United States Patent [19]

Hastings et al.

[11] **3,729,754**

[45] **May 1, 1973**

[54] INFLATABLE AIR CUSHION ARTICLE

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[73] Assignee: **Canam Manufacturing & Packaging Limited,** Ontario, Canada

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[52] **U.S. Cl.**.....**5/348,** 137/223

[51] **Int. Cl.**.....**A47c 27/08**

[58] **Field of Search**.....5/348, 349, 350, 5/337; 137/317, 320, 223

[56] **References Cited**

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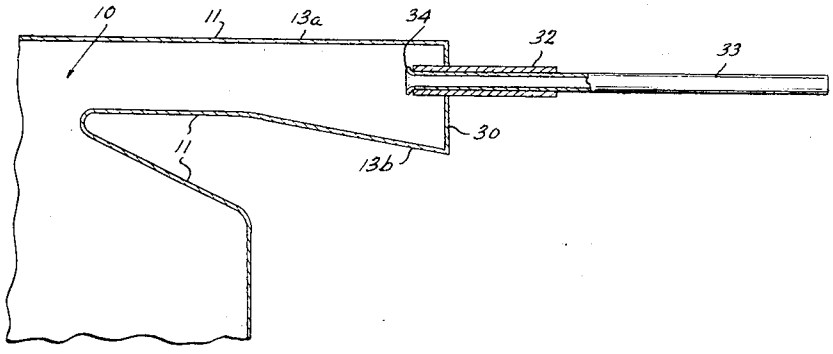
Assistant Examiner—Andrew M. Calvert
Attorney—Peter Kirby et al.

[57] **ABSTRACT**

Two plies of polyethylene sheet material are sealed around their edges to form an air-tight enclosure for use as a cushion or the like. A valve preventing escape of air is constituted by a narrow elongated neck formed of the plies themselves, separate valve elements being avoided. The valve effect is due to tension in the material at the neck. The article is inflated through a tube sealed into an extension of the valve neck. In a modification, a second tube is slidably mounted within the first tube to assist in desired deflation.

6 Claims, 9 Drawing Figures



2 Sheets-Sheet 1

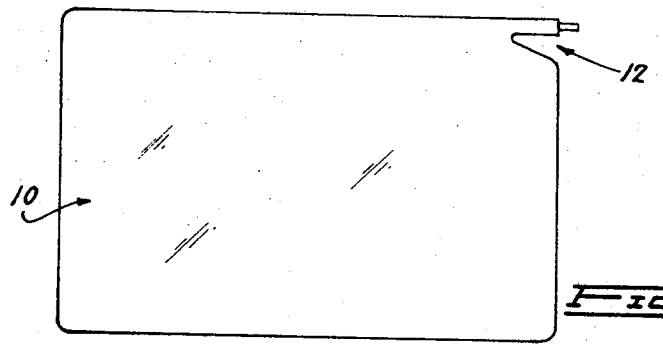


Fig. 1.

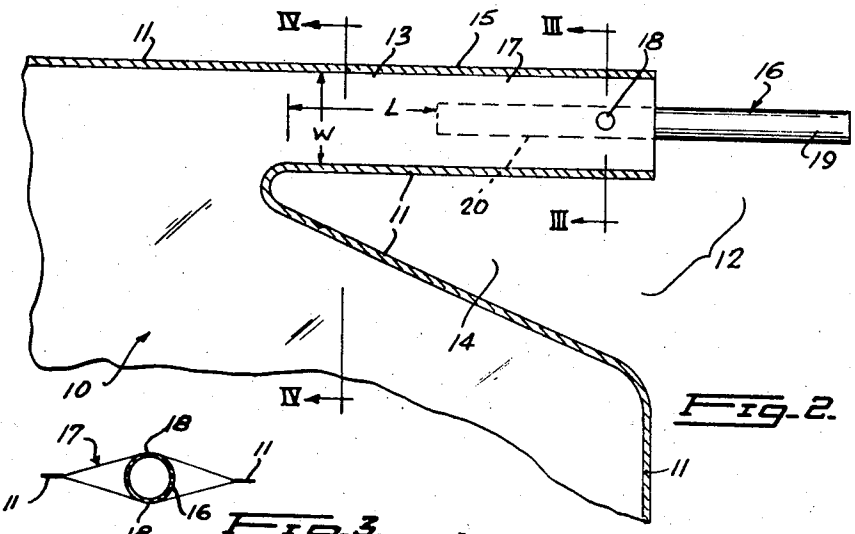


Fig. 2.

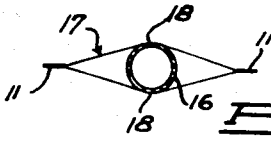


Fig. 3.

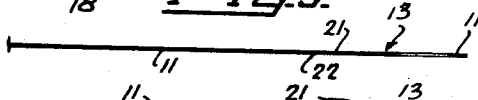


Fig. 4.

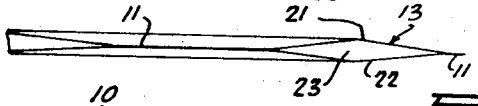


Fig. 4a.

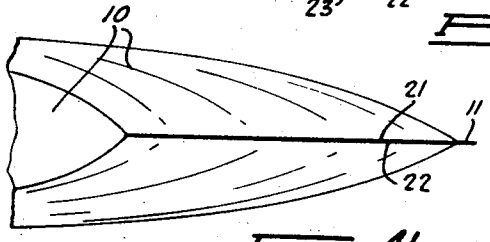


Fig. 4b.

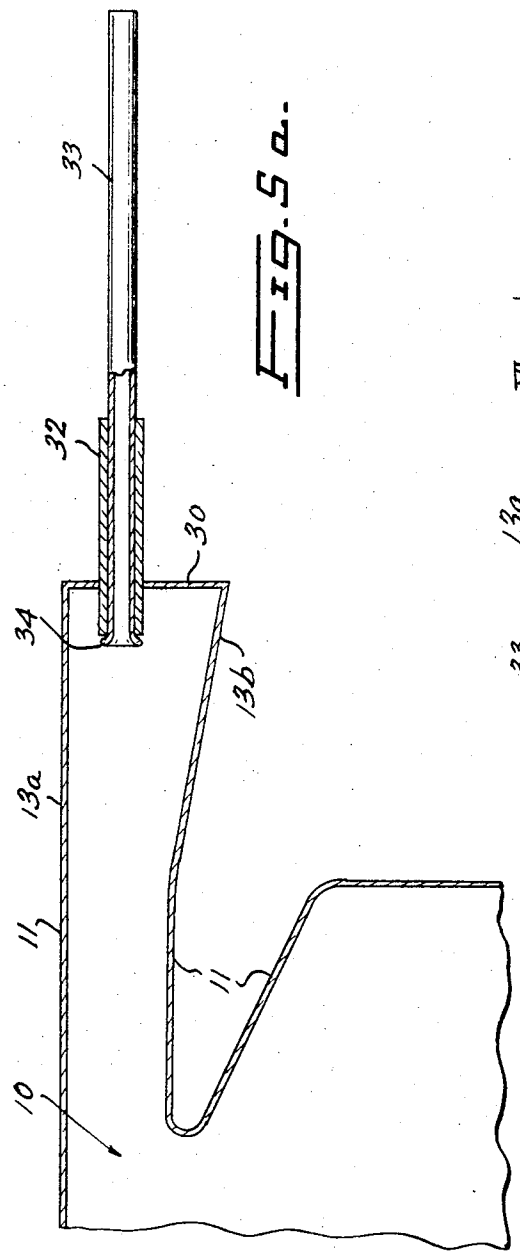


Fig. 5a.

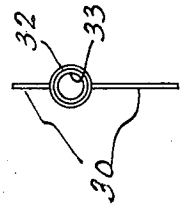


Fig. 6.

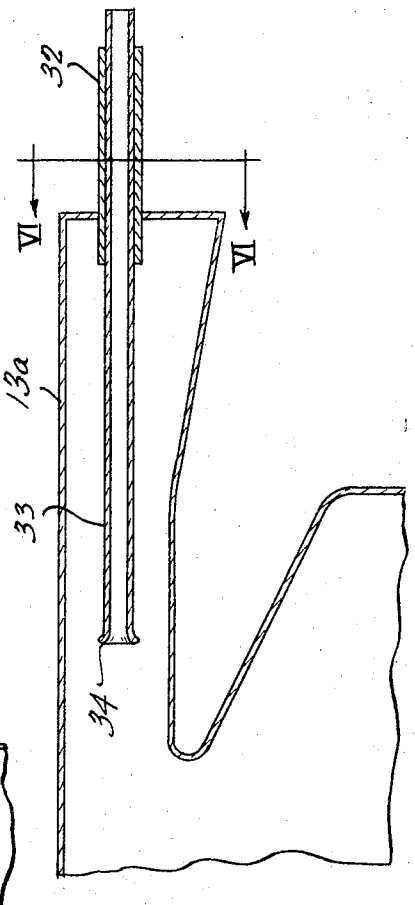


Fig. 5b.

INFLATABLE AIR CUSHION ARTICLE

This invention relates to improvements in air inflatable articles such as cushions, pillows, mattresses and the like, hereinafter referred to for convenience simply as cushions or articles.

The main object of the invention is to provide a form of air cushion that is especially cheap to manufacture and that is simple to use.

It is envisaged that one of the principal uses of the invention will be to provide air cushions that are so cheap that they can be treated as expendable. For example, they may be used as pillows for airline or other travellers, or for hospital patients, the articles being discarded after a single use for hygenic reasons. In any event, it is expected that the cost of the articles will be less than or about the same as the expense that would be involved in laundering conventional linen pillow covers.

For reasons of storage and transportation it is important that the articles should lie flat and be non-bulky when not in use. This is a significant advantage that an inflatable article has over a conventional pillow filled with solid stuffing material. On the other hand, an inflatable article requires some means for inflating it, as well as some means for keeping it inflated, such as a valve or stopper. Since the body of the article itself can readily be made of one of the plastic materials, such as polyethylene, now available very cheaply, the main expense in manufacturing such articles usually arises from the need for a valve or some equivalent structure for maintaining the article inflated.

This part of the article, i.e. the valve, is also the one most prone to malfunction or to misuse by the user. It is foreseen, for example, that inflatable pillows constructed in accordance with the present invention may well be suitable for distribution free or for a small charge at sports events, where the spectators' seats are often no more than hard benches. The spectators themselves would blow air into the articles, then using them as cushions to sit on. In this context the articles must be simple to operate, reliable and sturdy enough to support the weight of a man, say up to 250 pounds, for at least a few hours. These requirements, combined with cheapness and simplicity, are the basic criteria that the present invention is called upon to satisfy.

That the articles should be capable of subsequent deflation (other than by destruction) with later re-inflation, is not an essential requirement of the present invention in its broad scope, although the preferred form of the invention does have this added feature, at least in some measure, that is to say at least in respect of a few re-inflations. This is a feature that may be desirable in certain fields of applications of the articles. Generally speaking, however, the chief practical utility foreseen for such articles will be in areas where a single inflation is all that is required. After use the articles will probably be destroyed by being slashed with a knife, as the quickest way of ensuring complete deflation while rendering the remnants compact for convenient garbage disposal. There may even be some situations where re-inflatability would be considered a disadvantage, either for reasons of hygiene or commerce.

The key to the manufacture of inflatable articles meeting the above criteria is a simple, inexpensive, and yet reliable valve for incorporation in such articles.

The present invention is based on the discovery that any valve elements as such, that is to say conventional elements such as flaps, clamps or the like provided for the express purpose of constituting a valve, can be entirely dispensed with, since the adjacent plies of the material of the article itself can be caused to perform the valve function, provided that such plies are formed into a narrow elongated neck of appropriate dimensions.

The invention may be broadly defined as an inflatable air cushion article having a body portion and a valve portion,

a. the body portion comprising two plies of flexible, essentially non-stretchable material sealed around the edges to close the body except at the valve portion,

b. said valve portion comprising an elongated neck defining a passageway extending from the interior of said body to the exterior of the article, said neck being formed of said material plies,

c. and the length and width of said passageway being such that with the article inflated the resultant tension in said neck retains the plies thereof tightly together to prevent escape of air through said passageway.

One of the most readily available and convenient materials to use is polyethylene. It is cheap, light and readily heat sealed around the edges. Furthermore, when of adequate thickness, say 0.007 inch or more, it is sufficiently tough and durable for the duties likely to be imposed on it. In calling for an "essentially non-stretchable material" it is intended to exclude resilient materials such as rubber. It is found that such materials will not retain the necessary tension in the neck plies required to hold the valve closed. Polyethylene will eventually stretch, if subjected to sufficient tension, but such stretching constitutes destruction of the material and is non-reversible. Thus the term "essentially non-stretchable" is intended to mean that the material exhibits no appreciable elongation and particularly no elastic elongation under the tension it is designed to withstand, and that when it does finally yield and stretch this effect is the result of the material having been effectively destroyed by being subject to a tension higher than that for which it was intended.

A manner in which an article according to the invention may be constructed is illustrated diagrammatically in the accompanying drawings. It is to be understood that the article illustrated is shown by way of example only and not by way of limitation of the broad scope of the invention, which latter is defined in the appended claims. In the drawings:

FIG. 1 is an overall top view of the article prior to inflation;

FIG. 2 is an enlarged fragmentary view of the valve portion of the article of FIG. 1;

FIG. 3 is a section on the line III—III in FIG. 2;

FIG. 4 is a section on the line IV—IV in FIG. 2;

FIG. 4*a* is the same section as FIG. 4, but showing the article during the course of inflation;

FIG. 4*b* is the same section as FIG. 4 once the article has been fully inflated,

FIG. 5*a* is an enlarged fragmentary view of a modified valve portion, this view corresponding generally to FIG. 2;

FIG. 5*b* is the same as FIG. 5*a*, but showing the parts in a different position; and

FIG. 6 is a section on the line VI—VI in FIG. 5b.

The article comprises a body portion **10** composed of two generally rectangular plies of polyethylene sheet, the plies being heat sealed together around their edges (shown at **11** in FIGS. 2 to 4) to form a closed, air-tight enclosure; and a valve portion **12** providing access to the interior of such enclosure.

The valve portion **12** consists of an elongated neck **13** recessed into one corner of the article between a cut-out **14** and the nearer side edge **15**. Although the valve portion **12** could be located elsewhere around the perimeter of the body portion **10**, it is convenient to locate it at one of the corners for three reasons: firstly, there is convenience of manufacture; secondly, the more remote location at a corner is preferable if the article is to be used as a pillow supporting the user's head; and thirdly, the valve functions better when the neck forms almost a direct continuation of an edge, due probably to a certain measure of stiffness that such edge contributes to the closing action of the valve. It should also be noted that the cut-out **14** is not essential and that the neck **13** could be formed between a seal in the side edge and a second seal extending inwardly from an end edge, or even between a pair of generally parallel seals extending into the body of the article from any location on the perimeter thereof.

A semi-rigid tube **16** of polyethylene, or other material compatible with the material of the plies, is inserted into an extension **17** of the neck **13** and is fixed in place by heat sealing at **18**. Although compressible between the fingers, the tube **16** is rigid enough to ensure that it normally remains open, defining a conduit for air between its outer end **19** which constitutes a mouthpiece and its inner end **20** which communicates with the neck **13**.

When the article is inflated by blowing air along the tube **16** from the exterior, such air readily parts the plies **21** and **22** of the passageway **23** defined by the neck **13**, in the manner shown in FIG. 4*a*. However, once the article has been inflated and no more air is being introduced from the exterior, the tension created in the plies **21**, **22** by the bulging nature of the body portion **10** and the air pressure therein is sufficient to cause such plies to press tightly against each other and act as a valve preventing escape of air (FIG. 4b). The property of polyethylene that renders it susceptible to the accumulation of electrostatic charges may also be a contributing factor, but principally the phenomenon is one of tension in the neck plies **21**, **22**, since the valve effect can be destroyed and the air released from the article by disturbing the stress conditions in the vicinity of the neck **13** with the fingers, for example by applying squeezing pressure against the two plies a short distance inwardly from the inner end of the neck **13**. Such pressure forces the plies to bulge less at this location, releasing the tension across the neck. Another way of releasing the air is to compress the neck lengthwise, forcing the inner end of the tube **16** up into or even just towards the body end of the neck, i.e. shortening the neck beyond a critical length.

While the exact value of the critical length of the neck **13** (which obviously must not be too short), and the critical width of the passageway **23** defined within the neck (which obviously must not be too wide), are factors that will depend on one another, on the thickness of the plies and on the nature of the material of the plies, it can be said that satisfactory results have been obtained in a cushion of polyethylene sheet of 0.007 inch thickness; and length and width of body of **18** by 13 inches; with a neck length L of one-half inch and a neck passageway width W of five-sixteenths inch.

The neck length L can be increased say up to 1 inch, but if it is increased too much it becomes more difficult to fill the article during the inflation stage. The width W has been increased to three-eighths inch without loss of the valve effect, but this value is believed to be approaching the upper limit for W, given the other parameters mentioned. A diameter for the tube **16** of three-sixteenths inch has been found satisfactory.

When only small loads are required to be supported, e.g. when the article is to be used as a head pillow, a thinner gauge of polyethylene can be used, such as 0.004 inch, or even 0.002 inch. Conversely when heavy loads and hence higher internal pressures are to be resisted by the plies, both at the valve portion and in the body portion, the material gauge will require to be at least 0.007 inch.

In the alternative embodiment of the invention illustrated in FIGS. 5*a*, 5*b* and **6** the body portion of the article remains essentially unchanged, continuing to be composed of a pair of plies heat-sealed around their edges as shown at **11**. In the embodiment of FIGS. 5*a* to **6**, the neck, now designated **13***a* has been further elongated to include an outwardly flaired portion **13***b*. The plies have also been sealed together at the end of the neck portion **13***b*, as shown at **30**, this seal **30** tightly embracing and being sealed to a plastic tube **32**. Slidably fitted within the tube **32** is an inner tube **33** which can move between the two positions shown in FIGS. 5*a* and 5*b*, respectively. At its inner end, the tube **33** is flaired out slightly at **34** to prevent its moving outwardly beyond the position of FIG. 5*a*.

The article is inflated in essentially the same manner as described in connection with the first embodiment. Air is blown through the tube **33** to pass along the neck **13***a* into the body of the article. This inflation process can be carried out with the tube **33** in either of the positions shown. However, once the article has been inflated, the tube **33** must be moved to its withdrawn position (FIG. 5a) whereupon, as before, the tension created in the plies by the bulging nature of the body portion of the article and the air pressure therein causes such plies to press tightly against each other and act as a valve in the neck **13***a* preventing escape of air from the article.

When it is desired to deflate the article, the tube **33** is pushed into or towards its inner position (FIG. 5*b*).

We claim:

1. An inflatable air cushion article having a body portion and a valve portion,

a. the body portion comprising two plies of flexible, essentially non-stretchable sheet material sealed around the edges to close the body except at the valve portion;

b. said valve portion comprising an elongated neck defining a passageway extending from the interior of said body to the exterior of the article, said neck being formed of said material plies;

c. the length and width of said passageway being such that with the article inflated the resultant tension in said neck retains the plies thereof tightly drawn together to prevent escape of air through said passageway;

d. a semi-rigid tube sealed into said neck for inflating the article; and

e. an inner tube slidably mounted within said semi-rigid tube, said inner tube being movable between a withdrawn position remote from the tightly drawn together plies of said passageway and an inner position in which said inner tube forces said plies apart to allow escape of air through said passageway and said inner tube.

2. An article according to claim 9, wherein said article is generally rectangular and said valve portion is recessed into a a corner thereof.

3. An article according to claim 9, wherein said material is polyethylene.

4. An article according to claim 9, wherein said material includes polyethylene of a gauge between about 0.002 and about 0.007 inch, the length of said neck passageway being not less than about one-half inch and the width of said passageway being not greater than about three-eighths inch.

5. An article according to claim 9, wherein said material is a laminate of polyethylene sheet and paper.

6. An article according to claim 5, wherein said neck is formed to coincide with a bond between the polyethylene sheet and the paper.

* * * * *