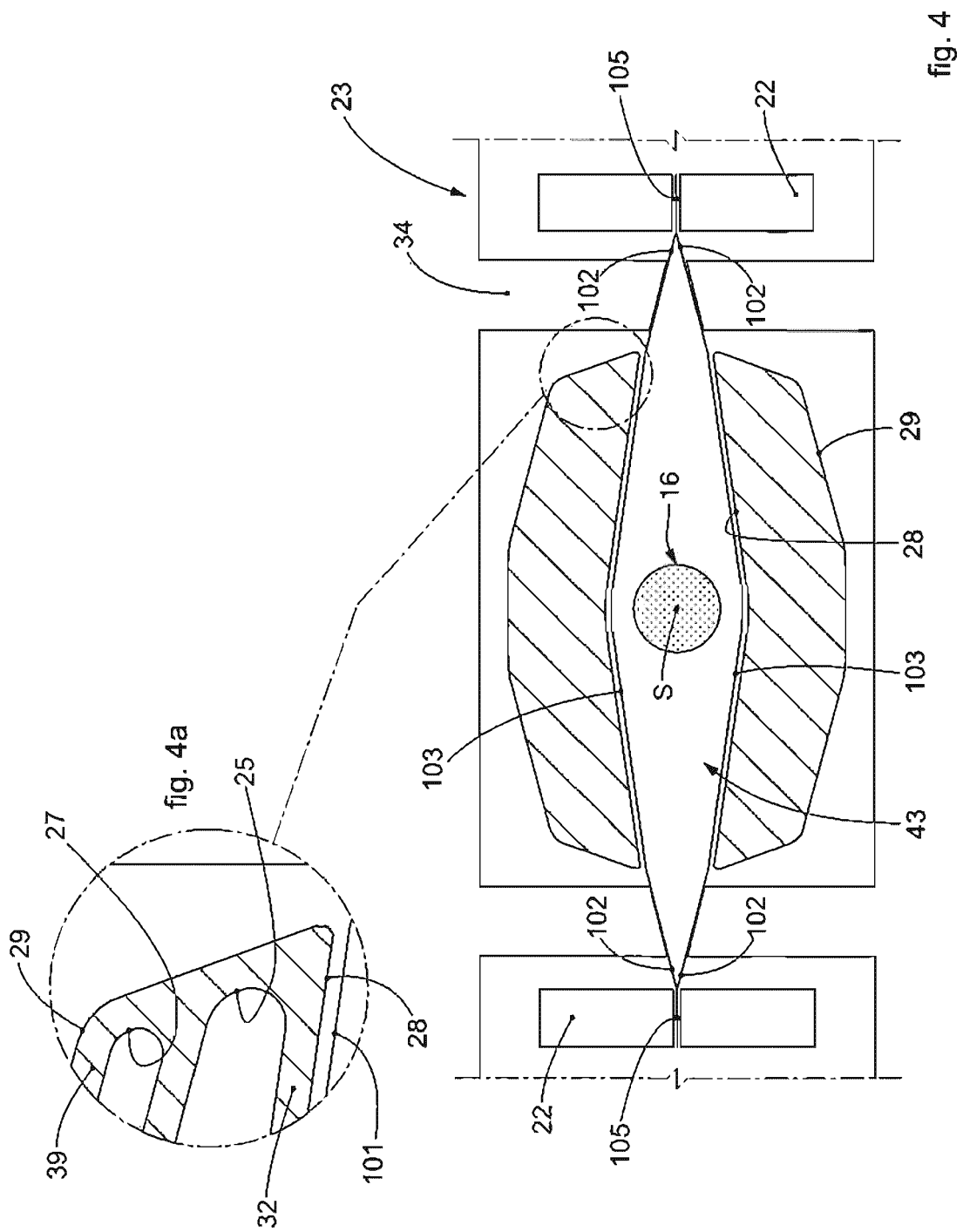


fig. 3





EUROPEAN SEARCH REPORT

Application Number
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			B65B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 June 2021	Examiner Yazici, Baris
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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