March 9, 1948. K. G. HANN 2,437,602

INFLATABLE ARTICLE

Filed July 12, 1945 2 Sheets-Sheet 1

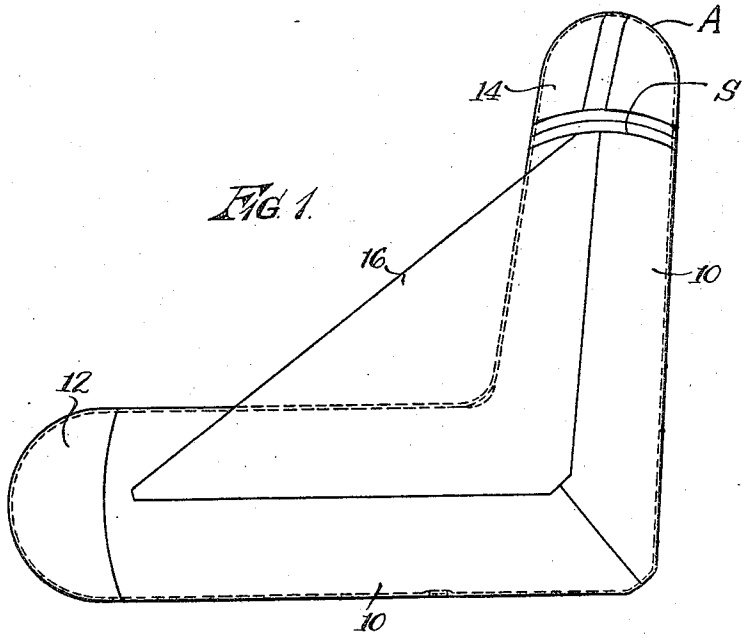

FIG. 1.

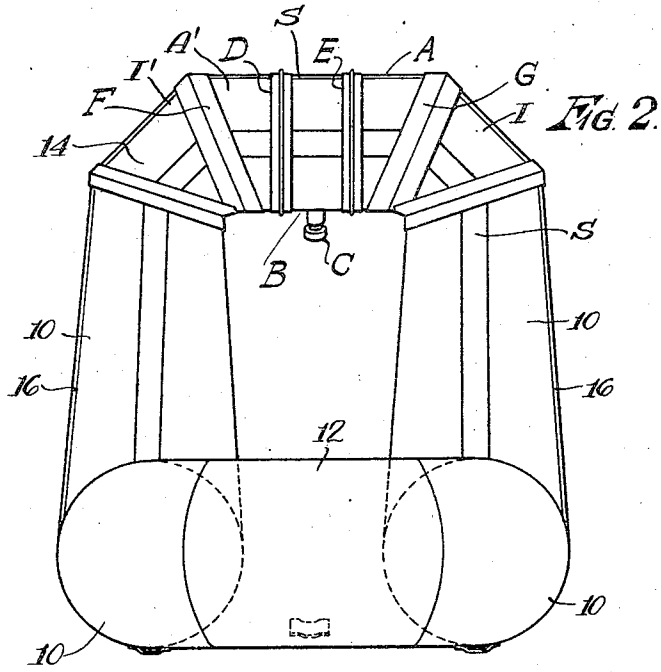

FIG. 2.

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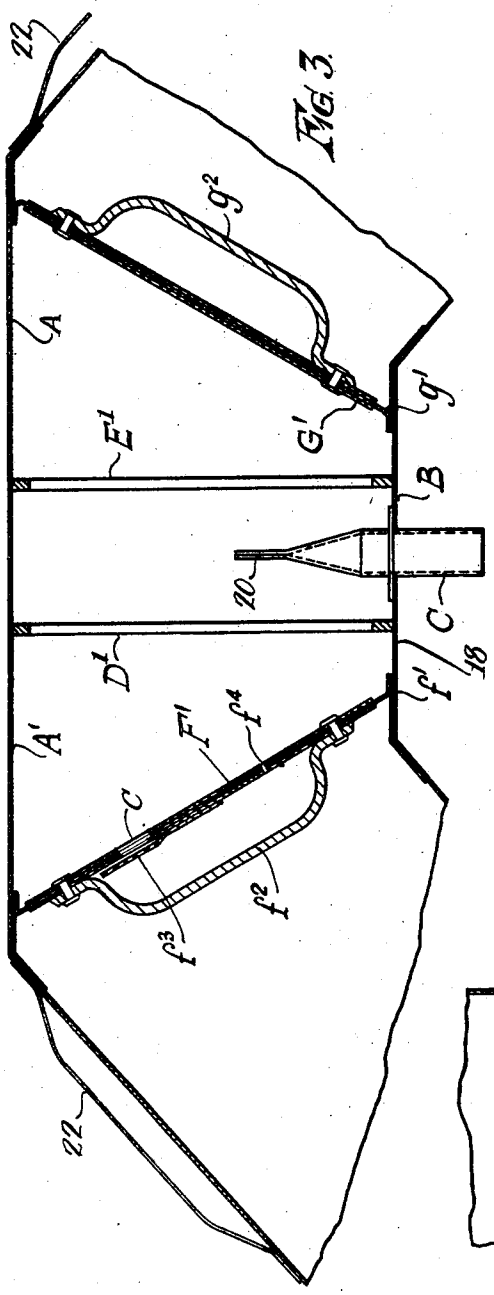

FIG. 3.

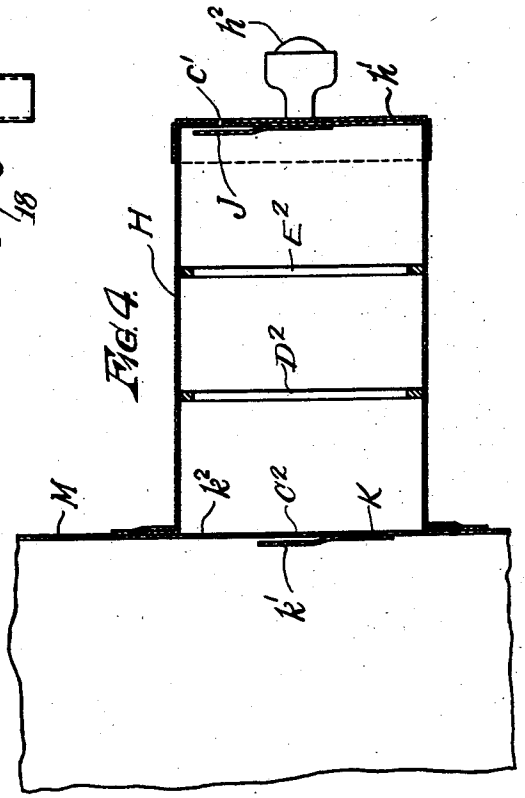

FIG. 4.

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UNITED STATES PATENT OFFICE

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INFLATABLE ARTICLE

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9 Claims. (Cl. 155—179)

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This invention relates to inflatable furniture and other inflatable articles, especially chairs, for example, of the type described in applicant's Patent No. 2,350,679; the chief object of the invention being to provide a means for inflating the said articles more conveniently than inflation by the use of ordinary bellows, which involves the use of external piping and valves.

According to this invention bellows are incorporated inside the chair or other article itself, in the form of two rigid discs or diaphragms joined around their edges to the inside of a tube forming a part of the chair or other article and spaced at a convenient distance apart, in one or both of which diaphragms is a non-return valve, means being provided to admit air from the atmosphere to the space between the two diaphragms through a non-return valve and thence to the interior of the article through the valve in the diaphragm. By manual operation one of the diaphragms is moved towards and away from the other, or both the diaphragms are moved towards and away from each other in concertina fashion. Thus on one stroke air is drawn in from the atmosphere, and on the stroke in the reverse direction air is forced through the non-return valve in one diaphragm into the interior of the chair or other article, which is thus inflated. The rigid diaphragms may be fitted with handles which can be grasped by the hands of the operator through the casing of the article to be inflated. When the article is almost fully inflated it will no longer be possible to grasp these handles, as the casing will then be under tension, but by placing the internal bellows in a suitable position in the article to be inflated the bellows can still be operated, because the expansion stroke of the bellows is effected automatically by means of the resilience of the inflated tubes of the article, the compression stroke being performed manually by pressing the outsides of the tubes together without the necessity of gripping the handles. Handle straps such as those used in concertinas may be provided, however, on the outsides of the tubes, these handle straps being made of canvas or webbing, either as an alternative or an addition to the handles on the diaphragms themselves.

The expansion stroke is the last stroke to be made by the bellows, as after the article is inflated above the normal pressure by the last compression stroke the bellows is filled in the last expansion stroke, after which a leakage of

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air takes place into the bellows to equalize the pressure. For this purpose one or both of the diaphragms may be provided with a non-return valve which is only, say 99 per cent efficient, so that air in the inflated article will leak back slightly into the bellows, thus equalizing the pressure. Alternatively, a very small hole may be made in the diaphragm and a fully efficient non-return valve used.

Hoops or rings may be placed between diaphragms either inside or outside the fabric surface to hold the fabric apart on the expansion stroke.

The invention can be applied to any inflatable structure which is of substantially tubular construction. In an armchair the tubes forming the arms have blocked-off ends, in which case one diaphragm of the bellows could form the end of a tube, and the inlet valve could be in the said diaphragm.

The invention is also applicable to inflatable mattresses. These mattresses are sometimes made in the form of a number of inflatable tubes placed side by side, in which case the bellows would be placed in some convenient place in one of these tubes.

In order that the said invention may be clearly understood and readily carried into effect, the same will now be further described with reference to the accompanying drawings, which illustrate two exemplifications of the invention applied to inflatable chairs.

Figure 1 represents in side elevation, a chair in which the internal bellows are located in the top of the chair back, the chair having a fabric cover.

Figure 2 represents in front elevation the chair shown in Figure 1 with the fabric cover removed.

Figure 3 represents a longitudinal section through the upper part of the back of a chair of the type shown in Figures 1 and 2 but showing a slightly modified structure.

Figure 4 represents in section an alternative arrangement in which the bellows are located in one end of one arm of an armchair.

Referring to Figures 1 and 2 of the drawings, the inflatable chair therein shown, and which is of the type described in my Patent No. 2,350,679, comprises tubular sections 10 of a flexible material such as rubber. The tubular sections are connected together to provide a U-shaped seat portion 12 and a U-shaped back portion 14, the portions being joined in the manner shown to form the chair-shaped tubular structure.

The opening within the seat and back portions

of the chair is covered by means of fabric for supporting the seat and back of the person occupying the chair. The back portion 14 of the chair also is braced with respect to the said portion by means of triangular-shaped members 16 which are suitably connected to the material of the seat and back portions 12 and 14.

The chair shown in Figures 1 and 2 is provided with an internal bellows located in the tubular section forming the top of the chair back. To that end, the tubular section at the top of the back of the chair, as indicated in Figure 2, is formed by panels A, A' and B, of flexible material. The panels A and A', at the inner edges, are fastened to the opposite edges of the panel B by exteriorly-positioned, overlapping strips D and E, and each of the panels A and A' is secured, at their outer edges, to panels I and I' by exteriorly-positioned, overlapping strips F and G. The sections I and I' are similarly secured to the upright tubular sections forming the sides of the chair back. The overlapping strips D, E, F and G, in addition to securing together the several panels, also function to reinforce the bellows section and, thereby, cause it to preserve its cylindrical shape when the chair is collapsed. If desired, reinforcing strip S may extend longitudinally of the tubular sections forming the sides and the top of the back of the chair.

An air inlet C, in communication with the atmosphere and the inside of the bellows, is mounted in the panel B, and provided with a non-return valve to prevent air from being expelled from the bellows on the compression stroke. The air inlet C should be of liberal size to allow air to enter the bellows freely.

The bellows diaphragms preferably are positioned adjacent the outer edges of the panels A and A', inside the tubular back section of the chair and the securing and reinforcing strips F and G.

The structure and arrangement of the bellows is more completely shown in Figure 3, which illustrates a slightly modified form of the upright part of the back of an inflatable chair. In that figure, the bellows is shown as comprising a tubular section 18 made of flexible material. An air inlet tube C, in the section 18, is provided with a non-return valve 20 of well-known type. Rubber or other rings D^1 and E^1 are attached to the interior surface of the material of the tubular section 18, in spaced relation to each other, to hold the fabric of the tubular section apart on the expansion stroke of the bellows. Diaphragms F' and G' are provided, respectively, on opposite sides of the rings, and are secured around their edges to the interior surface of the material of the tubular section 18, as indicated at f' and g', respectively. The diaphragms F' and G' are arranged so that they can be caused to approach and recede from the rings D^1 and E^1 by alternately pressing in and drawing back a pair of webbing or plastic handles f^2 and g^2.

The diaphragm F' is provided with a rubber flap valve f^3 which is adapted to close an air inlet c when the pressure inside the chair proper is greater than that within the bellows section. A small leak hole f^4 also is provided in the diaphragm F' to permit the pressure in the bellows section of the chair and in the remainder of the chair to equalize after the inflation of the chair has been completed. If the handles f^2 and g^2 are omitted, the manipulation of the bellows can be effected by alternately applying and removing manual pressure on the diaphragm through the flexible panels forming the upper section of the chair containing the bellows, or by the use of handle straps 22 of canvas or webbing provided on the outside of the tubes adjacent the diaphragms F' and G'. These straps 22 may be provided as alternative or in addition to the handles f^2 and g^2.

Referring to Figure 4, a cylindrical extension H of flexible material is attached to one end of a chair arm M, and terminates in a circular or other wall h^1, in which is an air inlet c^1. A rubber flap valve J is provided to close the said air inlet when pressure inside the extension H is greater than atmospheric pressure due to the wall h^1 being pushed inwardly by the handle h^2, which may be of any convenient form. At the same time a flap valve k^1 in the inner wall K of the extension H is opened due to such increase of air pressure, and admits air to the interior of the chair arm M through opening c^2. On the reverse stroke of the handle h^2, the valve k^1, closes and the valve J opens, re-charging the interior of the extension H. A small leak hole k^2 is provided for the purpose already described, also rings or hoops D^2 and E^2.

The invention is applicable to inflatable dinghies in the form shown in Figures 1 to 3, the dinghy being inflated in just the same way as a chair. The bellows would normally be placed either at the bow or stern of the dinghy for ease of working.

In dinghies incorporating inflatable seats it may be more convenient to place the bellows in one of these seats. Alternatively it may be found more convenient to employ a bellows in the form shown in Figure 4 in which the bellows forms an end of a tube, which may or may not form part of the structure of the dinghy.

I claim:

An inflatable article having a plurality of sections, one of said sections being tubular and of collapsible material, said tubular section being connected to another section of the article at one of the ends thereof, a pair of spaced, rigid diaphragms mounted in said tubular section and having their edges joined to the material of the tubular section on the interior surface thereof to provide a bellows chamber, said diaphragms, because of the collapsible nature of said tubular section, being movable towards and from one another, a non-return valve in the diaphragm intermediate the tubular section and said other section for discharge of air from the bellows chamber into the interior of said other section, and means including a non-return valve for admitting air from the atmosphere to the bellows chamber.

2. An inflatable article as defined in claim 1 in which the diaphragm intermediate the bellows chamber and said other section is provided with a small leakage opening therethrough to permit equalization of pressure between the bellows chamber and said other section.

3. An inflatable chair including a plurality of sections interconnected for the passage of air, one of said sections being tubular and of collapsible material, said tubular section being connected to another section of the chair at one end thereof, a pair of spaced diaphragms mounted in said tubular section and having their edges joined to the material of the tubular section on the interior surface thereof to provide a bellows chamber, said diaphragms, because of the collapsible nature of said tubular section, being mov-

able towards and from one another, a non-return valve in the diaphragm intermediate the tubular section and said other section for discharge of air from the bellows chamber into the interior of said other section, and means including a non-return valve for admitting air from the atmosphere to the bellows chamber.

4. An inflatable article having a plurality of sections, one of said sections being tubular and of collapsible material, said tubular section being connected to another section of the article at one end thereof, a pair of spaced diaphragms mounted in said tubular section and having their edges joined to the material of the tubular section on the interior surface thereof to provide a bellows chamber, said diaphragms, because of the collapsible nature of the tubular section, being movable towards and from one another, at least one ring secured to the material of the tubular section on the interior surface thereof, between and in spaced relation to said diaphragms, for holding the material of the tubular section between said diaphragms apart, means including a non-return valve for admitting air from the atmosphere to the bellows chamber, and means including a non-return valve for the discharge of air from the bellows chamber into said other section.

5. An inflatable article as defined in claim 4 in which means is provided for a small leakage of air from the inflated article into the bellows chamber to permit equalization of pressure between the bellows chamber and the remainder of the article when the article has been inflated to the desired degree by operation of the bellows.

6. In an inflatable article of flexible material, at least one diaphragm extending entirely across a part of the inflatable article and dividing off a portion of its interior to provide a bellows chamber, said diaphragm being manipulatable through the flexible material of the article to effect inflation of the article, means including a non-return valve for admitting air from the atmosphere to the bellows chamber, means including a non-return valve for the discharge of air from the bellows chamber into the remainder of the inflatable article to effect inflation thereof, and means for admitting air slowly into the bellows chamber from said remainder of the article to equalize the pressure in the article after the bellows has been operated to effect the inflation thereof.

7. An inflatable chair including a tubular section to be inflated, said tubular section including an inverted generally U-shaped portion, the base of said portion being of collapsible material and forming the top of the back of said chair, and the legs of said portion forming the sides of the back of the chair, a pair of spaced diaphragms mounted in the base of said portion and having their edges joined to the material of the tubular section on the interior surface thereof to provide a bellows chamber, said diaphragms, because of the collapsible nature of said base portion, being movable towards and from one another, a non-return valve in at least one of said diaphragms for discharge of air from said chamber into at least one of the legs of said portion, and means including a non-return valve for admitting air from the atmosphere to the space between the two diaphragms.

8. An inflatable article as defined in claim 1 made of flexible material and having a handle on each of said diaphragms within said tubular section and at the sides of the diaphragms remote from the bellows chamber to enable the diaphragms to be manipulated through the flexible material of the article to effect inflation thereof.

9. An inflatable chair as defined in claim 3 of flexible material in which at least one ring is secured to the material of the tubular section on the interior surface thereof, between and in spaced relation to said diaphragms, for holding the material of the tubular section between said diaphragms apart, and in which a handle is secured on each of said diaphragms within said tubular section and at the sides of the diaphragm remote from the bellows chamber, to enable the diaphragms to be manipulated through the flexible material of the article to effect inflation thereof.

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