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• **IZQUIERDO EREÑO, Eneko**
20560 Oñati (ES)

(74) Representative: **Igartua, Ismael**

Galbaian S. Coop.
Garaia Parke Teknologikoa
Goiru Kalea 1
20500 Arrasate-Mondragón (ES)

(71) Applicant: **Ulma Packaging, S.Coop.**
20560 Oñati (ES)

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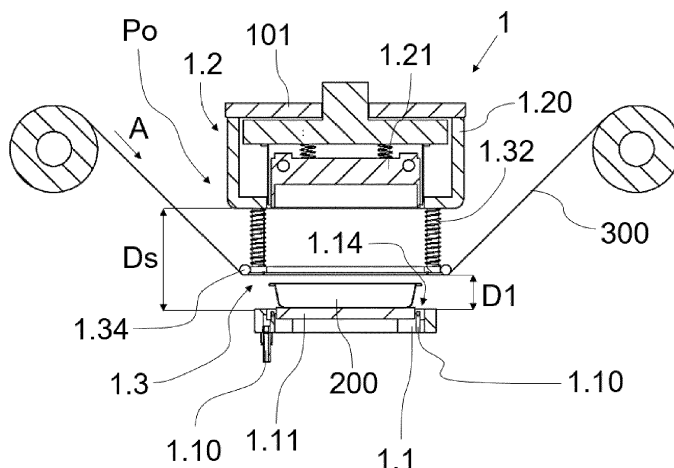
(72) Inventors:

• **MADINABEITIA FERNANDEZ, Ander**
20560 Oñati (ES)

(54) TRAY SEALING METHOD FOR A HEAT SEALING MACHINE AND HEAT SEALING MACHINE

(57) The invention relates to a tray sealing method and to a heat sealing machine with a lower sealing assembly (1.1) and an upper sealing assembly (1.2) facing each other and separated by a variable separation distance (D_s) between a maximum value and a minimum value. The method comprises arranging, between the sealing assemblies (1.1, 1.2), a film (300) at a distance (D_1) from the lower sealing assembly (1.1) which is less

than 65% of the difference between said maximum and minimum values of the separation distance (D_s), and a tray (200); and starting to inject and/or extract a gas between the foil (300) and the tray (200) during a relative displacement between the sealing assemblies (1.1, 1.2) and before said separation distance (D_s) is reduced by 65% of said difference starting from its maximum value.

**Fig. 2**

Description

TECHNICAL FIELD

[0001] The present invention relates to tray sealing methods for heat sealing machines, and to heat sealing machines.

PRIOR ART

[0002] A heat sealing machine comprises a sealing station that receives at least one tray with a product, and a lid film above the tray, and where the lid film is sealed to the tray and the product is packaged. The heat sealing machine may further comprise a cutting tool for cutting the lid film, to obtain a separate package with a packaged product inside.

[0003] The sealing station comprises a lower sealing assembly and an upper sealing assembly facing each other, between which the tray and lid film are arranged with the sealing station in an opening position.

[0004] For sealing, the tray and lid film are usually placed between the sealing assemblies and a relative displacement is caused between the two sealing assemblies so that the lid film is clamped between them. With the lid film thus clamped, a sealing tool of the upper sealing assembly presses the lid film towards the tray, the lid film being sealed to the tray. The upper sealing assembly comprises a box with a recess within it, which co-operates with the lower sealing assembly to seal the lid film, and the sealing tool is normally freely movably attached to the box and within the box.

[0005] In some cases, the relative displacement between the two sealing assemblies of the sealing station is caused by displacement of only one of the sealing assemblies, although it could be caused by displacement of both sealing assemblies. Normally, the lower sealing assembly is the only sealing assembly to be displaced.

[0006] For the packaging of products in some cases additional operations are required. For example, vacuum packaging may be required, in which it is necessary to create a vacuum (an extraction of air) in a cavity delimited between the lid film and the container in which the product to be packaged is housed. For example, modified atmosphere packaging may also be required, in which the introduction of a specific gas into this cavity is necessary for a better preservation of the product (in some cases, an extraction of the air present in this cavity is required prior to the injection of the gas, although in other cases it is the gas itself that pushes and evacuates the air).

[0007] EP4001136A1 discloses a packaging machine with a sealing station comprising an upper sealing assembly and a lower sealing assembly facing each other. In some embodiments, a lid film is clamped between the two sealing assemblies, and with the lid film thus clamped, the lid film is sealed to the tray. With the lid film clamped between the two sealing assemblies, and prior to the sealing operation between the lid film and the tray,

gas is injected into the cavity delimited between the lid film and the tray.

DISCLOSURE OF THE INVENTION

[0008] The object of the invention is to provide a tray sealing method for heat sealing machines, and a heat sealing machine, as defined in the claims.

[0009] The machine comprises a sealing station with a lower sealing assembly and an upper sealing assembly facing each other and separated by a variable separation distance, and the method comprises arranging at least a tray and a lid film between the sealing assemblies of the sealing station, with said sealing station in an opening position where the separation distance comprises a maximum value, the lid film being arranged above the tray and at a first determined distance from said lower sealing assembly; causing an approach between the tray and the lid film by a relative displacement between the sealing assemblies of the sealing station in which the separation distance between the lower sealing assembly and the upper sealing assembly is reduced; delimiting a cavity between the tray, the lid film and said lower sealing assembly during said relative displacement, when the lower sealing assembly and said lid film contact; and sealing the lid film to the tray in a closing position of the sealing station in which the separation distance comprises a minimum value.

[0010] Preferably, before a tray is arranged in the sealing station a product is arranged on the tray, such that the tray is arranged in the sealing station containing or supporting a product, although the product could be arranged on the tray once the tray has been arranged in the sealing station with the sealing station being in the opening position. This allows the product to be packaged once the lid film is sealed to the tray.

[0011] The lid film is arranged in the sealing station at a first determined distance from the lower sealing assembly, the first distance being less than 65% of the difference between the maximum value and the minimum value of the separation distance. In this way, the lid film is arranged at an intermediate point between the lower sealing assembly and the upper sealing assembly, when the sealing station is in the opening position.

[0012] The method further comprises starting to inject and/or extract a gas between the lid film and the tray during the relative displacement between the sealing assemblies in which the separation distance is reduced and before the separation distance is reduced by 65% of the difference between the maximum value and the minimum value, starting from its maximum value. Depending on the requirements, the resulting packaging can be of different types, such as vacuum packaging, which requires air extraction, or modified atmosphere packaging, which requires the injection of a gas that provides the modified atmosphere for the packaged product (and prior or simultaneously air extraction can also be carried out to free the space for the gas, for example).

[0013] The proposed solution speeds up packaging, since during the relative displacement between the sealing assemblies it is possible to perform the required injection and/or extraction, which reduces the cycle time and results in higher productivity in the machine incorporating the proposed method, by reducing or avoiding keeping the sealing station in the closing position while waiting for the gas injection and/or extraction to be completed in order to seal the lid film to the tray. This is further ensured by the arrangement of the lid film in the indicated position, since it allows to generate the cavity including the space where the product is packaged in advance of the sealing station reaching the closing position, and by the indicated starting point of injection and/or extraction, since the possibility to complete at least partly such injection and/or extraction before such sealing station reaches such closing position is obtained regardless of the height of the tray that has been arranged in such sealing station.

[0014] A second aspect of the invention relates to a heat sealing machine comprising a sealing station, a film feeder configured to feed a lid film to the sealing station, and actuating means configured to inject and/or extract a gas. The sealing station comprises a lower sealing assembly and an upper sealing assembly facing each other and separated by a variable separation distance, and said sealing station is configured to move from an opening position where the separation distance comprises a maximum value to a closing position where the separation distance comprises a minimum value, by means of a relative displacement between the sealing assemblies.

[0015] The machine further comprises a film positioner with a positioning support arranged in the sealing station between the upper sealing assembly and the lower sealing assembly of said sealing station, at a first determined distance from the lower sealing assembly which is less than 65% of the difference between the maximum value and the minimum value of the separation distance. The machine is also configured to arrange the lid film against said positioning support, below said positioning support. The advantages described for the proposed method are equally valid for the proposed machine.

[0016] These and other advantages and features of the invention will become apparent in view of the figures and the detailed description of the invention.

DESCRIPTION OF THE DRAWINGS

[0017]

Figure 1 shows an embodiment of the heat sealing machine of the invention.

Figure 2 schematically shows a sealing station of the machine of figure 1, the sealing station being in an opening position.

Figure 3 schematically shows a sealing station of the

machine of figure 1, the sealing station being in a closing position.

Figure 4 schematically shows a sealing station of the machine of figure 1, the sealing station being in an intermediate position between the opening position and the closing position, in which a cavity is generated between the tray, the lid film and the lower sealing assembly.

Figure 5 shows a bottom view of a film positioner of an embodiment of the machine of the invention.

Figure 6 shows a plan view of a lower sealing assembly of one embodiment of the machine of the invention.

DETAILED DISCLOSURE OF THE INVENTION

[0018] A first aspect of the invention relates to a tray sealing method for a heat sealing machine 100 as the one depicted in figure 1 by way of example. The machine 100 comprises a sealing station 1 with a lower sealing assembly 1.1 and an upper sealing assembly 1.2 facing each other and separated by a variable separation distance D_s between a maximum value, when the sealing station 1 is in an opening position P_a (see figure 2), and a minimum value, when the sealing station 1 is in a closing position P_c (see figure 3). The separation distance D_s varies with the relative displacement between the sealing assemblies 1.1 and 1.2, preferably by displacement of the lower sealing assembly 1.1.

[0019] The method comprises arranging at least one tray 200 (preferably a plurality of trays 200) and a lid film 300 between the sealing assemblies 1.1 and 1.2, with the sealing station 1 in the opening position P_a ; causing an approach between the tray 200 and the lid film 300 by relative displacement between said sealing assemblies 1.1 and 1.2; delimiting a cavity 5 between the tray 200, the lid film 300 and the lower sealing assembly 1.1 during said relative displacement, when the lower sealing assembly 1.1 and said lid film 300 contact (see figure 4); and sealing the lid film 300 to the tray 200 with the sealing station 1 in the closing position P_c . Once the cavity 5 is generated, said cavity 5 is maintained during the relative displacement between the sealing assemblies 1.1 and 1.2 in which the separation distance D_s is reduced until the closing position P_c of the sealing station 1.

[0020] The upper sealing assembly 1.2 preferably comprises a hollow box 1.20 and at least one sealing tool 1.21 which is freely movable in the box 1.20. In order to seal the lid film 300 to the tray 200, the sealing tool 1.21 is moved towards the tray 200 with the sealing station 1 in the closing position P_c . The sealing tool 1.21 is heated, such that the actuation causes the lid film 300 between the sealing tool 1.21 and the tray 200 to be heat sealed to the tray 200. Preferably the box 1.20 is taken as a reference of the upper sealing assembly 1.2 to determine

the separation distance D_s between the upper sealing assembly 1.2 and the lower sealing assembly 1.1, but any other element of the upper sealing assembly 1.2 could be used as a reference if required.

[0021] Preferably, before arranging a tray 200 in the sealing station 1 a product is arranged on said tray 200, such that the tray 200 is arranged in said sealing station 1 containing or supporting a product, although the product could be arranged on the tray 200 once said tray 200 has been arranged in the sealing station 1 with said sealing station 1 being in the opening position P_a . This allows the product to be packaged once the lid film 300 is sealed to the tray 200.

[0022] When the lid film 300 is arranged in the sealing station 1, the lid film 300 is arranged at a first distance D_1 determined from the lower sealing assembly 1.1, the first distance D_1 being less than 65% of the difference between the maximum value and the minimum value of the separation distance D_s . This ensures that the lower assembly 1.1 and the lid film 300 contact before the sealing station 1 reaches the closing position P_c during the relative displacement between their sealing assemblies 1.1 and 1.2.

[0023] The method further comprises starting to inject and/or extract a gas between the lid film 300 and the tray 200 during the relative displacement between the sealing assemblies 1.1 and 1.2 with which the separation distance D_s is reduced, and before the separation distance D_s is reduced by 65% of the difference between the maximum value and the minimum value, from its maximum value. The injection and/or extraction of gas allows the packaging of products in modified atmosphere or vacuum, for example, as previously described, and said start point together with the arrangement of the lid film 300 allows at least partly completing the injection and/or extraction of gas before the sealing station 1 is positioned in the closing position P_c , taking advantage of part of the time of the relative displacement between said sealing assemblies 1.1 and 1.2 to perform said function. Thus, there is no need to add more cycle time during the packaging of products for this type of packaging, a packaging of these characteristics being possible to be carried out with the same time long as a packaging without the need to inject and/or extract gas. In order to reduce excessive and inefficient gas consumption, in the case of injection, the injection is stopped before sealing.

[0024] The machine 100 comprises a film positioner 1.3 in the sealing station 1, and the film positioner 1.3 comprises a positioning support 1.30 arranged between the sealing assemblies 1.1 and 1.2 of the sealing station 1. The positioning support 1.30 is arranged at the first determined distance D_1 from the lower sealing assembly 1.1 with the sealing station 1 in the opening position P_a , which is less than 65% of the difference between the maximum value and the minimum value of the separation distance D_s . The machine 100 is configured to arrange the lid film 300 against said positioning support 1.30, below said positioning support 1.30, when said lid film

300 is arranged in the sealing station 1. In the method, during the relative displacement between the sealing assemblies 1.1 and 1.2 a relative displacement is caused between said positioning support 1.30 and the upper sealing assembly 1.2 when the lower sealing assembly 1.1 reaches the height of said positioning support 1.30, once the separation distance D_s between the sealing assemblies 1.1 and 1.2 has reduced the value of the first determined distance D_1 , said lower sealing assembly 1.1 cooperating with said positioning support 1.30 by pushing it towards the upper sealing assembly 1.2 from that point.

[0025] In the context of the invention, the duration required for the sealing station 1 to pass from the opening position P_a to the closing position P_c is called the lifting time; the time required for the lower sealing assembly 1.1 to contact the positioning support 1.30 of the film positioner 1.2 is called the approach time (with the lid film 300 arranged under said film positioner 1.3) during the change of position of the sealing station 1 from the opening position P_a to the closing position P_c , from the start of said change; and the duration of gas injection and/or extraction to reach the required gas or vacuum levels in the cavity 5 is referred to as the actuation time.

[0026] In the proposed method the approach time is preferably less than 65% of the lifting time, and the injection and/or extraction preferably starts before said 65% of the lifting time has elapsed. Preferably, the actuation time is less than the subtraction between the lifting time and the approach time, such that the injection and/or extraction ends before the sealing station 1 is positioned in the closing position P_c .

[0027] As a general rule the actuation time depends mainly on the volume of gas and/or vacuum level required in the cavity 5, and therefore on the dimensions of the tray 200, the characteristics of the product to be packaged, the flow rate of gas injected and/or extracted, etc., the actuation time being generally in the range of between 0.3 seconds and 1 second, while the lifting time being generally between 0.4 seconds and 1.1 seconds. Therefore, the present invention is particularly advantageous for those approach times which are short enough to perform the entire gas injection and/or extraction before the sealing station 1 passes from the opening position P_a to the closing position P_c , thus eliminating the need to wait to finish the gas injection and/or extraction with the sealing station 1 in the closing position P_c , and thereby increasing the packaging speed of the machine 100.

[0028] In case the upper sealing assembly 1.2 moves during the relative displacement between the sealing assemblies 1.1 and 1.2, the positioning support 1.30 moves together with the upper sealing assembly 1.2 until it cooperates with the lower sealing assembly 1.1, whereupon the positioning support 1.30 moves relative to the upper sealing assembly 1.2 as described above.

[0029] If the upper sealing assembly 1.2 does not move during the relative displacement between the sealing assemblies 1.1 and 1.2, the positioning support 1.30

remains static until it cooperates with the lower sealing assembly 1.1, whereupon the positioning support 1.30 moves relative to the upper sealing assembly 1.2 as described above.

[0030] Preferably, during the relative displacement between the sealing assemblies 1.1 and 1.2 of the sealing station 1, only the lower sealing assembly 1.1 is displaced towards the upper sealing assembly 1.2, the lid film 300 being clamped between said lower sealing assembly 1.1 and the positioning support 1.30 when the separation distance D_s is reduced below a value equal to the first distance D_1 during said displacement, said lower sealing assembly 1.1 pushing said positioning support 1.30 from said point until the sealing station 1 reaches the closing position P_c as described above.

[0031] Preferably the tray 200 is arranged on a tray support 1.11 of the lower sealing assembly 1.1, which is arranged in an elevated position with respect to a support surface 1.14 of said lower sealing assembly 1.1, when the sealing station 1 is in the opening position P_a (see figure 2), and as said lower sealing assembly 1.1 moves towards the upper sealing assembly 1.2, the position of said tray support 1.11 varies with respect to said support surface 1.14 until it is below said support surface 1.14 (see figure 4), the tray 200 thus resting on said support surface 1.14 with the sealing station 1 in the closing position P_c of the sealing station 1 (see figure 3).

[0032] The relative displacement between the sealing assemblies 1.1 and 1.2 of the sealing station 1 is preferably continuous, i.e. without stops between the opening position P_a and the closing position P_c of the sealing station 1.

[0033] A second aspect of the invention relates to a heat sealing machine 100 comprising a sealing station 1, a film feeder 103 configured to feed a lid film 300 to the sealing station 1, and actuation means 102 configured to inject and/or extract a gas into the sealing station 1.

[0034] The sealing station 1 comprises a lower sealing assembly 1.1 and an upper sealing assembly 1.2 facing each other and separated by a variable separation distance D_s between a maximum and a minimum value, as described above. The machine 100 further comprises a film positioner 1.3 with a positioning support 1.30 arranged between the upper sealing assembly 1.2 and the lower sealing assembly 1.1 of said sealing station 1, at a first distance D_1 from the lower sealing assembly 1.1, said first distance D_1 being measured with the sealing station 1 in the opening position P_a , and said first distance D_1 being less than 65% of the difference between the maximum value and the minimum value of the separation distance D_s , when said lid film 300 is arranged in the sealing station 1, as previously described. The machine 100 is configured to arrange the lid film 300 against said positioning support 1.30, below said positioning support 1.30. The film feeder 103 may comprise for this purpose the required foil tensioning means and foil deflectors (not shown in the figures), or clamping means not shown in the figures which clamp the foil

against said positioning support 1.30.

[0035] The machine 100 also comprises a control unit 104 communicated at least with the actuation means 102 and configured to control the injection and/or extraction of gas caused by said actuation means 102. Said control unit 104 may be further configured to control the relative displacement between the sealing assemblies 1.1 and 1.2.

[0036] The control unit 104 may comprise a microprocessor, microcontroller, FPGA or any other computationally capable device.

[0037] The lower sealing assembly 1.1 is configured so that the actuation means 102 injects and/or extracts gas through said lower sealing assembly 1.1, said lower sealing assembly 1.1 comprising for this purpose at least one conduit 1.10. The control unit 104 is configured so that the actuation means 102 starts injecting and/or extracting gas during the relative displacement between the sealing assemblies 1.1 and 1.2 of the sealing station 1 with which the separation distance D_s is reduced, and before said separation distance D_s is reduced by 65% of the difference between the maximum value and the minimum value, from its maximum value, as previously described.

[0038] The positioning support 1.30 is attached to an element of the machine 100 in a vertically movable manner with respect to the upper sealing assembly 1.2, preferably by means of at least one extensible guide or by means of at least one elastic element 1.32. This makes possible the relative displacement between the positioning support 1.30 and the upper sealing assembly 1.2 when the lower sealing assembly 1.1 cooperates with said positioning support 1.30 by pushing it towards the upper sealing assembly 1.2, and furthermore, facilitates the return of the positioning support 1.30 to its original position when required or when the lower sealing assembly 1.1 is separated from the upper sealing assembly 1.2. Depending on how the positioning support 1.30 is attached, such return may be passive (by the effect of its own weight or an elastic element 1.32 for example, as shown in Figures 2 and 4) or active (a controllable cylinder not shown in figures, for example).

[0039] In some embodiments the element to which the positioning support 1.30 is attached is the upper sealing assembly 1.2 of the sealing station 1 (see figures 2 to 4), although it could be attached to a frame 101 of said machine 100.

[0040] Preferably, the value of the first distance D_1 between the positioning support 1.30 and the lower sealing assembly 1.1 with the sealing station 1 in the opening position P_a is adjustable, whereby said first distance D_1 can be adjusted according to the height of the tray 200 to be arranged in the sealing station 1. The higher the tray 200 the greater said first distance D_1 will have to be. The adjustment of the first distance D_1 between the positioning support 1.30 and the lower sealing assembly 1.1, is adjusted by varying the distance at which the positioning support 1.30 is arranged with respect to the lower sealing

assembly 1.1 with the sealing station 1 in the opening position Pa. Preferably the positioning support 1.30 is adjusted at the smallest possible distance from the tray 200 with the sealing station 1 in the opening position Pa, in order to generate the cavity 5 in the shortest possible travel distance between the lower sealing assembly 1.1 and the upper sealing assembly 1.2 with which the separation distance Ds is reduced, and thus the greatest possible use of the injection and/or extraction of gas being achieved from the time said cavity 5 is generated until the sealing station 1 reaches the closing position Pc.

[0041] The lower sealing assembly 1.1 comprises at least one tray housing 1.12, the positioning support 1.30 comprising a hollow window 1.31 facing said tray housing 1.12, and preferably a sealing gasket 1.33 surrounding the window 1.31 (see figure 5) or the lower sealing assembly 1.1 comprises a sealing gasket 1.13 surrounding the tray housing 1.12 (see figure 6). The window 1.31 allows passage of the sealing tool 1.21 towards the tray 200 where applicable, and the sealing gasket 1.33 or 1.13 presses against the lid film 300 preventing injected gas from escaping from the cavity 5 (when a gas is injected) or air from outside the sealing station 1 from entering the cavity 5 between the lid film 300 and the lower sealing assembly 1.1.

[0042] Preferably the film positioner 1.3 comprises a roller 1.34 at each longitudinal side of the positioning support 1.30, and said rollers 1.34 are configured to be in contact with the lid film 300, such that they assist in the displacement of said lid film 300 in a feeding direction A and, furthermore, protect the lid film 300 against breakage. The lower sealing assembly 1.1 may comprise a respective housing (not shown in the figures) for each of said rollers 1.34.

[0043] The machine 100 may comprise a configuration adapted to support the method of the invention, in any of its embodiments and/or configurations, said configuration of the machine 100 being adapted to the corresponding embodiment and/or configuration of the method. Likewise, the method may be adapted to be implemented in the machine 100, in any of its embodiments and/or configurations, said method being adapted to the corresponding embodiment and/or configuration of the machine 100.

Claims

1. Tray sealing method for a heat sealing machine comprising a sealing station (1) with a lower sealing assembly (1.1) and an upper sealing assembly (1.2) facing each other and separated by a variable separation distance (Ds), the method comprising arranging a tray (200) and a lid film (300) between the sealing assemblies (1.1, 1.2) of the sealing station (1), with said sealing station (1) in an opening position (Pa) in which the separation distance (Ds) comprises a maximum value; causing an approach be-

tween the tray (200) and the lid film (300) by a relative displacement between the sealing assemblies (1.1, 1.2) of the sealing station (1) with which the separation distance (Ds) between the lower sealing assembly (1.1) and the upper sealing assembly (1.2) is reduced; delimiting a cavity (5) between the tray (200), the lid film (300) and said lower sealing assembly (1.1) during said relative displacement, when the lower sealing assembly (1.1) and said lid film (300) contact; and sealing the lid film (300) to the tray (200) with the sealing station (1) in a closing position (Pc) in which the separation distance (Ds) comprises a minimum value; **characterised in that** the lid film (300) is arranged in the sealing station (1) at a first determined distance (D1) from the lower sealing assembly (1.1), said first distance (D1) being less than 65% of the difference between the maximum value and the minimum value of the separation distance (Ds), the method further comprising to start injecting and/or extracting a gas between the lid film (300) and the tray (200) during the relative displacement between the sealing assemblies (1.1, 1.2) with which the separation distance (Ds) is reduced and before the separation distance (Ds) is reduced by 65% of the difference between the maximum value and the minimum value, from its maximum value.

2. Tray sealing method according to claim 1, wherein the lid film (300) is arranged in the sealing station (1) against a positioning support (1.30) of a film positioner (1.3) of the machine (100), below said positioning support (1.30), a relative displacement between said positioning support (1.30) and the upper sealing assembly (1.2) being caused by cooperation between the lower sealing assembly (1.1) and said positioning support (1.30), during part of the relative displacement between the sealing assemblies (1.1, 1.2) of the sealing station (1).

3. Tray sealing method according to claim 1 or 2, wherein during the relative displacement between the sealing assemblies (1.1, 1.2) of the sealing station (1) the lower sealing assembly (1.1) is displaced towards the upper sealing assembly (1.2), the lid film (300) being clamped between said lower sealing assembly (1.1) and the positioning support (1.30) when the separation distance (Ds) is reduced below a value equal to the first determined distance (D1) during said displacement, said lower sealing assembly (1.1) pushing said positioning support (1.30) from said point until the sealing station (1) reaches the closing position (Pc).

4. Tray sealing method according to any one of claims 1 to 3, wherein the relative displacement between the sealing assemblies (1.1, 1.2) of the sealing station (1) is continuous.

5. Tray sealing method according to any one of claims 1 to 4, wherein a plurality of trays (200) are arranged in the sealing station (1).
6. Heat sealing machine comprising a sealing station (1), a film feeder (103) configured to feed a lid film (300) to the sealing station (1), and actuating means (102) configured to inject and/or extract a gas, the sealing station (1) comprising a lower sealing assembly (1.1) and an upper sealing assembly (1.2) facing each other and separated by a variable separation distance (Ds), the sealing station (1) being configured to move from an opening position (Pa) in which the separation distance (Ds) comprises a maximum value to a closing position (Pc) in which the separation distance (Ds) comprises a minimum value, by means of a relative displacement between the sealing assemblies (1.1, 1.2), **characterised in that** the machine (100) further comprises a film positioner (1.3) with a positioning support (1.30) arranged between the upper sealing assembly (1.2) and the lower sealing assembly (1.1) of said sealing station (1), at a first determined distance (D1) from the lower sealing assembly (1.1) with the sealing station (1) in the opening position (Pa), said first distance (D1) being less than 65% of the difference between the maximum value and the minimum value of the separation distance (Ds), the machine (100) being configured to arrange the lid film (300) against said positioning support (1.30), below said positioning support (1.30).
7. Heat sealing machine according to claim 6, comprising a control unit (104) communicated with the actuation means (102) and configured to control the injection and/or extraction of gas caused by said actuation means (102), the lower sealing assembly (1.1) being configured so that the actuation means (102) injects and/or extracts gas through said lower sealing assembly (1.1) and the control unit (104) being configured so that the actuating means (102) start injecting and/or extracting gas during the relative displacement between the sealing assemblies (1.1, 1.2) of the sealing station (1) with which the separation distance (Ds) is reduced and before said separation distance (Ds) is reduced by 65% of the difference between the maximum value and the minimum value, from its maximum value.
8. Heat sealing machine according to claim 6 or 7, wherein the positioning support (1.30) is attached to an element of the machine (100) in a vertically movable manner with respect to the upper sealing assembly (1.2).
9. Heat sealing machine according to claim 8, wherein the positioning support (1.30) is attached to the element of the machine (100) by at least one extendable guide or by at least one elastic element (1.32).
10. Heat sealing machine according to claim 8 or 9, wherein the element of the machine (100) to which the positioning support (1.30) is attached is the upper sealing assembly (1.2) of the sealing station (1) or a frame (101) of said machine (100).
11. Heat sealing machine according to any of claims 6 to 10, wherein the value of the first distance (D1) between the positioning support (1.30) and the lower sealing assembly (1.1) with the sealing station (1) in the opening position (Pa) is adjustable by varying the distance at which the positioning support (1.30) is arranged with respect to the lower sealing assembly (1.1), with the sealing station (1) in the opening position (Pa).
12. Heat sealing machine according to any of claims 6 to 11, wherein the lower sealing assembly (1.1) comprises at least one tray housing (1.12), the positioning support (1.30) comprising a window (1.31) facing said tray housing (1.12).
13. Heat sealing machine according to claim 12, wherein the positioning support (1.30) comprises a sealing gasket (1.33) surrounding the window (1.31), or the lower sealing assembly (1.1) comprises a sealing gasket (1.13) surrounding the tray housing (1.12).
14. Heat sealing machine according to any of claims 6 to 13, wherein the film positioner (1.3) comprises a roller (1.34) at each longitudinal side of the positioning support (1.30), said rollers (1.34) being configured to be in contact with the supplied lid film (300) when said lid film (300) is placed in the sealing station (1).
15. Heat sealing machine according to any of claims 6 to 14, which is configured to carry out a tray sealing method according to any one of claims 1 to 5.

Amended claims in accordance with Rule 137(2) EPC.

1. Tray sealing method for a heat sealing machine comprising a sealing station (1) with a lower sealing assembly (1.1) and an upper sealing assembly (1.2) facing each other and separated by a variable separation distance (Ds), the method comprising arranging a tray (200) and a lid film (300) between the sealing assemblies (1.1, 1.2) of the sealing station (1), with said sealing station (1) in an opening position (Pa) in which the separation distance (Ds) comprises a maximum value; causing an approach between the tray (200) and the lid film (300) by a relative displacement between the sealing assemblies (1.1, 1.2) of the sealing station (1) with which the separa-

- tion distance (Ds) between the lower sealing assembly (1.1) and the upper sealing assembly (1.2) is reduced; delimiting a cavity (5) between the tray (200), the lid film (300) and said lower sealing assembly (1.1) during said relative displacement, when the lower sealing assembly (1.1) and said lid film (300) contact; and sealing the lid film (300) to the tray (200) with the sealing station (1) in a closing position (Pc) in which the separation distance (Ds) comprises a minimum value, by moving a heated sealing tool (1.21) of the upper sealing assembly (1.2) towards the tray (200), **characterised in that** the lid film (300) is arranged in the sealing station (1) at a first determined distance (D1) from the lower sealing assembly (1.1), said first distance (D1) being less than 65% of the difference between the maximum value and the minimum value of the separation distance (Ds), the method further comprising to start injecting and/or extracting a gas between the lid film (300) and the tray (200) during the relative displacement between the sealing assemblies (1.1, 1.2) with which the separation distance (Ds) is reduced and before the separation distance (Ds) is reduced by 65% of the difference between the maximum value and the minimum value, from its maximum value.
2. Tray sealing method according to claim 1, wherein the lid film (300) is arranged in the sealing station (1) against a positioning support (1.30) of a film positioner (1.3) of the machine (100), below said positioning support (1.30), a relative displacement between said positioning support (1.30) and the upper sealing assembly (1.2) being caused by cooperation between the lower sealing assembly (1.1) and said positioning support (1.30) with which the lower sealing assembly (1.1) pushes the positioning support (1.30) towards the upper sealing assembly (1.2), during part of the relative displacement between the sealing assemblies (1.1, 1.2) of the sealing station (1).
 3. Tray sealing method according to claim 1 or 2, wherein during the relative displacement between the sealing assemblies (1.1, 1.2) of the sealing station (1) the lower sealing assembly (1.1) is displaced towards the upper sealing assembly (1.2), the lid film (300) being clamped between said lower sealing assembly (1.1) and the positioning support (1.30) when the separation distance (Ds) is reduced below a value equal to the first determined distance (D1) during said displacement, said lower sealing assembly (1.1) pushing said positioning support (1.30) from said point until the sealing station (1) reaches the closing position (Pc).
 4. Tray sealing method according to any one of claims 1 to 3, wherein the relative displacement between the sealing assemblies (1.1, 1.2) of the sealing station (1) is continuous.
 5. Tray sealing method according to any one of claims 1 to 4, wherein a plurality of trays (200) are arranged in the sealing station (1).
 6. Heat sealing machine comprising a sealing station (1), a film feeder (103) configured to feed a lid film (300) to the sealing station (1), and actuating means (102) configured to inject and/or extract a gas, the sealing station (1) comprising a lower sealing assembly (1.1) and an upper sealing assembly (1.2) facing each other and separated by a variable separation distance (Ds), the sealing station (1) being configured to move from an opening position (Pa) in which the separation distance (Ds) comprises a maximum value to a closing position (Pc) in which the separation distance (Ds) comprises a minimum value, by means of a relative displacement between the sealing assemblies (1.1, 1.2), the upper sealing assembly (1.2) comprising at least one sealing tool (1.21) movable towards a tray (200) arranged between the sealing assemblies (1.1, 1.2) to seal the lid film (300) to the tray (200), **characterised in that** the machine (100) further comprises a film positioner (1.3) with a positioning support (1.30) arranged between the upper sealing assembly (1.2) and the lower sealing assembly (1.1) of said sealing station (1), at a first determined distance (D1) from the lower sealing assembly (1.1) with the sealing station (1) in the opening position (Pa), said first distance (D1) being less than 65% of the difference between the maximum value and the minimum value of the separation distance (Ds), the machine (100) being configured to arrange the lid film (300) against said positioning support (1.30), below said positioning support (1.30), the machine (100) comprising a control unit (104) communicated with the actuation means (102) and configured to control the injection and/or extraction of gas caused by said actuation means (102), the lower sealing assembly (1.1) being configured so that the actuation means (102) injects and/or extracts gas through said lower sealing assembly (1.1) and the control unit (104) being configured so that the actuating means (102) start injecting and/or extracting gas during the relative displacement between the sealing assemblies (1.1, 1.2) of the sealing station (1) with which the separation distance (Ds) is reduced and before said separation distance (Ds) is reduced by 65% of the difference between the maximum value and the minimum value, from its maximum value.
 7. Heat sealing machine according to claim 6, wherein the positioning support (1.30) is attached to an element of the machine (100) in a vertically movable manner with respect to the upper sealing assembly (1.2).

8. Heat sealing machine according to claim 7, wherein the positioning support (1.30) is attached to the element of the machine (100) by at least one extendable guide or by at least one elastic element (1.32).
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9. Heat sealing machine according to claim 7 or 8, wherein the element of the machine (100) to which the positioning support (1.30) is attached is the upper sealing assembly (1.2) of the sealing station (1) or a frame (101) of said machine (100).
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10. Heat sealing machine according to any of claims 6 to 9, wherein the value of the first distance (D1) between the positioning support (1.30) and the lower sealing assembly (1.1) with the sealing station (1) in the opening position (Pa) is adjustable by varying the distance at which the positioning support (1.30) is arranged with respect to the lower sealing assembly (1.1), with the sealing station (1) in the opening position (Pa).
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11. Heat sealing machine according to any of claims 6 to 10, wherein the lower sealing assembly (1.1) comprises at least one tray housing (1.12), the positioning support (1.30) comprising a window (1.31) facing said tray housing (1.12).
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12. Heat sealing machine according to claim 11, wherein the positioning support (1.30) comprises a sealing gasket (1.33) surrounding the window (1.31), or the lower sealing assembly (1.1) comprises a sealing gasket (1.13) surrounding the tray housing (1.12).
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13. Heat sealing machine according to any of claims 6 to 12, wherein the film positioner (1.3) comprises a roller (1.34) at each longitudinal side of the positioning support (1.30), said rollers (1.34) being configured to be in contact with the supplied lid film (300) when said lid film (300) is placed in the sealing station (1).
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14. Heat sealing machine according to any of claims 6 to 13, which is configured to carry out a tray sealing method according to any one of claims 1 to 5.
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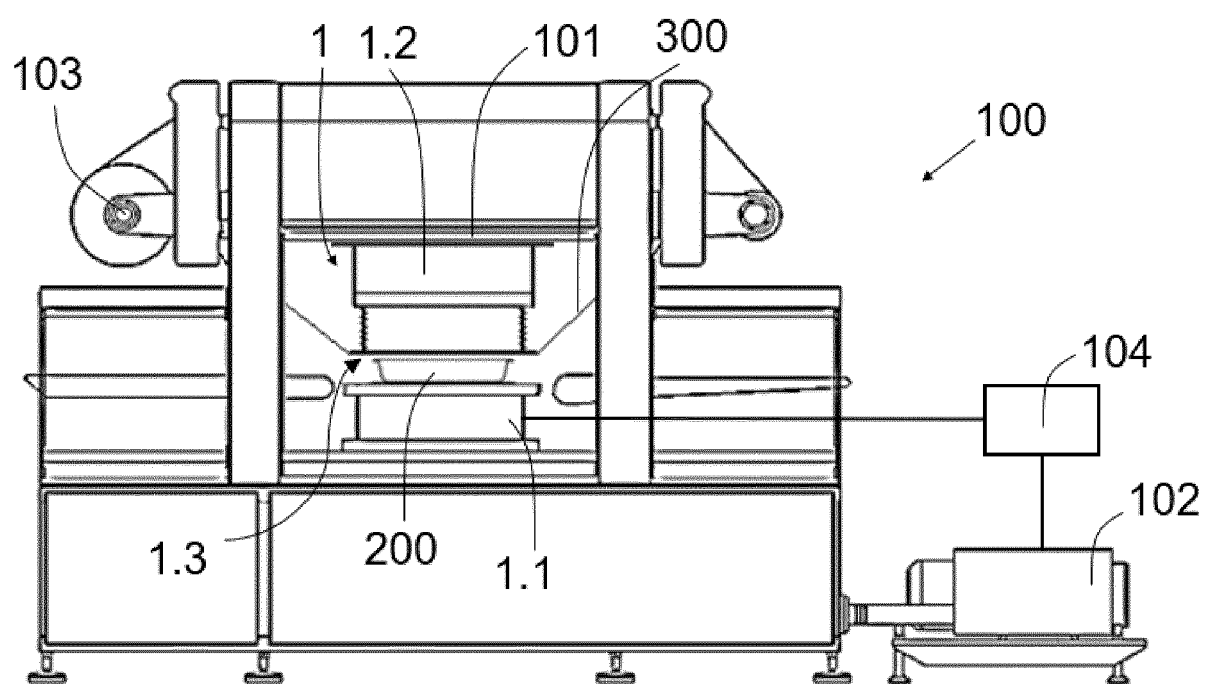


Fig. 1

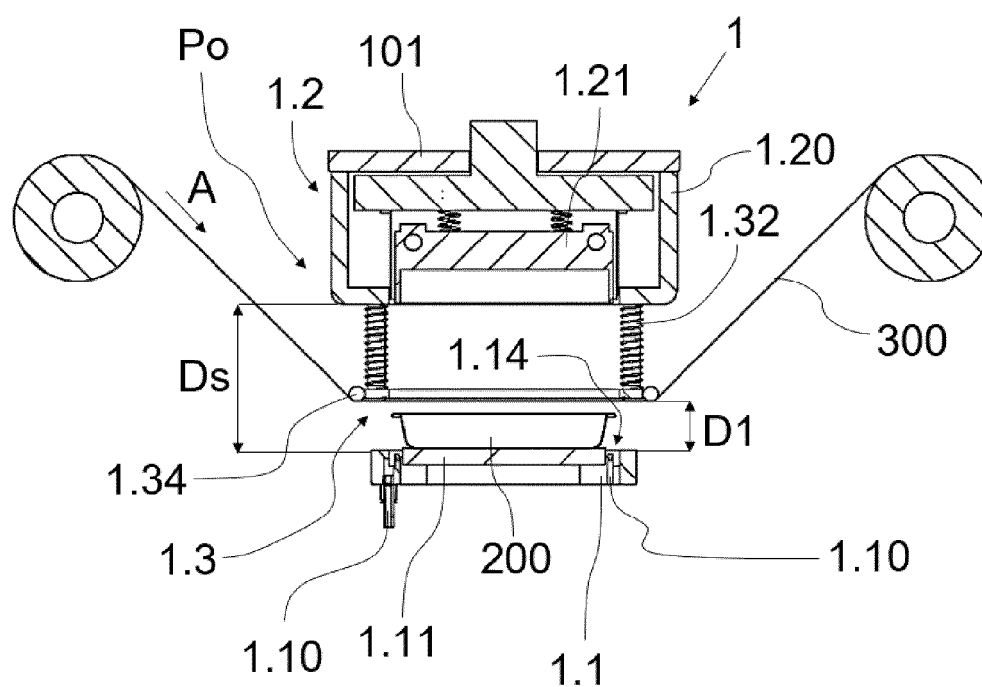


Fig. 2

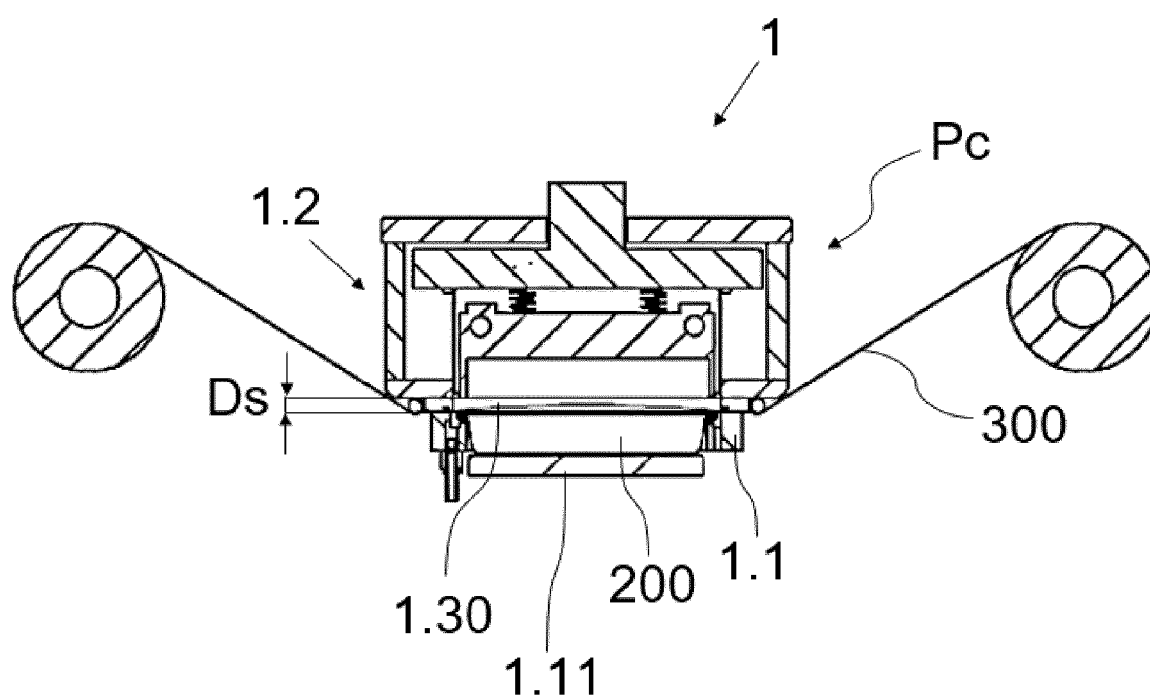


Fig. 3

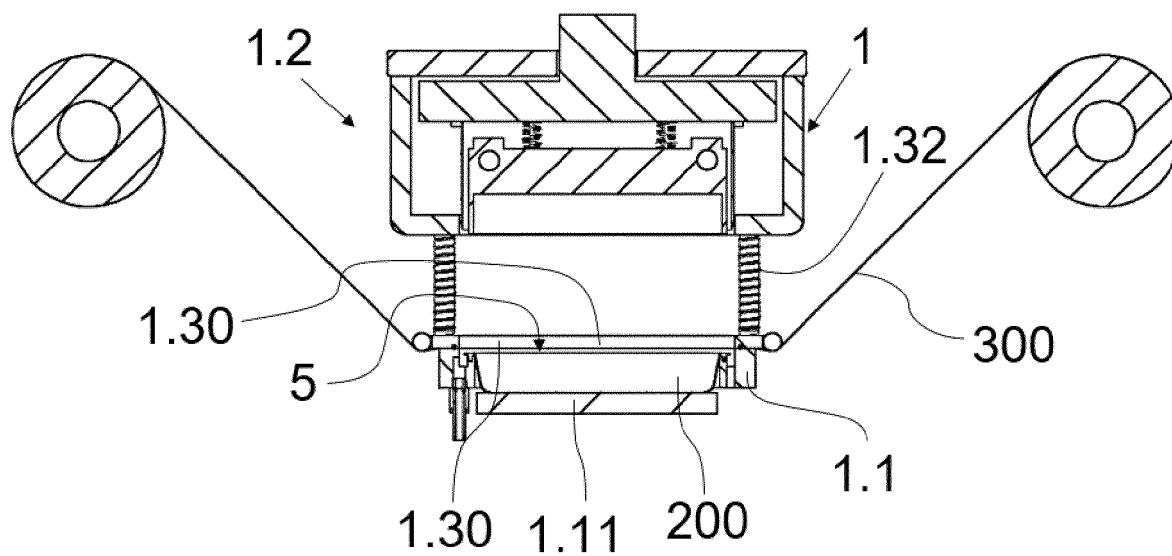


Fig. 4

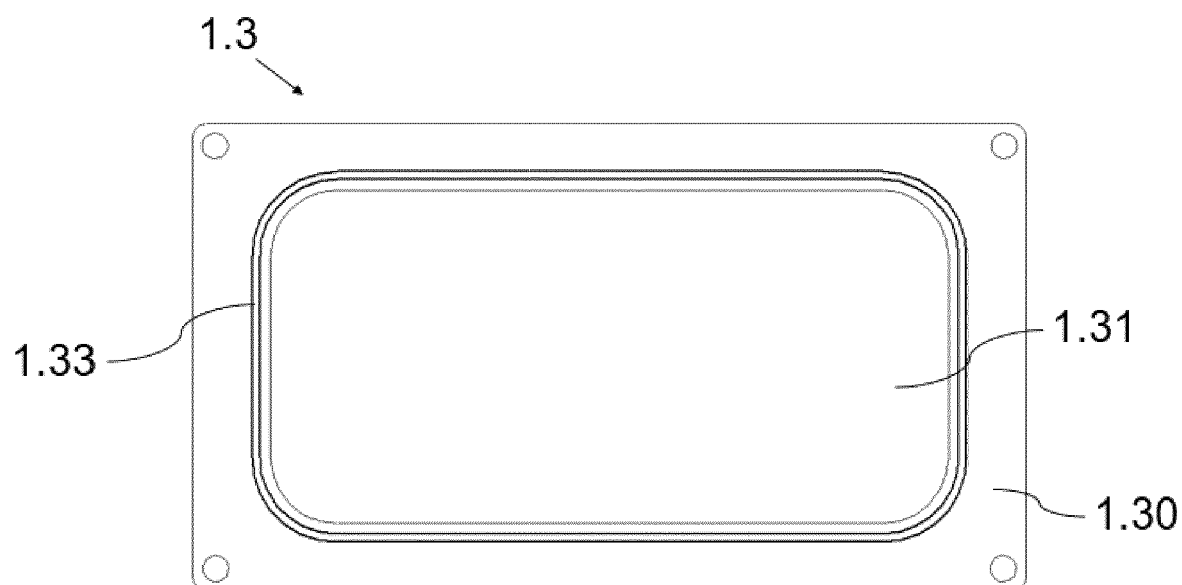


Fig. 5

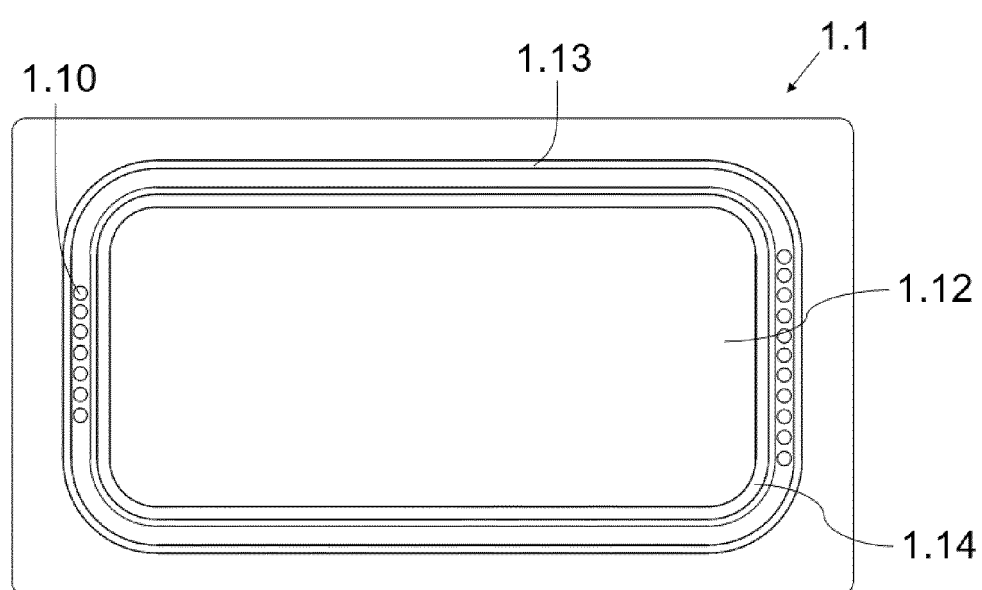


Fig. 6



EUROPEAN SEARCH REPORT

Application Number

EP 23 38 2587

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Y	* page 5, line 9 - page 18, line 32 *	5, 14	B65B7/16
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B65B
Place of search		Date of completion of the search	Examiner
Munich		11 January 2024	Yazici, Baris
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11-01-2024

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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