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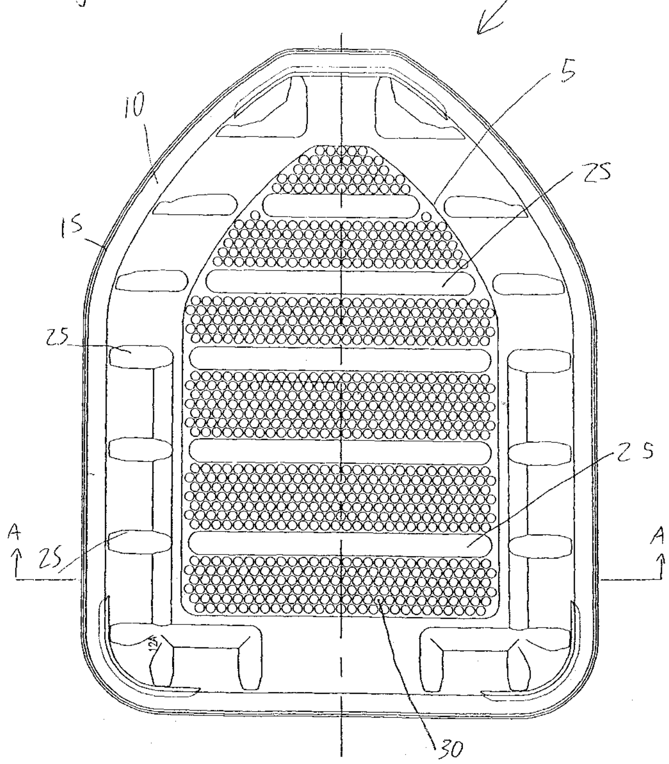
(54) **Absorbent tray container and mould and production method therefor**

(57) Containers for meat or other objects that give off liquid conventionally have an absorbent sponge material placed in the base so as to soak up the liquid. This adds to manufacturing and material costs. Therefore the present invention proposes a container 1 having one or more sidewalls 10, and a base 5 having a plurality of apertures 30 for retaining liquid by capillary action. The apertures have a depth of 30 to 60 % their diameter, which is deep enough to provide effective retention of liquid by capillary action, but not so deep that thermoforming of the container 1 becomes problematic due to limitations of the thermoforming process. Also disclosed are moulds and methods for forming the container 1.

Fig 1



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Description

[0001] The present invention relates to a container and a method and mould for making the container. It is envisaged that the container will be useful for containing objects which produce or give off liquid and/or moisture.

[0002] Food containers, e.g. food trays for containing meat, typically comprise a base and one or more side walls projecting upwardly from the base. Currently these containers are usually provided with an absorbent pad, which is placed on the base, to absorb any liquid (e.g. blood or meat juices) from the meat. However, these absorbent pads add to the cost of the container, both in material costs and because the pad has to be added to the container during the packaging process. It would be desirable to find a way of retaining the meat juices, without using an absorbent pad.

[0003] Accordingly, one aspect of present invention, at its most general, proposes a container having a sidewall or sidewalls and a base having a plurality of apertures for retaining liquid by capillary action. As the liquid can be retained in the apertures by capillary action, the absorbent pad is no longer needed. The invention will be particularly applicable to foodstuff containers, for example a meat tray for containing meat, but is not limited thereto; it may also find application to containers for cosmetics or containers for use in the medical industry, for example.

[0004] A first aspect of the present invention may provide a container having one or more sidewalls and a base having a plurality of apertures for retaining liquid by capillary action, each aperture having a depth at least 30% of its diameter.

[0005] If the depth is less than 30% of the diameter, then there will be insufficient capillary action to effectively retain liquid. Preferably the depth is at least 40% of the diameter, more preferably at least 50%. These greater depths, compared to the diameter, provide more effective capillary action. It is preferable that the depth is not greater than 60% of the aperture diameter. If the depth exceeds this level, then the manufacturing is made more difficult. For example, if a mould is used, then it is subjected to wear each time a moulded container is withdrawn from the mould. The deeper the apertures, the greater the friction on removing the formed container and the more rapid the wear. Furthermore, when the apertures are relatively deep compared to their diameter, e.g. a depth over 60% of their diameter, air might not be able to exit the apertures quickly enough if the entry of liquid is rapid or if the liquid is thick. Therefore it is best, although not essential that the depth is not greater than 60% of the aperture diameter.

[0006] Preferably each aperture has a depth of 30% to 60% of its diameter, more preferably 40% to 60%, in one embodiment the depth is 50% of the diameter.

[0007] Each aperture has an open end and a closed end, or bottom, usually opposite the open end. The depth of the aperture is the distance from end to end and the diameter referred to above is the diameter of the open end.

[0008] Usually each of the apertures will have approximately the same depth and cross-section, but this is not essential. The apertures may have any appropriate cross-sectional shape, for example circular, hexagonal, square or rectangular. In the case of a non-circular cross section, the diameter for the purposes of the above ratio is taken to be the diameter of the biggest circle which will fit into the cross-sectional shape of the open end of the aperture.

[0009] Preferably the diameter of the apertures is 2mm to 6mm. This has been found effective for retaining liquids, especially meat juices. More preferably the diameter of the apertures is 2mm to 4mm; most preferably 3mm to 4mm, which has been found to work best for the retention of meat juices. In one embodiment the apertures have a diameter of 3mm.

[0010] The apertures may be concave, i.e. depressions in the base of the container. They may have a shape approximating a semi-sphere. However, for a given diameter at the open end, a semi-spherical shape will not maximise the volume of liquid which can be retained. Therefore, it is preferable for the apertures to have an approximately cylindrical shape. They may have substantially flat (non-curved) aperture side walls and a flat bottom (closed) end. However, this is difficult to achieve if the base is thermo formed.

[0011] Preferably at least a portion of the aperture sidewalls are straight portions extending at an angle within 10 degrees of the perpendicular with respect to the plane of the container base (they may be perpendicular). Preferably the bottom (closed) end of the aperture has a flat portion. Preferably this flat portion has a diameter at least 50% of the diameter of the open end, more preferably at least 60%. In this way the volume of the aperture can be larger than a semi-spherical aperture.

[0012] As a result of the manufacturing process, at a least portion of the aperture walls will usually curve inwards towards the flat portion of the bottom end of the aperture.

[0013] Preferably at least 50% of the base is covered with apertures for retaining liquid, more preferably at least 60%, most preferably at least 80%. It is best that as much of the base as practical has apertures, because in this way more liquid can be retained and the retaining will be less dependent on location on the base.

[0014] The base may have one or more ribs for supporting an object (e.g. meat) to be contained and/or for giving the base and/or container structural integrity.

[0015] Preferably the base is formed of a non-absorbent material. Preferably the container is integrally formed, preferably of a non-absorbent material.

[0016] Preferably the apertures are formed integrally in the base. Preferably the closed ends of the apertures are integral with the base (e.g. the apertures each have a bottom wall at the closed end, integral with the aperture sidewalls. Preferably the base is integral with the sidewalls. This simplifies the manufacturing process.

[0017] The container may be formed of plastic. A hard plastic may be preferable, but an expanded plastic (e.g. expanded polystyrene) would also be possible.

[0018] Preferably the apertures are arranged in a hexagonal arrangement. That is a plurality of instances of a central aperture surrounded by six other adjacent apertures in a hexagonal arrangement; preferably the adjacent apertures are equidistant from the central aperture.

[0019] A second aspect of the present invention may provide a mould for a container, the mould being shaped to form a container having one or more sidewalls and a base, the mould having a plurality of features for forming apertures in the container base, said apertures having a depth at least 30% of their diameter.

[0020] The features of the mould for forming the apertures may be apertures in the mould or protrusions projecting from a surface of the mould. In use a mouldable material moulds itself around said features to form the container base apertures. Thus, for example, the mould may comprise one or more sidewalls, and a base having a plurality of apertures having a depth at least 30% of their diameter.

[0021] The mould may be shaped for forming a container having any of the features described above under the first aspect of the present invention and so may have any of the features mentioned above under the first aspect of the present invention.

[0022] The mould may comprise more than one part. A part of the mould for forming the apertures in the base of the container may be separate from a sidewall and/or base forming part of the mould.

[0023] The mould may have only a female part, or set of parts, or only a male part, or set of parts.

[0024] Alternatively, the mould may have both a male part or set of parts and a female part of set of parts (e.g. for forming upper and lower surfaces of the container). In that case either the male part or set of parts or the female part or set of parts will have features for forming the apertures in the base of the container (said aperture forming features will be protrusions if in the male part of the mould, apertures if in the female part of the mould).

[0025] Optionally, both the male and female parts may have features for forming the apertures in the base of the container.

[0026] The mould may be adapted for a thermoforming process. Alternatively the mould may be adapted for use in an injection moulding process.

[0027] Where the mould has both male and female parts, the male part may have a plurality of protrusions for forming said apertures in the base of the container and be adapted to form said protrusions by compression of the container material.

[0028] Preferably at least a part of the mould is formed of a material porous to air or the mould may have one or more through holes, e.g. small holes such as pinholes. Such through holes may be in the bottom end of mould apertures for forming the container base apertures. Such through holes and/or the porous material are useful in certain moulding techniques as they enable a vacuum or suction to be applied beneath the mould in order to draw material to be moulded (e.g. a sheet of thermoplastic) onto or into the mould and helps the material to conform to the shape of the mould.

[0029] A third aspect of the present invention may provide a method of manufacturing a container, comprising forming a container base and one or more container sidewalls and forming a plurality of apertures in the base, the apertures having a depth of at least 30% of their diameter.

[0030] The method may have further steps for forming any of the features mentioned above under the first aspect of the present invention. The apertures of the container may have any of the features mentioned above under the first aspect of the present invention.

[0031] The method may comprise placing or injecting a mouldable material onto or into a mould according to the second aspect of the present invention. The mould may have any of the features mentioned above under the second aspect of the present invention.

[0032] The mouldable material may be heated.

[0033] The method may comprise allowing the mouldable material to harden after it has been placed into or onto the mould (e.g. the mouldable material may harden by cooling).

[0034] Preferably the mouldable material is plastic. It may be a thermo plastic. It may be an expanded plastic (e.g. expanded polystyrene) or a non-expanded plastic. It may be any of the container materials mentioned above under the first aspect of the present invention.

[0035] The method may comprise drawing or otherwise placing a heated sheet of (mouldable) material into or onto the mould, allowing it to assume the shape of the mould and then allowing it to harden (e.g. by cooling).

[0036] Alternatively an injection moulding process may be used, whereby a fluid material (a liquid material, a melt or molten material, or semi-liquid material; e.g. a molten plastic) is injected into a two-part mould and allowed to harden (in the space existing between the two parts of the mould). The term "two-part mould" here is used in a general sense, it being understood that the mould may have more than two parts.

[0037] Alternatively, the container sidewalls and base may be formed in a first step (e.g. by thermoforming or another process) from a compressible material (e.g. an expanded plastic) and in a second step the apertures may be formed in the base of the container by mechanically deforming said compressible material. Generally the compressible material will be allowed to harden before the second step is carried out. The first step may be carried out with a female part or parts of the mould, the compressing step may be carried out with one or more male parts of the mould.

[0038] Vacuum, suction, air pressure, mechanical pressure, or a combination of any of these may be used to draw the mouldable material from which the container is to be formed into or onto the mould and/or to cause it to take the shape of the mould. In injection moulding fluid pressure is used for this purpose. If suction or vacuum are used then preferably at least a portion of the mould (e.g. its base) is formed of a material porous to air or the mould may have one or more through holes as described above under the second aspect of the present invention.

[0039] Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig. 1 is a top-down plan view of a container according to a first embodiment of the present invention;
Fig. 2 is a side view of the container of Fig. 1;
Fig. 3 is a end view of the container of Fig. 1;
Fig. 4 is a top-down plan view of a different design of container according to the present invention;
Fig. 5 is a sideview of the container of Fig. 4;
Fig. 6 is a partial cross-sectional view along the line A-A of Fig. 1 showing a cross-section of three of the apertures;
Fig. 7 illustrates the hexagonal packing arrangement of the apertures;
Fig. 8 is a cross-sectional view of a mould for making a container according to the present invention.
Fig. 9 shows a semi-spherical shaped aperture, and
Fig. 10(a) to (e) are top-down views of apertures having non-circular cross-sections (in the plane of the base, at their open ends).

[0040] Fig. 1 shows a meat container for containing meat. The present invention is however applicable, not just to meat but also to fish, other food stuffs and also non-food stuff containers for containing objects which give off liquid and/or moisture.

[0041] The container 1 comprises a base 5 and extending upwardly from said base, side walls 10. The side walls form the perimeter of the container. In an alternative embodiment, if the container was circular, then there would in effect only be one side wall. The container is in the form of a tray and has an outer rim 15, formed as a down turned flange of the side walls 10. The side walls 10 have a plurality of strengthening ribs 20. The base 5 has a plurality of strengthening ribs 25 extending laterally across the base of the container.

[0042] The base has a plurality of apertures 30 for retaining liquid produced by an object placed in the container (e.g. meat juices). When a piece of meat is placed in the container, it may rest on the raised (upwardly projecting) ridges 25 and blood and meat juices will drip and be deposited into the apertures 30.

[0043] The sidewalls 10 of the container are shown in more detail in Figs. 2 and 3 which are side and end views of the container respectively.

[0044] As can be seen in Fig. 1, the apertures take up more than 50% of the base area of the container. Fig. 4 is a plan view showing an alternative container base, in this case for a rectangular container. It has a plurality of apertures 30 for retaining liquid. It also has sidewalls 10, with a flange 15, and ribs 20 as described for the Fig. 1 container. Fig. 5 is a sideview of the Fig. 4 container.

[0045] Fig. 6 is a partial cross-sectional view showing some of the apertures along the line A-A of Fig. 1. Each of the apertures has an open end 35 (which opens into the object bearing surface of the container base) and a closed end, or bottom, 50. The apertures have the same size and depth as each other. Each aperture has a depth x (from end to end of the aperture), which may be 30% to 60% of the aperture diameter D at the open end. In this embodiment the depth of the aperture is 50% of the diameter D. This ratio of depth to diameter has been found to provide effective retention of liquid by capillary action. While in the illustrated embodiment, the apertures have a circular cross-section; it will also be possible to have apertures with a square, rectangular hexagonal or other cross-section. In the case of a non-circular cross-section then the diameter, for the purposes of the aforementioned ratio, should be taken to be the diameter of the largest circle which can fit in the aperture's cross-sectional shape at the open end. Fig. 10 gives some examples of the diameter's, D, of apertures 30 with a non-circular cross-section. The circles are imaginary circles used to determine the apertures diameters. It is thought that apertures with a diameter in the range 2mm to 6mm will be the best at retaining liquid. In this embodiment the apertures have a diameter of 3mm.

[0046] It is advantageous if the apertures have an approximately cylindrical shape. This allows the apertures to retain a significant volume of liquid and may give more effective capillary action. However, it is difficult to manufacture apertures with a perfectly cylindrical shape, so usually at least the corners will be rounded off (e.g. curved inwards). Fig. 6 is a cross-section showing the shape of the apertures in the present embodiment. It can be seen that the diameter, d of a flat section of the bottom of the aperture is more than 50% of the diameter D of the top, open end of the aperture. The aperture side walls have a straight portion 70 which has an angle θ of approximately 10° to the perpendicular (as measured from the plain of the container base). In an alternative embodiment it would be possible to have apertures having a semi-spherical shape, and one such aperture is shown in cross-section in Fig. 9.

[0047] It is desirable to have the apertures as closely packed as possible, so as to maximise their number and hence the retention of liquid. A hexagonal packing arrangement has been found particularly efficient in this respect. Fig. 7 shows such an arrangement, in which a central aperture 100 is surrounded by six adjacent apertures 105, 110, 115, 120, 125 and 130 from a hexagonal arrangement. That is, a hexagon can be drawn by linking the centre points of each of the surrounding apertures. The surrounding apertures 105, 110, 115, 120, 125 and 130 are equidistant to the central aperture 100.

[0048] The container is manufactured by a thermoforming process. A female mould 150 having an interior with the desired shape of the container is provided. A heated sheet of thermo-plastic is then placed over the mould and allowed to take its shape. The thermoplastic is then allowed to cool (or made to cool) so that it hardens and takes the form of the interior of the mould. The thermoplastic sheet may be drawn onto the mould with the assistance of a vacuum, suction, air pressure (e.g. blowing air) or mechanical pressure, or a combination of them.

[0049] It is preferred that a vacuum or suction means is used. Fig. 8 is a partial cross-sectional view of a part of the mould 150, showing just a base portion thereof and three of the apertures 155 (which correspond to and have the same shape as the apertures 30 of the container described above). The entire mould will have an interior with side walls, a base, ribs and so forth as shown in the container of Fig. 1 and as will be appreciated by a person skilled in the art. The closed bottom end of the apertures 50 may have a hole 200 for allowing a vacuum or suction means to apply suction to the interior of the mould (and interior of the apertures 155). The vacuum holes 200 may for example lead to a vacuum plate beneath the mould. When suction is applied through these holes 200, the heated thermoplastic sheet is drawn into each of the apertures 155. Alternatively, the mould may be made of a material porous to air, in which case the suction can pass through the mould and no, or fewer, holes 200 are needed. This is in fact preferable as manufacturing costs are then potentially decreased.

[0050] Instead of using a heated sheet method, an injection moulding or even a mechanical pressing or punching process may be used.

Claims

1. A container having one or more sidewalls and a base having a plurality of apertures for retaining liquid by capillary action, each aperture having an open end and a closed end and a depth at least 30% of its diameter.

2. A container according to claim 1 wherein the container is integrally formed of a non-absorbent material.

3. A container according to claim 1 or claim 2 wherein the diameter of the apertures is 2mm to 6mm.

4. A container according to any one of the above claims, wherein the apertures are arranged in a hexagonal arrangement.

5. A container according to any one of the above claims wherein each aperture has a depth of 40% to 60% it diameter.

6. A container according to any one of the above claims wherein the diameter of the apertures is 3mm to 4mm.

7. A container according to any one of the above claims wherein at least a portion of the aperture sidewalls are straight portions extending at an angle within 10 degrees of the perpendicular with respect to the plane of the container base.

8. A container according to any one of the above claims wherein the bottom end of the aperture has a flat portion.

9. A container according to claim 8 wherein said flat portion has a diameter at least 50% of the diameter of the open end of the aperture.

10. A container according to any one of the above claims wherein at least 60% of the base is covered with apertures for retaining liquid.

11. A container according to any one of the above claims wherein the apertures are formed integrally in the base.

12. A container according to any one of the above claims wherein the base is integral with the sidewalls.

13. A container according to any one of the above claims wherein the container is formed of a plastics material.

14. A mould for a container, the mould being shaped to form a container having one or more sidewalls and a base, the mould having a plurality of features for forming apertures in the container base, said apertures having a depth at least 30% of their diameter.

15. A mould according to claim 14, wherein at least a part of the mould is formed of a material porous to air or wherein the mould has one or more through holes for allowing the passage of air.

16. A mould according to claim 14 or 15 wherein the mould has a male part and a female part.

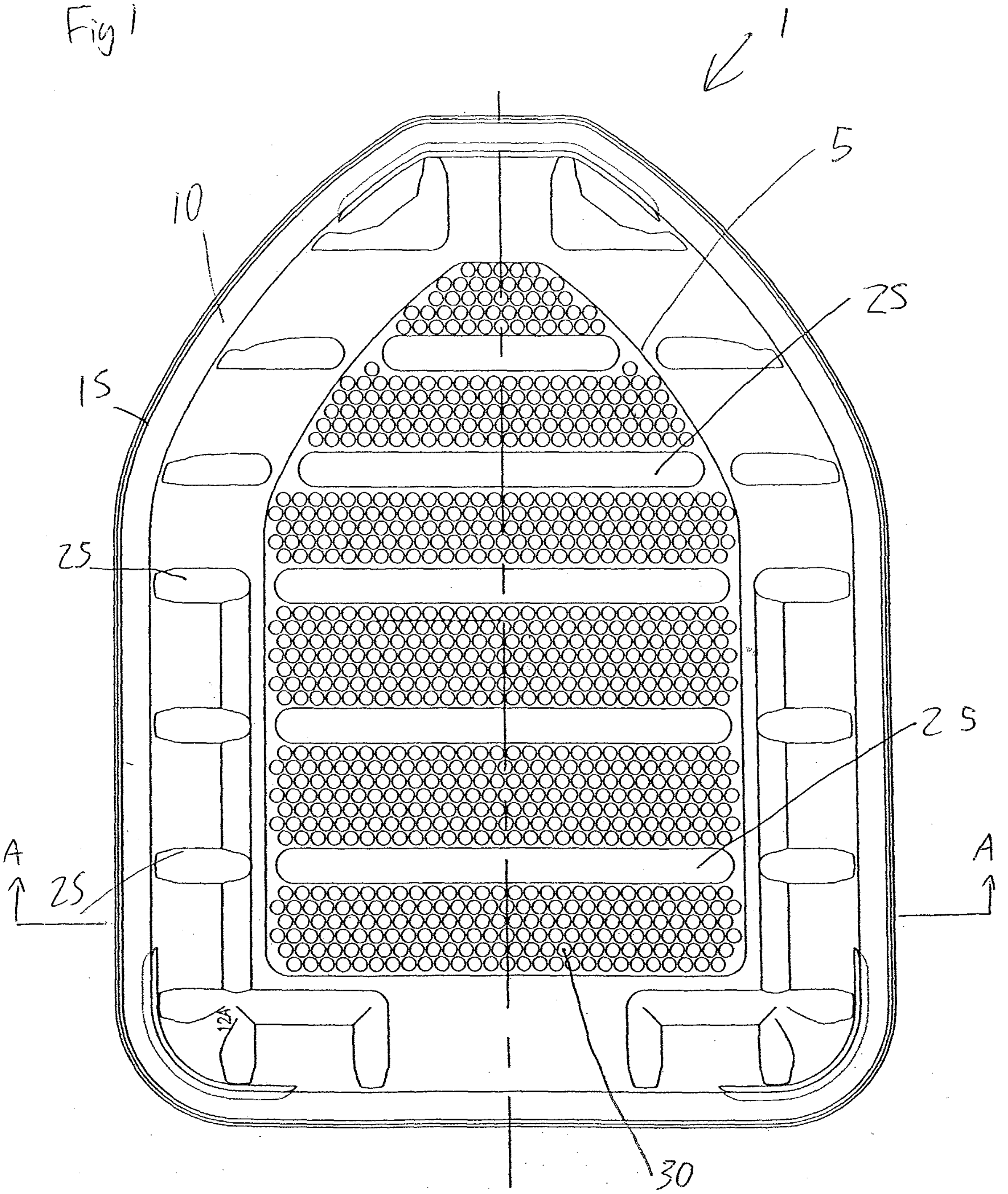
17. A method of manufacturing a container, comprising forming a container base and one or more container sidewalls and forming a plurality of apertures in the base, the apertures having a depth of at least 30% of their diameter.

18. A method according to claim 17 wherein the method comprises placing or injecting a mouldable material onto or into a mould according to any one of claims 14 to 16.

19. A method according to claim 18 wherein the mouldable material hardens after it has been placed into or onto the mould.

20. A method according to claim 18 or 19 wherein the mouldable material is drawn onto the mould by suction.

Fig 1



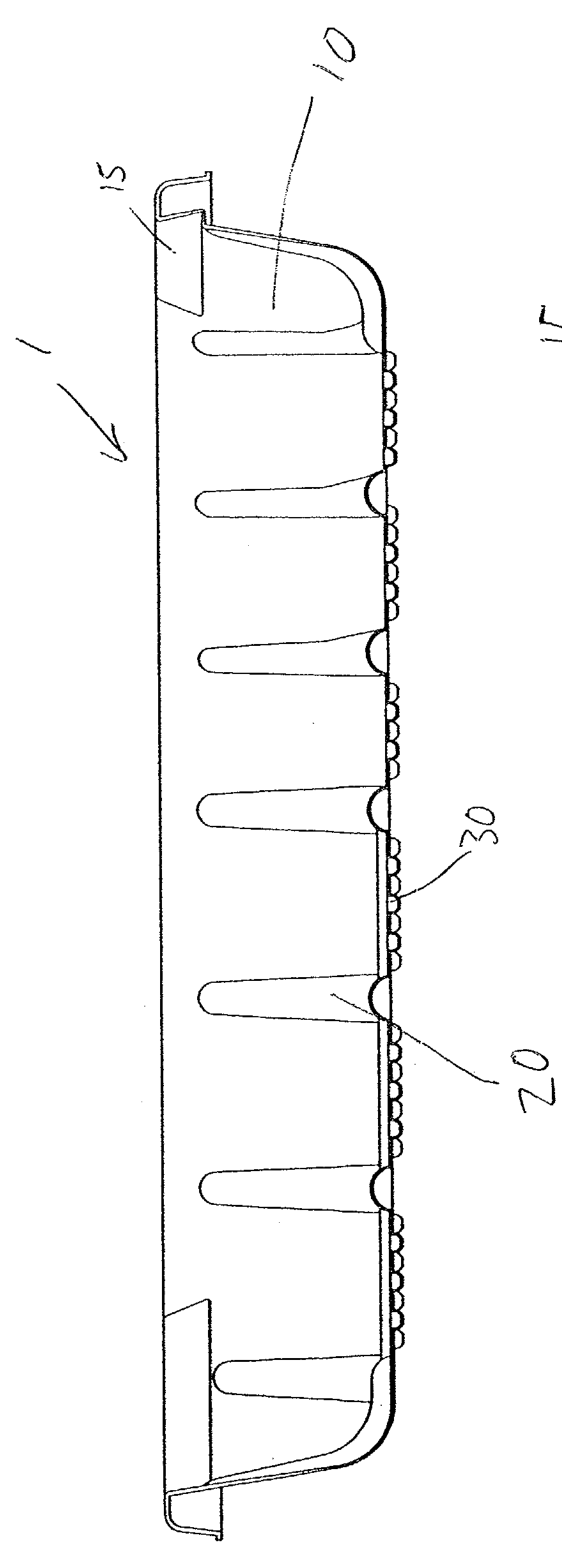


Fig 2

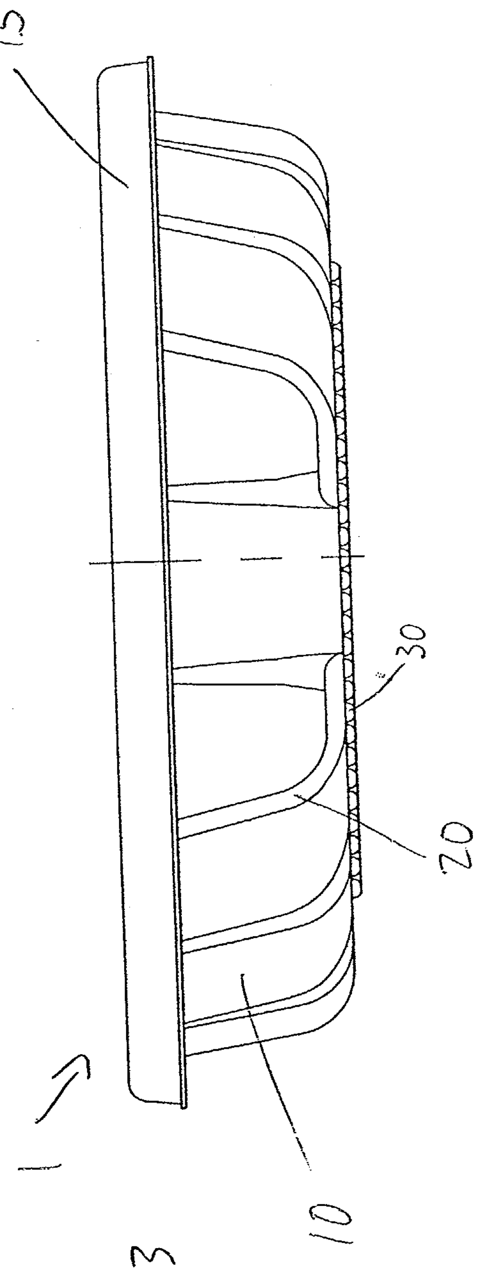


Fig 3

Fig 4

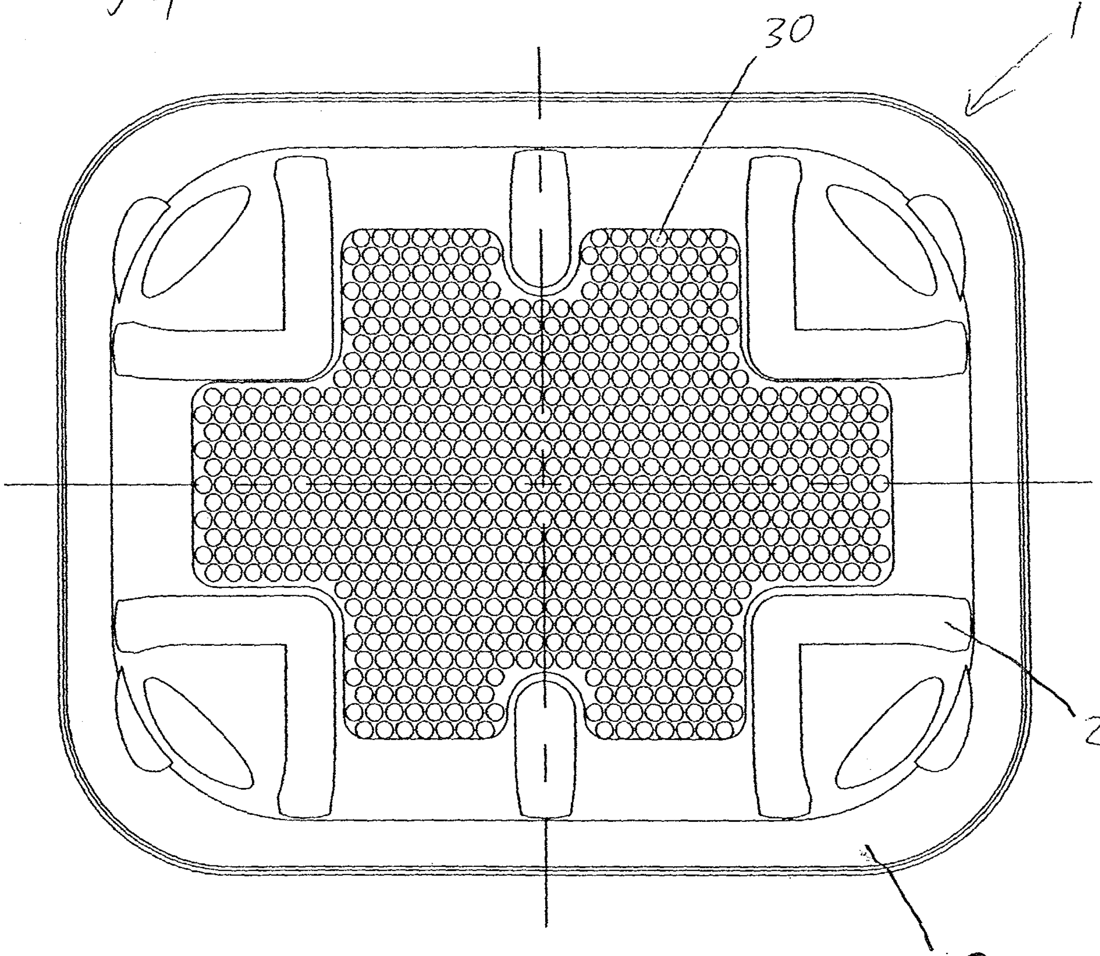


Fig 5

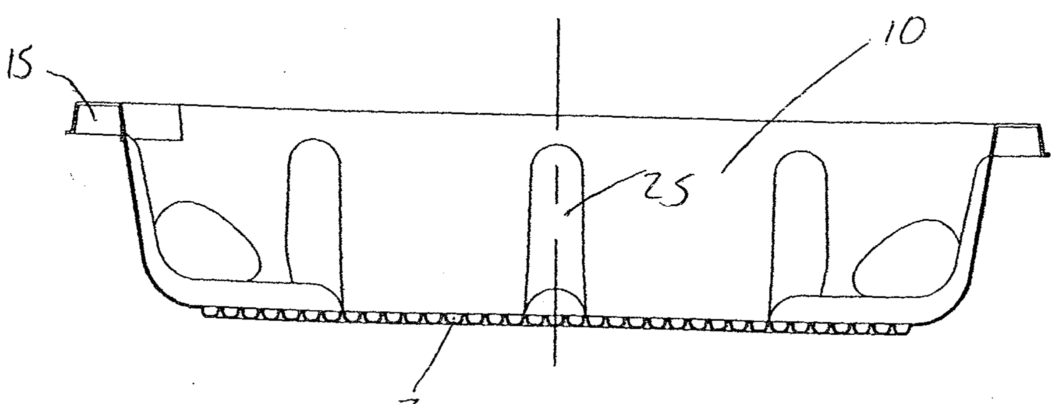


Fig8

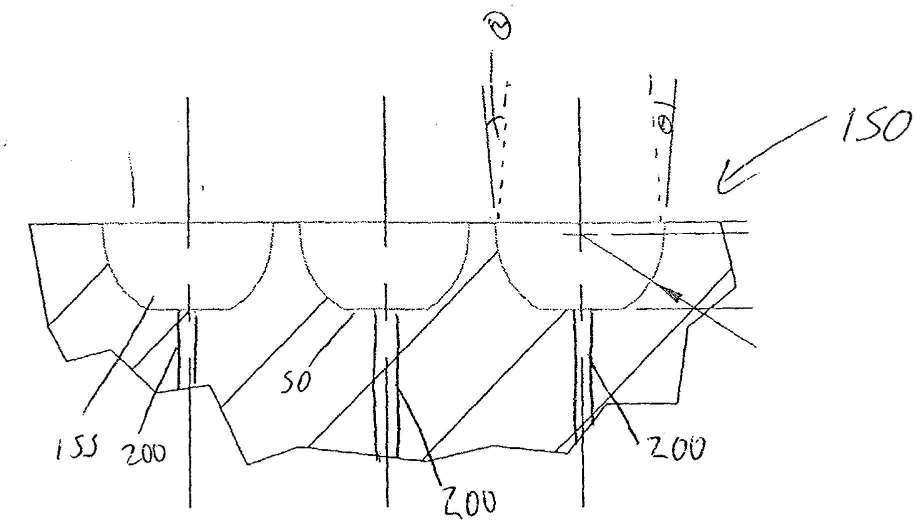


Fig 6

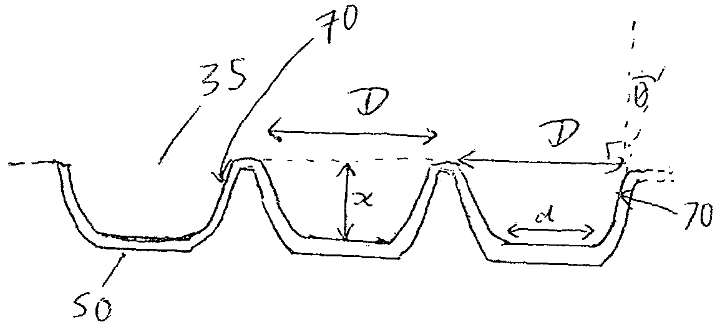


Fig 9

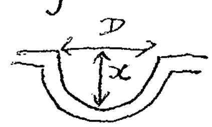


Fig 7

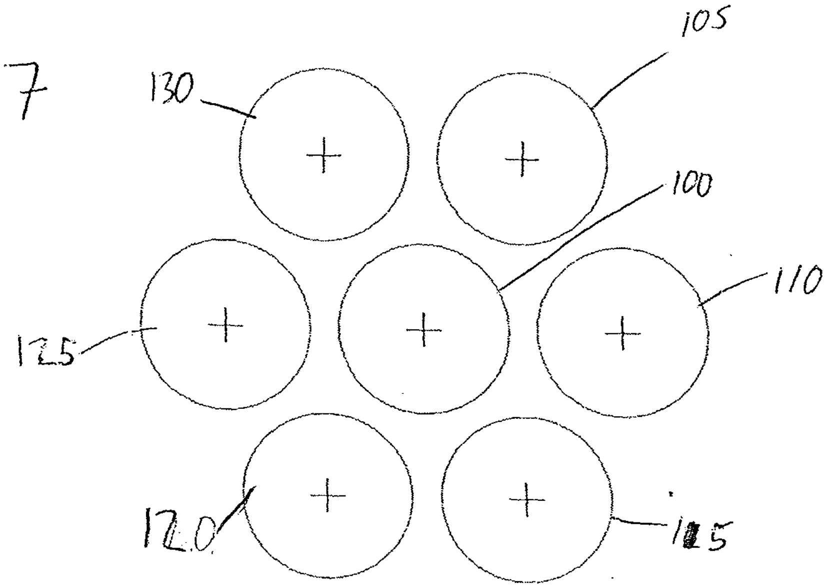


Fig 10