United States Patent

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[54] **INFLATABLE CUSHIONS OF UTILITY AS JACKS**

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[51] **Int. Cl.**.....**B66f 3/24**

[58] **Field of Search**.....254/93 HP; 280/150 AB

[56] **References Cited**

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[57] **ABSTRACT**

A method for manufacturing an inflatable cushion of utility as a jack. The cushion is made from a piece of fabric coated with elastomer and comprising a polygonal bottom wall and a top wall which includes triangular portions between which are circumferentially interposed gores. The top wall is formed by folding over the triangular portions onto the bottom wall and securing the gores to the triangular portions, as by an adhesive or vulcanization. If desired, a reinforcing and retaining disc can be secured to the outer and/or inner face of the upper wall. A center inflating valve may be secured to the center of the upper wall.

8 Claims, 5 Drawing Figures

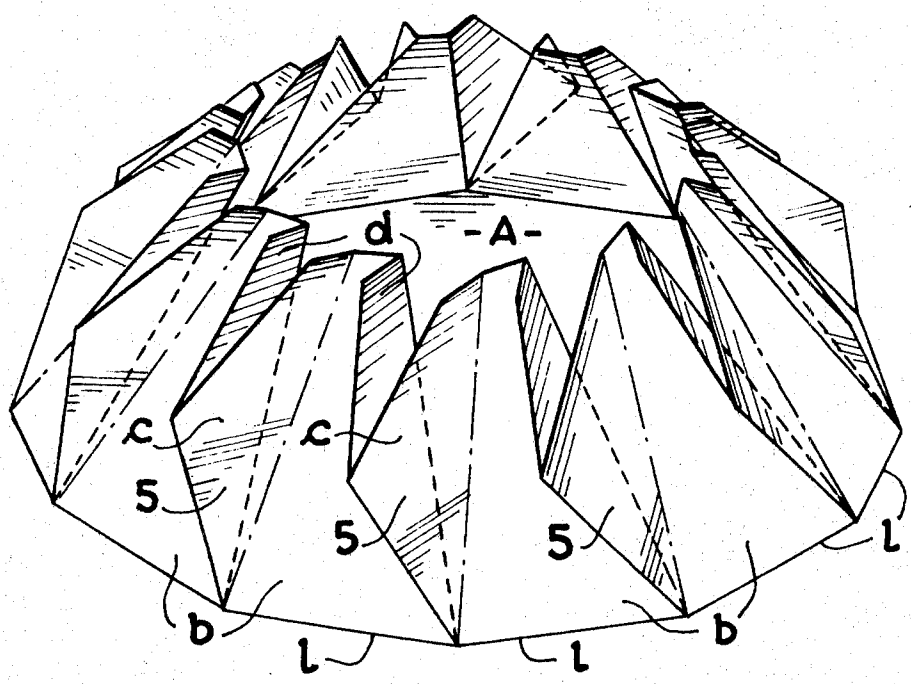


Fig.1

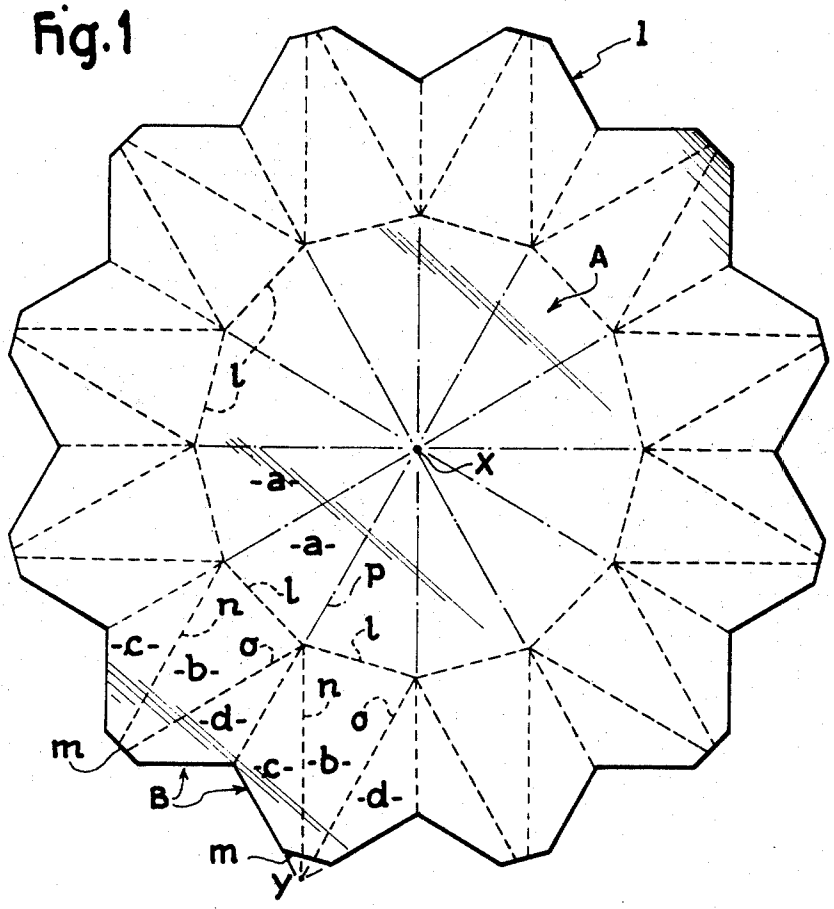
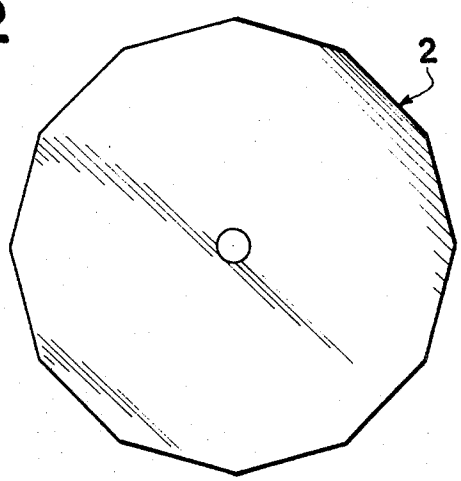


Fig.2



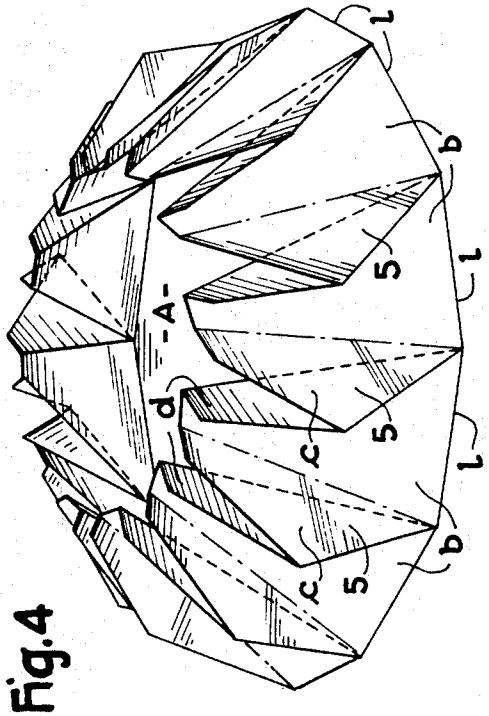


Fig.4

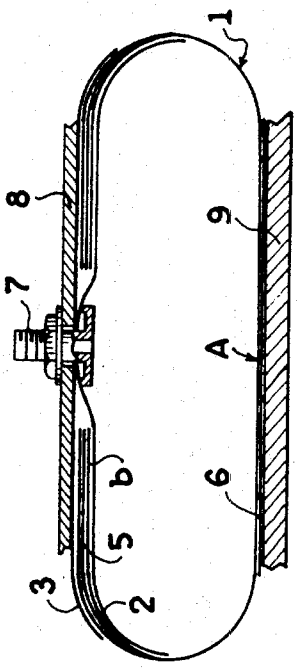


Fig.5

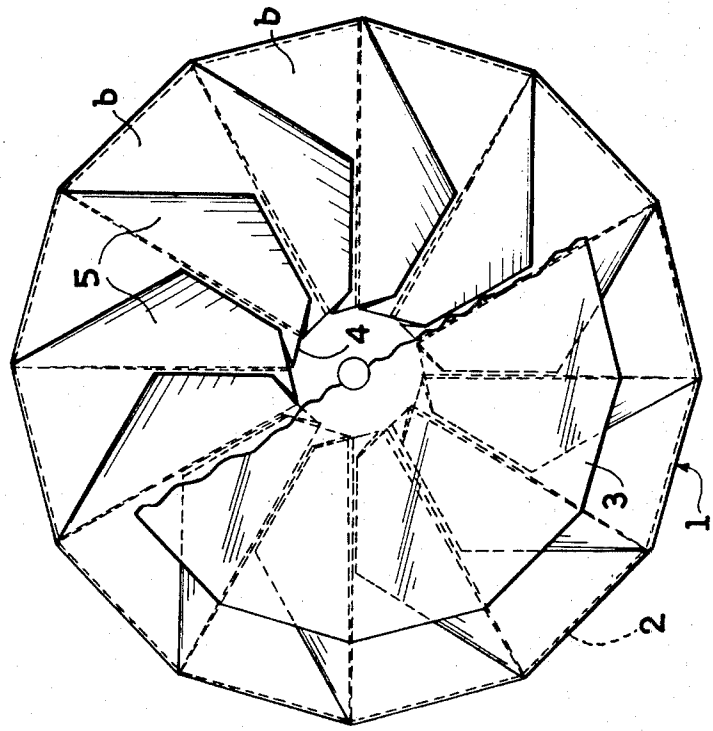


Fig.3

INFLATABLE CUSHIONS OF UTILITY AS JACKS

The present invention relates to flexible jacks or raising cushions which comprise a perfectly fluidtight, very strong container composed of fabric coated with elastomer and inflatable with a fluid under pressure. This fluid, which may be a gas or a liquid, develops on the surface of the cushion placed under a load a force proportional to the internal pressure and to the bearing face whereby it is possible to raise the load.

Such cushions, when circular in shape, are manufactured at the present time either by moulding rubber with interposition of fabric or canvas, or by means of pieces of fabric coated with elastomer which are cut out in the form of a disc, these pieces being superimposed on each other and their peripheries welded together.

The first-mentioned procedure requires costly tooling and, bearing in mind that a fabric or canvas must be embedded inside the rubber in the course of moulding, the process is rather difficult to carry out. Moreover, it is impossible to obtain flexible jacks having a small height when under no load.

The second procedure gives rise to no major difficulty in manufacture but has the drawback of creating a zone of decreased resistance in the peripheral welding, that is, where the material is subjected to maximum stress. Further, when the jack is adapted to operate a very large number of times, the elastomer, which is subjected to alternating stresses, has a tendency to slip or flow within the weld which is liable to weaken the adhesion between the layers and consequently reduce the overall strength of the cushion.

An object of the invention is to provide a method employing the aforementioned second procedure but in which the drawbacks are avoided.

The invention provides a method comprising preparing a piece of fabric coated with elastomer and having a generally polygonal shape wherein a regular polygon defines a bottom wall divided into triangular sector portions each of which is extended by a peripheral portion which is approximately in the shape of a polygon having an apex which is symmetrical to the center of the bottom polygon with respect to the corresponding side of the bottom polygon, forming a folding line along each side of the bottom polygon so as to permit an inward folding over of the corresponding peripheral polygonal portion, forming in the peripheral polygonal portions fold lines which are such that when folding inwardly they define in each peripheral polygonal portion a cover triangular portion superimposed on a corresponding triangular sector portion, and in two adjacent peripheral polygonal portions, two residual triangular portions which are superimposed and constitute a gore which is foldable in the flat state onto or under one of the adjacent cover triangular portions, and, after folding over, adhering all of the gores to the cover triangular portions so as to constitute the upper part of the wall of the cushion.

This arrangement, while it permits manufacturing the cushion in the flat state by folding, folding over and adhesion, creates in the wall an absolute continuity of the resisting material which is mainly the fabric of which the basic part is made, so that there is no region of reduced resistance in the finished cushion and that, for a given quality of fabric and given overall size, the cushion has a working capacity superior to that of cushions manufactured by the edge-to-edge welding of superimposed discs.

It is advantageous that before folding over the peripheral polygonal portions, a disc, whose shape roughly coincides with that of the bottom polygon, be superimposed on the latter and that the peripheral cover triangular portions be interconnected by adhesion to said discs, the residual triangular portions superimposed in pairs being adhered to each other and advantageously rendered stationary in contact with the top of the cover triangular portions by a second retaining disc which is applied and adhered to the upper part of the wall.

By adhesion is generally meant any method of connecting rubber to itself, whether it concerns cold adhesion or hot vulcanization.

Further features and advantages of the invention will be apparent from the ensuing description with reference to the accompanying drawings.

In the drawings:

FIG. 1 is a plan view of a piece of cut-out fabric adapted to constitute the main element of the inflatable cushion;

FIG. 2 is a view of a polygonal disc which can be superimposed on the center polygonal portion of the piece of fabric shown in FIG. 1;

FIG. 3 is a view of a cushion manufactured in the flat state from the elements shown in FIGS. 1 and 2;

FIG. 4 is a perspective view showing the inward folding over of the peripheral part of the piece shown in FIG. 1 which forms gores, and

FIG. 5 is a diagrammatic sectional view of the inflated cushion.

The piece of fabric 1 coated with elastomer shown in FIG. 1 has the shape of a rosette consisting of a regular dodecagonal bottom portion A which defines between the center X and the respective sides *l* triangular sector portions *a* and twelve peripheral polygonal portions B which are in the extension of the triangular sector portions *a* and have a virtual apex Y which is symmetrical with the center X with respect to the corresponding side *l*.

The polygonal portions B are approximately pentagonal portions, but as the apices Y are truncated at *m* along lines parallel to the sides *l*, they are in fact hexagonal portions having the line X–Y as axis of symmetry.

The sides *l* constitute folding over lines by means of which it is possible to superimpose on the triangular sector portions *a* triangular portions *b* formed in the polygonal portions B by fold lines *n o* intersecting the apex Y and ends or corners formed by the sides *l*. In order that this folding over be possible without rolling or creasing, it is necessary to give to the polygonal portions B an outer contour which, in the whole of the rosette, gives a toothed shape so that, in two adjacent polygonal portions B, the residual triangular portions *c d*, having as common side the extension of the radial side *p* common to the corresponding two triangular sector portions, can be superimposed on each other and form a gore 5 which can thereafter be folded flat on the back of one of the adjacent triangular portions *b*. This folding over operation is shown diagrammatically in FIG. 4.

A disc 2 having a regular dodecagonal shape and the same size as the dodecagonal portion A is also cut from a sheet of coated fabric and superimposed on the dodecagonal portion A. Then the cover triangular portions *b* are made to adhere to the inner disc 2. The pairs of triangular portions *c d* of each gore are adhered to each other and all the gores are maintained in contact with the triangular portions *b* by means of a reinforcing circular or polygonal disc 3 composed of fabric (FIG. 3) which is adhered to the top of the gores and on the adjacent free surface of the triangular portions *b*.

A reinforcing fabric disc 6 can also be provided on the underside of the dodecagonal portion A (FIG. 5).

The truncations *m* of the polygonal portions B define, after folding over, a center opening 4 for accommodating an inflating valve 7 which can be so arranged as to retain a plate 8 employed as a bearing surface for the load to be raised, the bottom wall of the cushion bearing against a plate 9.

It will be understood from the foregoing description and from FIG. 5 that the fabric of the basic piece 1 extends in a continuous manner throughout the section of the raising cushion, irrespective of the angle at which this section is taken so that there is no zone of reduced strength.

Further, the surfaces on which the assembly is effected, namely the superimposed surfaces in the form of gores of the triangular portions *c d* are very large so that the assembly is very strong. This is all the more true that these assembly surfaces are for the most part in contact with the upper plate 8 and, that, as experience has shown, these bearing zones are practically stress-free. Consequently, in the flexible jack according to the invention no zone of adhesion is subjected to stress. It may be added that, owing to the regular arrangement of the various folded or folded over portions, an automatic manufacture is possible and the manufacturing cost is consequently much lower than in the manufacture of moulded cushions.

As compared to the moulding method for producing cushions, the method according to the invention avoids the expense of a mould. This is of particular interest in the case of the manufacture of relatively small batches.

It must be understood that the invention is also applicable to a base polygon having any number of sides, the dodecagonal shape having been given merely by way of example. Further, the gores 5 may be folded flat not on the outer face or back of the folded over cover triangular portions *b*, as shown, but on their inner face.

Having now described my invention what I claim and desire to secure by Letters Patent is:

1. An inflatable lifting jack in the form of means defining an airtight cushion, the cushion comprising a wall which is made from a piece of fabric coated with elastomer and is in one piece, said piece having in the non-inflated condition of the cushion a plane bottom wall portion in the shape of a polygon and an upper wall portion in superposed relation to the bottom wall portion and comprising overlapping assemblies of gores and polygonal portions of the piece of fabric, each of which overlapping assemblies is located in the region of a polygonal sector portion of said bottom wall portion, and means for supplying air to the interior of the cushion.

2. A jack as claimed in claim 1, further comprising two retaining and reinforcing discs attached respectively to an outer face and to an inner face of said upper wall portion of the cushion.

3. A jack as claimed in claim 1, wherein the means for supplying air comprise an inflating valve mounted in the center of said upper wall portion.

4. An inflatable lifting jack in the form of means defining an inflatable airtight cushion, the cushion comprising a wall which is made from a piece of fabric coated with elastomer and is in one piece, said piece having in the non-inflated condition of the cushion a plane bottom wall portion in the shape of a polygon and an upper wall portion which is in superposed relation to the bottom wall portion and comprises first portions co-extensive with corresponding portions of the bottom wall portion and pleat portions in alternating relation to the first portions in the upper wall portion, the pleat portions being in a condition folded flat against the first portions, means for maintaining the pleat portions folded against the first portions upon inflation of the cushion, and means for inflating the cushion.

5. A jack as claimed in claim 4, wherein said maintaining means comprise adhesive between adjoining faces of the pleat portions and the first portions of the upper wall.

6. A jack as claimed in claim 4, wherein said maintaining means comprise vulcanization between adjoining faces of the pleat portions and the first portions of the upper wall.

7. A jack as claimed in claim 4, further comprising a retaining and reinforcing disc secured to the upper face of the upper wall portion.

8. A jack as claimed in claim 4, wherein said piece of fabric has a developable surface.

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