United States Patent [19]

Rausing

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[45] **June 5, 1973**

[54] **PACKAGING CONTAINER HAVING A CONTAINER BODY OF THERMOPLASTIC MATERIAL AND A METAL FOIL LINING INSERTED INTO THE CONTAINER BODY**

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[21] Appl. No.: **125,350**

[52] **U.S. Cl.** .....**229/14 B,** 229/3.5 MF, 229/48 T

[51] **Int. Cl.** **B65d 25/14**

[58] **Field of Search**.....229/3.5 MF, 14 B, 229/48 T; 215/1 C

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Attorney—Pierce, Scheffler & Parker

[57] **ABSTRACT**

A substantially impermeable packaging container having a container body of a thermoplastic material with an outwardly extending flange about the top opening thereof, said container body having a metal foil lining extending upwardly to the edge of the top opening and a lid member of thermoplastic material with an inner metal foil lining, said lining stopping short of the marginal edge of the lid member, said flange and the marginal edge of the lid being sealed together to close the packaging container.

2 Claims, 9 Drawing Figures

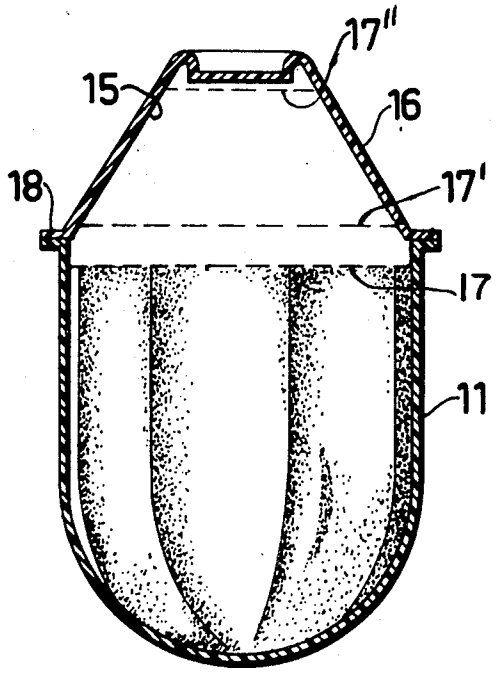


Fig. 1a

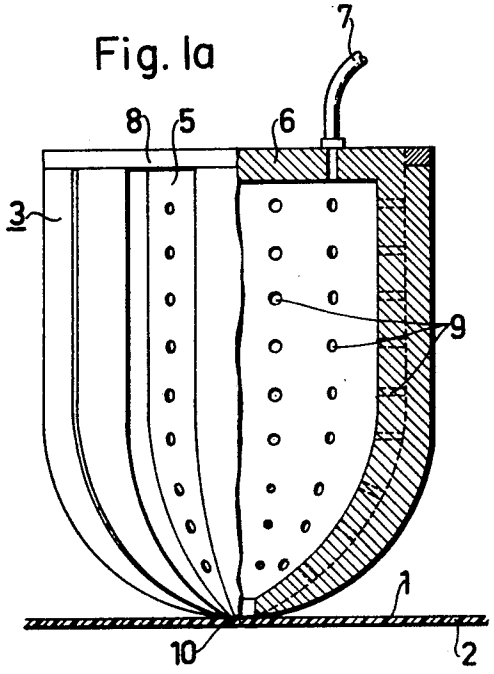


Fig. 1b

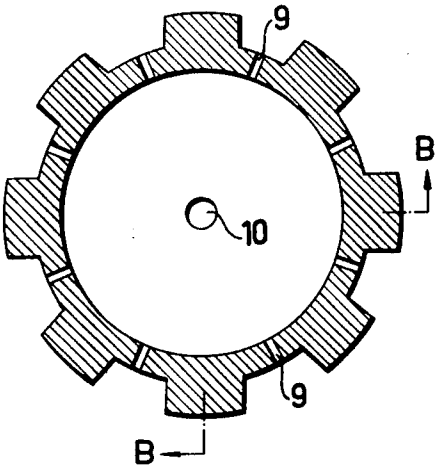


Fig. 2

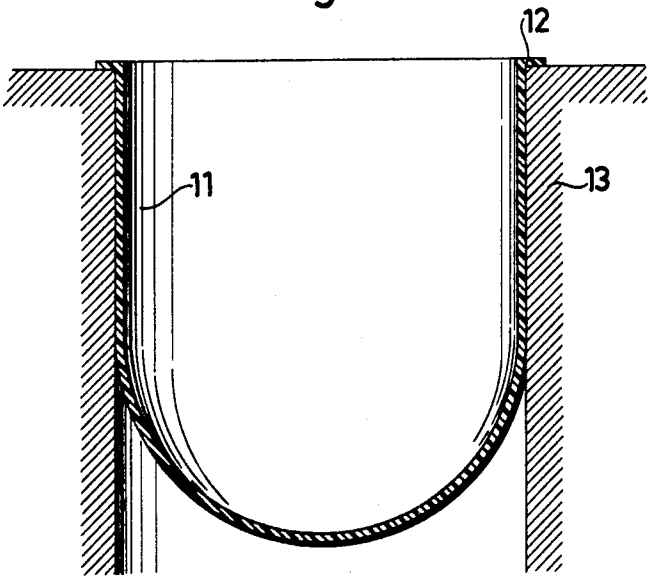


Fig. 3a

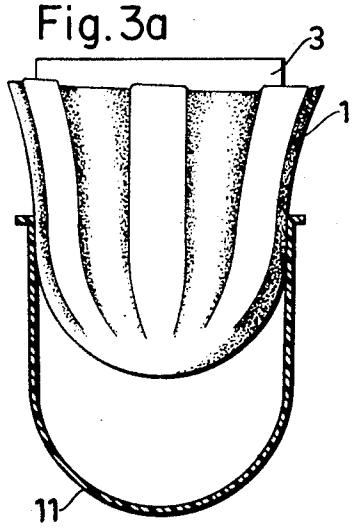


Fig. 3c

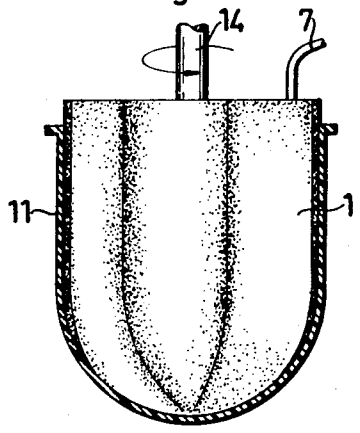
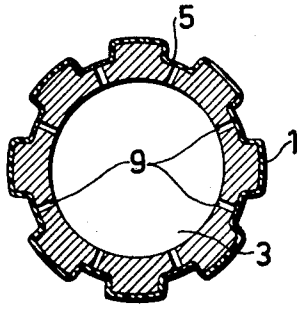


Fig. 3b



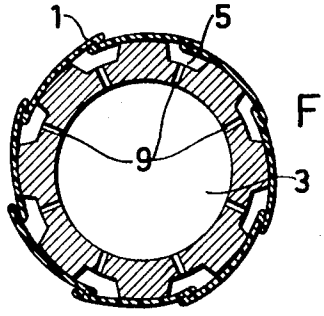


Fig. 3d

Fig. 4

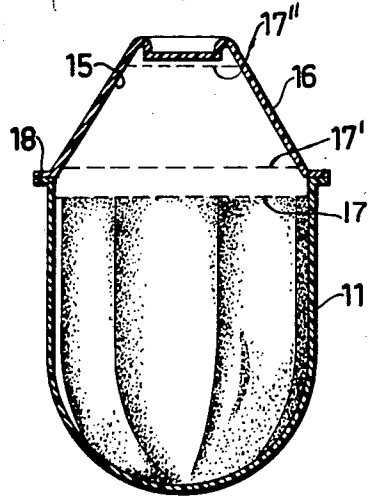
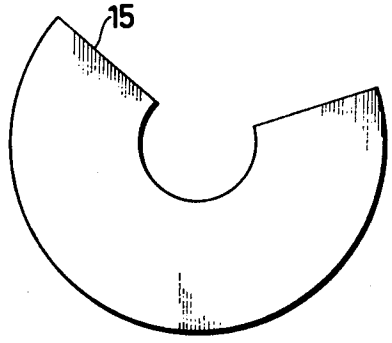


Fig. 5



PACKAGING CONTAINER HAVING A CONTAINER BODY OF THERMOPLASTIC MATERIAL AND A METAL FOIL LINING INSERTED INTO THE CONTAINER BODY

This application is a divisional application of my earlier filed parent application Ser. No. 758,433 filed Sept. 9, 1968 now U.S. Pat. 3,616,033.

This invention is concerned with a method of producing a packaging container comprising a container body of thermoplastic material and a metal foil lining inserted into the container body. The invention is further concerned with a device for carrying out the operation in accordance with the above and also with a packaging container produced in accordance with this method.

It has for a long time been the objective within the packaging industry to develop types of package that solve in the best way the specific problems which arise within packaging technology. A throw-away package shall, e.g., be inexpensive but it shall also be well suited to its contents, so that it protects the contents in the best way both mechanically and otherwise. The package shall further appeal to the customer, i.e., the contents shall be easily accessible when the customer wants to make use of them. It shall further have a low weight and be well suited to storage in available spaces. These requirements that modern packages have to meet have resulted in the development of a great number of different types of package, each of which has been suited to one special type of contents.

Within the canning industry, packaging materials other than sheet metal have not been used very much up till now, which material exhibits many properties suited to canning. Sheet metal is, e.g., very impermeable and has very satisfactory mechanical strength. The drawbacks of sheet metal packaging are that it is comparatively expensive and besides so strong mechanically that sheet metal packaging containers cannot be opened without the use of special aids in the shape of tin openers or keys. Glass packages in the shape of jars or bottles have so far been the predominant method of packaging for aerated liquids, e.g., aerated drinks, beer, etc. The impermeability of glass is certainly remarkable, but glass packaging is heavy, expensive and comparatively easy to damage, and attempts have therefore been made to find a method of packaging which will replace sheet metal and glass for the above groups of products. The "solutions" which have so far been put forward in this connection entail a transition to sheet metal or glass packages which have a lesser thickness. Attempts have also been made in many places to use plastic packages as an alternative to sheet metal or glass packages, but these attempts have come to nothing as a result of the fact that known plastic materials that can be used economically have an impermeability that is too unsatisfactory for use for either canned goods or aerated drinks. In the case of canned goods, oxygen diffuses into the package, as a result of which the contents are oxydised, and in the case of aerated drinks, carbon dioxide diffuses out of the package.

It can be stated that there exists a need for a cheaper, lighter and easier-to-open packaging container that has sufficient impermeability, and this invention gives directions concerning such a packaging container as well as the method of its production.

The invention is thus concerned with a method of producing a packaging container which comprises a container body of thermoplastic material and a metal foil lining inserted into the container body. The invention is characterised by a blank, conveniently of round shape, of a metal foil coated with thermoplastic material being, by means of a tool, pressed into the said container body and by the plastic coating of the metal foil, at least along a continuous joint, being heat sealed to the container body around its opening. The invention is further characterised by the blank, or roundel, being made to assume, through being folded, the shape of the container body, and by the said folding and shaping being brought about by the blank, through the application of vacuum, being sucked against the tool which has longitudinal grooves that facilitate the formation of the folds, the grooves being capable of connection to a source of vacuum.

Packaging containers which have been produced in accordance with the invention have the advantages of the conventional cans, i.e., they have very satisfactory impermeability as a result of the incorporation of a metal foil layer in the wall of the container. They can also be made sufficiently stiff mechanically by surrounding the packaging container by, e.g., a sleeve of cardboard or plastic. The package will be lighter than earlier conventional preserve packages, and also considerably easier to open, since it is possible to break through the walls of the package with a much simpler tool, or the package may quite simply be fitted with an opening device that makes a special opening tool unnecessary.

One constructional form will be described in the following by reference to the attached diagrammatic drawings, of which

FIG. 1*a* shows a vertical elevation of a vacuum tool in partial section along line B—B of FIG. 1*b* and

FIG. 1b is a similar view in horizontal cross section

FIG. 2 shows the thermoplastic container body which has been placed in a holder and is ready to receive the metal lining.

FIGS. 3a, 3b, 3c and 3d show how the metal lining is inserted by stages into the container body,

FIG. 4 shows a cross section of the completed packaging container and finally

FIG. 5 shows a flat blank which is to be inserted into the conical top portion of the container.

For the sake of clarity, we will first of all define the terminology used as regards the packaging container itself. The term "container body" thus refers in this case to a pre-produced hollow body of thermoplastic material. The layer of metal foil inserted into the container body is termed "lining," the container body and the lining together forming a packaging container that may in a suitable manner be provided with some kind of closure covering the opening of the container.

FIG. 1a shows a partial section of a folding tool **3** which consists of a cylindrical portion and a curved bottom portion. The tool has a number of pleating grooves **5** which extend parallel along the cylindrical portion and towards the centre part of the bottom portion, which grooves through ducts **9** (see also FIG. 1b) are connected to the inside of the tool, which in turn is connected to a source of vacuum or of gas under pressure by means of tube **7**. The upper portion of the tool shown is covered by a sheet **6** around the outside edge of which there is fitted a ring-shaped welding unit **8**. There is on the curved bottom portion of the tool a central suction hole **10** by means of which the tool is capable of attaching to itself flat blanks.

The insertion of the lining into the container body is effected in the following way: the pre-produced container body **11** shown in FIG. **2** is inserted into an outer holder **13** which supports the sides of container body **11**, the outward-folded flange **12** of container body **11** being preferably made to rest on the top of holder **13**. The material from which the lining is to be made consists of pre-produced roundels **1** of metal foil, preferably aluminium foil, coated with thermoplastic, the coating consisting of a layer of polyethylene or polypropylene, or some varnish that is suitable for lamination.

The lining operation is begun by the inside of tool **3** through tube **7** being connected to a source of vacuum and by the tool being thereafter brought into contact with a pre-produced lining blank. This is preferably done by the tool being lowered towards a pile of plastic-coated roundels of aluminium foil. When the centre portion of the tool has come into surface contact with the uppermost roundel in the pile, this is attached by suction to the tool by means of suction hole **10**. Tool **3** can now be lifted up and will then take with it the uppermost roundel in the pile. While the inside of the tool **3** is still connected to a source of vacuum, the tool is positioned above the container body **11** inserted into holder **13** and is lowered into this. When tool **3** is lowered down into container body **11**, the roundel of metal foil is folded up against the outside of the tool and is sucked into the grooves **5** in the tool. This suction of the roundel **1** of metal foil into grooves **5** is accompanied by the formation of folds in the roundel of metal foil, the design of grooves **5** being such that the folds formed are even.

When the roundel **1** of metal foil has been sucked against tool **3** as shown in FIG. **3***a* and has been sucked into grooves **5** in tool **3**, as shown in FIG. **3***b*, and when tool **3** has been brought to the final position shown in FIG. **3***c*, the inside of tool **3** is connected to a source of gas under pressure through the tube **7**. Instead of being sucked into grooves **5**, the lining **1** is now forced out of the grooves into a position shown in FIG. **3***d*, i.e., the lining forms a largely even inside coating in container body **11**. In order that the contact between lining **1** and the inside of container body **11** may be further improved, it is an advantage if, in conjunction with lining **1** being pressed out of grooves **5** through the action of gas under pressure, tool **3** is rotated by means of shaft **14**. This rotation of the tool also results in the extraction of the tool out of the container body being easier to achieve without the lining being withdrawn as well.

While the tool **3** is still inside container body **11**, the plastic layer of lining **1** is welded to container body **11** along a continuous sealing zone shown at **17** by the dashed line in the vicinity of the opening of container body **11**. This welding or sealing of the plastic layer of lining **1** to container body **11** is carried out with the did of the ring-shaped sealing unit **8** fitted around the upper part of tool **3**. The welding operation may be effected by heat being produced in the sealing unit, and by this heat being then conducted by way of the metal foil layer to the plastic layer and to the wall of container body **11**, and by so much heat being supplied that the plastic layer of the lining is fused with the inner surface of the container body **11**. The heat required for this fusion may also be produced by means of ultrasonic waves or by high-frequency methods. The choice of the welding method used depends on the properties of the material. Thus, it may sometimes be difficult to conduct a sufficiently large quantity of heat through a metal foil layer, since the cooling area of the metal foil is large. High-frequency welding would also seem not to be directly applicable to the sealing of a laminate comprising a layer of metal foil, since the heat quantity produced tends to be concentrated in the layer of metal foil. The most suitable welding method in the present case is probably ultrasonic welding, i.e., mechanical oscillations of ultrasonic frequency are generated in sealing unit **8** which is then brought into contact with the laid-up material layers which are to be welded together; or also "impulse sealing," i.e., sealing with the aid of a unit that by means of impulses of current is heated to sealing temperature. The heat generated in the plastic material shall be sufficient for the materials to be welded together into an impermeable and homogeneous joint.

The packaging container, i.e., the container body **11** provided with the lining, that has been formed can be closed by a thin sheet of material being placed over the opening of the container and welded to the flange **12** of the container body. In order that this cover shall have the same impermeability as the rest of the packaging container, it should also contain a layer of metal foil. In order to enable the cover material to be heat sealed to the packaging container along the flange **12**, the cover material is provided with a coating of plastic which can be welded against the upper side of flange **12**. In order that such welding of the cover material should be possible, it is naturally necessary that the metal foil lining **1** in the packaging container should not extend above the plane of the opening of the container, since any metal foil that may have been folded out over flange **12** would make it impossible to effect a seal between the cover material and the said flange.

The closure of the packaging container may also be effected by the opening of the container body **11** being covered, by means of a conical or hemispherical part that has a flange corresponding to flange **12** of the container body, being placed over the opening of the container body in such a way that the flanges coincide. The two flanges can now be welded together, a bottle-shaped container being obtained.

In order that the impermeability characteristics of the packaging container should not be made worse, the packaging container with the conical upper part **16**, shown in FIG. **4**, should be provided with a lining **15** of metal foil, which is sealed to the conical part **16** along continuous weld joints shown at **17'** and **17''** by dashed lines, the conical part being preferably of the same material as the container body **11**. The metal foil lining **15** can in the case of the packaging container shown in FIG. **4** be made as a flat circular sector consisting of a metal foil coated with plastic. By means of the edges of the sector shown in FIG. **5** being brought together, a conical shape is formed that can be inserted into the conical upper part **16**. It is also of importance here that the metal foil lining should not be allowed to project beyond the flange **18**.

The constructional example of the invention shown here is only intended as an illustration of the idea behind the invention, and it is thus possible, within the framework of the invention, to modify both the shape of the container body and the shape of the part **16** covering the opening of the container body. The invention has proved to be very valuable and is the first solution that we know of, of the problem of obtaining the same

impermeability characteristics in a packaging container of plastic as in packaging container of sheet metal or glass known earlier.

I claim:

1. A substantially impermeable packaging container comprising a container body composed of a thermoplastic material and provided with an upper flange extending outwardly about the top opening of said container, a metal foil lining disposed within said container body and affixed thereto, said metal foil lining being seamless and continuous and shaped to conform with the inside of said container body by overlapping folds extending axially from the base to the edge of the top opening of said container body, a lid member of thermoplastic material and a metal foil lining on the inner side of said lid member, said lining stopping short of the marginal edge of said lid member, the marginal edge of said lid member and the flange of said container body being sealed together to form a closed container.

2. A packaging container as claimed in claim **1** wherein said lid member has the shape of a hollow, truncated cone, provided with and an outwardly extending flange about the bottom thereof said bottom flange being sealed to the upper flange of said container body and said metal foil lining extending substantially over and affixed to the inner conical surface of said lid member.

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