A pressure operated fastening means for container comprising hinged male and female halves, the male half comprising a cylindrical stub chamfered at its end portion and provided with hemispherical projections, which may be hollow or in the form of solid spherical pips, positioned generally midway between the head and the foot of the stub. The female half includes a circular ring of relatively greater thickness than the adjoining lateral wall, with insertion of the male half during fastening subjecting the projections to compression by the circular ring, with the projections upon further insertion forcing the relatively thinner lateral wall inwardly to effect the desired fastening.

9 Claims, 6 Drawing Figures
PRESSURE OPERATED FASTENING MEANS FOR CONTAINERS

The invention relates to a pressure-operated fastening means for containers comprising two hinged halves produced integrally with the fastening elements by vacuum moulding a thin sheet of thermoplastic material. A pressure-operated fastening means similar to that to be described is known in which the male element is connected to its supporting base by means of a frusto-conical collar having a very sharp taper extending towards the foot of the male element, which collar has to be compressed in this zone in the radial direction through the action of one or more pins projecting from the body of the male element.

Also, the collar connecting the element to the base and the radial compression of the foot of the male element permit axial movement of the male element when the force necessary for pressing one of the fastening elements to the other is applied to the male element, thus rendering it difficult to effect the fastening.

Because of their special rigidity and shape, the edges or lobes of the pins on the male element become worn by the walls of the female element when they move into contact with each other during the closing and opening of the container.

Another type of pressure-operated fastening means is also known in which the male element is provided with projecting teeth which cooperate with tongues projecting from the female element.

The male and female elements are locked together as a result of the tongues bending under the action of the teeth, which tongues have to return to their normal position after the fastening has been effected. Such closure means, which necessitate the use of material having good elastic properties are unable to stand up to repeated use, and have been made from P.V.C., polystyrol or the like sheet material. The main object of the present invention is to provide fastening elements which resist the tensile forces applied to them in opposite directions, without deteriorating or flattening as a result of permanent deformation of one or both fastening elements as a consequence of their being repeatedly used even if the sheet material employed e.g. P.V.C., polystyrol or the like does not possess a high degree of elasticity.

To achieve the object of the invention, there are provided on the female element of the fastening means structures which resist compression while being able to yield elastically, the elements projecting therefrom having zones which cause the male element to yield elastically during the operations of locking the fastening elements together; the female element also has elastically yielding portions for accommodating the projecting elements when they pass from the compressed position to the normal position in which the fastening is effected.

Some embodiments of the invention are illustrated, by way of non-limiting examples, on the attached sheet of drawings in which:

FIG. 1 is a plan view of the male element;
FIG. 2 is a side view of the male element;
FIG. 3 is a median section through the male and female elements prior to their being locked together;
FIG. 4 is a section similar to the preceding one showing the phase in which the male element is compressed by part of the female element;
FIG. 5 is a section similar to that shown in FIG. 3 and FIG. 4, and shows the male and female elements during the phase in which the female element is deformed as a result of pressure exerted by the male element; and
FIG. 6 is a side-elevation similar to that of FIG. 2 and showing a male element of different form from that seen in FIG. 2.

In the drawings, the same reference numerals are used for like or equivalent parts. It will be seen from FIGS. 1 and 3 that the male element projecting from the surface of a hinged half of the container is supported on a hollow frusto-conical base and is constituted by a hollow cylindrical stub 9, which is sharply chamfered at its end 10 which is closed by a disc 11.

To simplify the description, this terminal portion 10 and the disc 11 will hereinafter be referred to as the head of the male element, the purpose of which is to facilitate insertion of the male element into the female element by virtue of the arrangement just described.

The female element comprises a frusto-conical hollow portion 16 having a base 18 and of a depth corresponding to the height of the male element. Said hollow portion communicates by way of a ring 17 with its frusto-conical support 15 which projects from the surface 14 of the hinged half of the container (see FIG. 3).

In the median and therefore particularly resilient zone 9 between the head and the foot of the male element there are provided diametrically opposed outwardly projecting hemispherical hollow elements 12, or spherical or spheroidal pins. When the male and female elements are being locked together, these projections come into contact with the ring 17 which is of greater strength than the other portions of the female element, so that the projections 12 are subjected to compression.

In this phase, the projections 12 do not suffer any deformation and the pressure applied to them pushes them in the direction of the median longitudinal axis of the zone 9. Consequently, the circular bases 12' of the female elements 12, subjected to pressure, cause the side wall of the cylindrical stub 9 to curve inwards as can be clearly seen in FIG. 4.

This inward curvature of the portion 9 caused by the circular bases 12' of the projections 12 is of a completely elastic nature even if the material used is P.V.C., polystyrol or similar material, and it is due to the resilience of the zone in which the projections 12 are located and to the circular line of their base 12'.

Practical tests have shown that the elastic inward curvature of the part 9 does not cause any permanent deformation to the male element either at the base or the apex of the projections 12. These tests have also shown that the projections 12 do not cause any flattened portions on the ring 17 of the female element because of their spherical surfaces and the arcuate cross-sectional line of ring 17, so that the fastening means remains efficient even after repeated use. This ring 17, the inside diameter of which corresponds approximately to the outside diameter of the part 9, applies pressure to the projections 12 on the part 9, when the male element is inserted into the female element, and the ring in turn undergoes slight elastic deformation caused by said projections 12.

The ring 17 is in fact subjected to slight stretching in the zones corresponding to those extending over the element 9 between two successive projections 12, and undergoes slight outward curvature at points corresponding to each projection 12.

It is obvious that the projections 12 will return to their normal positions when those portions of the stub 9, previously inwardly curved upon the passage of the projections 12 through the ring 17 acting as a clip-ring, resume their normal positions.

When the foot of the stub 9 and the ring 17 are positioned in the same plane the fastening of the male to the female element is completed and, as can be seen from FIG. 4, the lateral wall 16 of the female element will assume an outward curvature 16' corresponding to the projections 12, which curvature is facilitated by the thinness of the wall 16. The wall 16 is then joined to the ring 17, or by the particularly resilient zone of the female element i.e. a zone located roughly half way along the length of said element.

For the purpose of increasing the resistance of the male element to curvature of its zone of maximum resilience, and in order to avoid any axial movement of the male element, ribs 13 extend from the face 12' of each projection 12 to the foot of the support 8 of the male element as can be seen in FIGS. 1 to 6. Referring particularly to FIG. 6, it will be seen that the male element illustrated therein because of its height can accommodate projections 12 and 12', of the kind previously described, which are located at different levels.
This feature enables a two-level fastening to be obtained which can be particularly useful in some cases, and it is clear that the corresponding female element will have to be of a height corresponding to that of the male element.

It will be obvious that any formal variations of a practical nature to the subject-matter of the invention are to be considered as falling within the scope of the invention covered by the following.

What is claimed is:

1. Pressure-operated fastening means for containers comprising two hinged halves, which closure means is produced integrally with the container by vacuum moulding a thin sheet of thermoplastic material such as polystyrol, P.V.C., and the like, said means being constituted by a recess contained in a hollow frusto-conical part projecting from the surface of one half of the container, which recess adjoins a circular ring having a thickness greater than the lateral wall of the recess and than the lateral wall of the part constituting the support for the female element, the means also comprising a male element formed by a hollow cylindrical stub, which is sharply chamfered at its end portion and is closed by a circular disc and is located on a hollow frusto-conical base projecting from the surface of the other half of the container characterized in that hemispherical projections are provided on the male element at roughly midway between its head and foot, and in that the female element is outwardly curved.

2. The fastening means of claim 1 wherein said hemispherical projections are hollow.

3. The fastening means of claim 1 wherein said hemispherical projections comprise spherical pips.

4. The fastening means according to claim 1, characterized in that the hemispherical projections are provided at diametrically opposite points on the male element.

5. The fastening means according to claim 1, characterized in that the ring connecting the female element to its frusto-conical support is of a thickness approximately equal to the maximum thickness of the half of the container.

6. The fastening means according to claim 1, characterized in that the thickness of the female element diminishes from the ring, joining it to the support, towards its base.

7. The fastening means according to claim 1, characterized in that the male element has reinforcing ribs extending from the base of each hemispherical projection to the foot of the support of the male element.

8. The fastening means according to claim 1, characterized in that the hemispherical projections are aligned in a single plane.

9. The fastening means according to claim 1, characterized in that the hemispherical projections are disposed in at least two different parallel planes.

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