

[54] FLEXIBLE CONTAINERS  
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Attorney, Agent, or Firm—Young & Thompson

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[58] Field of Search..... 150/.5, 52 R, 52 K; 403/5

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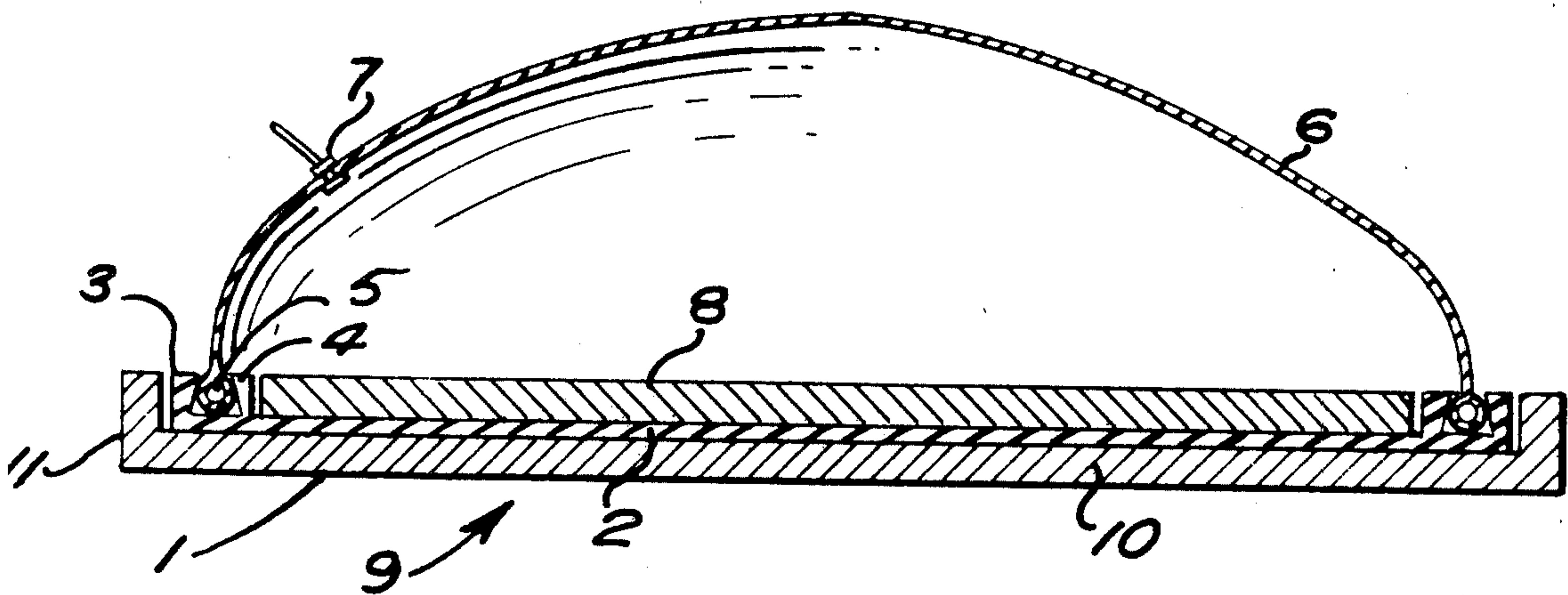
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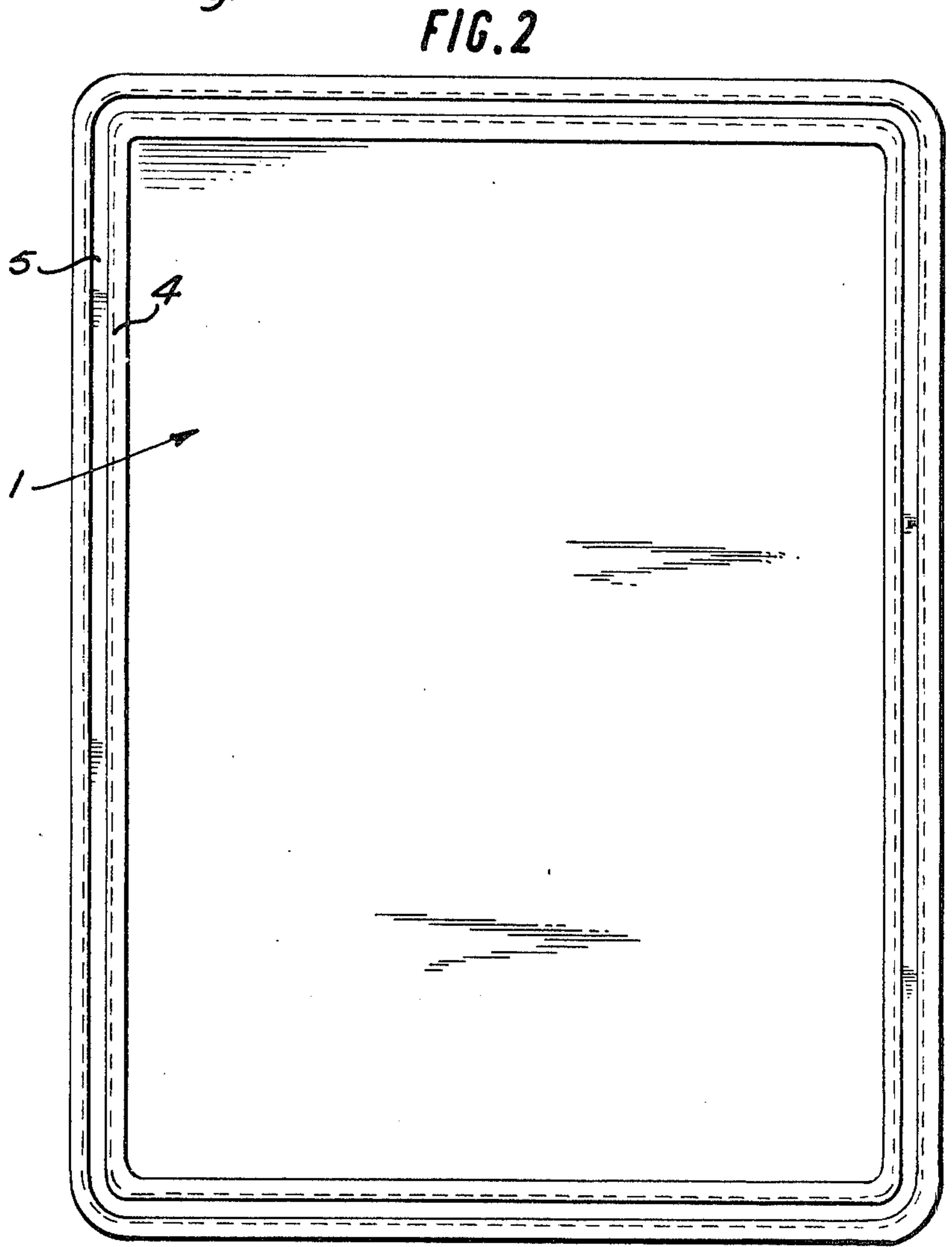
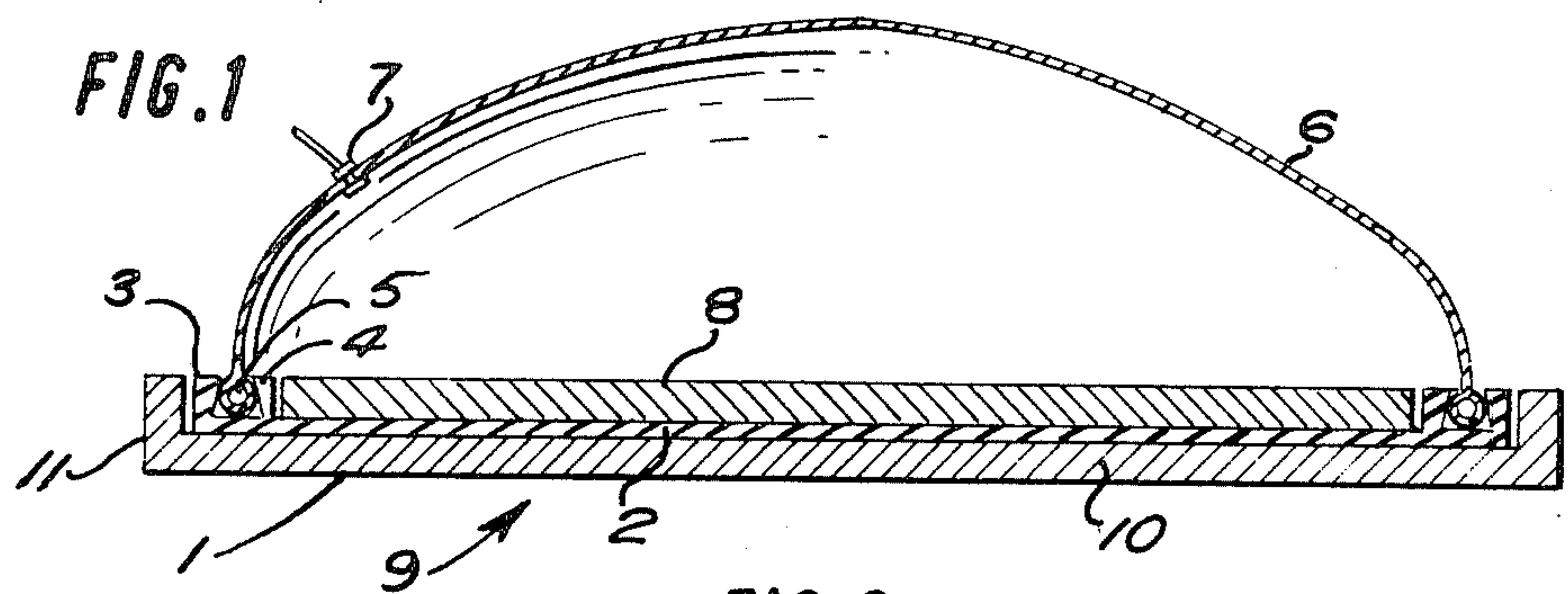
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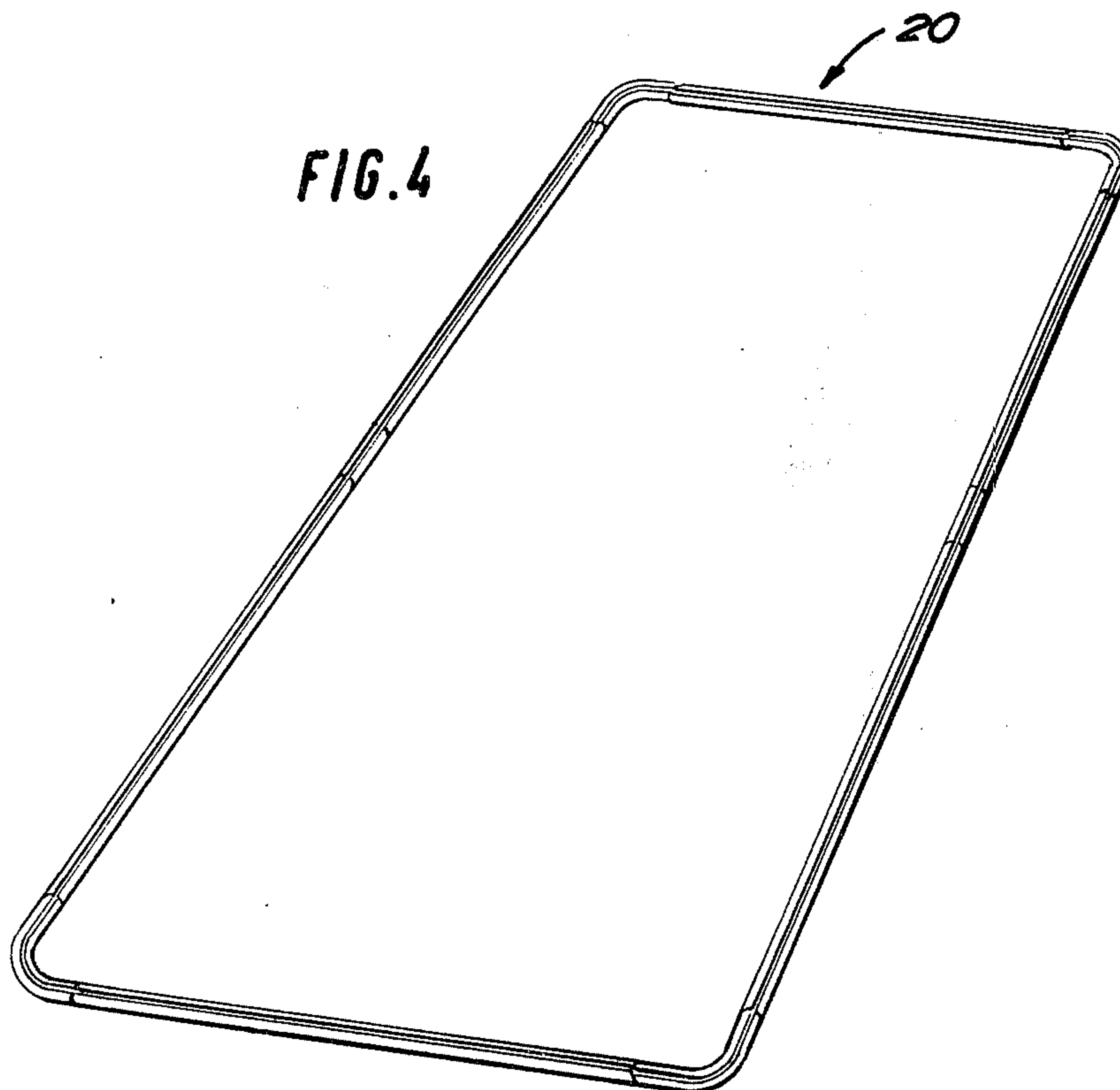
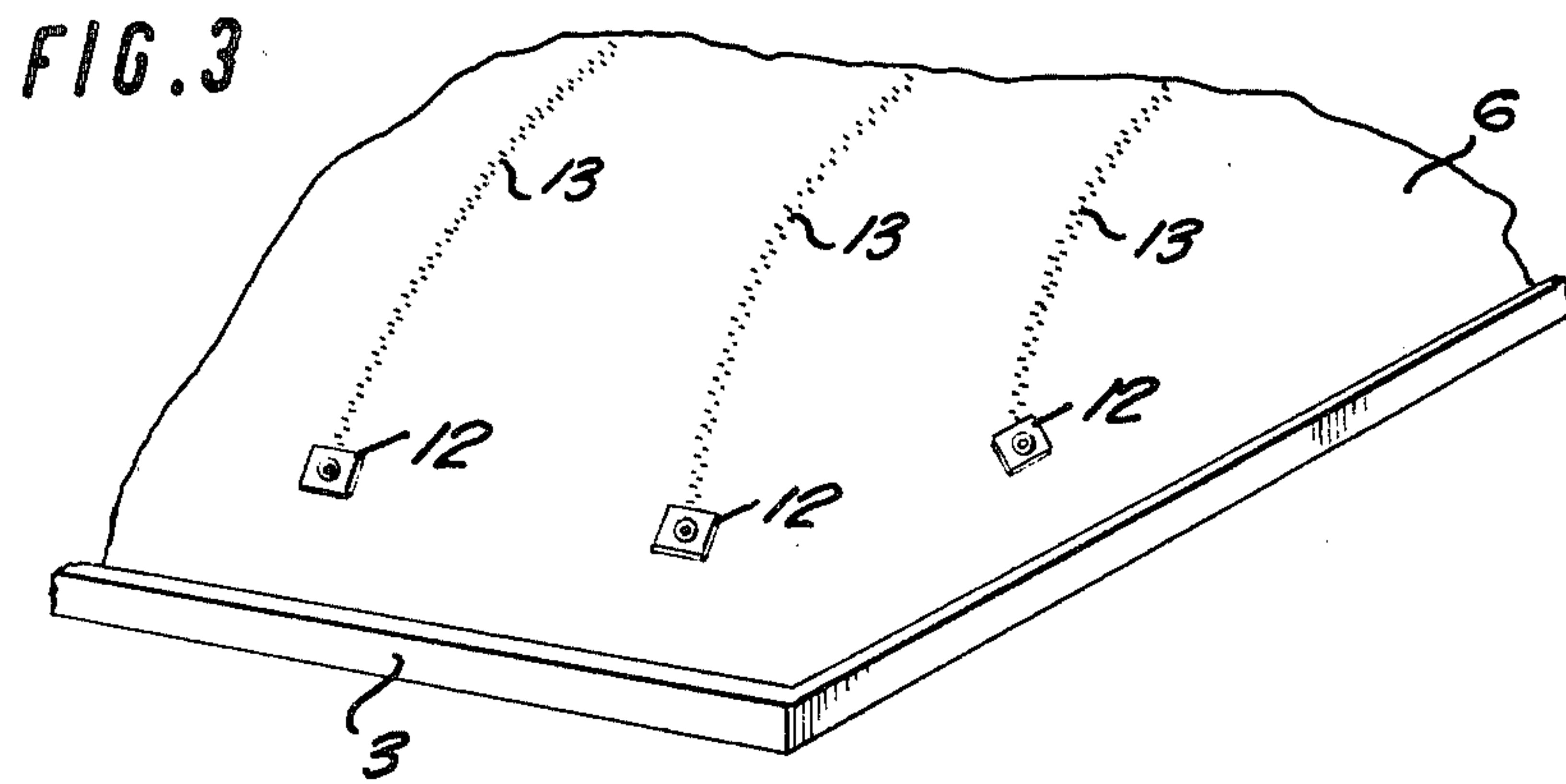
ABSTRACT

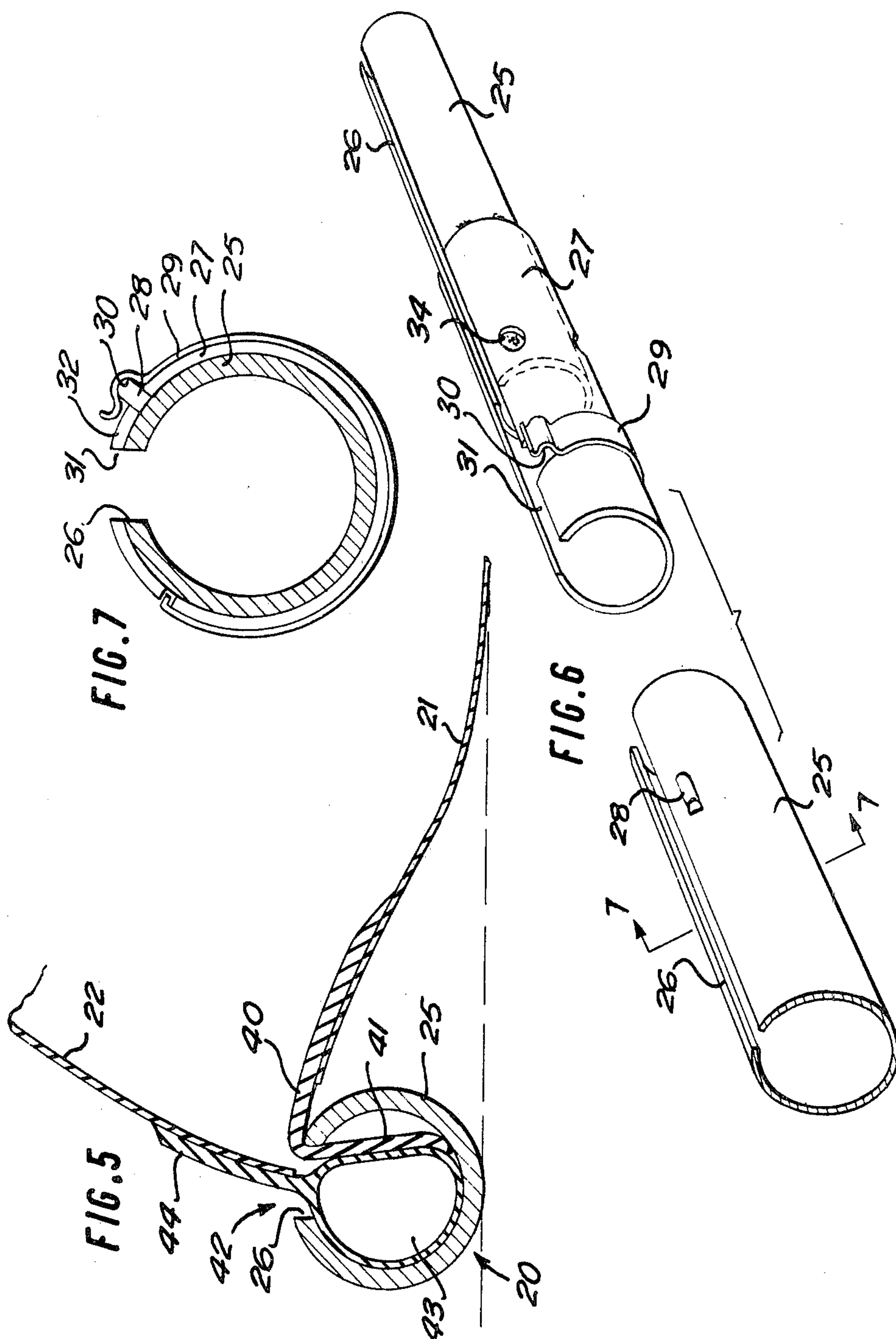
A flexible container, particularly for storage of a vehicle, comprises a flexible impermeable base sheet with an upstanding channel portion around its periphery, the channel portion being integral with the sheet or formed as a separate rigid frame sealed to the base sheet. A flexible impermeable cover has its periphery sealed in the channel by an inflatable seal.

14 Claims, 7 Drawing Figures











## FLEXIBLE CONTAINERS

## BACKGROUND OF THE INVENTION

## 1. Field of the Invention

This invention relates to a flexible container which can be at least partly collapsed by withdrawal of air into movement-restraining and close-fitting engagement with goods within the container when it is assembled.

## 2. Prior Art

In my prior British Specification No. 1191921 there is described a container or carrier for goods comprising an envelope which is formed wholly or partly of flexible impermeable material, an opening being provided in the envelope with re-usable means operable to close and seal the envelope and non-return valve means whereby air may be drawn out of the envelope to collapse it into closely-fitting restraining engagement with the goods. Such a construction however gives rise to problems for very large goods because of the difficulty of re-sealing a large opening and of handling the heavy flexible container and the goods. In my U.S. Pat. No. 3,850,214, this problem is partly overcome by the use of a rigid base having a channel, the cover being sealed in the channel with an inflatable tube. Such a construction however still does not satisfactorily permit of storing heavy vehicles such as trucks because the rigid base must be airtight yet able to support the weight of the vehicle. A rigid base of unitary structure capable of supporting a large vehicle is necessarily very bulky and heavy and hence is not readily portable.

## SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved form of container which is particularly suitable for storing large objects, such as heavy vehicles yet is readily portable.

According to the invention a flexible container comprises a flexible, impermeable base member which includes an upstanding part having a continuous channel encircling an area of the base member, a flexible impermeable cover with sealing means adapted to cooperate with the channel to provide a fluidtight seal therewith sealing the perimeter of the cover to the base member and valve means controlling an outlet for air from the interior of the container whereby suction can be applied to and maintained within the said interior.

Preferably the container is provided with a load-bearing rigid member which is adapted to fit within the upstanding part and is preferably disposed to lie flush with the upstanding part. There may also be provided a further rigid member adapted to underlie and surround the base member so that at least the major part thereof is sandwiched between two rigid members. One purpose of this invention is to provide adequate support for a vehicle such as a tank or other armoured vehicle, which can be driven onto the base member and be supported on the first-mentioned load-bearing member. Subsequently the cover can be fitted into the channel, brought into sealing engagement therewith, and air and moisture extracted from the container so as to collapse the cover into closely-fitting movement-restraining engagement with the vehicle or other heavy goods. The container could however be used without the rigid load-bearing members if desired and in any event the flexibility of the base member would enable it to be stowed in a relatively small space.

The channel may be shaped to be wider below its mouth and the perimeter of the cover may be formed as a tube which is insertable into the channel and inflatable into sealing engagement with the channel. Alternatively the channel may have at least one inflatable liner for gripping the perimeter of the cover to provide a fluidtight seal between the perimeter and the channel; the channel may be provided with two inflatable side-liners for gripping opposite sides of the perimeter of the cover. In yet another arrangement, a separate sealing tube is provided within the channel.

The upstanding part with the channel may be formed integrally with the flexible base member. Alternatively, the channel may be formed of a rigid member; conveniently of a plurality of channel-shaped members which fit together, e.g. with jointing members to form a continuous channel for the reception of the periphery of the cover. Such a rigid member may have a single channel to receive the peripheral portions of both the cover and the base member or may have separate channels to receive and seal the cover and base member.

The cover may be provided with a re-usable openable airtight fastener, preferably consisting of one or more airtight sliding clasp fasteners of the type disclosed in British Patents Nos. 940461 and 1201290. The fasteners may be associated with means to seal any gap between adjacent ends and such means may be as disclosed in British Patent No. 913113.

The cover may be formed with at least one aperture positioned in accord with the expected location of a protrusion of the contents of the container, so that the protrusion can extend through the aperture, which is preferably provided with sealing means for sealing the aperture round the protrusion.

The cover may be formed with eyelets or other anchorages for elastic ropes. Such ropes may serve to hold the cover against the enclosed goods even if the cover itself is punctured accidentally or deliberately.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional view of a container forming one embodiment of the invention;

FIG. 2 is a plan view of the base of the container of FIG. 1;

FIG. 3 is a simplified perspective view of the container of FIGS. 1 and 2 when in use;

FIG. 4 is a perspective view of a frame member used in another construction of container;

FIG. 5 is a section through part of the frame member of FIG. 4 showing a base sheet and a cover secured therein;

FIG. 6 is a part exploded perspective view illustrating one form of jointing usable in the frame of FIG. 4; and

FIG. 7 is a transverse section through part of the frame joint along the line 7—7 of FIG. 6.

## DESCRIPTION OF PREFERRED EMBODIMENTS

The container illustrated in FIGS. 1 to 3 has a flexible impermeable base member 1 made for example of butyl rubber. In this particular embodiment the base member 1 comprises a sheet portion 2 having at its periphery an upstanding part in the form of a rim 3 which, in its upper surface, has a channel 4 surrounding the base. As can be seen from FIG. 2 the base member 1 is generally rectangular with rounded corners and the channel is, in this embodiment, undercut from its mouth 5.



The container also comprises a flexible impermeable cover 6 formed for example also of butyl rubber. The perimeter is adapted to engage the channel 4 to provide a fluidtight seal therewith. For this purpose the periphery of the cover is formed with a flexible tube which can be inserted into the slot and is inflatable into pressure engagement with the walls of the slot. Means are provided in addition for retaining the tube within the channel; the means may take the form of a flap extending from the cover and engageable by means of hooks and eyes with the base portion as disclosed in for example British Pat. No. 1286544 to which reference may be made for further details of an appropriate form of seal.

There is also provided a valve 7 through which suction can be applied to the interior of the container formed by the base and the cover and maintained within the interior of the container. When goods to be stored are disposed over the base and enclosed by the cover, air and accordingly moisture is then drawn out through the valve so as to collapse the cover into close-fitting engagement with the contents of the container. The valve in this embodiment comprises a non-return valve 7 provided in the cover 6 but the valve could be disposed elsewhere, for example in the base member.

The container illustrated in the drawings is particularly intended for use in the transportation or stowage of heavy goods, such as armoured vehicles. The container assembly includes a rigid load-bearing member 8 which is of a size that will fit inside the upstanding part 3 and preferably lie flush therewith. The assembly preferably also includes a further rigid load-bearing member 9 which has a base part 10 and a rim 11 inside which the upstanding part 3 of the base 2 of the container fits so that the base member 1 is sandwiched between two rigid load-bearing members. With this arrangement a heavy vehicle can be driven onto the load-bearing member 8 without causing damage to the base of the container. Even so the container including the base can be rolled up and stowed in a relatively small space or used for other purposes as required.

The cover may be provided with apertures for accommodating protruding parts of the contents and with means for sealing the apertures to those protruding parts. Moreover the cover may be provided with reusable openable airtight fasteners for providing access to the contents of the container if desired. The fasteners may comprise airtight sliding clasp fasteners and if necessary seals of the form described, for example, in British Patent No. 913113 to seal the gap between ends of the clasped fasteners.

FIG. 3 illustrates diagrammatically the container which has been collapsed over its contents. In FIG. 3 is shown the optional features of eyelets 12 for securing elastic ropes 13 which can extend over the top of the cover to retain it in close-fitting engagement with the contents even though the cover itself may be punctured.

The container may include a second valve whereby the container may be filled with nitrogen or some other inert gas if desired.

FIGS. 4 to 7 illustrate a construction used in a further embodiment of the invention. In this embodiment, a rigid frame 20 of generally rectangular form with rounded corners is used as part of the base member, a flexible impermeable sheet 21 made for example of butyl rubber, being sealed to the frame to form a base sheet and a second flexible impermeable sheet 22 used to form a cover is also sealed to the rigid frame 20. The

frame 20 is, for convenience of transport, formed in sections which are jointed together as shown in FIGS. 6 and 7. Referring to these figures, it will be seen that the frame consists essentially of metal tubes 25 which each have a slot 26 extending along the whole length of its upper surface. Suitably shaped lengths of tubes are used at the corners of the frame as shown in FIG. 4. Adjacent lengths of tube 25 are joined together by means of a sleeve 27 (FIG. 6) which fits around the abutting ends of two lengths of tube 25, the frame being assembled together by sliding the ends of the tubes into the sleeve. Each tube 25 may have a locking lug 28, as shown in FIGS. 6 and 7, near one end thereof arranged to co-operate with a spring clip 29 secured around the sleeve. This spring clip is shaped to provide a recess 30 to receive the aforementioned lug. With this construction, the tube 25 is slid into the sleeve 27 with the lug 28 aligned with and extending along a slot 31 in the sleeve 27. When the lug has reached a position adjacent the end of the spring clip, the tube 25 is rotated so that the lug moves into a recess 32 in one side of the slot 31 and is engaged in the recess 30 in the spring clip 29 to be resiliently retained therein. In this retained position, the slot 26 in the tube 25 is aligned with the slot 31 in the sleeve 27. FIG. 6 also illustrates an alternative way of securing a tube 25 in the sleeve 27, which may be more convenient if a permanent assembly is required. The sleeve 27 is provided with a series of holes 34 giving access to the tube 25 inside the sleeve 27 for tack-welding of the sleeve 27 to the tube 25.

In this particular embodiment the base sheet 21 has, around its periphery, a thickened rubber sealing portion 40 (FIG. 4) which is secured by adhesive to the sheet 21 to form an airtight joint. The sealing portion, in use, is bent over as shown at 41 to lie inside the channel of the frame member. The cover 22 has secured to it a sealing portion 42 extending completely around the periphery of the cover, this sealing portion including an inflatable tubular element 43 integrally formed with a thickened outwardly extending lip 44; the outwardly extending portion 44 is sealed with an adhesive to the periphery of the cover sheet 22. In use, the inflatable portion 43 is put inside the channel of the assembled frame and is then inflated through a valve (not shown) at one point along its length so that it expands and seals against the surface of the base sealing member 41.

It will be readily appreciated that various alternative forms of sealing may be employed. The peripheries of the cover sheet 22 and base sheet 21 may extend into the channel, or sealing elements attached to these sheets may extend into the channel and a separate inflatable tube or more than one separate inflatable tube may be provided in the channel to seal the base member and the cover member together or to seal these two members against the walls of the channel.

As in the construction of FIGS. 1 to 3, the cover member and/or the base member is provided with a non-return valve for connection to an air pump so that the air, and hence the moisture in the air, can be drawn out from within the container. The container is collapsed down into closely-fitting engagement with the article or articles within the container.

Instead of having a single channel into which both the cover and the base sheet are sealed, the rigid frame might comprise a member having two channels, for example two channels back-to-back so permitting of the base sheet and the cover sheet to be separately



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sealed and retained in position. This permits of the base sheet being fixed firmly within the rigid frame before a vehicle or other equipment to be stored is placed on the base sheet. The cover can then be put in position and sealed to the rigid frame. As in the arrangement of FIGS. 1 to 3, preferably a rigid base member is put over the sheet. When a rigid frame is used, for storing vehicles, it may be more convenient merely to put two rigid strips along the length of the base sheet to support the wheels of the vehicle as it is driven into position. In some cases, for example if a suitable flat surface is being employed beneath the base sheet, there may be no need to provide such rigid members. In other cases it may be preferable to provide also rigid members underneath the base sheet so that at least the part of the base sheet lying under the track of the vehicle wheels is sandwiched between two rigid members.

The base and/or the cover may be formed with an aperture positioned in accordance with the expected location of a protrusion of the contents of the container and, in such a case, the aperture would be provided with sealing means for sealing the aperture around the protrusion. Alternatively the base and/or the cover may be provided with pockets for the reception of protrusions of the contents.

The above-described construction finds particular application for storing large items such as vehicles, e.g. military vehicles. Provided the fuel tank and radiator are appropriately sealed, it is possible to store vehicles ready for immediate use, it merely being necessary to take the cover off the container and the vehicles are immediately ready to be driven off the base. The container is fully weatherproof and can be used for long term storage of a vehicle already loaded and fully equipped for use. The containers are readily portable and could be located on rough ground or on prepared bases as required.

I claim:

1. A flexible container comprising a flexible, impermeable base member which includes an upstanding part having a continuous channel encircling an area of the base member, a load-bearing rigid member fitting within said upstanding part, a flexible impermeable cover with sealing means adapted to co-operate with the channel to provide a fluidtight seal therewith sealing the perimeter of the cover to the base member and valve means controlling an outlet for air from the interior of the container whereby suction can be applied to and maintained within the said interior.

2. A flexible container as claimed in claim 1 wherein said upstanding part having a continuous channel is formed of a rigid member.

3. A flexible container as claimed in claim 2 wherein said continuous channel is formed of a plurality of channel-shaped members which fit together to form a continuous channel for the reception of the periphery of the cover.

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4. A flexible container as claimed in claim 2 wherein said continuous channel is arranged to receive the periphery of the cover and of the base member.

5. A flexible container as claimed in claim 2 wherein the cover is formed at its perimeter as a tube which is insertable into the channel and inflatable into sealing engagement with the channel.

6. A flexible container as claimed in claim 1 wherein said sealing means comprises an inflatable tube in said channel.

7. A flexible container as claimed in claim 6 wherein the inflatable tube is integrally formed around the perimeter of said cover.

8. A flexible container as claimed in claim 6 wherein said inflatable tube is formed as a liner for said channel.

9. A flexible container as claimed in claim 1 wherein said continuous channel is formed integrally with the flexible base member.

10. A flexible container as claimed in claim 1 wherein said load-bearing rigid member has an upper surface lying flush with the top of said upstanding part.

11. A flexible container as claimed in claim 10 and having a second rigid member adapted to underlie and surround the base member with at least a major part of the base member sandwiched between the two rigid members.

12. A flexible container comprising a base member formed of a flexible impermeable sheet having an integral raised upstanding portion extending continuously around the periphery of the sheet, said upstanding portion having a continuous uniform section channel therein, said channel having a mouth narrower in transverse dimension than the channel section into which the mouth opens, at least one rigid member on the upper side of said base fitting within said upstanding part to form a load-bearing member, a cover comprising a sheet of flexible impermeable material having an inflatable tube sealed to the cover sheet around the periphery thereof, the length of the cover sheet periphery being substantially equal to the length of the channel, the tube being dimensional so as to be able when uninflated to pass through said mouth but, when inflated to form a fluidtight seal in said channel, and a non-return valve in at least one of said cover sheet and said base sheet.

13. A flexible container comprising a flexible impermeable base sheet, a flexible impermeable cover sheet, non-return valve means in at least one of said sheets for the extraction of air, a rigid frame around the periphery of the base and having a single continuous channel therein and a single inflatable tube sealing the peripheries of both the cover sheet and the base sheet in said channel.

14. A flexible container as claimed in claim 13 wherein said inflatable tube is carried on the periphery of the cover sheet.

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