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(54) Vacuum pack with a special appearance and method and apparatus for obtaining such vacuum pack

(57) The invention relates to a vacuum pack manufactured from a thin-walled and flexible packaging foil and filled with a granular material. The pack has a desired shape deviating from a beam, which shape is maintained as a result of the vacuum pressure prevailing in the pack. The invention also relates to a method and apparatus for obtaining such vacuum pack.

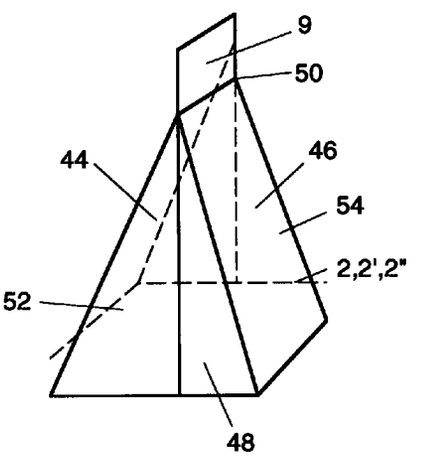

Fig. 9

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Description

The invention relates to a vacuum pack manufactured from a thin-walled and flexible packaging foil and filled with a granular material. The invention also relates to a method and apparatus for obtaining a vacuum pack.

Such a known vacuum pack, method and apparatus are known, for instance, from Dutch patent application 9001945. The finished vacuum pack is here obviously designed in the form of a rectangular pack with flat sidewalls.

Partly for commercial reasons, a need has arisen to offer the packaged product, such as for instance ground coffee, in a more appealing form. An option considered for that purpose is packaging the pack in, for instance, a cardboard or metal package, having a more appealing form than the pack itself. However, this leads to a waste of packaging material, which is nowadays considered unacceptable.

The invention provides an entirely different solution, which does not entail the above-mentioned disadvantages. The vacuum pack according to the invention is accordingly characterized in that the pack has a desired shape deviating from a beam, which shape is maintained as a result of the vacuum pressure prevailing in the pack. The invention is based *inter alia* on the insight that a vacuum pack can be given a random shape, which is maintained as a result of the normal atmospheric pressure. A beam is here understood to refer to a cube or a rectangular parallelepiped.

In particular, the pack comprises a bottom and at least two opposite upright sidewalls, with the two upright sidewalls at least substantially slanting towards each other in upward direction. Such a pack is experienced by the consumer as 'triangular' or 'pyramid-shaped'. However, the invention is not limited to these shapes.

In accordance with a method according to the invention for obtaining a vacuum pack filled with granular material, with a predetermined shape, the contents of a pack manufactured from a thin-walled and flexible packaging foil, placed in a holder and filled with granular material, are compressed by pressing two opposite inside walls of the holder towards each other, while during at least a part of the period in which the pack is compressed, on the outside of the pack a pressure is present which corresponds with the instantaneous pressure on the inside of the pack in such a manner that the pack is deformable, with at least a first portion of a first inside wall of the opposite inside walls and at least a second portion of a second inside wall of the opposite inside walls being directed obliquely relative to each other at least during a part of the period in which the pack is deformable, these portions of the inside walls shaping the pack in such a manner that the pack assumes a desired shape deviating from a beam.

In particular, the opposite inside walls at least substantially slant towards each other at least during a part of the period in which the contents of the pack are compressed. In that case, the above-described special pack can be manufactured with a 'triangular' appearance.

An apparatus according to the invention for obtaining a vacuum pack filled with granular material, with a predetermined shape, comprising a holder for placing therein the pack manufactured from a thin-walled and flexible packaging foil, with the holder comprising at least two opposite inside walls which can be pressed towards each other for compressing the contents of the pack, is characterized in that at least a first portion of a first inside wall of the opposite inside walls and at least a second portion of a second inside wall of the opposite inside walls are directed obliquely (not parallel) relative to each other at least during a part of the period in which the pack is compressed, these portions of the inside walls shaping the pack during the compression in such a manner that the pack assumes a shape deviating from a beam.

The invention will be further explained with reference to the drawings, wherein:

Fig. 1 shows a still open pack to be processed;
Fig. 2 shows a closed pack to be processed;
Fig. 3 shows a first embodiment of a holder according to the invention in a non-compressed position;
Fig. 4 shows the holder of Fig. 3, with the opposite walls pressed towards each other;
Fig. 5 shows a pack as shown in Fig. 1 or 2, placed in the holder shown in Fig. 3;
Fig. 6 shows the assembly of Fig. 5, with the opposite inside walls pressed towards each other;
Fig. 7 shows a boxlike chamber with, respectively, a bag-shaped envelope, a cover, a pressure fluid unit, control means and a vacuum means;
Fig. 8 shows the chamber of Fig. 7, closed airtightly with the cover, after the bag-shaped envelope and the holder with the pack of Fig. 5 have been placed therein;
Fig. 9 shows a first embodiment of the finished pack;
Fig. 10 shows a first process diagram as an illustration for carrying out first various possible methods with the apparatus according to Fig. 8;
Fig. 11 shows a second process diagram as an illustration for carrying out second various possible methods with the apparatus according to Fig. 8;
Fig. 12 shows a third process diagram as an illustration for carrying out third various possible methods with the apparatus according to Fig. 8;
Fig. 13 shows an alternative embodiment of an apparatus according to the invention;
Fig. 14 shows a bottom view of the apparatus according to Fig. 13;
Fig. 15 shows a first alternative embodiment of a holder according to the invention;
Fig. 16 shows a second alternative embodiment of a holder according to the invention; and
Fig. 17 shows an alternative embodiment of a finished vacuum pack according to the invention.

A possible starting point for obtaining a filled vacuum pack manufactured from a thin-walled and flexible packaging foil and filled with a granular material is a pack 2 which is still open at the top, as shown in Fig. 1.

Another possible starting point is a vacuum pack 2' filled with granular material, which has been evacuated and has been folded up and sealed at the top thereof, as shown in Fig. 2. A third possibility is a pack 2" filled with granular material, which has not been evacuated yet but has been folded up and sealed at the top thereof, as shown in Fig. 13. In all cases, the starting point is a rectangular, that is, a beam-shaped pack. A beam is here understood to refer to a rectangular parallelepiped, inclusive of a cube.

Fig. 3 shows a holder 4 with two opposite inside walls 6, 8 which are interconnected at their upper end through a pair of springy hinges 10. In this example, the inside walls 6, 8 are of rigid design.

The hinges each consist, for instance, of a springy metal wire, which at its ends is fixedly connected to the first inside wall 6 and the second inside wall 8, respectively. The hinges allow a displacement, in order that the inside walls can be pressed towards each other, as shown in Fig. 4.

When the inside walls have not been moved towards each other, an interior space 12 is present between the inside walls, in which a pack 2, 2', 2" can be received, see also Fig. 5. In Fig. 5, the filled pack 2 has already been folded up at the top thereof, but not yet sealed. The packs 2' and 2" in Fig. 5 are folded up too and also sealed. In all cases, a folded upper part 9 of the pack 2, 2', 2" projects through the hinges, outside the holder 4. In Fig. 5 the pack 2, 2', 2" has been placed on a bottom 14, whereafter the holder 4 has been arranged over the pack. In this example, the bottom 14 has a width approximately corresponding with the width of a bottom 18 of the pack 2, 2', 2". However, this is not essential and can also be designed differently. The bottom can also be omitted.

When the inside walls 6, 8 of the holder are pressed towards each other, it holds that at least during a part of the period in which the pack 2, 2', 2" is compressed, at least a first portion of a first inside wall of the opposite inside walls and at least a second portion of a second inside wall of the opposite inside walls are directed obliquely (not parallel) relative to each other, with these portions of the inside walls shaping the pack during the compression in such a manner that the pack assumes a desired shape deviating from a beam. In the example of Fig. 6, it is even the entire inside walls that are directed obliquely (not parallel) relative to each other during the entire period in which the pack 2, 2', 2" is compressed. In other words, the portions of the inside walls referred to taper towards each other. What also holds in this example is that the inside walls are each located at least substantially in a flat plane and are not parallel to each other at least during a part of the period in which the contents of the pack are compressed.

Fig. 7 shows a part of the apparatus according to the invention, which comprises a chamber 20 with an airtightly closable access opening 22, a vacuum means 24, 25 for evacuating the chamber, pressure means 26, 28, 30 for pressing towards each other the inside walls 6, 8, and control means 31 for controlling the vacuum means and the pressure means. The pressure means comprise a flexible bag or envelope 26 manufactured from, for instance, rubber. The pressure means further comprise a pressure fluid unit 30 for supplying a pressure fluid such as air or water externally of the bag-shaped envelope 26 via a connection 28. Upon placement in the chamber, the bag has a flanged upper edge 32 resting on the flat upper edge of the chamber, with the bottom of the bag resting on the bottom of the chamber. The bag can be removable or, for instance, be fixed permanently in the chamber. The edge 32 of the bag also serves as an airtight sealing between the upper edge of the chamber and a cover 34, to be placed on the chamber, centrally provided with a slotted opening 36. Finally, a vacuum element 24 can be airtightly mounted on the cover 34, this vacuum element 24 being provided with a connection 38 connected to a vacuum pump 25 controlled by the control means 31. The vacuum element and the vacuum pump together form the vacuum means referred to.

When practising the invention, for instance for manufacturing a 100 gram vacuum pack with ground coffee, the holder 4 (inclusive of the bottom 14) with the pack 2, 2', as shown in Fig. 5, is placed in the bag 26 or secured therein. The dimensions of the holder 4 and the bag 26 are preferably such that the holder 4 can be placed in the bag with a little clearance. The shape of the bag can, if desired, be adapted to the more or less triangular shape of the holder. The chamber can now be closed with the cover 34. The upright edge 9 of the pack 2, 2' projects through the slotted opening 36 in the cover. This situation is shown in Fig. 8.

Then the vacuum element 24 is placed on the cover 20 with an airtight seal.

The apparatus is now ready for use. First of all, it is assumed that the chamber accommodates a holder with a pack 2 which has been folded up but has not been evacuated yet. The apparatus of Fig. 7 further comprises diagrammatically represented folding means 40, mounted on the cover 34 and controlled by the control means 31, which folding means can keep the upright edge 9 of the pack 2 pressed shut to some extent, so that air can escape from the pack, only gradually so, via the gap formed in the edge (flap) 9.

The operation of the apparatus will be further discussed with reference to Fig. 10. In Fig. 10, line A represents the course of the pressure within the bag 26, in which the holder 4 with the pack 2 are disposed. The dotted line B represents the course of the pressure in the pack 2. At time t1 the apparatus, as described hereinbefore, is ready for use and the pressure in the pack and the pressure inside the space 12 of the holder is approximately 1 atm. At time t3 the control unit controls the vacuum pump 25 in such a manner that it is acti-

vated. As a result, the pressure in the interior space 12 of the holder 4, but outside the pack, will gradually decrease to a minimum value of, for instance, 50 mbar (see line A). The pressure in the pack 2 will likewise start to decrease gradually, but less fast than in the space 12 outside the pack. The result is that the pack 2 will tend to expand. As a result, the foil of which the pack is made, will be stretched and crinkles, if any, will disappear from the foil material of the pack 2. The walls of the pack end up disposed against the inside walls 6, 8. Owing to the fact that the pressure inside and outside the pack more or less correspond up to time T7, the pack 2 is easily deformable. In this example, the control means activate at time t4 the pressure fluid unit 30 for supplying the pressure fluid externally of the bag-shaped envelope 26 via a connection 28, so that the inside walls 6, 8 are pressed against the pack. As a result, the inside walls will be pressed towards each other, as is shown in Fig. 6. There where the pack 2 is not in contact with the inside walls 6, 8 and bottom 14, the bag 26 itself will press against the pack 2. The result is that the pack is clamped on all sides. As a result, the volume of the pack will decrease and as a result of this too air will escape from the pack. Owing to the foil of the pack being stretched and owing to the contents of the pack being compressed by the inside walls, the pack will assume the predetermined shape, as shown in Fig. 6. At time t5 the folding means 40 are deactivated, so that air can escape from the pack at an accelerated rate (line B). At time t6 the pressure in the pack 2 and in the space 12 has decreased to approximately 50 mbar. The contents of the pack have moreover been compressed into the predetermined shape, so that the shape of the pack no longer changes. The pack is now sealed under the control of the control means 30 with the aid of closing means, for instance in the form of welding means 42, which are likewise arranged on the cover 34. The control means thereupon control the vacuum pump 25 at time t7, in such a manner that the pressure in the chamber and hence in the space 12 will gradually rise to 1 atm. again. Because the pack 2 has been sealed, the pressure in the pack will remain 50 mbar. Owing to the fact that the pressure outside the pack presently becomes much greater than the pressure in the pack, the pack will become rigid and maintain its desired predetermined shape. When the pressure in the chamber has run up to, for instance, 1 atm, it is possible, for instance at time t8, for the control means to deactivate the pressure fluid means, so that the bag no longer presses the inside walls towards each other. The pack has then been pressed on for the period of time C, see Fig. 10. The inside walls will thereafter move away from each other due to the spring action of the hinges 10. Presently, the finished vacuum pack can be removed from the chamber and has a shape as shown in Fig. 9.

The pack has a desired shape deviating from a beam, which shape is maintained as a result of the vacuum pressure prevailing in the pack. The pack further has two opposite sidewalls 44, 46, at least a first wall portion of a first sidewall 44 of the opposite sidewalls and at least a second wall portion of a second sidewall 46 of the opposite sidewalls being directed obliquely relative to each other. In this example, with the exception of the flap 9, the entire sidewalls 44, 46 are directed obliquely relative to each other. Both sidewalls are each disposed substantially in a flat plane. The pack further comprises a bottom 48, which connects to the two opposite upright sidewalls 44, 46, while the two upright sidewalls at least substantially slant towards each other. The two upright sidewalls 44, 46 terminate at the top of the pack in a closing seam 50. The closing seam 50 is at least substantially parallel to the bottom 48. In this example, the two upright sidewalls 44, 46 at least substantially have a rectangular shape.

The pack further comprises a second pair of opposite upright sidewalls 52, 54, each having at least three circumferential edges respectively connecting to the bottom 48 and the two first-mentioned upright sidewalls 44, 46. Each sidewall 52, 54 of the second pair of upright sidewalls has a triangular shape. In addition, each sidewall of the second pair of upright sidewalls at least partly has a concave shape on the outside of the pack. This has been caused by the envelope or the bag 26 which, as has been described hereinbefore, has been pressing directly against the walls 52, 54.

It is also possible that the movement of the sidewalls towards each other is started already at time t2, for instance, and is ended at time t8. It is also possible that the operation of pressing on the contents of the pack is ended at a time t9 when a fairly great pressure, for instance 0.5 atm., is already present on the outside of the pack.

If no folding means are present, the pack will be evacuated faster (line C), so that perhaps not all of the crinkles disappear from the pack. Now too, the pressure in the pack, for instance at time t4, will correspond sufficiently with the pressure outside the pack, so that the pack is properly deformable. Thus the pack acquires the desired eventual shape, because the pack is pressed on during at least a part of the period in which the pack is deformable. It is preferred that in all cases the pack is compressed until the end of the period in which the pack is deformable, so that the pack will definitely maintain the acquired shape; that compressing the contents of the pack with the aid of the opposite sidewalls is started after the pack has been closed.

Fig. 11 shows a process in which again no folding means are present for keeping the flap of the pack 2 squeezed shut. Again, by means of the control means 30 the evacuation is started at time t3. The pressure in the pack (line D) and the pressure outside the pack in the space 12 will initially decrease fast as well, until at time t6 both inside and outside the pack a pressure of 75 mbar is present. At time t6 the control means control the welding means 44, in such a manner that the evacuated pack is closed airtightly. Then, after the pack has been closed at time t10, the control means 30 control the vacuum pump, in order that the pressure in the inte-

rior space 12, but outside the pack 12, is further reduced to, for instance, 10 mbar. As a result, the pack will again bulge to some extent, and the foil of the pack will be stretched, so that crinkles, if any, will disappear from the pack.

Also, the control means control in such a manner that subsequently at time t12, which is after time t10, the inside walls of the holder 4 are pressed towards each other, so that the contents of the pack are compressed into the desired shape. At time t12 the pressure outside the pack and the pressure inside the pack correspond to a sufficient extent to render the pack properly deformable. Then the pressure in the chamber is increased gradually again from time t7, as has been discussed in relation to Fig. 10. The termination of the compression of the contents of the pack can again take place at time t9 or t8.

It is also possible that the compression of the contents of the pack is commenced at time t6 or before.

With reference to Fig. 12, it will be discussed how with the apparatus according to Fig. 7 an already evacuated vacuum pack 2' can be processed. The pack 2' along with the holder is placed in the bag 26 in a manner entirely analogous to that discussed hereinbefore. Then the control unit will control the vacuum pump 25 in such a manner that the pressure in the interior space 12 (in the chamber 20) is gradually reduced to 25 mbar. The pressure in the pack 2' (see line F) is already 50 mbar at the time. At time t13 the pressure outside the pack 2' will have decreased to a value that is lower than the instantaneous vacuum pressure in the pack 2'. As a result, the pack 2' will again bulge to some extent and any folds or crinkles in the foil of the pack 2' will be stretched. The control means control the pressure fluid unit 30, for instance at time t13, in such a manner that the inside walls 6, 8 are pressed towards each other by the bag 26. The contents of the pack are then compressed again as has already been explained with reference to Fig. 10 and Fig. 11. As a result, the pack will assume the desired shape again, as shown in Figs. 6 and 9. Then, from time t7 the pressure in the chamber is gradually raised again to an atmospheric value and at time t9 or t8 the pressure fluid unit 30 can be deactivated. The pack 2' is now ready and has the properties as discussed with reference to Fig. 9. For the sake of completeness, it is observed that the pressing on the pack can also be commenced before time t14, that is, at a moment when the pressure in the pack is still lower than the pressure outside the pack. However, such pressing has little or no effect if the pressure difference is considerable, and between times t14 and t13 the foil of the pack, as a result of such pressing, has perhaps somewhat less opportunity to stretch.

Finally, Fig. 13 shows a second embodiment of an apparatus according to the invention for processing a pack 2". The pack 2" to be processed is already sealed at its upper end, like the pack 2', but the pack has not yet been evacuated. The appearance of the pack 2" is therefore as shown in Fig. 2 and, together with the holder 4, as shown in Fig. 5, is placed in the apparatus of Fig. 13.

Fig. 13 shows a rigid chamber 112 open at one end, which is arranged with the open end directed downwards. Disposed in the chamber with some clearance is a bag-shaped body, in this case designed as a double-walled rubber bag 126. Connected to the bag is the pressure fluid unit 30 for supplying compressed air to the interior of the bag and thereby inflating the bag. At the lower end of the chamber, hinged clamps 117 are mounted, with which a supporting plate, in this case cover 116, can be clamped airtightly against the chamber. Arranged within the bag 126 with slight clearance is the holder 4 with the pack 2" arranged therein. The pack is closed but has not been evacuated yet. The cover 116 contains a centrally located opening 131. At the location of the opening 131 a welding strip 118 has been welded along the edges 129 thereof against the inside wall of the pack. The welding strip is provided with a number of openings 119 located within the weld edges but off the centre (see also Fig. 13).

The apparatus further comprises the vacuum element 121 which can be connected airtightly onto the cover 116 over the opening 131 therein by means of a sealing ring 127. The interior space of the vacuum element is connected to a line 123 which is connected with the vacuum pump 25. Arranged inside the vacuum element is a welding means 124 which at the end proximal to the opening 131 in the cover comprises an annular welding jaw 122 which can heated electrically. The welding means can be moved within the vacuum element, back and forth, to and from the opening 131. Arranged within the welding means 124 is a needle 125 which by means of an electromagnet can move back and forth relative to the welding jaw 122 through a central opening in the welding jaw.

The apparatus according to Fig. 13 is used as follows. First, the holder 4 accommodating the pack 2" which has been completely filled and closed airtightly but not evacuated yet, is slipped into the bag 126 without the bottom (or the chamber 112 with the bag 126 is arranged over the pack). At this time, the cover 116 and the vacuum element 121 have not been fitted yet. When the holder with the pack has been disposed in the bag, the cover 116 is placed on the chamber 112 and with the aid of the pivoting clamps 117 pressed airtightly against the edges of the chamber. Then a stamp 128 (Fig. 14) is inserted through the opening in the cover. The stamp 128 is moved up so far that the convex forward end thereof to some extent presses upwards the foil at that point and also the welding strip 118 located behind it. In this position, the stamp is fixed. Now, compressed air is supplied to the bag 126, which expands as a result, whereby the outside wall of the bag settles against the inside wall of the chamber and the outside wall of the bag is pressed against the holder, so that the inside walls 6, 8 of the holder 4 are pressed towards each other (Fig. 4). The bottom of the bag thereby presses the pack against the cover 116 and also against

the stamp 128 disposed in the opening thereof, so that the pack is compressed on all sides. The pack is pressed on as strongly as is needed to reduce the relative mobility of the granules to such an extent that upon the subsequent evacuation no granules are sucked out of the filling. The stamp 128 is now removed from the opening 131 and from the cover and the vacuum element 121 is then connected to the cover 116. Via the vacuum line 123 the interior of the vacuum element is evacuated. Upon commencement of the vacuum suction, the foil 120 adjacent the opening 131 is to some extent sucked towards the vacuum element and thereby moves away from the welded strip. Owing to the openings 119 present in the welding strip, no pressure difference arises on opposite sides of the welding strip, so that it maintains the position assumed. The electromagnet operating the needle 125 is now activated, so that the needle is moved outwards and pierces a hole in the foil. In doing so, the needle does not touch the welding strip 118. This is the situation as depicted in Fig. 13. During the ongoing evacuation, via the hole in the foil which functions as suction opening and via the openings 119 in the welding strip, the contents of the pack are evacuated. After achieving the desired level of vacuum in the pack, the welding means is activated, so that through its heated welding jaw 122 it presses the foil 120 and the welding strip against each other and welds them together. During this operation, the welding strip is supported by the filling which has become hard through the compression of the pack and the vacuum. Owing to the foil and welding strip being welded together in a zone within the openings 119 in the welding strip, an airtight closure of the pack is produced at that point. The compressed air pressure on the bag is now removed, so that the bag shrinks again. If desired, at this moment a vacuum source can be connected to the interior of the bag, so that the bag shrinks to an even further extent and the pack can be removed more easily from the bag. The vacuum element can now be removed from the cover and likewise the cover can be removed from the chamber. The now finished pack is slipped out of the bag and replaced by a next pack to be evacuated. It is noted that during the entire evacuation process, the exterior of the pack, with the sole exception of the small area opposite the opening 131 in the cover, is not subjected to vacuum and remains in an atmospheric environment.

The invention is not in any way limited to the embodiments described hereinbefore. Thus the inside walls 6, 8 can be flexible, rather than rigid. It is important, however, that at least a first portion of the first inside wall 6 of the opposite inside walls and at least a second portion of the second inside wall 8 of the opposite inside walls are directed obliquely relative to each other at least during a part of the period in which the pack is deformable, see for instance Fig. 15 or 16. Accordingly, such oblique orientation can also result from the bending of the inside walls during the compression of the contents of the pack. Also, it is possible to use more than two inside walls movable towards each other.

In particular, the opposite inside walls at least substantially slant towards each other, at least during a part of the period in which the contents of the pack are compressed. See for instance Fig. 15. In Fig. 16 both the upper half and the lower half of the inside walls slant towards each other in upward and downward direction, respectively. What also applies to the inside walls of Figs. 15 and 16 is that at least one of the inside walls substantially has a curved surface. It holds for the inside walls of Fig. 3, however, that the inside walls are each at least substantially located in a flat plane and are not parallel to each other at least during a part of the period in which the contents of the pack are compressed.

The inside walls can also be designed without hinges and the inside walls can be pressed towards each other with other means than a bag, for instance using a hydraulic drive mechanism such as a linear actuator. In many cases, the pack can also be placed in the chamber in inverted position. This applies invariably to the packs 2', 2", which are already closed. The pack can also assume other predetermined, fancy forms, as is shown in Fig. 17. It holds for this finished pack that it comprises at least two opposite sidewalls, with at least a first wall portion 80 (hatched) of a first sidewall of the opposite sidewalls and at least a second wall portion 82 of a second sidewall 8 of the opposite sidewalls are directed obliquely relative to each other. It further holds that at least one of the sidewalls substantially is not located in a flat plane and that at least one of the sidewalls substantially comprises a curved surface 84 and at least two opposite upright sidewalls 6, 8, with the two upright sidewalls at least substantially slanting towards each other in upward direction and that the two upright sidewalls at the top of the pack terminate in a closing seam.

These variants are all understood to fall within the scope of the invention.

Claims

1. A vacuum pack manufactured from a thin-walled and flexible packaging foil and filled with a granular material, characterized in that the pack has a desired shape deviating from a beam, which shape is maintained as a result of the vacuum pressure prevailing in the pack.

2. A vacuum pack according to claim 1, characterized in that the pack comprises at least two opposite sidewalls, with at least a first wall portion of a first sidewall of the opposite sidewalls and at least a second wall portion of a second sidewall of the opposite sidewalls being directed obliquely relative to each other.

3. A vacuum pack according to any one of the preceding claims, characterized in that at least one of the

sidewalls is substantially not located in a flat plane.

4. A vacuum pack according to any one of the preceding claims, characterized in that at least one of the sidewalls substantially has a curved surface.

5. A vacuum pack according to claim 1, characterized in that the pack comprises a bottom and at least two opposite upright sidewalls, with the two upright sidewalls at least substantially slanting towards each other in upward direction.

6. A vacuum pack according to claim 5, characterized in that the two upright sidewalls terminate in a closing seam at the top of the pack.

7. A vacuum pack according to claim 6, characterized in that the closing seam is at least substantially parallel to the bottom.

8. A vacuum pack according to claim 7, characterized in that the two upright sidewalls at least substantially have one rectangular shape.

9. A vacuum pack according to any one of the preceding claims 5-8, characterized in that at least one of the upright sidewalls is located at least partly in a flat plane.

10. A vacuum pack according to any one of the preceding claims 5-9, characterized in that at least one of the upright sidewalls is located at least partly in a curved plane.

11. A vacuum pack according to any one of the preceding claims 5-10, characterized in that the pack further comprises a second pair of opposite upright sidewalls each having at least three circumferential edges, which three circumferential edges respectively connect to the bottom and the two first-mentioned upright sidewalls.

12. A vacuum pack according to claim 11, characterized in that each sidewall of the second pair of upright sidewalls has a triangular shape.

13. A vacuum pack according to claim 12, characterized in that each sidewall of the second pair of upright sidewalls at least partly has a concave shape on the outside of the pack.

14. A method for obtaining a vacuum pack filled with granular material, with a predetermined shape, wherein the contents of a pack, manufactured from a thin-walled and flexible packaging foil, placed in a holder and filled with granular material, are compressed by pressing two opposite inside walls of the holder towards each other, while during at least a part of the period in which the pack is compressed, on the outside of the pack a pressure is present, which corresponds with the instantaneous pressure on the inside of the pack, in such a manner that the pack is deformable, and wherein at least a first portion of a first inside wall of the opposite inside walls and at least a second portion of a second inside wall of the opposite inside walls are directed obliquely relative to each other at least during a part of the period in which the pack is deformable, and wherein these portions of the inside walls shape the pack in such a manner that the pack assumes a desired shape deviating from a beam.

15. A method according to claim 14, characterized in that the opposite inside walls at least substantially slant towards each other at least during a part of the period in which the contents of the pack are compressed.

16. A method according to claim 14 or 15, characterized in that at least one of the inside walls is substantially not located in a flat plane.

17. A method according to claim 16, characterized in that at least one of the inside walls substantially has a curved surface.

18. A method according to claim 15, characterized in that the inside walls each lie at least substantially in a flat plane, and are not parallel to each other at least during a part of the period in which the contents of the pack are compressed.

19. A method according to any one of claims 14-18, characterized in that during at least a part of the period in which the pack is compressed, on the outside of the pack a pressure is present which is less than the instantaneous pressure on the inside of the pack.

20. A method according to any one of the preceding claims 14-19, characterized in that the pack placed in the holder and filled with granular material is open before the operation is performed, wherein the holder is airtightly closed when the filled pack is disposed in the holder, the interior space of the holder in which the pack is located is evacuated, at least during a part of the period in which the interior space is evacuated the contents of the pack are compressed by the opposite inside walls, the pack is closed airtightly, and wherein upon the closure the vacuum pressure in the interior space is removed.

21. A method according to claim 20, characterized in that the compression of the contents of the pack by means of the opposite inside walls is ended after the pressure in the interior space has been raised to above the vacuum pressure in the pack.

22. A method according to claim 20 or 21, characterized in that the compression of the contents of the pack by means of the opposite inside walls is started before the interior space of the holder is vacuumized.

23. A method according to claim 20 or 21, characterized in that the compression of the contents of the pack by means of the opposite inside walls is started during the period in which the interior space of the holder is vacuumized.

24. A method according to claim 20 or 21, characterized in that the compression of the contents of the pack by means of the opposite inside walls is started after the pack has been closed airtightly.

25. A method according to claims 19 and 24, characterized in that the vacuum pressure in the interior space of the holder is further reduced after the pack has been closed airtightly, so that the vacuum pressure in the closed pack is higher than the vacuum pressure in the interior space.

26. A method according to claim 20 or 21, characterized in that the pack is folded up before or directly after the interior space is evacuated, so that the pressure in the interior space of the holder but outside the pack decreases faster during a period than does the pressure in the pack, and wherein the contents of the pack are compressed by means of the opposite inside walls at least during a part of the last-mentioned period.

27. A method according to any one of claims 14-19, characterized in that the pack placed in the holder and filled with granular material is already closed and evacuated before the operation is performed, wherein the holder is closed airtightly, after the evacuated pack has been placed in the holder, the interior space of the holder in which the evacuated pack is disposed is evacuated to a pressure comparable with the vacuum pressure in the pack, so that the pack becomes deformable, and wherein at least during a part of the period in which the interior space is evacuated the contents of the pack are compressed by the opposite inside walls.

28. A method according to claims 19 and 27, characterized in that at least during a period in which the pack is compressed by the opposite inside walls, the pressure in the interior space is reduced to a vacuum pressure lower than the instantaneous vacuum pressure in the pack.

29. A method according to claim 27 or 28, characterized in that the compression of the contents of the pack by means of the opposite inside walls is ended after the pressure in the interior space has been raised to above the vacuum pressure in the pack.

30. A method according to claim 14, characterized in that the pack, before being evacuated, is closed airtightly; and that thereupon a vacuum means is connected to a suction opening provided in a wall of the pack, which vacuum means evacuates the pack via the suction opening, and that after the evacuation the suction opening is closed airtightly.

31. A method according to claim 30, characterized in that the pack is not externally subjected to a vacuum.

32. A method according to any one of the preceding claims 14-31, characterized in that the holder is placed in a thin-walled bag-shaped envelope and the inside walls of the holder are pressed against the pack through the supply of a pressure fluid externally of the envelope.

33. An apparatus for obtaining a vacuum pack filled with granular material, with a predetermined shape, comprising a holder for placing therein the pack manufactured from a thin-walled and flexible packaging foil, wherein the holder comprises at least two opposite inside walls which can be pressed towards each other for compressing the contents of the pack, characterized in that at least a first portion of a first inside wall of the opposite inside walls and at least a second portion of a second inside wall of the opposite inside walls are directed obliquely (not parallel) relative to each other at least during a part of the period in which the pack is compressed, and wherein these portions of the inside walls shape the pack during the compression in such a manner that the pack assumes a desired shape deviating from a beam.

34. An apparatus according to claim 33, characterized in that the two opposite inside walls at least substantially extend towards each other at least during a part of the period in which the contents of the pack are compressed.

35. An apparatus according to claim 33 or 34, characterized in that at least one of the opposite inside walls at least substantially does not lie in a flat plane.

36. An apparatus according to claim 33 or 34, characterized in that at least one of the opposite inside walls substantially has a curved surface.

37. An apparatus according to claim 33 or 34, characterized in that the inside walls each lie at least substantially in a flat plane, and are not parallel to each other at least during a part of the period in which the contents of the pack are compressed.

38. An apparatus according to any one of claims 33-37, characterized in that the apparatus further comprises a chamber with an airtightly closable access opening, a vacuum means for evacuating the chamber, pressure means for pressing the inside walls towards each other, and control means for controlling the vacuum means and the pressure means.

39. An apparatus according to claim 38, wherein the pack placed in the holder and filled with granular material is open before the operation is performed, characterized in that the apparatus further comprises closing means for airtightly closing the pack, while the control means control the vacuum means, the closing means and the pressure means in such a manner that the interior space of the holder in which the pack is located is evacuated; at least during a part of the period in which the interior space is evacuated, the contents of the pack are compressed by the opposite inside walls; the pack is closed airtightly; and that upon the closure the vacuum pressure in the interior space is removed.

40. An apparatus according to claim 39, characterized in that the control means control in such a manner that the compression of the contents of the pack by means of the opposite inside walls is ended after the pressure in the interior space has been raised to above the vacuum pressure in the pack.

41. An apparatus according to claim 39 or 40, characterized in that the control means control in such a manner that the compression of the contents of the pack by means of the opposite inside walls is started before the interior space of the holder is evacuated.

42. An apparatus according to claim 39 or 40, characterized in that the control means control in such a manner that the compression of the contents of the pack using the opposite inside walls is started during the period in which the interior space of the holder is evacuated.

43. An apparatus according to claim 39 or 40, characterized in that the control means control in such a manner that the compression of the contents of the pack using the opposite inside walls is started after the pack has been closed airtightly.

44. An apparatus according to claim 43, characterized in that the control means control in such a manner that the vacuum pressure in the interior space of the holder is further reduced, after the pack has been closed airtightly, so that the vacuum pressure in the closed pack is higher than the vacuum pressure in the interior space.

45. An apparatus according to claim 39 or 40, characterized in that the apparatus further comprises folding means, controllable by the control means, for folding up or keeping folded up an open top of the pack, the control means controlling in such a manner that the pack is folded up or kept folded up before or directly after the interior space is evacuated, so that the pressure in the interior space of the holder but outside the pack decreases faster during a period than does the pressure in the pack, and wherein the contents of the pack are compressed using the opposite inside walls at least during a part of the last-mentioned period.

46. An apparatus according to claim 38, wherein the pack placed in the holder and filled with granular material is already closed and evacuated, characterized in that the control means control the vacuum means and the pressure means in such a manner that the interior space of the holder in which the evacuated pack is located is evacuated to a pressure comparable to the vacuum pressure in the pack, so that the pack becomes deformable; at least during a part of the period in which the interior space is evacuated the contents of the pack are compressed by the opposite inside walls.

47. An apparatus according to claim 46, characterized in that the control means control in such a manner that the pressure in the interior space, at least during a period in which the pack is compressed, is reduced by the opposite inside walls to a vacuum pressure lower than the instantaneous vacuum pressure in the pack.

48. An apparatus according to claim 46 or 47, characterized in that the control means control in such a manner that the compression of the contents of the pack by means of the opposite inside walls is ended after the pressure in the interior space has been raised to above the vacuum pressure in the pack.

49. An apparatus according to any one of claims 33-37, characterized in that the apparatus further comprises a vacuum means for evacuating the pack and closing means for airtightly closing the pack, pressure means for pressing the inside walls towards each other and control means for controlling the vacuum means, the closing means and the pressure means, the control means controlling in such a manner that the pack, before being evacuated, is compressed by the opposite inside walls; that thereafter the vacuum means is connected to a suction opening provided in a wall of the pack, which vacuum means evacuates the pack via the suction opening; and that after the evacuation the suction opening is closed airtightly.

50. An apparatus according to any one of the preceding claims 33-49, characterized in that pressure means

consist of a thin-walled bag-shaped envelope in which the holder has been placed, and a pressure fluid unit for supplying a pressure fluid externally of the envelope, so that the inside walls are pressed against the pack.

51. A vacuum pack according to any one of the preceding claims 1-13, characterized in that the two sidewalls have a smooth outer surface.

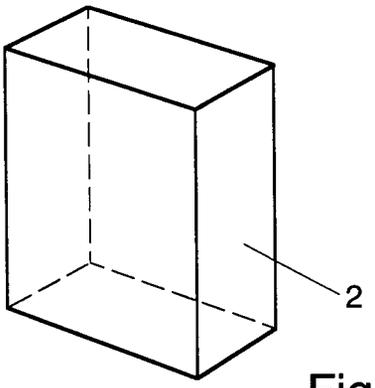

Fig. 1

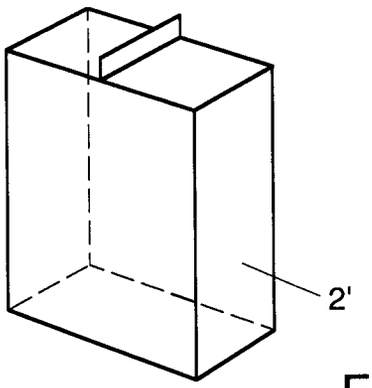

Fig. 2

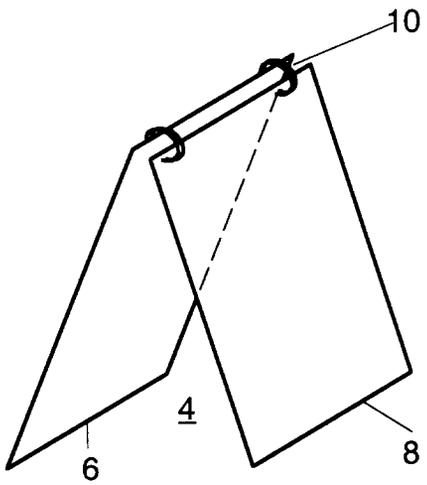

Fig. 3

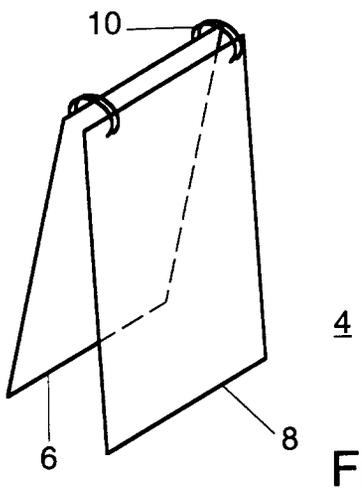

Fig. 4

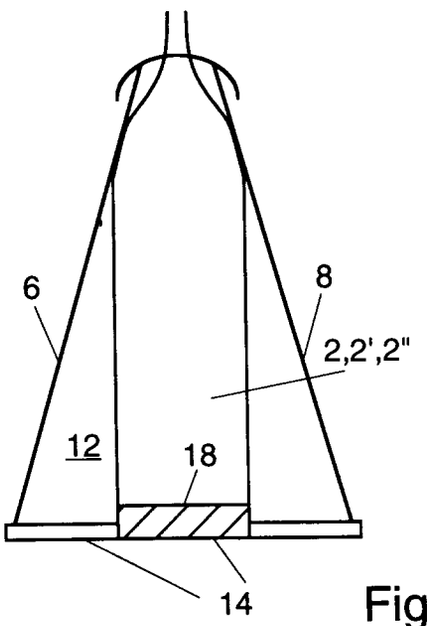

Fig. 5

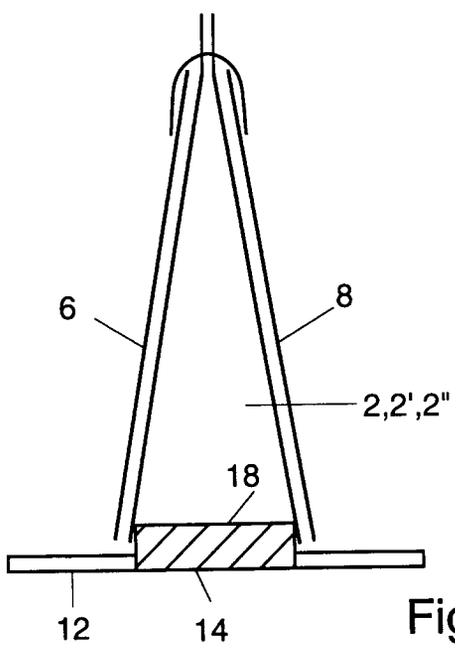

Fig. 6

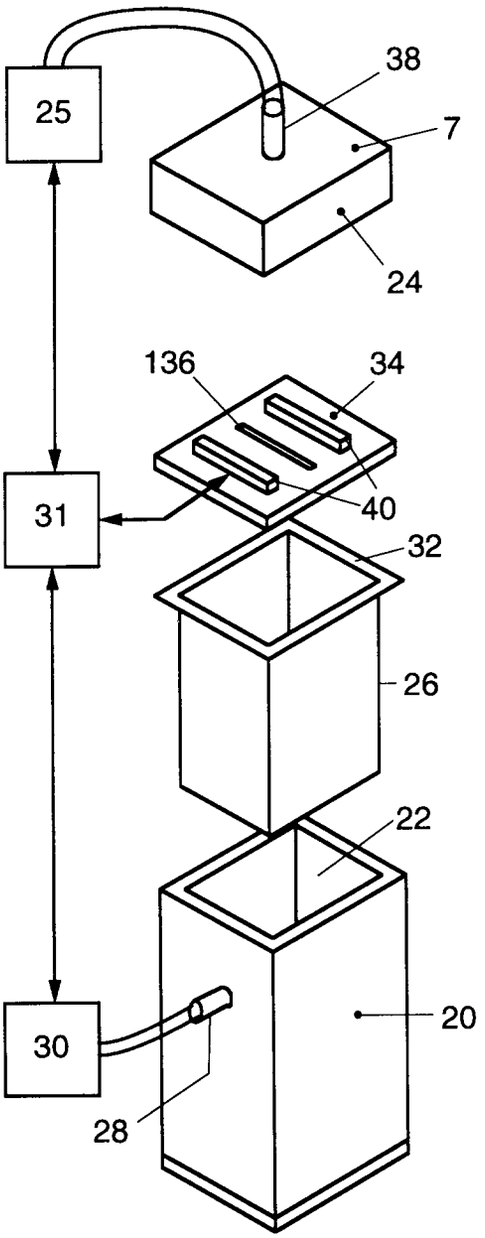

Fig. 7

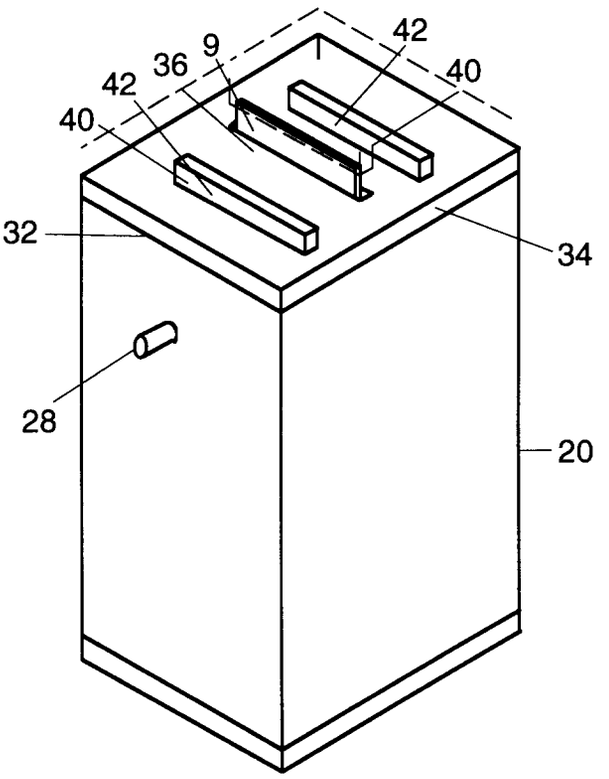

Fig. 8

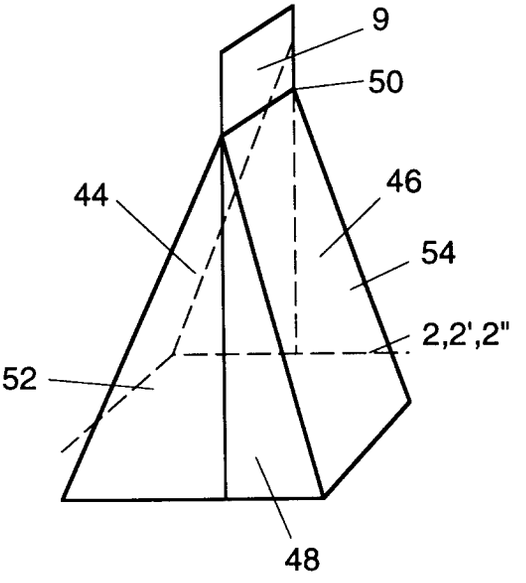

Fig. 9

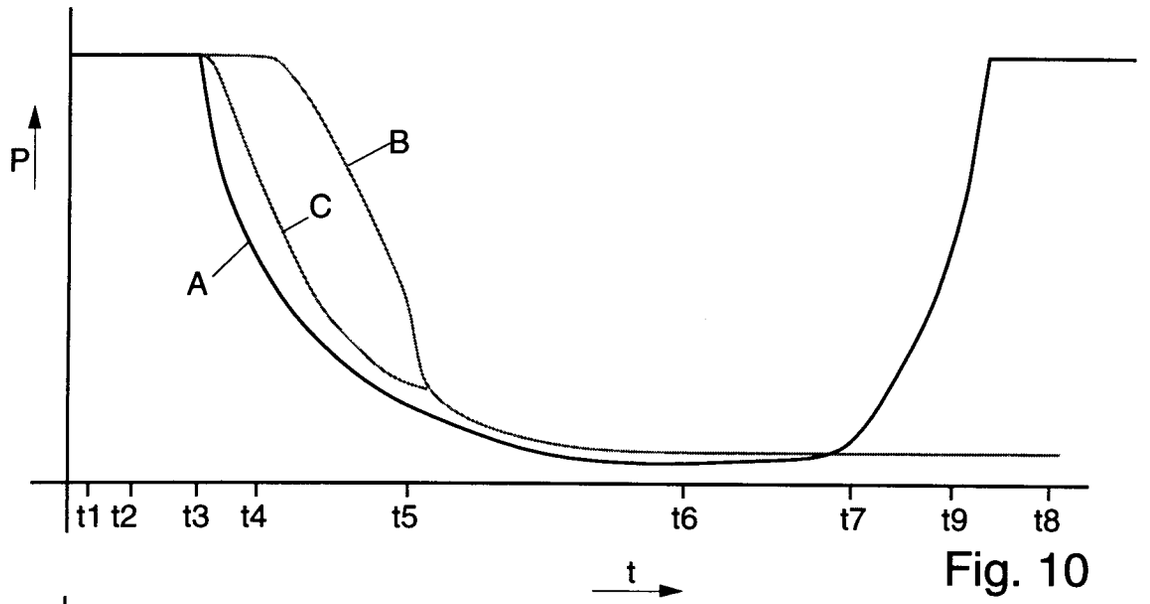

Fig. 10

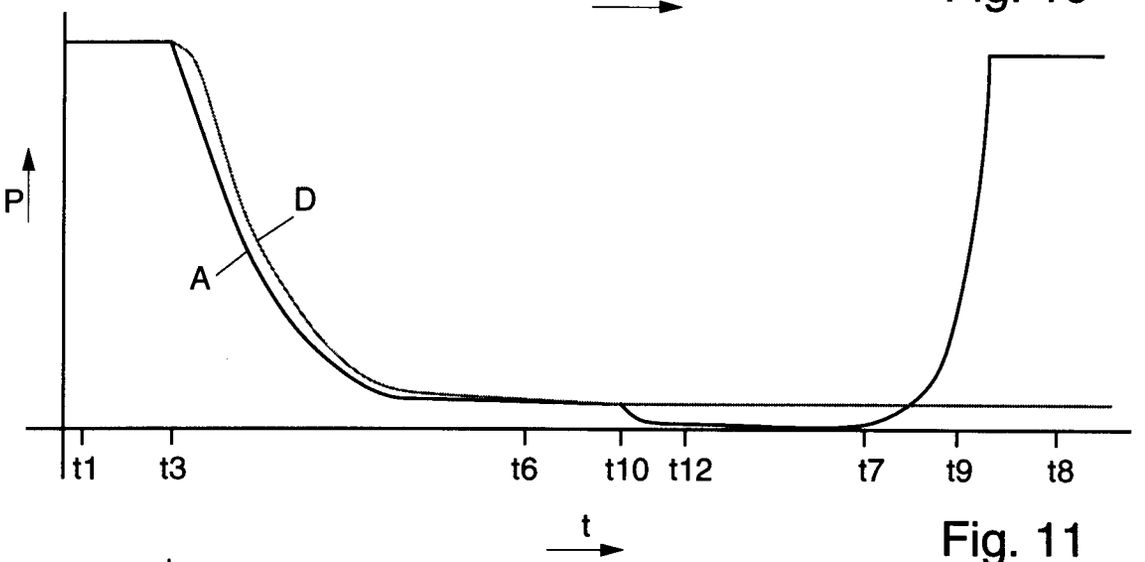

Fig. 11

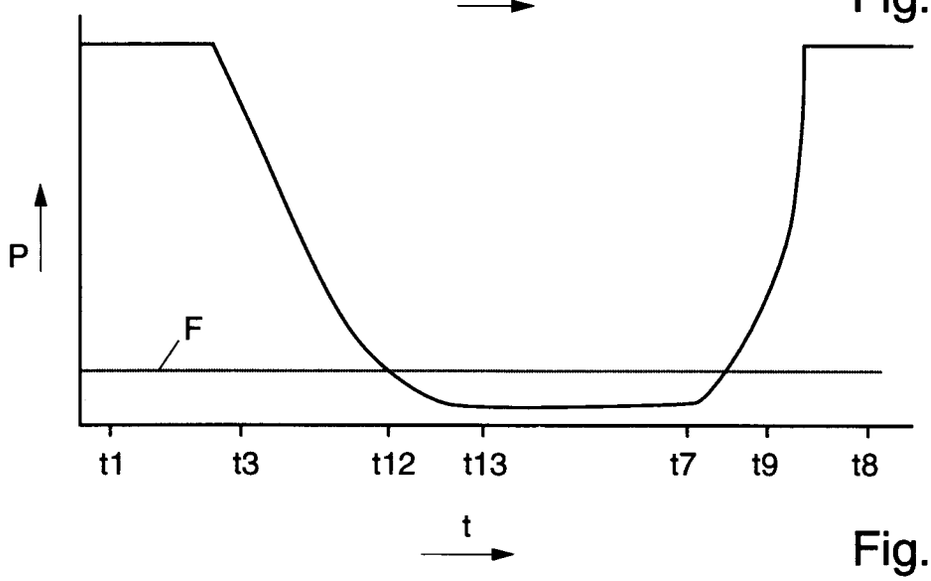

Fig. 12

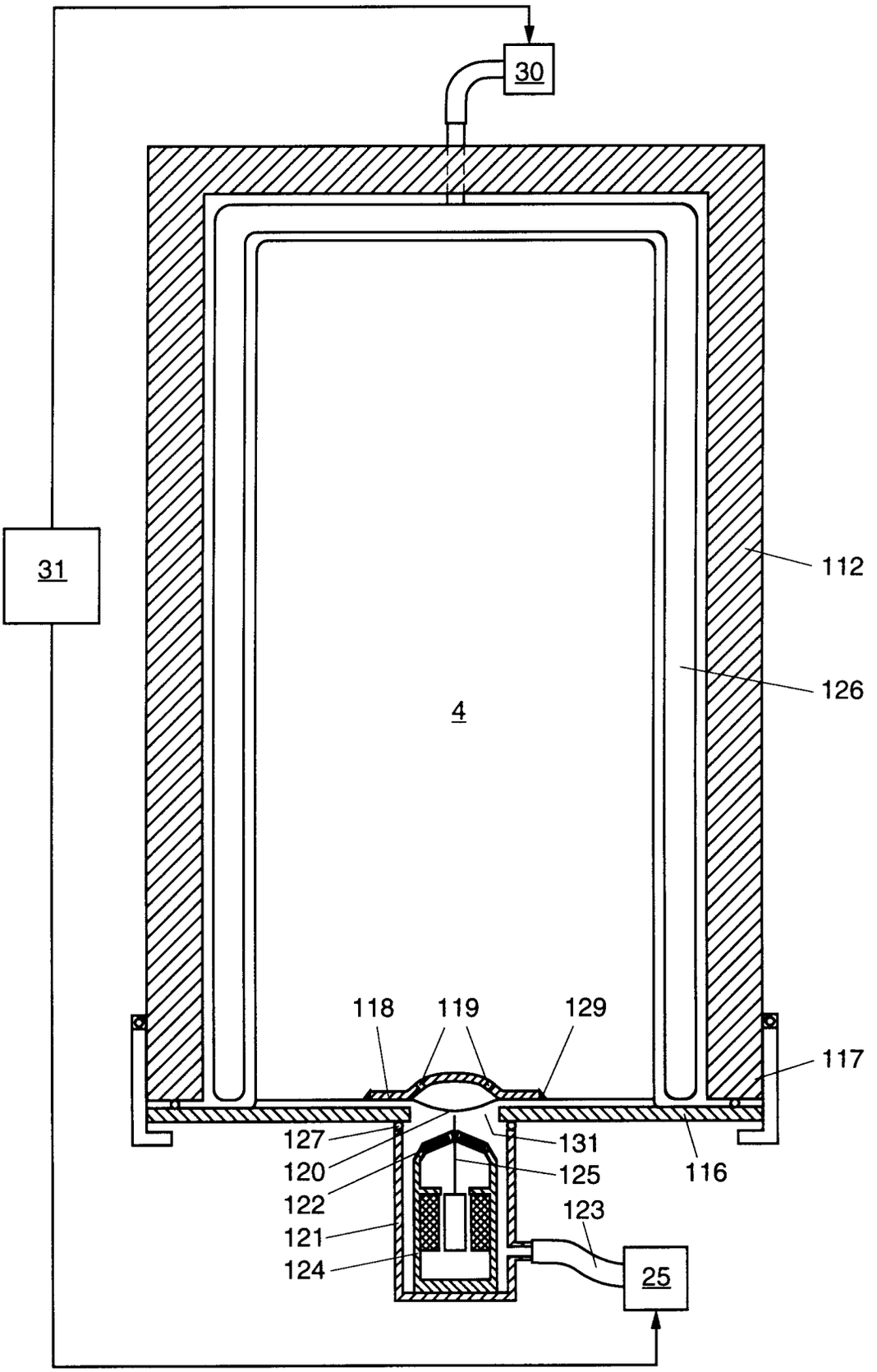
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Fig. 13

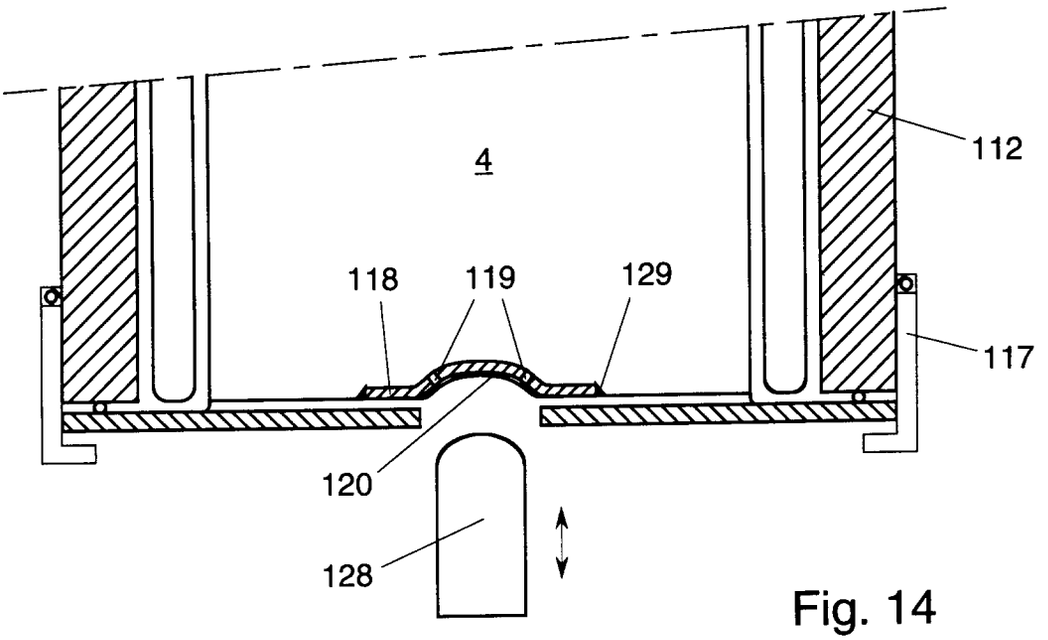

Fig. 14

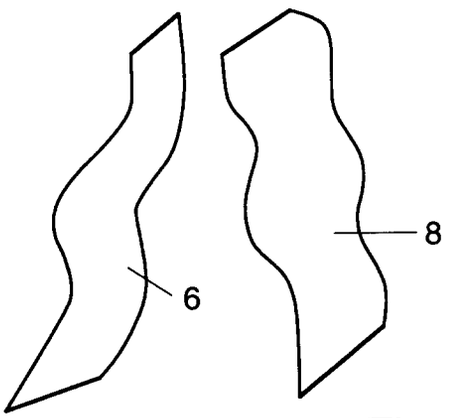

Fig. 15

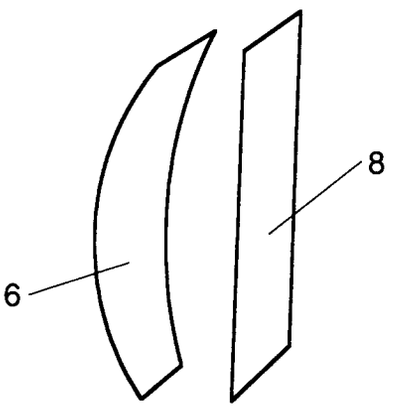

Fig. 16

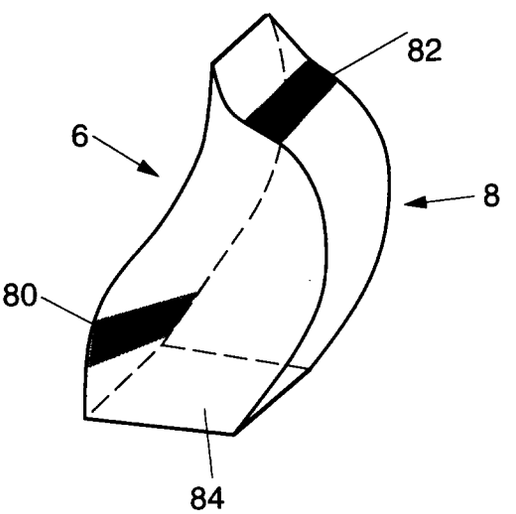

Fig. 17

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 20 3042

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US 3 545 983 A (WOODS) 8 December 1970 * column 5, line 6 - column 6, line 3; figures 1-3 *	1-3,14, 33,38,39	B65D81/20 B65B31/02
A	EP 0 441 189 A (SATAKE) 14 August 1991 * column 6, paragraph 15 - column 8, line 28; figures 1-4 *	1-3,14, 33,38	
A	US 5 331 789 A (CUR) 26 July 1994 * column 2, line 57 - column 5, line 35; figures 1-9 *	1-3,14, 33,38	
D,A	EP 0 475 514 A (AARTS) 18 March 1992 * claims 1,11; figures 1-5 *	1,14,33	
A	FR 2 079 331 A (GRACE & CO.) 12 November 1971 * figures 1-8; tables 1-9 *	1,14,33	
A	EP 0 121 211 A (KARLSEN) 10 October 1984 * column 4, line 7 - line 13; figure 2 *	1-3	B65D B65B

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	31 January 1997	Vantomme, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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