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(54) A nesting and stacking container

(57) A container 10 having a flat rectangular base 12 and four walls 14,16,18,20 extending upwardly from the base 12 so as to diverge outwardly from the base, where an upper part depth of the walls have an external rim 26. Each wall having two stacking and nesting means 42, each of which means 42 comprising an external projection 44 and an associated internal recess 52 in the rim 26, Each means 42 also has an aperture 64 through the wall perpendicularly between the projection and the recess, allowing two similar containers 10 to be nested when in the same orientation relative to each other with the projections 44 of the stacking and nesting means 42 of an upper container being received within the recesses 52 of a lower container to extend outwardly through the associated aperture 64 of the lower container. Each of the stacking and nesting means 42 being positioned on the walls of the container to be offset from the means 42 of the opposed wall of a similar container when one container is rotated through 180 degrees relative to the other and stacked as a vertical column, with the projections 44 of the upper container engaging an upper edge 30 of the lower container.

In addition there is also provided a system of two containers of different depths which may be nested one within the other, both of which employ nesting restraint means engageable between the nested containers to alleviate wedging of the inner nested container in the outer nested container, irrespective of which of the containers is nested within the other.

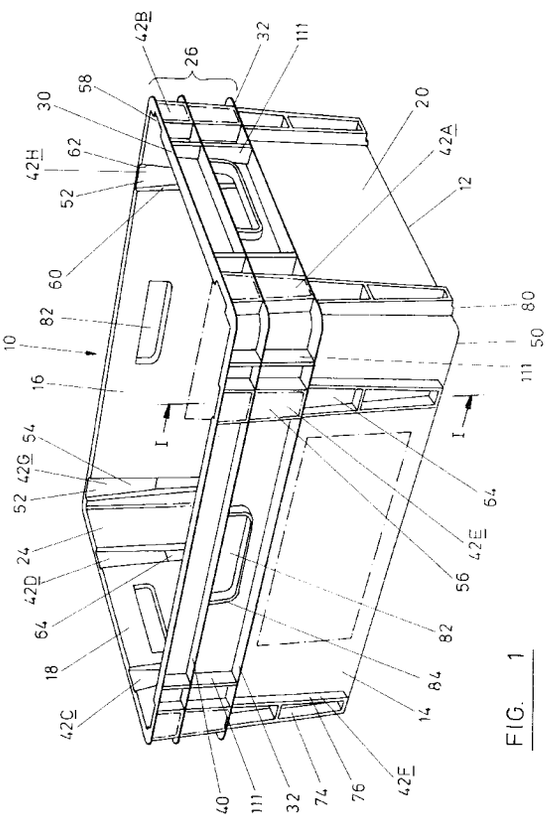


FIG. 1

EP 0 758 612 A1

Description

The present invention relates to an open topped container of the type which is capable of being nested within a similar container when two similar containers are in a first aligned orientation and may be stacked vertically on top of a similar container when one container is rotated through 180 degrees relative to the other.

Such nesting and stacking containers are well known and many different kinds have been designed. Such designs usually employ an array of adjacent projections and recesses, whereby such projections usually form the walls of the container. In a first orientation the projections of an upper container are aligned with the projections of a lower container to enable such containers to be stacked, wherein when the two containers are rotated through 180 degrees relative to one another the projections of the upper container are aligned with the recesses of the lower container so that these projections are received within the recesses to enable the containers to be nested.

However, a requirement of these type of containers is that the internal storage space must be large in respect to the external size of the container to provide maximum storage/transport capacity whilst occupying as little space as possible in when in storage. Typically, known containers must have reduced base sizes to fit into an upper aperture of a similar container during stacking whereby this aperture is usually reduced by the projections required for stacking, thus the storage capacity is much smaller than the exterior dimensions. A typical example is disclosed in French Patent No. FR-007413 (Allibert SA). In addition, such projections are often solid in order to provide the required strength to support the stacked containers, which increases the weight of such containers and the materials used in their construction.

In addition, such nesting and stacking containers are usually constructed in variety of different depths for containing different materials. Often, these containers of varying depth are used in a single environment such as a warehouse and the variation in such depths may be difficult to ascertain visually between two different containers where the depth differences are not substantial. In such cases, two or more containers may be nested together whereby a container having a greater depth is nested within a container having a shallower depth which will result in the deeper container becoming wedged within the lower container within which it is nested. This creates the problem having to sort through various size containers into separate batches of similar sized containers in order to prevent this wedging effect, and then storing each set of containers of similar size and dimension together in separate areas increasing the required storage space for such containers when not in use.

It is an object of the present invention to provide a nesting and stacking container which alleviates the aforementioned problems in a simple and relatively inexpensive manner.

According to the present invention there is provided an open topped container capable of nesting and stacking comprising a substantially flat rectangular base, two opposed side walls and two opposed end walls extending upwardly from said base at an angle inclined from a plane perpendicular to the base so as to diverge outwardly from the base, an upper part depth of the walls providing an external rim which presents an external downwardly directed shoulder and carries an upper edge of the container remote from the base; the rim extending outwardly with respect to the container a predetermined maximum distance from the base, each wall of an opposed pair of having two stacking and nesting means, each of which means comprising an external projection directed outwardly of the container and having an outer edge a predetermined distance from the base which is less than that of the rim from the base, and associated with each projection is an internal recess which opens into the upper edge of the rim and extends downwardly through the rim, the projection and recess of each means being aligned perpendicularly with respect to the base with the projection disposed between the recess and base, whereby two like containers may be nested in the same orientation relative to each other with the projections of the stacking and nesting means of an upper container being received within the recesses of similar stacking and nesting means of a lower container; each of the stacking and nesting means being positioned on the walls of the container to be offset from the stacking and nesting means of the opposed wall of a similar container when two containers are disposed in an orientation in which one is rotated through 180 degrees relative to the other and stacked as a vertical column with the projections of the means of the upper container engaging the upper edge of the lower container; wherein each means has an aperture through the wall perpendicularly between the projection and the recess which extends from said recess and through which the associated projection of an upper container may extend when two similar containers are nested.

Preferably, each recess will have an inwardly directed surface in a plane which is substantially perpendicular with respect to the base and the outer edge of the projection which underlies the recess will lie in this same perpendicular plane, or a parallel plane closer to the container, so that when two similar containers are nested the projection will be received in the recess.

The recess preferably has an upwardly directed opening into upper edge of the rim, which is substantially rectangular with opposed recess walls converging towards each other as they extend downwardly from the upper edge to present the recess with a tapered configuration. This tapered configuration provides the advantage of deflecting a projection (and therefore container) received therein during nesting to a required position to enable similar containers to be neatly and uniformly

stacked. Usually, the aperture underlying the recess will have opposed edges aligned with the recess walls and which edges extend to converge towards each other as they extend downwardly from the recess to present the aperture with a tapered configuration which continues the tapered configuration of said recess.

In addition, the projections will usually have downwardly extending projection edges proud of the wall leading to a downwardly directed engaging surface for engaging the upper edge of an underlying container, wherein these projection edges converge toward each other as they extend downwardly towards the engaging surface to present the projection with a substantially tapered configuration, these projection edges extending outwardly of the container a distance equal to or less than the outer edge of the projection from the base. Again, the tapered configuration of the projection will allow ease of deflection of the projection (and, thus, container) within a recess and aperture of a similar container to enable alignment of the nested containers. The tapered configuration of the projections will preferably be similar to the tapered configuration of the associated apertures of a similar container so that when two such containers are nested the projection is received in an aligned close fit within the aperture, restraining relative sideways displacement between the nested containers. The projection may comprises a solid block or, alternatively, a flat extension with support flanges.

Preferably, the projection edges will comprise reinforcing flanges which are at least partially received within the associated recess when two similar containers are nested. These flanges add strength to the projection to alleviate damage during handling of the containers and support the projection when such projections support the weight of the container and its contents when stacked with other containers. In the preferred embodiment, the reinforcing flanges may extend upwardly from the projection to abut the shoulder of the rim and support said rim. Thus, the reinforcing flanges also serve to provide strength to the rim when it supports the weight of other containers stacked on top. One of the objectives of the present invention is to reduce the external dimensions of the container with respect to the internal capacity. One way of achieving this is to reduce the thickness of the walls and rim. However, in doing so the strength of the rim may be weakened and so the reinforcing flanges are used to strengthen the reduced thickness rim.

The containers of the present invention may further comprise stop means which are engageable between two similar containers, when nested, to support an inner container at a predetermined nesting depth relative to an outer container for restraining the inclined walls of the inner container of two nested containers from becoming wedged within the outer container. One of the simplest form of stop means will usually comprise the external shoulder of the rim and the upper edge of the rim wherein the shoulder of an upper container of two nested containers engages the upper edge of the lower container.

However, a preferred form of stop means, according to the present invention, comprises a support surface located on a lower edge of each aperture for supporting the associated projection of an upper container when two similar containers are nested. Usually, the reinforcing flanges will extend upwardly to engage and reinforce this support means, since such support means may bear the weight of nested containers above. Furthermore, it is preferable that the distance between the engaging surface and the support surface is equal to or greater than the upstanding depth of the external rim. This particular type of stop means is particularly preferable in meeting the objectives of the present invention. As previously mentioned, in order to reduce the exterior dimensions of the container it is preferable to reduce the rim thickness. The use of the support means enables these support means to carry the weight of nested container/s rather than the rim. However, it will be appreciated that the weight of the nested container can be borne by a combination of both the above stop means if the distance between the engaging surface and the support surface is equal to the depth of the rim. In this case the rim shoulder of the upper container will engage the upper edge of the lower container whilst the engaging surface of the upper container engages the support means of the associated aperture, thus further distributing the weight of nested containers.

Preferably, the containers will have two stacking and nesting means on each wall of each pair of opposing walls for increased stacking stability.

Usually, the engaging surface may have a downwardly extending flange forming a projection shoulder with the rim surface, which projection shoulder being for engagement with an inner lip of the upper edge of the rim of a lower container when two containers are stacked to restrict relative lateral displacement of the stacked containers. Since the base of the container must be less than an upper opening into the container then when two similar containers are stacked the engaging means of the projections rest on the upper edge of a lower container but the wall of the upper container will not abut the inner wall of the lower container which may allow relative movement between two stacked containers. However, the projection shoulder is designed to engage the inner lip of the rim of a lower container to alleviate this problem.

Usually, the end walls and side walls of the container are predominantly solid, with any apertures formed therethrough removing less than 35% of the wall surface. Such containers will usually be made of moulded plastics material.

Preferably, the end walls and side walls are inclined outwardly from the base at an angle in the range of 1 to 15 degrees from a plane perpendicular from the base. The smaller the angle then the greater the ratio of the container capacity to exterior dimensions.

Further according to the present invention there is

also provided a system of two containers each of which correspond to the containers described above and in which a first of the two containers has a greater depth than the depth of the second container and the bases of both containers are of corresponding size and shape and the outer dimensions of the rims of both containers are of corresponding size and shape, wherein nesting restraint means are provided on each of the two containers which are engageable between the first and second containers when said containers are in a nested configuration for restraining the inner nested container at a predetermined position relative to the outer container to alleviate wedging of the inner nested container in the outer nested container, irrespective of which of the first and second containers is nested within the other.

Preferably, the system comprises two containers in which the nesting restraint means will usually comprise the aforementioned stop means, whereby when the second container is nested within the first container the external shoulder of the rim of the second container engages the upper edge of the first container for restraining the inner nested container from becoming wedged in the outer nested container and when the first container is nested in the second container then at least one of either:-

i) the projections of the first container engage the support surfaces of the second container; or
ii) the external shoulder of the rim of the first container engages the upper edge of the second container,

to restrain the inner nested container from becoming wedged within the outer nested container.

In this way, containers of different depths may be nested together without wedging. In addition, such containers may also be stacked in the manner previously discussed whereby the projections of the nesting and stacking means of each container may engage the upper edge of the rim of a lower container when two such containers are rotated through 180° relative to each other. Since containers of different depths may be stacked together without wedging occurring it alleviates the necessity to sort out such containers into separate like groups for storage and removes the necessity of storing such containers separately.

A further advantage of incorporating the stop means as the nesting restraint means is that such stop means are located in the exterior of the container and do not therefore take up valuable storage space within the containers.

A preferred embodiment of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:-

FIGURE 1 is a perspective view of a container;
FIGURE 2 is a side elevation from one end of the container of Figure 1;
FIGURE 3 is a side elevation from the opposed end of the container of Figure 1;
FIGURE 4 is a side elevation of one side of the container of Figure 1, the opposed side corresponds;
FIGURE 5 is a side elevation from one side of two similar containers of Figure 1 in a stacked arrangement;
FIGURE 6 is a side elevation of two similar containers of Figure 1 in a nested configuration;
FIGURE 7 is a cross section of the container of Figure 1 along the nine I-I;
FIGURE 8 is a cross section of the two nested containers of Figure 6 along the line II-II;
FIGURE 9 is an enlarged view of the stacking and nesting means of the container of Figure 1 in a stacked configuration;
FIGURES 10a and 10b are cross sections of a simplified container to illustrate the relationship of the nesting depth to the angle of inclination of its walls;
FIGURE 11 is a partial cross-sectional view of two nested containers of different depths in which the inner nested container has a greater depth than the outer nested container; and
FIGURE 12 is a partial cross-sectional view of two nested containers of different depths in which the outer nested container has a greater depth than the inner nested container.

Referring to the drawings, a container 10 comprises a flat, rectangular base 12 lying in a horizontal plane, two opposed upstanding side walls 12 and 14 and two opposed upstanding end walls 18 and 20. The container 10 is preferably moulded from plastic material so that the base and walls are integral. Apertures 22 (optionally shown in Figures 5 and 6) may be provided in the side and end walls to reduce the weight of the container and allow the free circulation of air through the side walls if required. It will also be appreciated that such apertures may also be included in the base 12 although not in the particular embodiment described herein.

The base 12 is substantially flat with the walls 14, 16, 18 and 20 inclined with respect to a plane perpendicular to the base 12 so as to diverge outwardly as they extend vertically away from the base 12. In the preferred embodiment described herein the angle of inclination of the walls from the perpendicular plane lies between the range of 1 and 15°C. However it will be appreciated that the present application could be applied to containers having any angular inclination required. As a result of the inclination of the walls, the container 10 has an upper rectangular opening 24 parallel to the base 12, and which opening 24 having a greater size than the area of the base 12, so as to allow a base 12' of a similar container 10' to be received within the opening 24 to allow two or more similar containers to be nested when not in use.

The main requirement of containers of this type is that the interior capacity of such containers 10 is as large

as possible with respect to the exterior dimensions of such containers 10. Obviously, the benefits of having a large interior capacity means that the containers can be used to hold the maximum possible quantity of material whereas when such containers are not in use they may be stacked to occupy as little storage space as possible. In addition, if the inclined walls of such containers have steep angles then the storage space of such containers cannot be used to its optimum since containers of this type are often used to store rectangular goods and inclined side walls simply result in wasted space when storing such goods. For this reasons it is desirable to have the side and end walls of a container 10 as close to the perpendicular as is possible.

In addition, it is desirable for such similar containers to nest so that upper containers are received as deeply as possible in the lower container in order to reduce storage space when such containers are not in use. However, as shown graphically in the simplified containers 210 and 210' of Figures 10a and 10b, the depth of nesting (D) of two similar containers 210, 210' (the distance D between the lower side 222' of the base 212' of an upper nested container 210' and the upper side 224 of the base 212 of a lower nested container 210) is proportional to the thickness of the container walls and/or base and to the angle (A) of inclination of the container walls from a plane perpendicular to the container base 212. More particularly, the depth of nesting D is proportional to the distance X between the outermost edge of the lower side 222 and the outermost edge of the upper side 224 of the base 212. This distance X being dependant on the structure and thickness of the walls. In fact, the nesting depth D may be simply calculated using the standard formula:-

$$D = X/\tan A$$

Therefore, in order for the nesting depth D to be as small as possible for the smallest possible angle A it is necessary to reduce the distance X, usually by reducing the thickness of the walls and base of the container (Figure 10b). In practice, the depth D is determined by the required use of such containers whereby the wall thickness defines the strength of the container and so a compromise between wall thickness, hence strength, and nesting depth must be achieved.

Returning now to the preferred embodiment, the container 10 has a rim 26 formed on an upper part depth 28 of each wall 14, 16, 18 and 20, remote from the base 12. This rim 26 extends on the outwardly directed surfaces of each of the walls and comprises an upper edge 30 extending around the upper opening 24 to present a substantially flat edge parallel with the base 12. This rim 26 also comprises a lower edge 32 on each of the four walls which presents a substantially downwardly directed outer shoulder 34 (Figure 9) the lower edge extending parallel to the upper edge 30. Each of the lower edge 32 and the upper edge 30 have outwardly directed lips 36 and 38 respectively which lie on the same plane perpendicular to the bottom 12 and offset outwardly a predetermined distance from the peripheral edge 50 of the base.

The rim 26 further comprises additional ribs 40 extending parallel with the upper 30 and lower 32 edges. In the preferred embodiment herein described only one such rim 40 is included although it will be appreciated any number or none such ribs could be employed. In one of its simplest form the entire rim 26 may comprise a single such rib, having an upper edge presenting the outwardly directed surface and a lower edge presenting a downwardly directed shoulder. It will also be appreciated that the rim 26 herein described has not been moulded as a solid plastics rim but rather comprises a lower edge 32, an upper edge 30, one supporting rib 40 and vertical support flanges 111 (extending between the upper 30 and lower 32 edges), thereby reducing the weight of the container and the plastics material used. It is envisaged that to simplify moulding procedures such a rim could be made of solid plastics so that the rim had an outwardly directed face extending perpendicular to the base 12.

Each of the four walls 14, 16, 18 and 20 have two nesting and stacking means 42 (Figure 9). The arrangement of the nesting and stacking means 42 about the container are such that when two similar containers are nested one on top of the other then such nesting and stacking means 42' of the upper container 10' are aligned with the nesting and stacking means 42 of the lower container 10 (Figure 5) and when an upper container 10' is rotated 180° relative to the lower container 10 then the nesting and stacking means 42' of the upper container 10' are no longer aligned with the nesting and stacking means 42 of the lower container 10 (Figure 6).

In the container 10 described herein the end wall 20 has a first nesting and stacking means 42A immediately adjacent to the side wall 14 and a second nesting and stacking means 42B immediately adjacent to the side wall 16. The opposed end wall 18 has a first stacking and nesting means 42C disposed inwardly remote from the side wall 14 and a second nesting and stacking means 42D disposed inwardly remote from the end side wall 16. The side wall 14 has a first nesting stacking means 42E disposed inwardly remote from the end wall 20 and a second nesting and stacking means 42F disclosed immediately adjacent to the end wall 18 with the stacking and nesting means 42H and 42G of wall 16 being aligned parallel with the nesting and stacking means 42E and 42F of the opposed side wall 14.

Referring now to Figures 7 and 9, the nesting and stacking means 42 comprises a stacking projection 44 extending outwardly from an outer surface of its associated wall to present an engaging surface 46 substantially parallel with the base 12. The projection 44 has an outer edge 48 substantially parallel with the wall on which it is mounted whereby this outer edge 48 is set a

predetermined distance remote from the peripheral edge 50 of the base 12, and which predetermined distance is less than the distance between the outwardly directly lips 36, 38 of the rim 36 from the peripheral edge 50 of the base 12.

Perpendicularly above the stacking projection 44 and located in the rim 26 is an inwardly directly recess 52 having an inwardly directed surface 54 extending in a perpendicular plane relative to the base 12. The rim 26 in the region of this recess has an outermost surface 56 parallel with the inwardly directed surface 54 and extending between the upper edge 30 and lower edge 32. This recess 52 presents a substantially rectangular opening 58 (Figure 1) into the upper edge 30 of the rim 26. This recess 52 having opposed recess walls 60, 62 which converge towards each other as they extend downwardly from the upper edge 30 to present the recess with a substantially tapered configuration.

Disposed perpendicularly (with respect to the base 12) between each stacking projection 44 and recess 52 is an aperture 64 extending through the associated wall of the container. Vertical side edges 66, 68 of the aperture 64 extend along the same tapered paths of the adjacent recess walls 60, 62 to form a tapered aperture 64 (Figure 7) which continues the tapered configuration of the recess 52.

Each aperture 64 has a bottom edge 70 presenting a support surface 72 extending outwardly of the wall and parallel with the base 12.

The stacking projection 44 has support flanges 74 and 76 extending outwardly of the associated wall to provide extra strength and support to this projection 44. These flanges 74, 76 extend substantially upward with respect to the base 12 and diverge outwardly of the projection 44 to engage and further support the support surface 72 and continue to follow the aperture side walls 66 to 68 to support and strengthen the aperture 64.

These support flanges 74 and 76 engage and abut the outer shoulder 34 of the rim 26 to provide added support to the lower edge 32 of the rim and the opposed recess walls 60, 62 respectively, effectively providing support to the recess walls 60, 62 which serve to support the upper edge of the rim 26. Overall, the support flanges 74 and 76 taper downwardly from the rim 26 to present a substantially tapered configuration whereby the projection 44 has a smaller horizontal area than the support surface 72, and both of which are smaller than the rectangular opening 58 of the recess 52. Each of these support flanges 74 and 76 has an outwardly directed edge which extends in the same perpendicular plane with respect to the bottom 12 that also contains the outer edge 48 of the projection 44 and on outer edge 73 of the support surface 72.

These support flanges serve additionally as reinforcing ribs to strengthen the walls of the containers. As discussed above (in general terms) the nesting depth D of two similar stacked containers may be reduced by reducing the wall thickness, whereby the strength of the walls may be retained by using these flanges as support ribs on such thinner walls.

All of the nesting and stacking means 42A to 42H comprise the same arrangement as described above.

When two or more similar containers 10, 10' are stacked so as to form a vertical column (Figures 5 and 9) then the upper of the containers 10' must be rotated through 180° relative to the lower container 10 so that the nesting and stacking means 42' of the upper container does not overlie the nesting and stacking means 42 of the lower container 10. In this orientation, the engaging surfaces 46' of the stacking projection 44' of the upper container rest on the upper edge 30 of the rim 26 to stack the containers in the vertical column. Rim support flanges 111, one each associated with each nesting and stacking means 42, comprise outwardly directed flanges extending between the lower edge 32 and upper edge 30 of the rim 26 so as to underlie the nesting and stacking means 42' of an upper stacked container 10' so as to provide additional strength the upper edge 30 in the region supporting the weight of the stacked container 10'.

The predetermined distance of the outer edge 48 of the stacking projections 44 from the peripheral edge 50 of the base 12 being sufficient to engage the upper edge 30 of the rim 26. However, the upper edge 30 of the rim 26 has an inner lip which is offset outwardly with respect to the peripheral edge 50 of the bottom 12 which will allow relative horizontal movement between the upper and lower containers 10, 10' when stacked, since the outer surfaces of the walls of the upper container will be offset inwardly with respect to the inner surfaces of the walls of the lower container 10. Therefore, in a further embodiment of this invention the engaging surfaces 46 of each stacking projection 44 have downwardly directed shoulders 80 (shown optionally by a broken line in Figure 9) formed with a downwardly extending part extension of the flange means 74, 76 respectively, for this shoulder to engage with the inner lip of the upper edge 30 in a stacked arrangement to restrict relative horizontal displacement between two stacked containers 10, 10'.

When such containers 10, 10' are required to be nested during storage, then the two similar containers are orientated so as to be perpendicularly aligned (Figures 6 and 8) whereby nesting and stacking means 42' of the upper container 10' are aligned with the nesting and stacking means 42 of the lower container. In this orientation, the projections 44' of the upper container are aligned with the associated recess 52 of the lower container and received therein (Figure 8) as the containers are moved together vertically relative to each other. The tapered nature of the recess walls 60, 62 and the tapered nature of the support flanges 70', 76' serve to deflect the two nested containers 10, 10' into a predetermined position relative to each other to allow the inclined walls 12',14',16',19' of the upper container 10' to be received within the inclined walls of the lower con-

tainer 10.

When nested, the engaging surface 46', of the upper container 10, abuts the support surface 72 of the aperture 64 of the lower container 10 to support the nested container 10' in a predetermined vertical position relative to the lower container 10 to prevent the inclined walls of the two containers becoming wedged together. Referring to Figure 10, wedging of two nested containers will occur when the optimum nesting depth D is achieved. Therefore by calculating this depth D and positioning the support surfaces so as to be positioned a distance greater than D from the base of the container ensures that the risk of such wedging is alleviated. In this way, the weight of the nesting containers is supported not by the rim 26 of the lower container 10 but by the support surfaces 72 which are adequately reinforced by the support flanges 74, 76 to bear the weight of nested upper containers 10'.

By supporting the weight of the nesting containers 10 in this manner the thickness of the rim 26 may be reduced, by reducing its thickness and reducing the amount of plastics material used to form the rim (or simply using the rib and surface arrangement described herein) enabling a lighter container to be constructed. The other advantage afforded by the use of such support surfaces 72 is that these surfaces are disposed much nearer to the base 12 than is the rim 26, so that the weight of an upper nested container 10' is borne by the walls of the lower container at a much reduced height than if supported by the rim. It is well understood that the risk of such walls buckling is proportional to the ratio of wall height to wall thickness, and the smaller distance of wall from base 12 to support surface 72 serves to provide increased support strength for the nested containers than could be obtained by the rim, which strength is further reinforced by the support flanges. Thus the use of such support surfaces during nesting substantially alleviates the risk of the wall buckling while again allowing a reduction of the wall thickness.

In addition, since the rim is not required to support the weight of the nested containers then it need not be as thick as normally required in such containers which can help reduce the exterior thickness of this rim which is one of the objectives of the present invention.

When the upper nested container 10' is fully received within the lower container 10, the stacking projection 44' of the upper container is received by and passes through the associated aperture 64 of the lower container. Thus, the projection 44' is not restricted from relative downward movement during nesting by engagement with the wall of the lower container until it abuts the support surface. The use of the aperture 64 enables a deeper nesting of two such nested containers 10, 10' since there is no inclined wall to engage the stacking projection 44' of the upper container. This allows for the employment of steeper inclined walls 14, 16, 18, 20 of the containers which meets a further objective of this invention. In addition, the outer edges 48' of the stacking projections 44' of the container do not extend outwardly of the nested containers 10, 10' beyond that of the outwardly directed lips 36, 38 of the rims 26, 26' of both containers (which are themselves in the same perpendicular plane).

Further advantages of the present invention reside in manufacturing requirements. It will be appreciated that the distance between the engaging surface 46 and the support surface 72 must be greater than the distance between the upper and lower edges 30, 32 of the rim 26 in order for the engaging surface 46' of an upper container to engage the support surface 72 of the lower container 10' (when nested) before the outer shoulder 34' of the upper container 10' engages the upper edge 34 of the lower rim 26. However, if the distance between the engaging surface 46 and the support surface 72 is made exactly the same as the distance between the upper and lower edges of the rim 26 then it will be appreciated that the weight of the upper nested container 10' will be borne by a combination of the support surfaces 72 and also the upper rim 26' abutting the rim 26 of the lower container 10. Again this assists in distributing the weight of the nested containers to avoid too great a stress being produced on one or other of such nesting support means. Similarly, or alternatively, if the upstanding depth of the rim is greater than the nesting depth D then again the risk of wedging will be alleviated since the rim 26' of the upper nested container will abut the rim 26 of the lower nested container before the nesting depth D is achieved, preventing further nesting movement between the similar containers.

Further still, if desired, the distance between the engaging surface 46 and support surface 72 may be made less than the distance between the upper and lower edges of rim so that the full weight of the containers is borne by the upper edge 30 of the rim 26 to the lower container. It will also be appreciated if that the depth of the rim may be varied as required by varying the distance between the support surface 72 and the engaging surface 46 so that the above nesting support relationships are achieved .

It will also be appreciated that although the preferred embodiment herein described employs the use of tapered recesses 52 and tapered support flanges 76 to help guide the nesting containers into a required position relative to each other. This is not an essential feature of the invention but merely a manufacturing preference. It is simply necessary that the opening 58 of the recess 52 into the upper edge 30 of the rim 26, and the size of the aperture 64, be greater than the size of the projection 44.

Furthermore, instead of the use and engaging surface 46 and support flanges 74, 76 the stacking projection 44 could alternatively comprise a solid block projection in its simplest form.

It will also be seen that the container comprises apertures 82 extending through each of its walls which are employed as handles and have supporting flanges 84

to increase the strength of these handles.

Although the preferred embodiment described herein employs the use of two nesting and stacking means associated with each wall it will be appreciated that such a container may only require four such nesting and stacking means, two each disposed on each of two opposed side walls or each of two opposed end walls. Alternatively, more than two such means 42 may be employed on each wall as desired. This may be useful on larger containers. Other variations to the basic design of this invention would be to vary the height of the projections 44 relative to the bottom 12 of the container 10 in order to adjust the heights of nested containers as required for a particular container usage.

A further advantage of the containers of the present invention is that the container 10 of Figure 1 may be constructed in a variety of different dimensions. In particular it is desirable to have containers of different depths for storing different materials more efficiently. The depth of such containers may be shallow or deep depending on the particular requirement. For existing stacking and nesting container designs this variation in depth can result in nesting difficulties whereby containers of different sizes and depths, when nested, may become wedged together due to the different dimensions, making their storage and the separation of such nested containers difficult, with the possible risk of damage to the outer nested container. In addition, where existing containers of different sizes are mistakenly nested together then the nesting stack may become uneven, and potentially dangerous, due to the size differences of the containers.

Therefore the present invention also considers a system of two, or more, containers of the type previously discussed but of varying depths which may be nested together, irrespective of whether the inner nested container is of greater or lesser depth of the outer nested container, in such a manner to alleviate wedging of the inner nested container within the outer nested container.

Referring now to Figure 11, two containers according to the present invention, 410, 510, may be nested together. The first container 410 of this system has a depth D1 measured between its upper edge 430 and base 412. The second container 510 has a depth D2 between its upper edge 530 and base 512, whereby the depth D2 of the second container 510 is substantially greater than the depth D1 of the first container 410. Apart from variations in depth, these containers 410, 510 correspond to the design criteria of container 10, Figure 1, whereby similar features are numbered with the prefix "4" or "5" respectively to correspond to the features of container 10. In both cases, the bases 412 and 512 of the two containers 410 and 510 respectively are of the exact same size and dimensions. Furthermore, each container has an associated rim 426 and 526 respectively where exterior dimensions of these rims are the same so that the only difference between the dimensions of the two containers 410 and 510 resides in the depth. Therefore, the angle of inclination (relative to the base) of the side walls of each container 410 and 510 must be different. This can clearly be seen in Figure 11.

Due to the variation in depths between the two containers 410 and 510 then the stacking and nesting means 442, 542 of each container is scaled respectively in size, but maintains the same configuration and design of container 10, Figure 1. Referring now to Figure 11 it will be appreciated that when a container 410, which has a shallow depth D1, is nested within the larger container 510 the side walls of the smaller container 410 will not engage and wedge against the side walls of the larger container 510 since the bases of the two containers are of the same dimensions and the angle of the walls of the deeper container 510 are steeper than the walls of the container 410. In this situation the downwardly directed shoulder 432 of the rim 426 of the upper container 410 engages and rests on the upper surface 530 of the rim 526 of the lower container 510. In this manner the two containers are nested in a conventional manner whereby the rim of the upper container 410 rests on the rim of the lower container 510.

Referring now to Figure 12, the present invention also enables the container deeper 510 to be nested within the container 410 in a manner whereby the larger container 510 does not become wedged within the small container 410 during such nesting. The nesting and stacking means 542 and 442 of the two containers 510, 410 respectively are engageable in the nested condition to prevent wedging occurring. As seen in Figure 12, and since the two containers have similar exterior dimensions (except for depth) the nesting and stacking means 542 of the container 510 will engage and co-operate with the nesting and stacking means 442 of the lower container 410 in a similar manner as previously described for containers of similar depths. Therefore, the projection 544 is received within the associated recess 442 of the lower container so that the engaging surface 546 of the upper container 510 abuts a support surface 472 of the lower container 410 in a predetermined vertical position relative to the lower container preventing the inclined walls of the two nested containers becoming wedged together. Effectively, during nesting of a deeper container 510 within a smaller container 410 the projection 544 of the upper container 510 may be considered to act as if it was a projection of a similar sized container, and therefore acts to nest the containers in a similar manner as if both containers were the same size as previously discussed. The use of the support surfaces 472 of the outer container for engagement with the projections 544 of the inner container defines a minimum nesting depth N which can be achieved between nested containers. N will vary depending on the size of the outer container but is primarily determined by the height of the support surfaces above their associated base and also to the height of the projections 42 of the inner nested container above its associated base. The main requirement is that N is a height above the base whereby the base 512 of an inner nested container (510, Figure 12)

does not abut the inner surface of the side walls of the outer container 410, and is independent of the depth of the inner nested container (Referring to Figures 10a, 10b and the accompanying description, N must be greater than D to avoid wedging). N will therefore vary dependant on the depth of the outer container and the associated angle of the container walls. As the outer container becomes deeper the associated walls become steeper and the minimum nesting depth N must increase to prevent wedging of the inner nested container. If the walls are made steeper then the depth of the container increases (since rim and base sizes remain constant) until the situation occurs where the upper edge of the rim of the outer container will engage the shoulder of the rim of the inner container. In the situation described in relation to Figure 11 the minimum nesting depth will not be achieved due to nesting engagement of the rims of the nested containers.

In addition, size and shape of the nesting and stacking means 542 and 442 of the respective containers 510 and 410 are such to enable the deflection of the stacking and nesting means of the inner nested container in a similar manner to the nesting of two similar size containers. To this end, the lower and upper dimensions of the nesting and stacking means are maintained uniform for containers of different depths, resulting in the tapering side walls of these means to have steeper angles for the shallower containers. It will also be appreciated that two containers of different depths D1 and D2 may be stacked vertically in a similar manner as if they were identical size containers (as previously discussed) upon rotation of the two containers through 180° relative to each other.

In this way, the system of two or more containers, varying only in depth, may be nested together in such a manner whereby the inner container does not become wedged within the outer container irrespective of whether the container with the greater depth is nested within the container of the smaller depth or whether the container of the smaller depth is nested within the container of the greater depth. It will also be appreciated that although Figures 11 and 12 show two extreme cases of depth D1 and D2 in practice the variation of depths in D1 and D2 may be such that it is hard to determine the difference visually. However, the principal described in relation to Figures 11 and 12 applies accordingly.

Claims

1. An open topped container capable of nesting and stacking comprising a substantially flat rectangular base, two opposed side walls and two opposed end walls extending upwardly from said base at an angle inclined from a plane perpendicular to the base so as to diverge outwardly from the base, an upper part depth of the walls providing an external rim which presents an external downwardly directed shoulder and carries an upper edge of the container remote from the base, the rim extending outwardly with respect to the container a predetermined maximum distance from the base,

   each wall of an opposed pair having two stacking and nesting means, each of which means comprising an external projection directed outwardly of said container and having an outer edge a predetermined distance from the base which is less than that of the rim from the base, and associated with each projection is an internal recess which opens into the upper edge of the rim and extends downwardly through the rim, the projection and recess of each means being aligned perpendicularly with respect to the base with the projection disposed between said recess and base, whereby two like containers may be nested in the same orientation relative to each other with the projections of the stacking and nesting means of an upper container being received within the recesses of similar stacking and nesting means of a lower container,

   each of the stacking and nesting means being positioned on the walls of the container to be offset from the stacking and nesting means of the opposed wall of a similar container when two containers are disposed in an orientation in which one is rotated through 180 degrees relative to the other and stacked as a vertical column with the projections of the means of the upper container engaging the upper edge of the lower container,

   wherein each means has an aperture through the wall perpendicularly between the projection and the recess which extends from said recess and through which the associated projection of an upper container may extend when two similar containers are nested.

2. A container as claimed in claim 1 in which an inwardly directed surface of each recess is in a plane which is substantially perpendicular with respect to said base and the outer edge of the projection which underlies said recess lies in this said plane.

3. A container as claimed in claim 2 in which the recess has an upwardly directed opening into upper edge of the rim which is substantially rectangular with opposed recess walls converging towards each other as they extend downwardly from the upper edge to present the recess with a tapered configuration.

4. A container as claimed in claim 3 in which the aperture underlying the recess has opposed edges aligned with the recess walls and which edges ex-

tend to converge towards each other as they extend downwardly from the recess to present the aperture with a tapered configuration which continues the tapered configuration of said recess.

5. A container as claimed in either claim 3 or claim 4 in which the projections have downwardly extending projection edges proud of the wall leading to a downwardly directed engaging surface for engaging the upper edge of an underlying container, wherein said edges converge toward each other as they extend downwardly towards the engaging surface to present the projection with a substantially tapered configuration, said projection edges extending outwardly of the container a distance equal to or less than the outer edge of the projection from the base.

6. A container as claimed in claim 5 in which said projection comprises a solid block.

7. A container as claimed in claim 5 in which said projection edges comprise reinforcing flanges which are at least partially received within said associated recess when two similar containers are nested.

8. A container as claimed in claim 7 in which reinforcing flanges extend upwardly from the projection to abut the shoulder of the rim and support said rim.

9. A container as claimed in any one of the preceding claims further comprising stop means which are engageable between two similar containers when nested to support an inner container at a predetermined nesting depth relative to an outer container for restraining the inclined walls of the inner container of two nested containers from becoming wedged within the outer container.

10. A container as claimed in claim 9 in which the stop means comprises a support surface located on a lower edge of each aperture for supporting the associated projection of an upper container when two similar containers are nested.

11. A container as claimed in claim 10 when appended to either claim 7 or claim 8 in which said reinforcing flanges extend upwardly to engage and reinforce said support means.

12. A container as claimed in claim 10 when appended to claim 5 in which the distance between the engaging surface and the support surface is equal to or greater than the upstanding depth of the external rim.

13. A container as claimed in claim 10 in which said stop means comprises the external shoulder of the rim and the upper edge of the rim wherein the shoulder of an upper container of two nested containers engages the upper edge of the lower container.

14. A container as claimed in any one of the preceding claims having at least two stacking and nesting means on each wall of each pair of opposing walls.

15. A container as claimed in claim 5 or any one of claims 6 to 14 when appended to claim 5 in which the engaging surface has a downwardly extending flange forming a projection shoulder with the rim surface, which projection shoulder being for engagement with an inner lip of the upper edge of the rim of a lower container when two containers are stacked to restrict relative lateral displacement of the stacked containers.

16. A container as claimed in any one of the preceding claims in which said end walls and side walls are predominantly solid.

17. A container as claimed in any one of the preceding claims in which said end walls and side walls are inclined outwardly from the base at an angle in the range of 1 to 15 degrees from the plane perpendicular from the base.

18. A container as claimed in any one of the preceding claims made substantially of moulded plastics material.

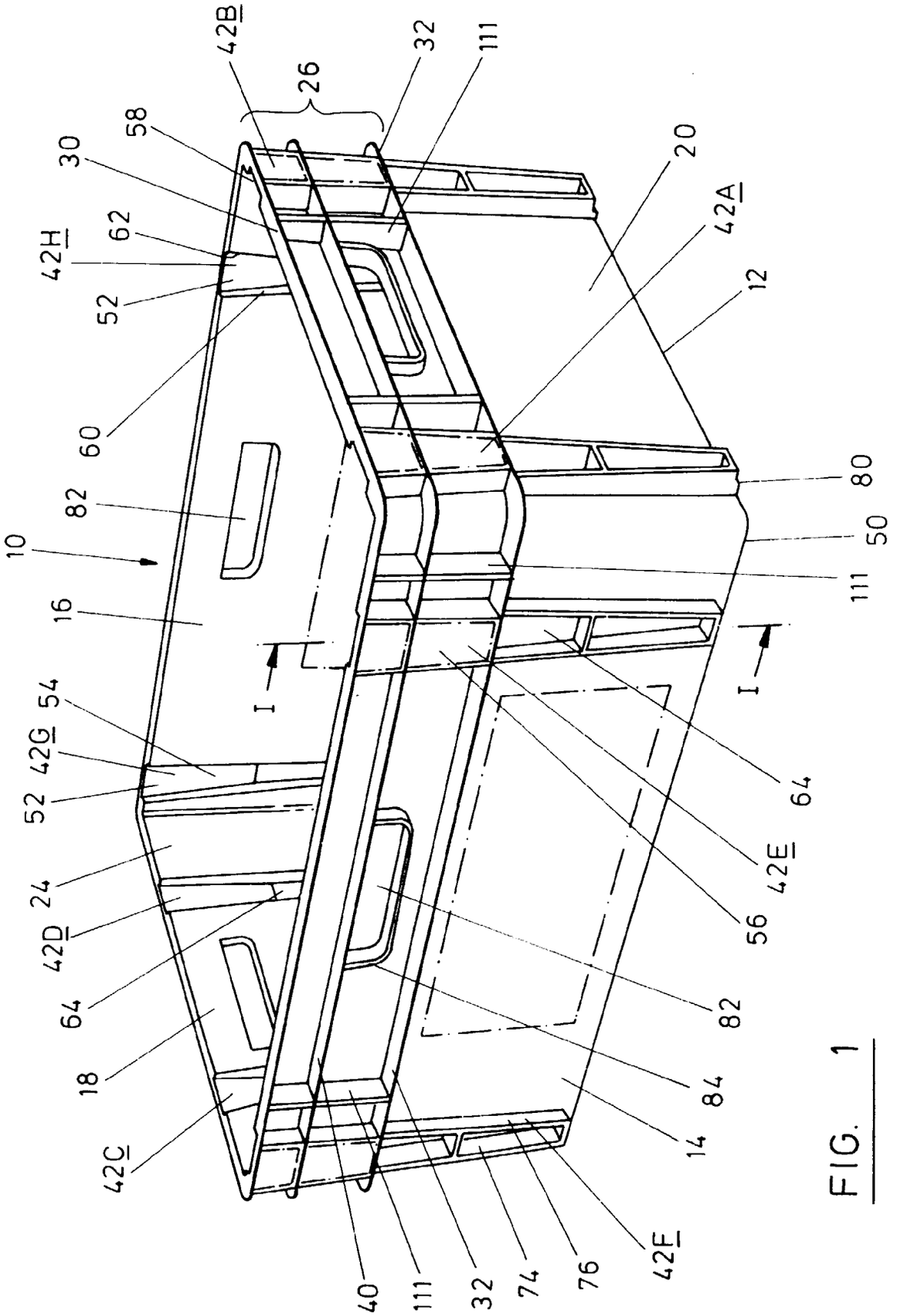
19. A system of two containers each of which is as claimed in any one of the preceding claims and in which a first of the two containers has a greater depth than the depth of the second container and the bases of both containers are of corresponding size and shape and the outer dimensions of the rims of both containers are of corresponding size and shape, wherein nesting restraint means are provided on each of the two containers which are engageable between the first and second containers, when said containers are in a nested configuration, for restraining the inner nested container at a predetermined position relative to the outer container to alleviate wedging of the inner nested container in the outer nested container, irrespective of which of the first and second containers is nested within the other.

20. A system as claimed in claim 19 when appended to containers as claimed in claim 13 in which said nesting restraint means comprises said stop means, whereby when said second container is nested within said first container the external shoulder of the rim of the second container engages the upper edge of the first container for restraining the inner nested container from becoming wedged within the

outer nested container and when said first container is nested in said second container then at least one of either:-

i) the projections of the first container engage the support surfaces of the second container; or ii) the external shoulder of the rim of the first container engages the upper edge of the second container to restrain the inner nested container from becoming wedged within the outer nested container.

21. A system as claimed in either claim 20 or claim 21 in which said stacking and nesting means of each of the first and second containers are positioned on the walls of each respective container so that the two containers may be nested when in the same orientation relative to each other.


42B
26
32
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58
30
20
42A
62
42H
12
52
60
80
82
10
50
111
16
I
I
54
42G
52
64
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42E
42D
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64
82
18
84
14
42C
42F
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111
32
74
76

FIG. 1

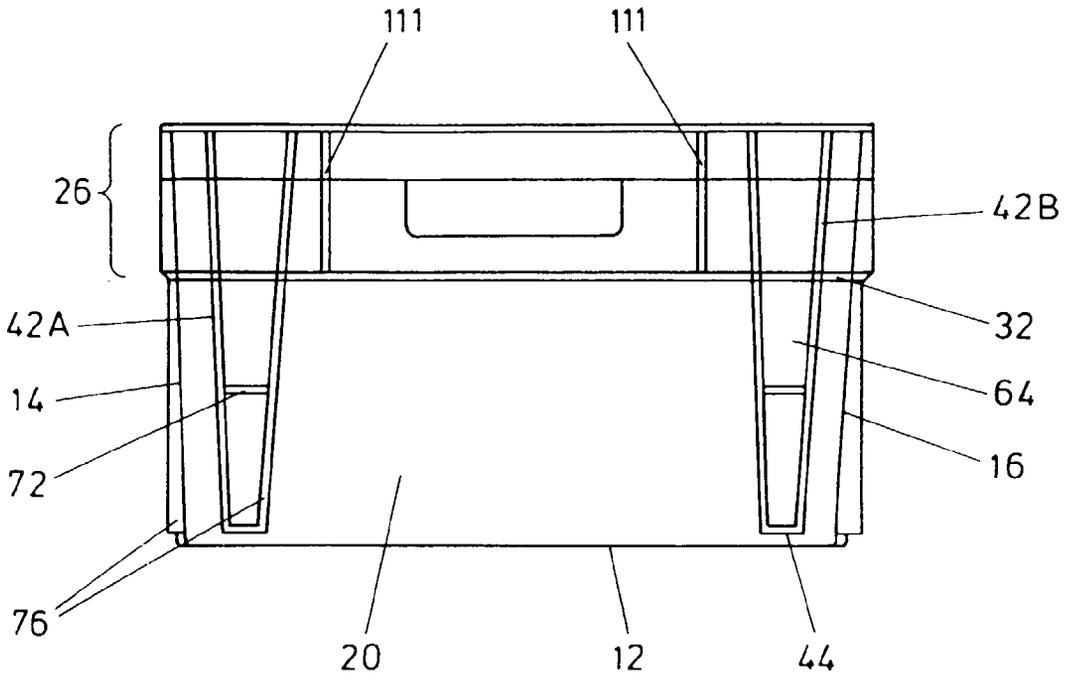
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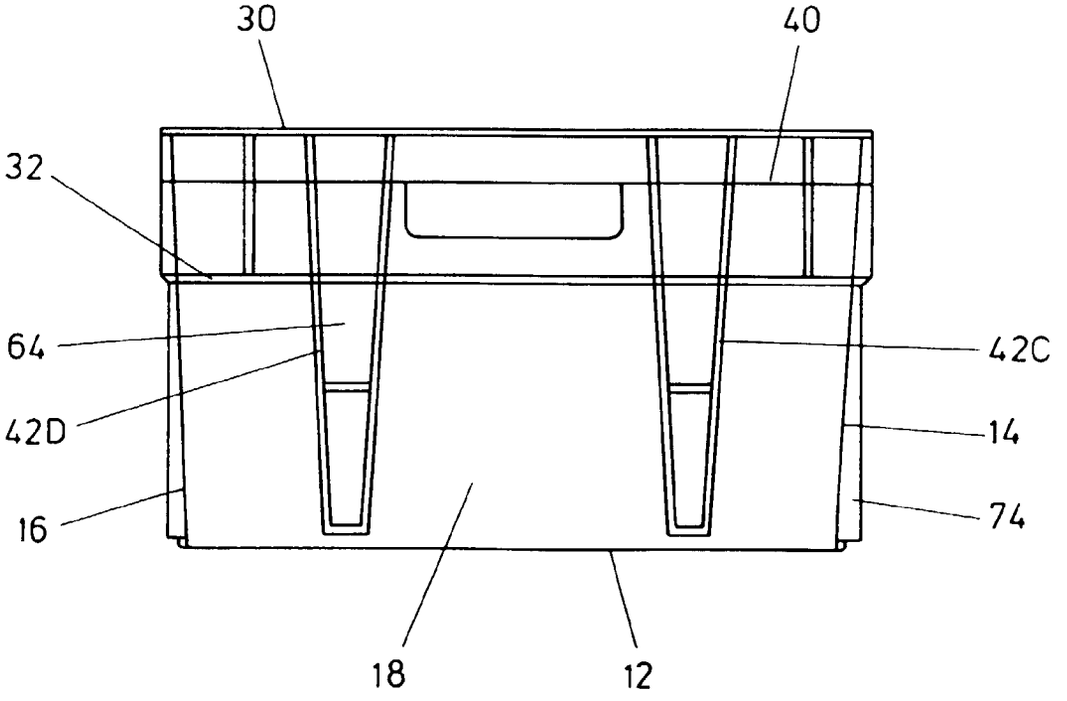
FIG. 2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64
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42D
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16
74
18
12

FIG. 3

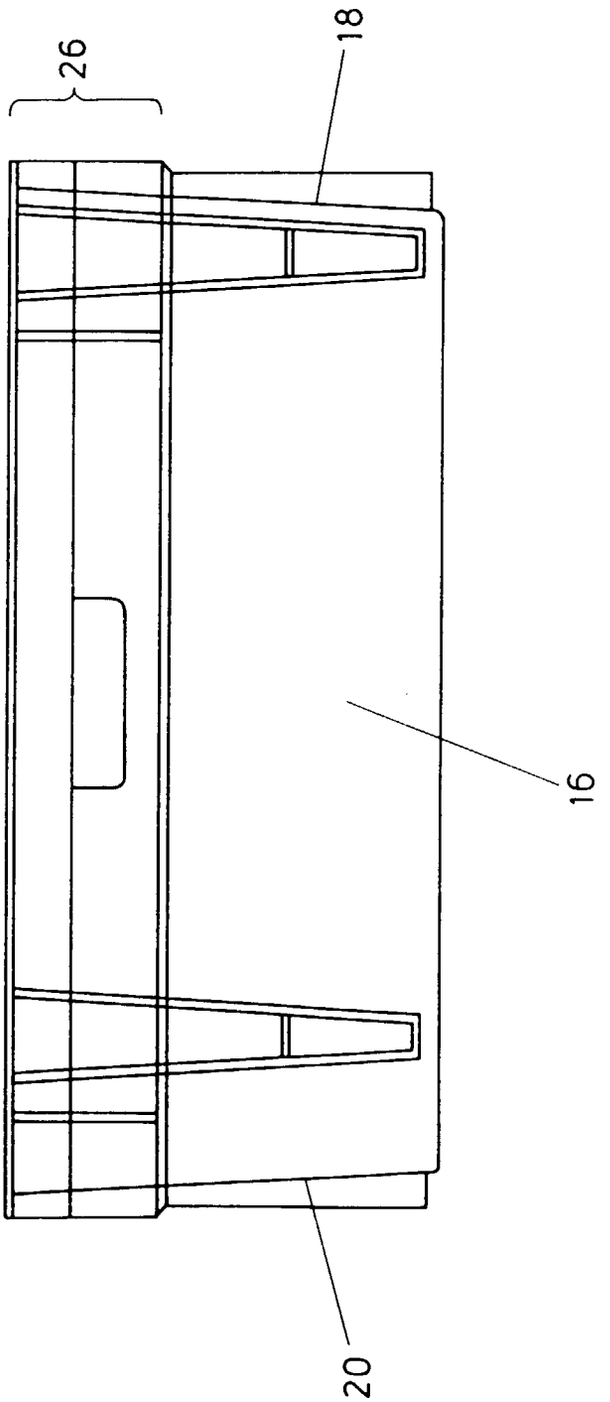


FIG. 4

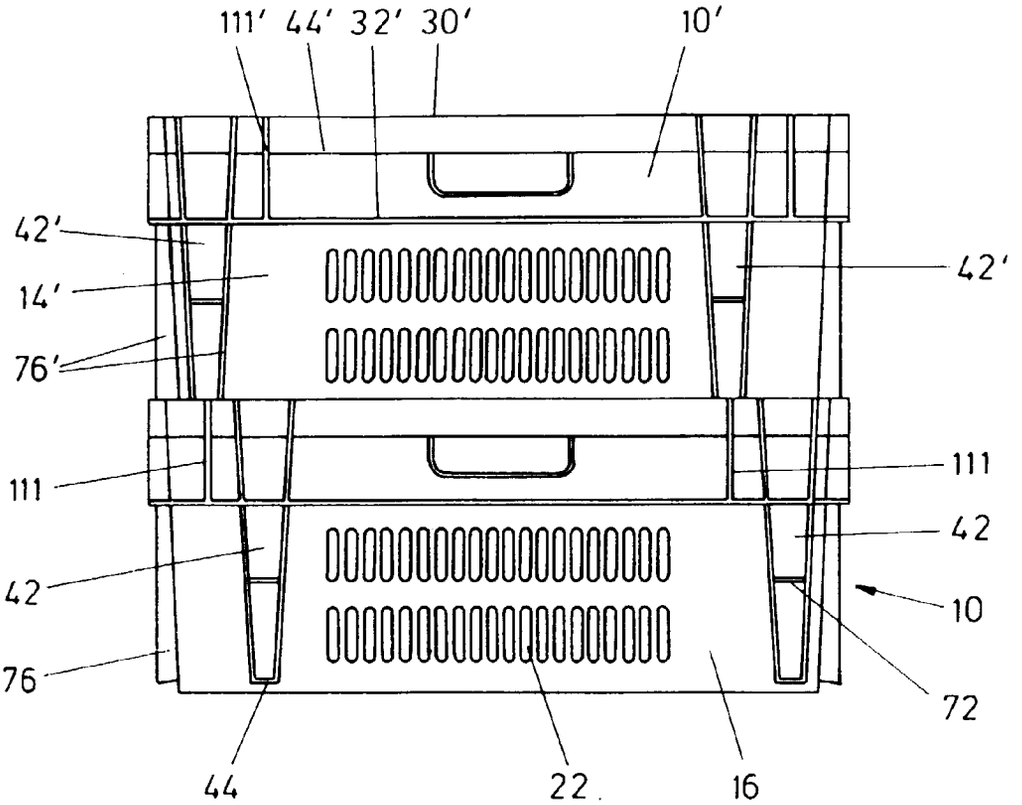

111'
44'
32'
30'
10'
42'
14'
76'
42'
111
111
42
42
10
76
72
44
22
16

FIG. 5

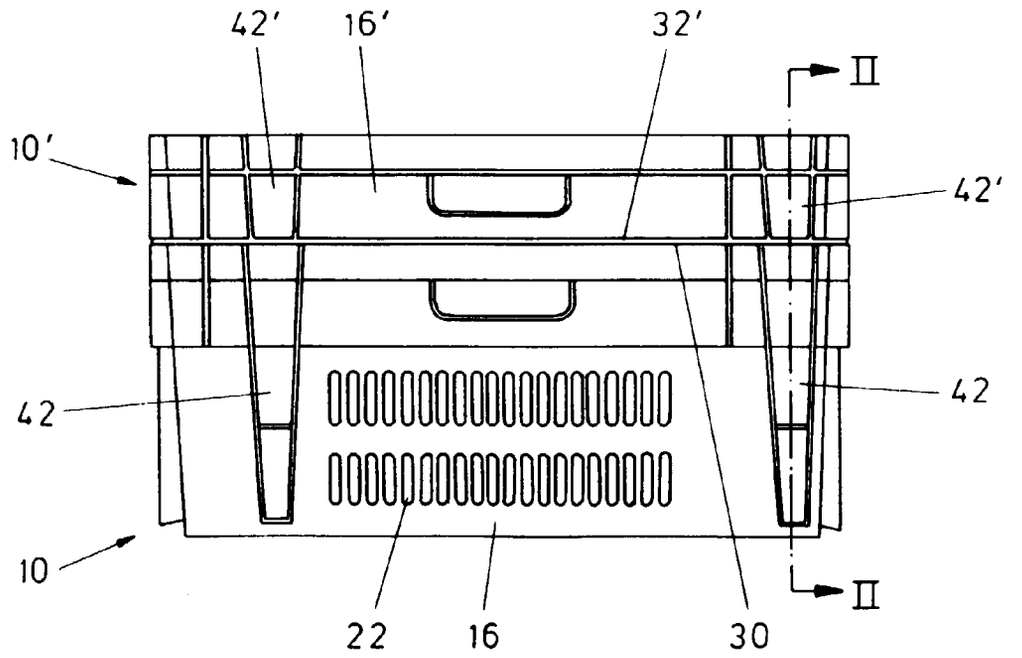
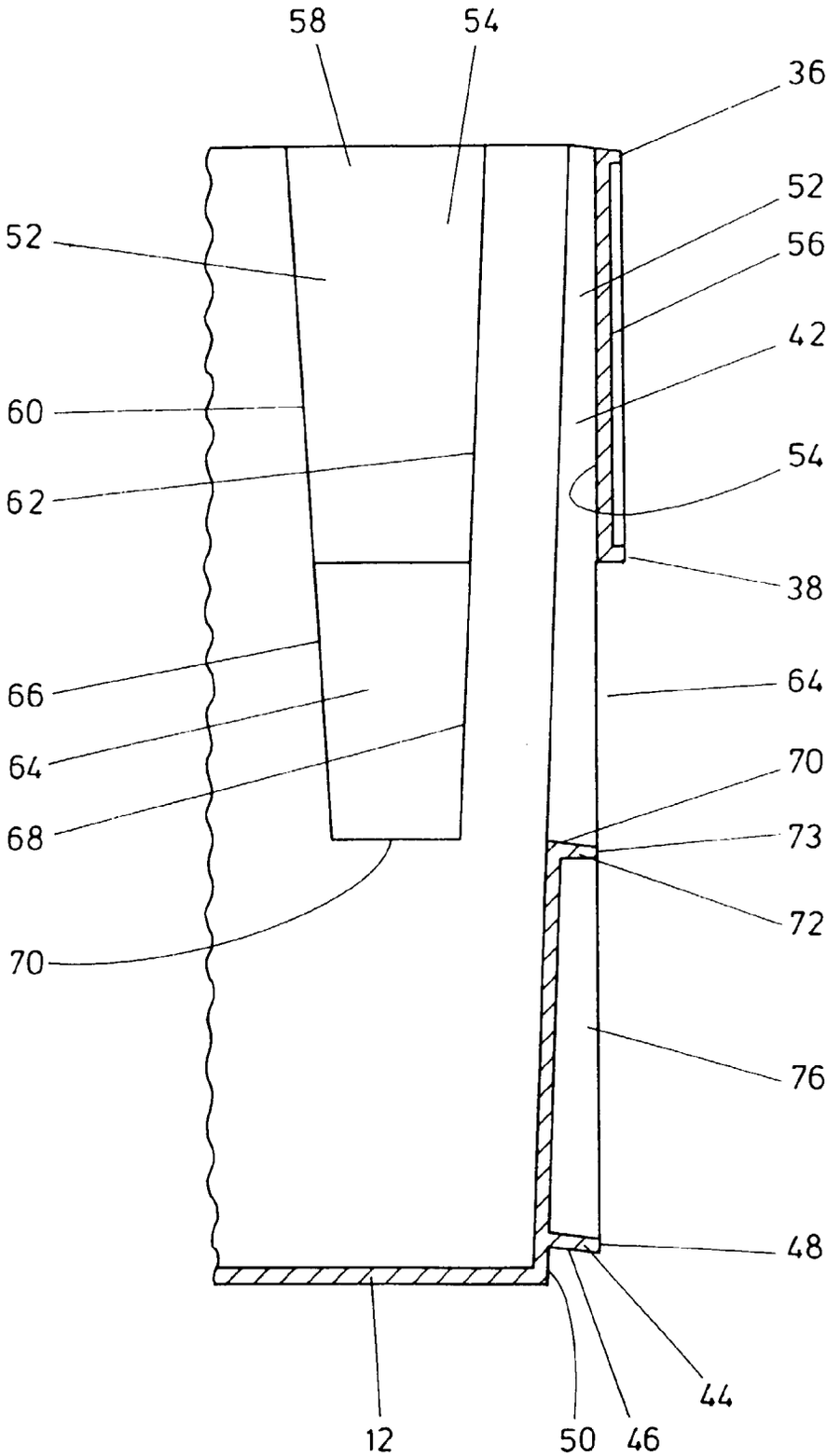

42'
16'
32'
II
10'
42'
42
42
10
22
16
30
II

FIG. 6


58
54
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52
56
42
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38
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68
73
72
70
76
48
12
50
46
44

FIG. 7

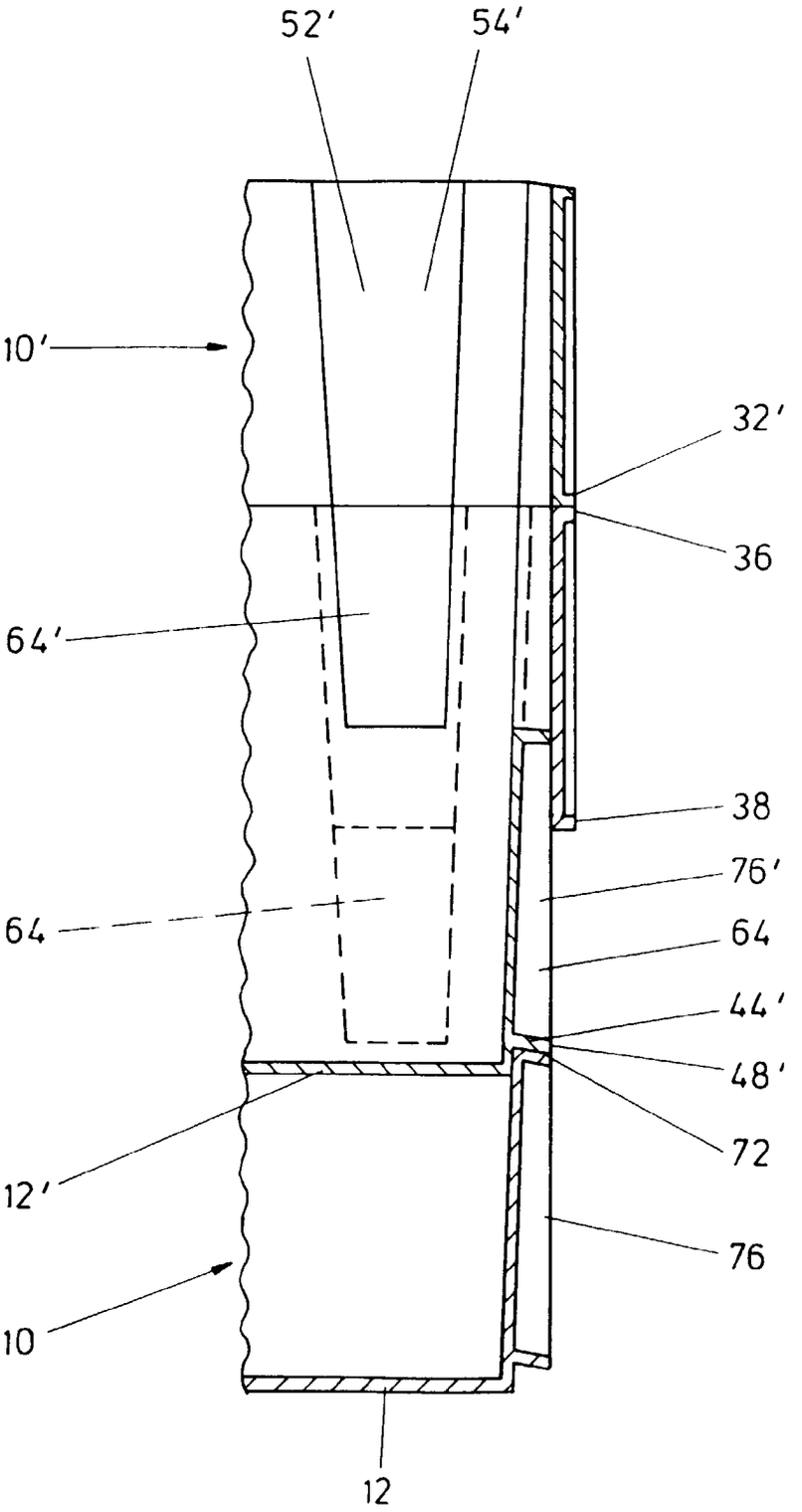

FIG. 8

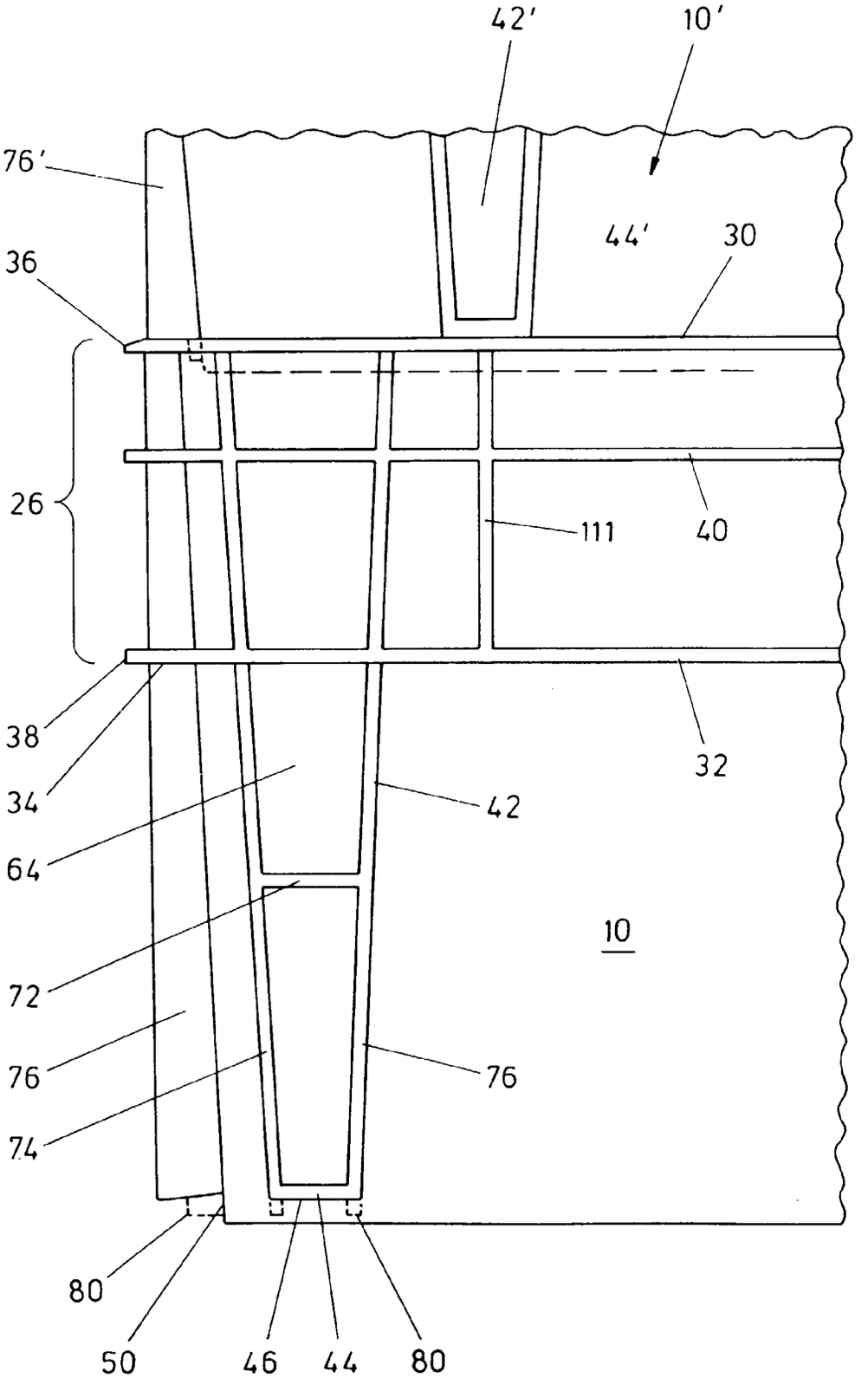

FIG. 9

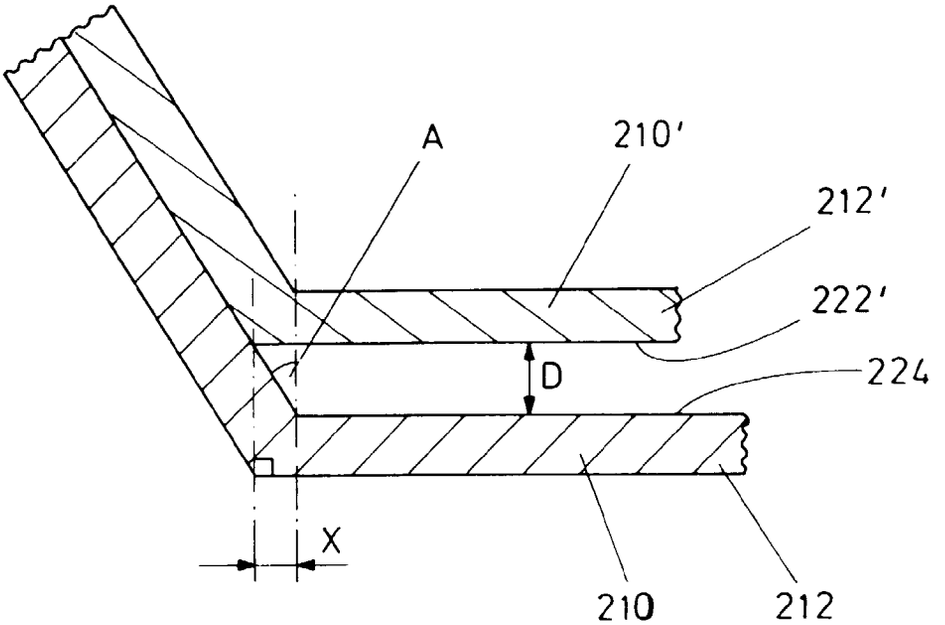

FIG. 10a

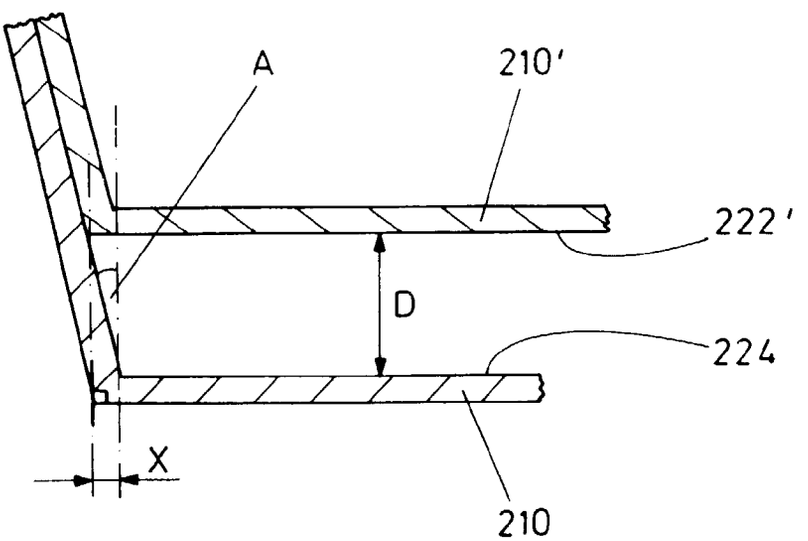

FIG. 10b

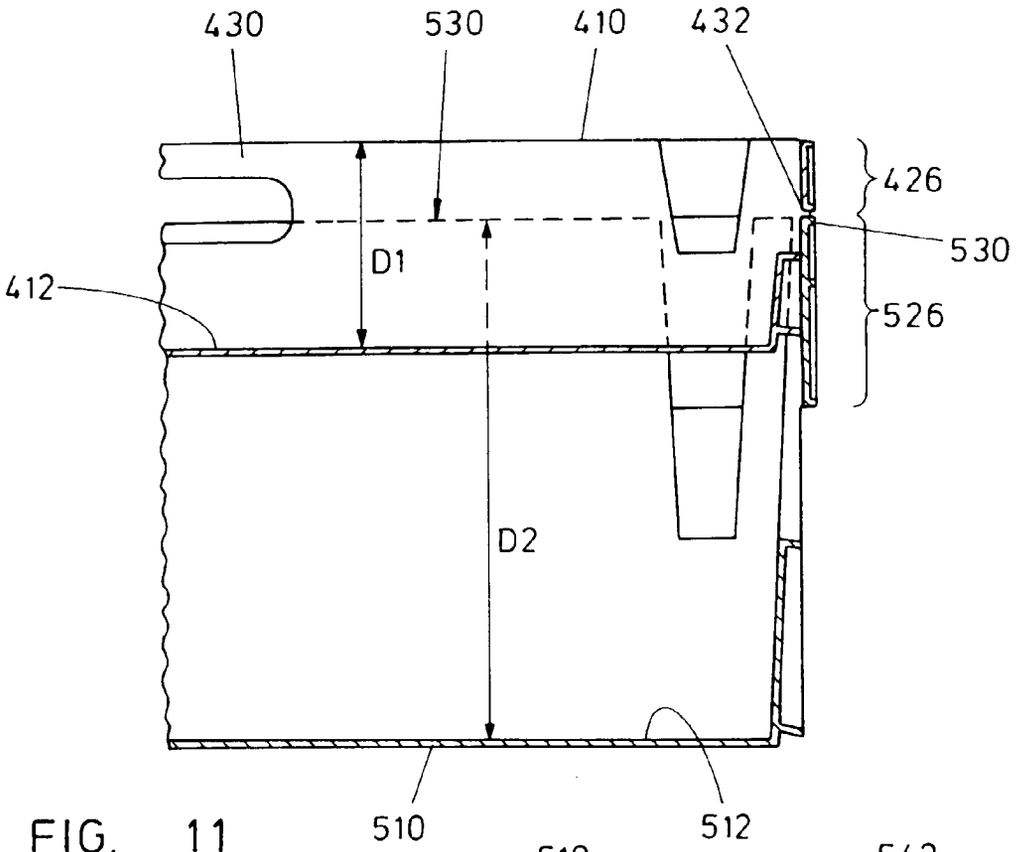
430
530
410
432
426
530
526
412
D1
D2
510
512

FIG. 11

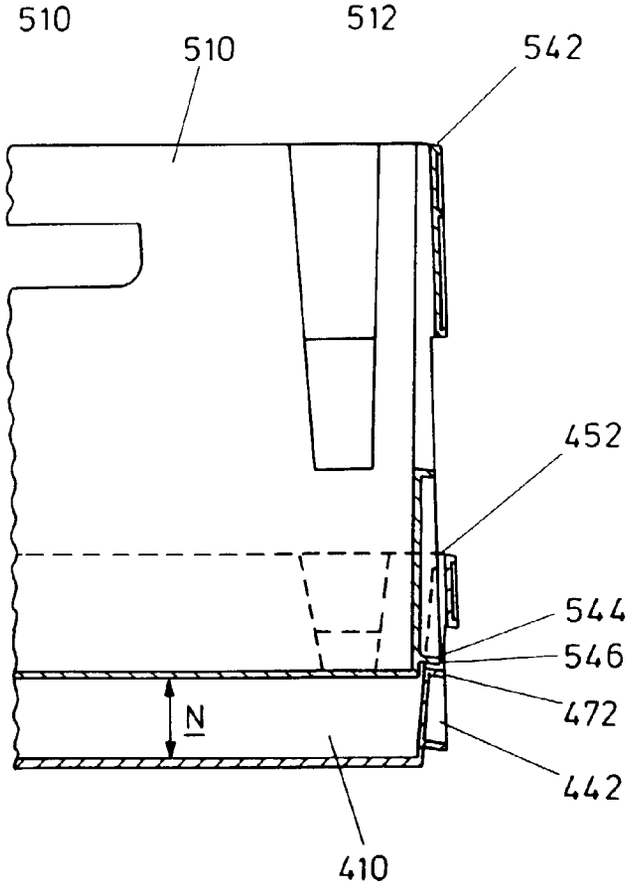
510
542
452
544
546
472
442
410
N

FIG. 12

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 30 3766

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)
X	FR-A-2 563 188 (MANUJET) * the whole document * ---	1-21	B65D21/04
X	FR-A-2 504 889 (MANUJET) * page 5, line 1 - page 8, line 31; figures 1-7 * ---	1-4,9, 10, 12-14, 16-21	
X	AU-A-3 020 677 (ACUMEN IND.) * page 4, line 23 - page 7, line 16; figures 1-8 * ---	1-21	
A	GB-A-1 243 387 (MOLDED FIBER GLASS BODY CY) * page 2, line 76 - line 128; figures 1-8 * -----	1,6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18 November 1996	Martens, L

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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