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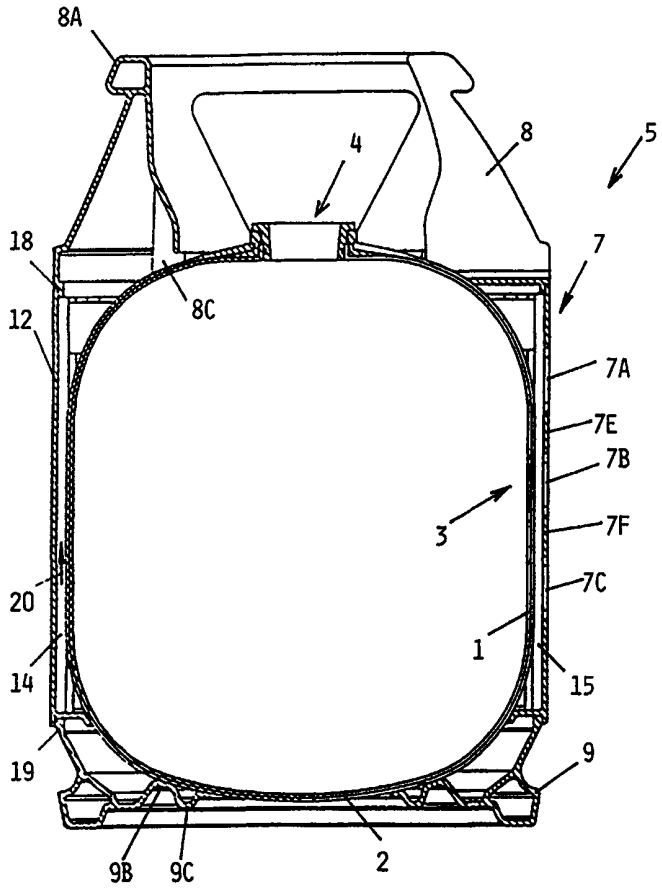
(54) Title: PRESSURE CONTAINER FOR FLUIDS

(57) Abstract

Pressure container for fluids, such as propane and butane, comprinsing an inner, fluid–tight liner layer (1) and a pressure supporting layer (2) outside the liner, as well as an outer, protective casing (5). As known per se the said layers (1, 2) consist of transparent or translucent materials, and the casing (5) comprises a middle section (7) having surface portions (7A, 7B, 7C) being cut–away so that parts of the actual container (3), being located inside the casing (5), are visible from the outside, and that the casing has shock–absorbing properties.



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PRESSURE CONTAINER FOR FLUIDS.

Propane bottles and other pressure containers for fluids have been commonly known for many years, based on metal as construction material, in particular steel. These known containers, being to a large extent utilized by people during cabin and outdoor life, have the drawback, inter alia, of being heavy and accordingly difficult to handle. Moreover there is often a problem of knowing how much of the original contents is still left in the bottle or container.

Because of the risk of explosion and accidents, many and strict requirements are imposed with respect to such pressure containers. Thus, the safety aspect is very essential in this connection.

In recent years there has been put on the market a propane bottle of composite materials, as described in Norwegian patent No. 179.423. This known structure is made in part of transparent or translucent materials, these besides being relatively light, so that some of the drawbacks mentioned above regarding pressure containers of steel, are eliminated. The known propane bottle of composite materials however, can not be manufactured in a rational and inexpensive way when the strict safety requirements are to be satisfied, while at the same time preventing damage and accidents as a result of mechanical stresses, such as shock and impact.

In contrast to the manner of manufacturing according to the above Norwegian patent specification, it is particularly advantageous to produce the actual pressure container by first making an inner liner and then winding around it fibre reinforced elements, for example glass fibre bands or treads.

The latter manufacturing method forms the basis of the pressure container being known from Norwegian patent No. 170.552, wherein besides there is described and shown an outer, protective sheath to serve for resisting fire or heat influence.

Thus, taking the latter design as a starting point, the invention is related to a pressure container of the type comprising an inner fluid-tight liner and a pressure sup-

porting layer outside the liner, as well as an outer, protective casing.

What is novel and specific in the pressure container according to the invention, in the first place consists therein that the liner and said layer as known per se consist of transparent or translucent materials, that the casing comprises a middle section having surface portions being cut-away so that parts of the actual container, being located inside the casing, are visible externally, and that the casing has shock-absorbent properties.

The liner or inner layer can be manufactured by methods known per se, in particular blow-moulding as one piece or injection moulding in two or more parts to be assembled. The particular form of casing comprised by the invention, can also be produced by injection moulding, possibly in two or three separate parts being then assembled into an integral structure. In this connection it is essential that the casing structure has shock-absorbent properties, provided for by a suitable choice of materials and/or the actual configuration of the casing.

The pressure container according to the invention, having a casing as stated above, has substantial advantages, in particular in consideration of two important factors with respect to this type of pressure containers, where there is involved a filling of a fluid in liquid phase, such as propane, to be delivered to a consumer appliance or the like upon vaporization in the pressure container. In order that a desired capacity is obtained in a use situation, it is important that the required heat of vaporization can be supplied from the environment. On the other hand and as already mentioned above, it is of much interest to the users to be able to observe the liquid level in the container, which is possible when this consists of transparent or translucent materials. The cut-away portions of the casing makes it possible to observe the liquid level. Besides these portions will involve a "venetian blind" effect, that in strong sun radiation prevents a too intense heating of the actual pressure container.

It is more important however, that the configuration of

the casing with the cut-away portions enable an air flow from the outside and over the actual container surface, so that the required heat can be supplied thereto for the varorization mentioned above. This latter and highly desirable effect will be particularly enhanced when at least the preferably cylindrical middle section of the casing, according to a preferred embodiment of the invention, is designed with spacer elements so as to form air flow passages between the container surface and the casing in general. In this connection it is a particular advantage when the air flow passages are adapted to extend in a generally vertical direction when the pressure container has a normal, standing position resting on the bottom and with the axis of the cylindrical section oriented substantially vertically.

The pressure container according to the invention will be explained more closely in the following description with reference to the drawings, which illustrate exemplary embodiments based on the invention.

Fig. 1 in axial section shows a pressure container according to the invention, e.g. for use as a propane bottle,

Fig. 2 shows the actual container in the example of Fig. 1,

Fig. 3 in exploded perspective view shows three sections of the casing for the container in Fig. 1,

Fig. 4 shows a cylindrical middle section of a casing for a larger (higher) pressure container than the one found in Figs. 1 and 2,

Fig. 5 shows another and preferred form of protective casing in elevation,

Fig. 6 in partial view shows a further embodiment of the protective casing,

Fig. 7 in partial cut-away elevation shows an advantageous design of a bottom section for the pressure container,

Fig. 8 at a smaller scale shows the bottom section in Fig. 7 as seen from above,

Fig. 9 in a corresponding manner as Fig. 8, shows a first alternative bottom section to the one in Fig. 8,

Fig. 10 shows a second alternative bottom section,

Fig. 11 shows a third alternative design of a bottom section for the pressure container, and

Fig. 12 in perspective view shows an advantageous design of a boss at the top of the pressure container.

The actual container, which is manufactured for a desired volume capacity, in Figs. 1 and 2 is indicated with reference numeral 3. As illustrated in Fig. 1 the container 3 comprises an inner layer or liner 1, in the first place adapted to be a fluid-tight layer so that the contents can not escape from the container, even when being under comparatively high pressure. Outside the liner 1 there is shown a reinforcing or pressure-supporting layer 2 being here provided by means of winding fibre reinforced elements, such as glas fibres to which there has been applied a suitable adhesive or the like, for subsequent curing in the form of a number of winding layers on the liner 1. There is here the question of manufacturing steps and a choice of materials being known per se and without any need for closer explanation. In this connection it is obvious that the selected materials and material compositions in the layers 1 and 2, in a way known per se can provide a container 3 having transparent or translucent walls. This property is particularly desired in the cylindrical wall portions being usually incorporated in such containers. This however, does not exclude the possibility that e.g. purely spherical containers with transparent walls can be of interest in connection with the invention. A main shape with rotational symmetry is clearly preferred.

Quite in general in Fig. 2 at 4 there are shown parts incorporated in a mounting arrangement for a valve or the like, at an opening on top of container 3. See also Fig. 1 in this connection. These parts of the structure however, are only of subordinate interest in connection with the present invention, and will not be discussed further here.

Of particular interest however, in this connection is the surrounding casing, which according to the above explanations, has a novel and particular combination of functions. As will appear from Figs. 1 and 3, the casing 5

shown, comprises a middle section 7 being preferably of a generally cylindrical shape, a top section 8 and a bottom section 9. As indicated in Fig. 3 these three sections can be produced separately and then be assembled into a more or less integrated, total structure constituting the casing 5. As an alternative sections 7 and 9 can be manufactured integrally as one piece, e.g. by injection moulding, and subsequently be joined to the top section 8 when the actual container 3 has been put into the middle section 7. Another alternative consists in producing sections 7 and 8 integrated as one piece, with subsequent joining to the bottom section 9. Taking into account, inter alia, a rational production, the casing can also as a whole in its basic shape deviate more or less from the basic shape of the container within it.

The middle section 7 is built up by a number of ribbon-like elements of which two are indicated at 7E and 7F, extending around the whole circumference of section 7 and having a spacing in axial direction, as indicated e.g. at 7A, 7B and 7C. These spaces form the cut-away surface portions mentioned above, that make it possible to observe parts of the actual container 3 inside the casing, in particular for the purpose of seeing the liquid level in the container. In this connection it can be an advantage when the cut-away portions or spaces 7A, 7B and 7C have a substantially larger dimension in the lateral direction than in the height direction. This design is also favourable in view of the venetian blind effect mentioned above, i.e. a shading effect against undesired solar heating.

So as to form an integral and strong structure in the middle section 7, there is in addition to the ribbon elements around the circumference, also provided longitudinal elements as shown e.g. at 11 and 12, forming in this example a rectangular, cross-wise pattern of the ribbon elements. It is clear that the configuration of pattern or elements forming the middle section 7 of the casing, can be varied within wide limits while maintaining the effect described, on the basis of cut-away surface portions. These can be more or less elongate and can extend in different directions,

also at an inclination. Oval and circular open portions can also be contemplated. The proportion of the total surface of the middle section representing the cut-away surface portions, can vary a good deal in relation to what is seen from the example of Fig. 1 and 3. It is preferred however, that the cut-away portions constitute a relatively significant proportion of the total surface. It has been found that the proportion of cut-away surface portions should be at least 20% of the total exterior surface of the casing.

On the inside of middle section 7 there is provided a number of projections, ribs or webs adapted to form relatively wide air gaps between the outer surface of container 3 and the main parts of the adjacent casing. Such ribs or webs are shown at 14 and 15 in Fig. 1, and an additional example is illustrated at 16 in Fig. 3. As will appear from this figure there is a relatively high number of such projecting ribs around the whole circumference interiorly of middle section 7. In this way there are formed air gaps that make possible air flows, in particular in vertical direction as indicated with arrow 20 in Fig. 1. This solution as also seen in association with the cut-away portions 7A, 7B and 7C in Fig. 1, is highly advantageous in view of the desired vaporization effect, at the same time as the air throughflow in the case of undesired intense solar heating, has the effect of maintaining a lower and acceptable surface temperature on container 3. It is obvious that spacer elements in the form of projections, ribs or webs as discussed above, can be provided for in different manners and at various locations interiorly of middle section 7.

In order that the spacer elements shall also have a resilient and shock-absorbing effect in relation to container 3, they can be adapted to be deformed preferably elastically when there is a tendency to small relative movements between the casing and the container, i.e. movements or stresses mainly normal to the major surfaces. Such a resilient structure can also be useful in the case of expansion of container 3, e.g. during filling to a certain overpressure, or in the case of different heat expansion of the container and the casing 7 during temperature changes. It is obvious

that such resilient spacer elements can have their effect based on other mechanisms than bending as mentioned, e.g. in that the element material as such yields, or by some form of break mechanism, possibly with a resulting permanent deformation.

Elastically resilient spacer elements as discussed above, can also serve to accommodate or even out dimension variations in containers 3 as produced, and besides they can have a useful effect for load distribution so that reaction forces between casing and container will be distributed over a larger surface area on the basis of contact or engagement that in principle can have a linear form. This latter effect will be present on condition that the spacer elements are provided and distributed at such a number and with such length that a regular distribution of the load or stresses as mentioned, will be attained.

When looking at the top section 8 in Figs. 1 and 3, it will be seen that at the lower portion thereof there is an edge 18 around the circumference, intended for cooperation with and joining to the top of section 7. At the upper part of top section 8 there is shown a relatively strong ring 8A which among other things, forms a practical and convenient handgrip for lifting and manipulating the pressure container as a whole. From handgrip 8A there is shown a deep cut-out portion 8B which permits a convenient leading out of e.g. a propane hose from a connector and valve device (not shown) on top of the actual container 3. This top area of container 3 with components 4 (Fig. 2) are freely accessible from above through a top opening 8D in top section 8. Finally Fig. 3 also shows at the interior of top section 8, a number of radial ribs or webs 8C adapted to engage the upper side of container 3 when the whole pressure container is assembled. Ribs 8C like the spacer elements described above, can have an effect both for the desired air flow as for schock-absorbing and compensation for expansion, as explained above.

As far as bottom section 9 is concerned, this has also an upwardly directed edge or the like 19 for joining to the lower circumference of middle section 7. Bottom section 9

has a central opening 9A making possible inspection of the bottom of container 3 after assembly, whereby the profiled shape of the bottom portion of bottom section 9 brings opening 9A to be located somewhat elevated in relation to the downwardly facing supporting surface of bottom section 9. As known per se the underside of bottom section 9 and the top of top section 8, in particular handgrip 8A, are so mutually adapted and designed that pressure containers can be stacked on top of each other.

The profiled form of the bottom as mentioned, has a wavy shape as shown at 9B and 9C in Figs. 1 and 3, forming rings in a bellows-like bottom portion or suppporting member which has a certain degree of resiliency, and thus has a shock-absorbing effect in relation to the bottom of container 3. As will appear in particular from bottom section 9 in Fig. 3, this has a recess 9E being open laterally at a portion of the circumference, so that there is provided a suitable handgrip, obtained in particular in view of the spacer elements, which means that this circumferencial portion below edge 19 will lie at a certain distance from the adjacent container surface.

The above described sectional subdivision of the whole casing 5, enables a very rational production of the complete pressure container. In particular it is advantageous that the cylindrical middle section 7 can be manufactured with different, selected height dimensions for corresponding pressure containers of various capacities. Whereas e.g. the embodiment of Fig. 1, 2 and 3 can be suitable for gas or propane bottles with a propane content of maximum 6 kg, there is in Fig. 4 shown a middle section 27 intended for a propane bottle of maximum capacity 11 kg propane. Section 27 in Fig. 4 is composed of quite corresponding elements as section 7 in Fig. 3, but the number of ribbon elements 31-38 is approximately doubled. The corresponding gaps or cut-away portions are denoted 41-48 in Fig. 4. Moreover in compliance with the embodiment described above, the example of Fig. 4 has longitudinal, bracing elements as shown at 21 and 22. Finally in the interior of section 27 there is shown a rib-shaped spacer element 26, as one of several such elements

around the internal circumference of section 27.

Fig. 5 in a simplified way shows another and preferred embodiment of a casing for the pressure container according to the invention, more specifically a middle section 57 for such a casing. There is here the question of a generally cylindrical middle section 57 being provided with a number of substantially axially extended cut-away surface portions, whereby three such portions 51,52 and 53 are indicated in the figure. It is obvious that a larger number of such cut-away portions can be distributed around the whole circumference of middle section 57. Thus, portions 51, 52 and 53 here have a relatively slit-like shape, being distinguished from the surface pattern of Figs. 3 and 4 in that the slit or gap portions extend generally in the axial direction instead of the circumferencial direction. In both cases the venetian blind effect referred to above will be obtained, and the same applies to the effect on the air flow between the casing and a container inside it.

A particular variant of cut-away surface portions is illustrated in Fig. 6, which shows only a partial segment of a middle section 67 in a corresponding perspective view as Fig. 5. At 63 in Fig. 6 there is indicated how an upper part of the actual container will be located in relation to the casing middle section 67. At 61 there is indicated a recess or opening that in itself alone has a relatively small extension, but with a quite high number of such openings or cut-away portions, being located at a quite small spacing, there is provided a total through-flow area that can have the same effect as the gaps or openings in Fig. 3 and Fig. 5, respectively. With an arrangement or pattern of openings 61 as in Fig. 6, each of these or groups of these in combination can represent letters or other characters, or possibly a logo being a company symbol or a trademark. This may then indicate the manufacturer or distributor of the pressure container.

Irrespective of the type of openings shown, it can be an advantage to employ a float device for clearly indicating a liquid level in the container, as described in simultaneous Norwegian patent application Nr. 97.0457.

A further modification, relating to the bottom section, is illustrated in Fig. 7. In contrast to the bellows-like bottom section in Figs. 1 and 3, the one in Fig. 7 has a number of rib-like spacer elements, three such elements 71, 72 and 73 being specifically indicated in the interior of bottom section 79 in Fig. 7. Like the spacer elements described above, also these elements 71, 72 and 73 and so forth, will have a favourable effect both on the air flow and with respect to shock-absorbing, heat expension and dimensional tolerances in the actual container and the casing. In Fig. 7 it is to be noted specifically that spacer elements 71, 72, 73 and so forth, have a certain inclination so that they form an angle to adjacent surface portions of the actual container 77, this angle being different from 90°. Such an inclination implies that the elements so to speak are prepared for a deformation by flexing, namely to a more bent inclination upon occurence of sufficiently high stress or forces from container 77. Of course a quite corresponding effect will be present with spacer elements extending further upwards along container 77, in a middle section of the casing, or also in a top section.

Fig. 8 shows a complete arrangement of such elements 71, 72, 73 and so forth, in bottom section 79, being here seen from above. There is also seen a relatively large central opening 75 where the radially inner ends of the spacer elements are located. The bottom of container 77 will be accessible through such an opening 75, but it is obvious that this does not necessarily have to be provided, since a substantially complete, cover or bottom design can be incorporated in bottom section 79. Such a tight bottom will be able to protect the actual container 77 in a better way against damage from below, but nevertheless can be provided with smaller holes or perforations, e.g. for draining out water.

An alternative embodiment of the bottom structure with associated spacer elements, is shown in Fig. 9. From the circumference of the bottom section 99 shown therein, plate-shaped elements are extended to be tangent to a central opening 95 similar to opening 75 in Fig. 8. One such element

is indicated at 91. With such an arrangement the spacer elements will have an inherent inclination in relation to the bottom itself, or possibly the top, of an inserted container, so that a corresponding effect as discussed above with reference to Figs. 7 and 8, will be obtained. In Fig. 9 there is also at 97 indicated an outer circumference of a more or less cylindrical part of the actual container, and at this part the elements 91 can be extended axially but with a relatively short length as shown at 91A, from the inside of the casing corresponding to contour 99, for contacting the outside of the actual container 97. The inclination of the element length or piece 91A is clearly shown in this figure of drawings.

Figs. 10 and 11 are in particular directed to arrangements of spacer elements in the bottom section, in the principle by locating a number of such elements in an arcuate or circular form about the central axis of the associated container and casing. More definitely bottom section 100 i Fig. 10 has upwardly projecting, relatively long spacer elements 101 and 102 which in a polygonal pattern extend around the bottom section. The somewhat related arrangement in Fig. 11 shows a higher number of spacer elements 111 and 112, respectively, being each shorter than the elements in Fig. 10, and forming together approximately circular patterns in bottom section 110. Because of the curvature of the bottom of the associated container itself, the spacer elements both in Fig. 10 and in Fig. 11 will engage the container surfaces at the respective locations at an angle different from 90° between the container surface and the general plane of the spacer elements described. As already indicated above the arrangements of spacer elements as illustrated in Figs. 7-11 for the bottom section, in a corresponding manner could as well be employed in the top section of the casing.

In addition to spacer elements as described and illustrated, there can also be provided shock-absorbing shapes or bodies at other desired locations in the casing structure, as will be obvious to an expert in the field. It is to be noted specifically in this connection that handgrip 8A on

top section 8 and supporting or engagement members around the bottom of bottom section 9 (Figs. 1 and 3), can be formed as hollow structures as known per se, with e.g. an open or foam-like core, so as to sustain mechanical stresses that will occur during practical use of such pressure containers.

The mounting device or boss 4 as generally shown in Fig. 2, advantageously can have a design at the top as illustrated in Fig. 12. As will appear from Fig. 12 there is provided a nut-like part 4A that can e.g. have a hexagonal shape, which by the strong anchoring of the boss structure at the top of the actual container 3, implies that this and nut-part 4A are rotationally securely interconnected. When mounting a valve or connecting device or the like to the boss 4 in Fig. 2, e.g. by means of a thread connection, the nut-part 4A thus can be favourably utilized. Thereby the users of such pressure containers will not be dependent on a secure rotational anchoring of the casing structure described, outside the actual pressure container.

C l a i m s

1. Pressure container for fluids, such as propane and butane, comprising an inner, fluid-tight liner layer (1) and a pressure supporting layer (2) outside the liner, as well as an outer, protective casing (5,57,67), c h a r a c t e r i z e d in that said layers (1,2) as known per se consist of transparent or translucent materials, that the casing (5,57,67) comprises a middle section (7,57,67) having surface portions (7A,7B,7C,41-48, 51-53,61) being cut-away so that parts of the actual container (3), being located inside the casing (5,57,67), are visible from the outside, and that the casing has shock-absorbing properties.

2. Pressure container according to claim 1, c h a r a c t e r i z e d in that the cut-away surface portions comprise relatively elongate gaps (51-53) extending generally in a vertical direction in a normal, standing position of the pressure container (Fig. 5).

3. Pressure container according to claim 1, c h a r a c t e r i z e d in that the preferably cylindrical middle section (7) comprises ribbon-like elements (7E,7F,31-38) extending around the circumference and having mutual spaces in the axial direction so as to form the cut-away surface portions (7A,7B,7C,41-48), and axially extending elements (11,12,21,22) to which the ribbon-like elements are joined.

4. Pressure container according to claim 1, 2 or 3, c h a r a c t e r i z e d in that at least some of the cut-away surface portions are in the form of letters or other characters or a logo (61), that can e.g. indicate a producer or distributor (Fig. 6).

5. Pressure container according to any one of claims 1-4, c h a r a c t e r i z e d in that the casing (5) is composed of three or more separately manufactured sections,

comprising at least said middle section (7), a top section (8) and a bottom section (9).

6. Pressure container according to any one of claims 1-4, c h a r a c t e r i z e d in that the middle section (7) is manufactured in one piece together with a top section (8) or with a bottom section (9), and is joined to a separate bottom section or a separate top section, respectively, so as to form the complete casing (5).

7. Pressure container according to any one of claims 1-6, c h a r a c t e r i z e d in that at least the middle section (7) has spacer elements (14,15,16) forming air flow passages (20) between the outer surface of the container (3) and the casing (5), and preferably having resilient or shock-absorbing properties.

8. Pressure container according to claim 7, c h a r a c t e r i z e d in that also the top section (8) and the bottom section (69) have spacer elements (8C,71-73, 91,101,102,111,112) forming air flow passages between the outer surface of the container (3) and the casing (5), and preferably having resilient or shock-absorbing properties.

9. Pressure container according to claim 7 or 8, c h a r a c t e r i z e d in that at least some of the spacer elements are in the form of generally radial, flat ribs (16) which in the middle section (7) preferably extend in axial direction outside the container (3).

10. Pressure container according to claim 7, 8 or 9, c h a r a c t e r i z e d in that at least some of the spacer elements (71-73,91) are inclined so as to form an angle somewhat different from 90° with respect to the adjacent portion of the container surface (77).

11. Pressure container according to any one of claims 7-10, c h a r a c t e r i z e d in that the spacer elements are provided and distributed at such a number and with such

length that together they bring about a substanial degree of smooth load distribution between the container and the casing.

12. Pressure container according to any one of claims 7-11, c h a r a c t e r i z e d in that the spacer elements (14-16,8C,71-73,91,101,102,111,112) are preferably elastically resilient in relation to the container (3,77), such as by being flexible at least at edge portions engaging the container surface.

13. Pressure container according to any one of claims 7-11, c h a r a c t e r i z e d in that at least some of the spacer elements are permanently deformable such as by breaking, upon occurence of forces or stresses exeeding a certain limit, between container and casing.

14. Pressure container according to any one of claims 7-13, c h a r a c t e r i z e d in that at least some spacer elements (101,102,111,112) in the top section and/or bottom section (100,110) are located in an approximate arcuate or circular form, preferably about a central axis of the container and the casing.

15. Pressure container according to any one of claims 1-14, c h a r a c t e r i z e d in that the bottom section (9) of the casing (5) comprises a shock-absorbing, bellows-like supporting member (9B,9C) which supports the bottom of the container (3).

16. Pressure container according to any one of claims 8-15, c h a r a c t e r i z e d in that the bottom section (9) of the casing (5) is provided with at least one laterally directed recess (9E) along a portion of the circumference, in order, inter alia, to serve as a handgrip.

17. Pressure container according to any one of claims 1-16, c h a r a c t e r i z e d in that the cut-away surface portions (7A,7B,7C,41-48,51-53,61) together have an area

that constitutes at least 20% of the total exterior surface area of the casing.

AMENDED CLAIMS

[received by the International Bureau on 30 June 1998 (30.06.98); original claims 1-17 amended (4 pages)]

1. Portable pressure container for fluids, such as propane and butane, comprising an inner, fluid-tight liner layer (1) and a pressure supporting layer (2) outside the liner, as well as an outer, protective casing (5,57,67), c h a r a c t e r i z e d in that said layers (1,2) as known per se consist of transparent or translucent materials, that the casing (5,57,67) comprises a middle section (7,57,67) having surface portions (7A,7B,7C,41-48, 51-53,61) being cut-away so that parts of the actual container (3), being located inside the casing (5,57,67), are visible from the outside, and that the casing has shock-absorbing properties.

2. Portable pressure container according to claim 1, c h a r a c t e r i z e d in that the cut-away surface portions comprise relatively elongate gaps (51-53) extending generally in a vertical direction in a normal, standing position of the pressure container (Fig. 5).

3. Portable pressure container according to claim 1, c h a r a c t e r i z e d in that the preferably cylindrical middle section (7) comprises ribbon-like elements (7E,7F,31-38) extending around the circumference and having mutual spaces in the axial direction so as to form the cut-away surface portions (7A,7B,7C,41-48), and axially extending elements (11,12,21,22) to which the ribbon-like elements are joined.

4. Portable pressure container according to claim 1, 2 or 3, c h a r a c t e r i z e d in that at least some of the cut-away surface portions are in the form of letters or other characters or a logo (61), that can e.g. indicate a producer or distributor (Fig. 6).

5. Portable pressure container according to any one of claims 1-4,
c h a r a c t e r i z e d in that the casing (5) is composed of three or more separately manufactured sections, comprising at least said middle section (7), a top section (8) and a bottom section (9).

6. Portable pressure container according to any one of claims 1-4,
c h a r a c t e r i z e d in that the middle section (7) is manufactured in one piece together with a top section (8) or with a bottom section (9), and is joined to a separate bottom section or a separate top section, respectively, so as to form the complete casing (5).

7. Portable pressure container according to any one of claims 1-6,
c h a r a c t e r i z e d in that at least the middle section (7) has spacer elements (14,15,16) forming air flow passages (20) between the outer surface of the container (3) and the casing (5), and preferably having resilient or shock-absorbing properties.

8. Portable pressure container according to claim 7,
c h a r a c t e r i z e d in that also the top section (8) and the bottom section (69) have spacer elements (8C,71-73, 91,101,102,111,112) forming air flow passages between the outer surface of the container (3) and the casing (5), and preferably having resilient or shock-absorbing properties.

9. Portable pressure container according to claim 7 or 8,
c h a r a c t e r i z e d in that at least some of the spacer elements are in the form of generally radial, flat ribs (16) which in the middle section (7) preferably extend in axial direction outside the container (3).

10. Portable pressure container according to claim 7, 8 or 9,
c h a r a c t e r i z e d in that at least some of the spacer elements (71-73,91) are inclined so as to form an angle somewhat different from 90° with respect to the adjacent portion of the container surface (77).

11. Portable pressure container according to any one of claims 7-10,
c h a r a c t e r i z e d in that the spacer elements are provided and distributed at such a number and with such length that together they bring about a substanial degree of smooth load distribution between the container and the casing.

12. Portable pressure container according to any one of claims 7-11,
c h a r a c t e r i z e d in that the spacer elements (14-16,8C,71-73,91,101,102,111,112) are preferably elastically resilient in relation to the container (3,77), such as by being flexible at least at edge portions engaging the container surface.

13. Portable pressure container according to any one of claims 7-11,
c h a r a c t e r i z e d in that at least some of the spacer elements are permanently deformable such as by breaking, upon occurence of forces or stresses exeeding a certain limit, between container and casing.

14. Portable pressure container according to any one of claims 7-13,
c h a r a c t e r i z e d in that at least some spacer elements (101,102,111,112) in the top section and/or bottom section (100,110) are located in an approximate arcuate or circular form, preferably about a central axis of the container and the casing.

15. Portable pressure container according to any one of claims 1-14,
c h a r a c t e r i z e d in that the bottom section (9) of the casing (5) comprises a shock-absorbing, bellows-like supporting member (9B,9C) which supports the bottom of the container (3).

16. Portable pressure container according to any one of claims 8-15,
c h a r a c t e r i z e d in that the bottom section (9) of the casing (5) is provided with at least one laterally directed recess (9E) along a portion of the circumference, in order, inter alia, to serve as a handgrip.

17. Portable pressure container according to any one of claims 1-16,
c h a r a c t e r i z e d in that the cut-away surface portions (7A,7B,7C,41-48,51-53,61) together have an area that constitutes at least 20% of the total exterior surface area of the casing.

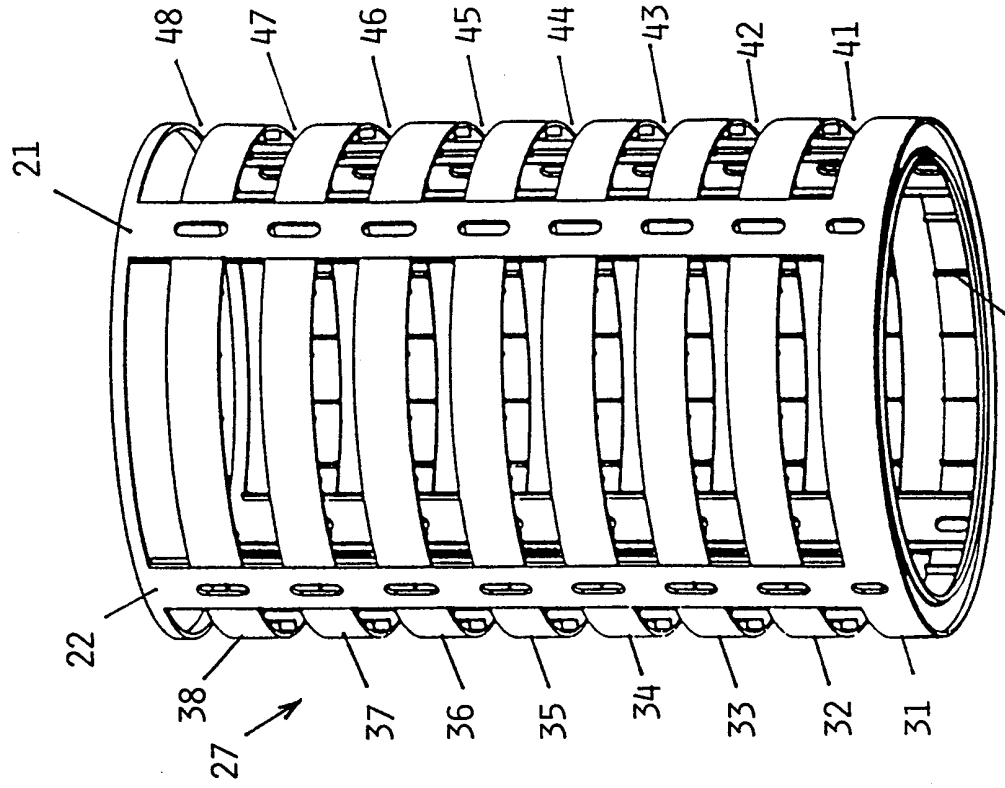
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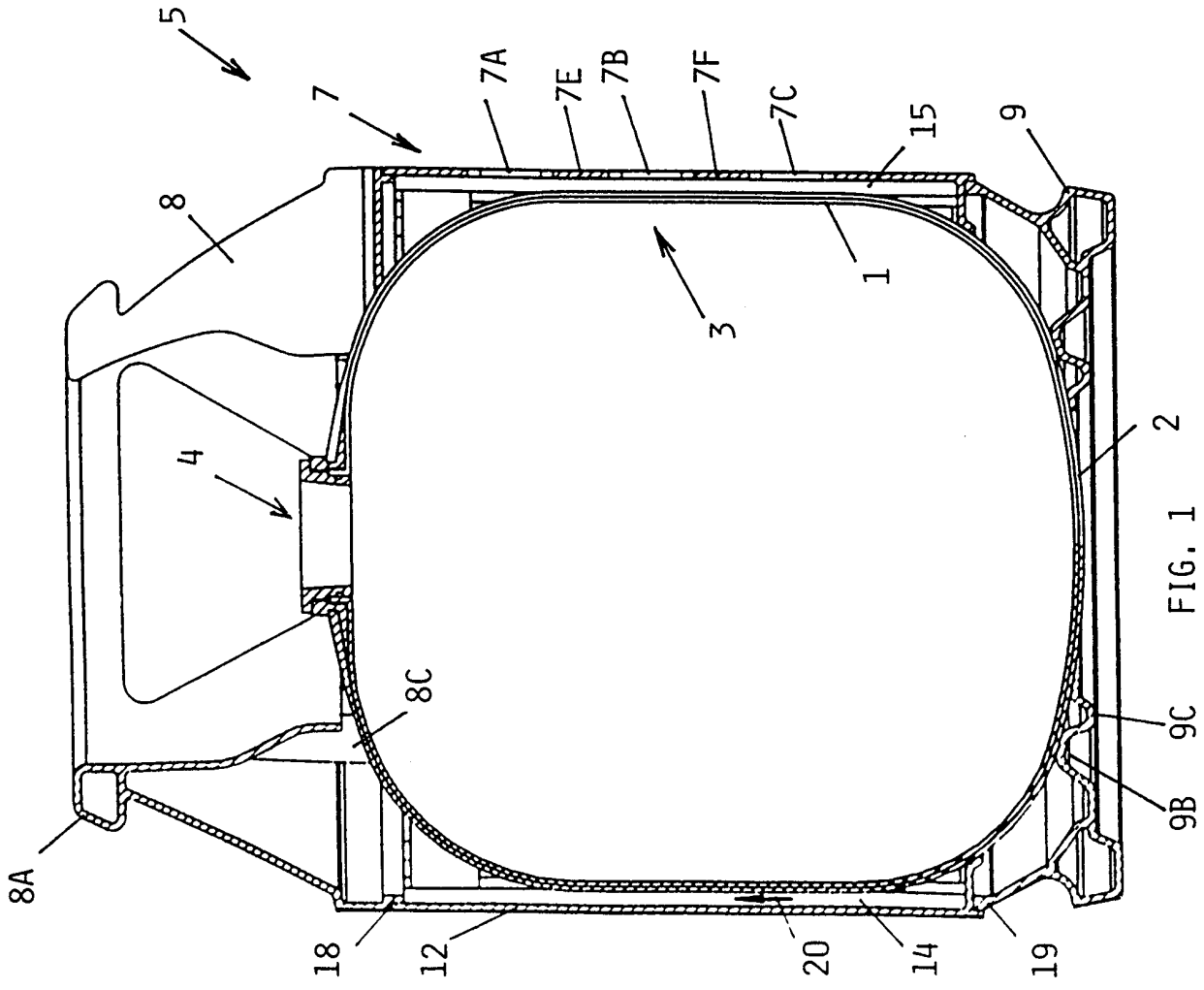
FIG. 4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7
7A
7E
7B
7F
7C
15
9
8
1
3
4
2
8C
9C
9B
8A
18
12
20
14
19

FIG. 1

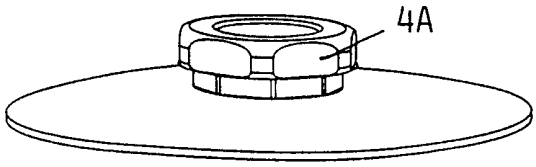

FIG. 12

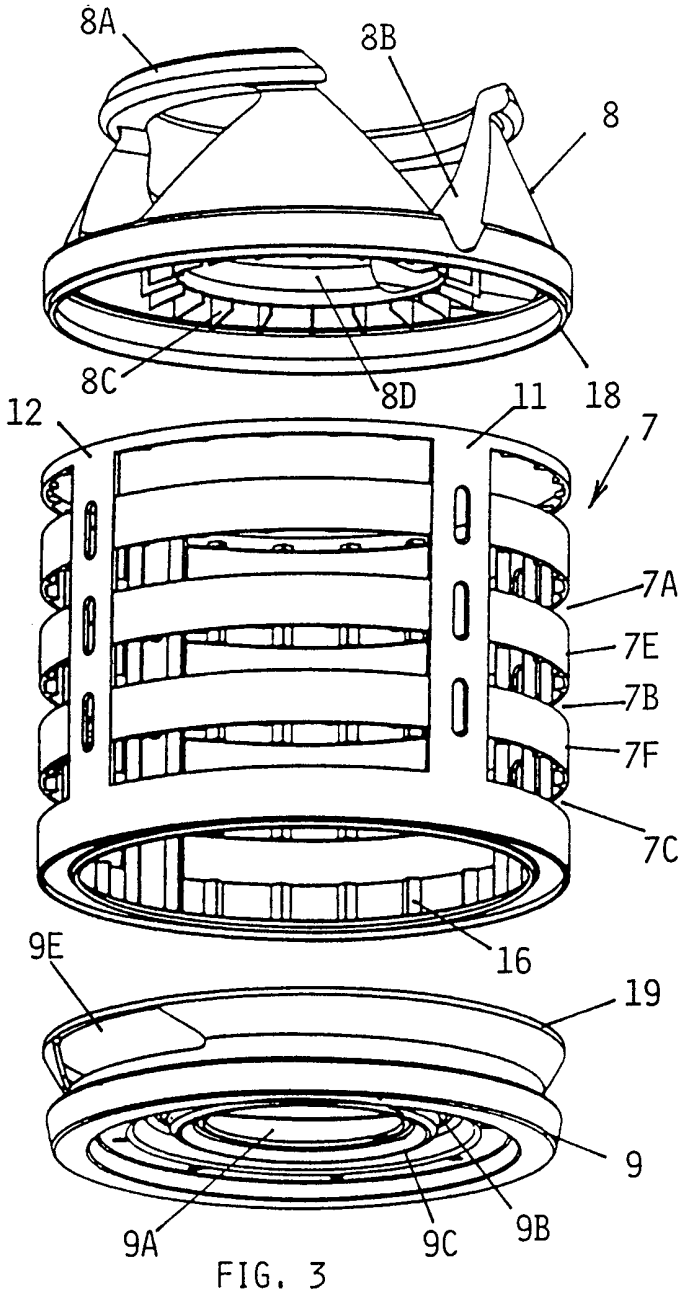

FIG. 3

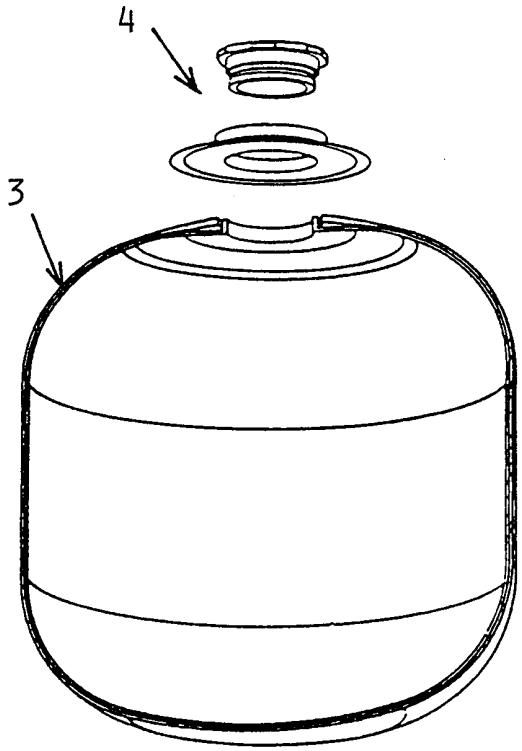

FIG. 2

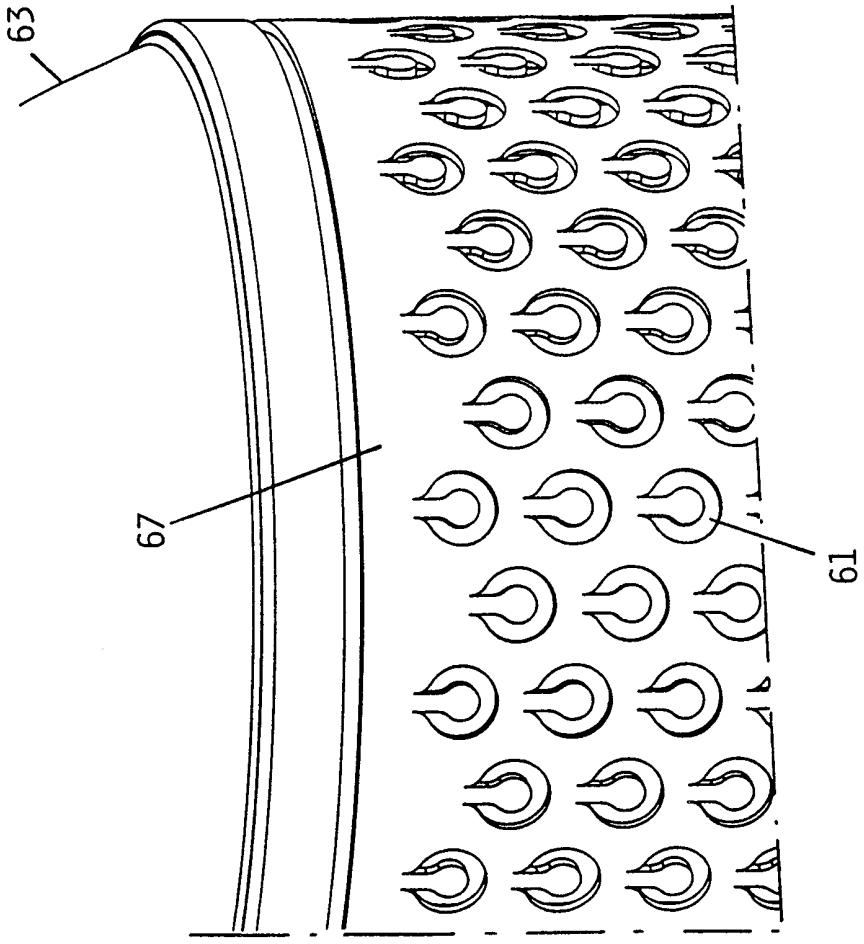

FIG. 6

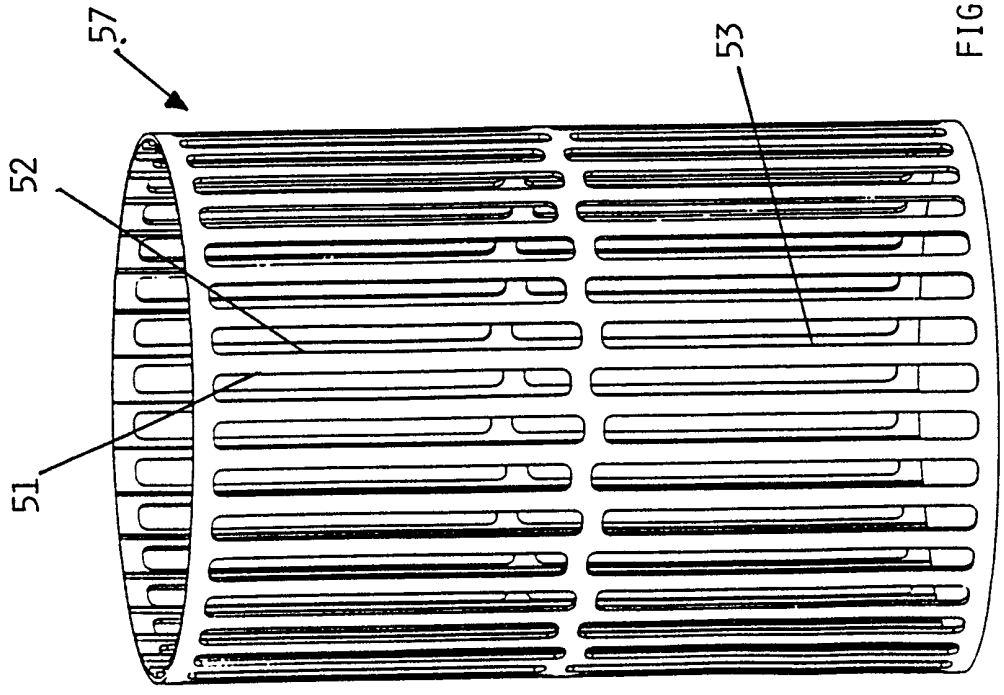

FIG. 5

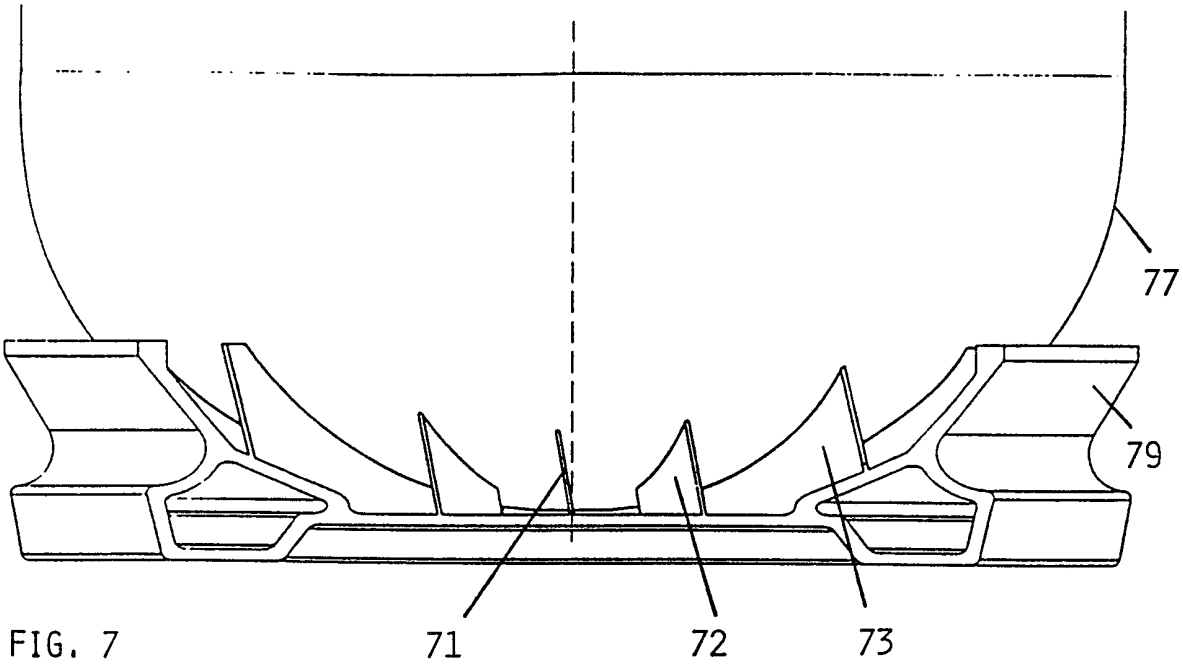

FIG. 7

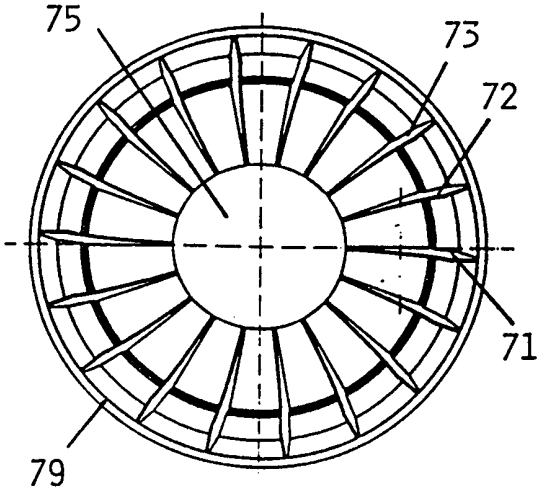

FIG. 8

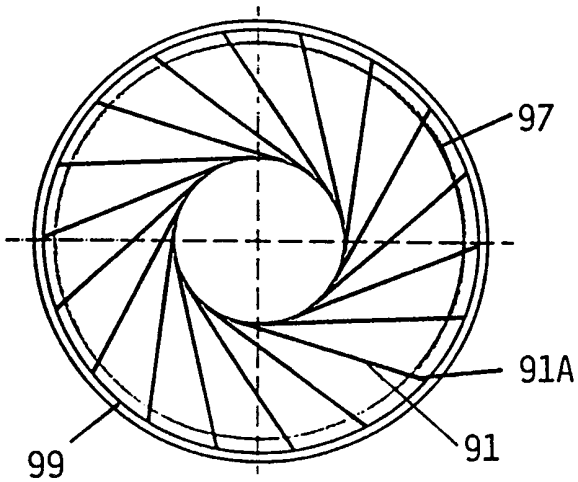

FIG. 9

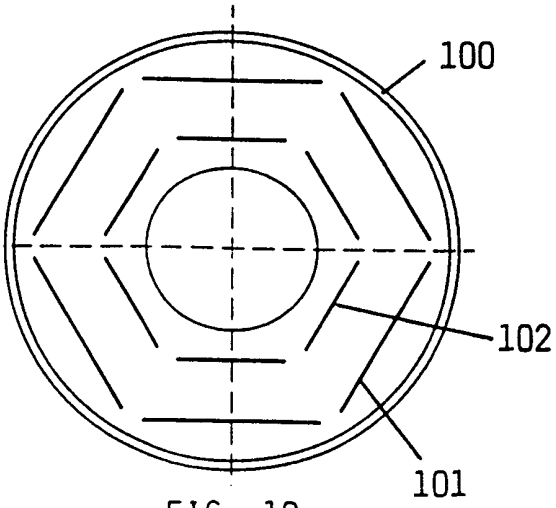

FIG. 10

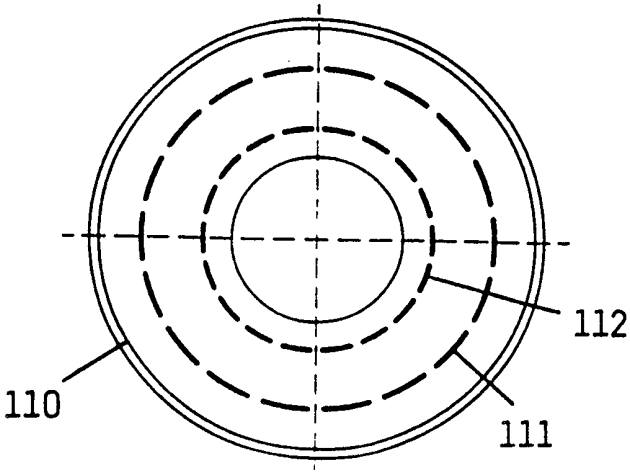

FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 98/00026

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: F17C 1/02, F17C 1/16
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: F17C, F16J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DD 234475 A1 (VEB HALBLEITERWERK), 2 April 1986 (02.04.86), page 2, line 1 - line 15, figure 1, abstract --	1-17
A	US 4234014 A (ROGER E. KNIGHT), 18 November 1980 (18.11.80), figure 1, abstract --	1-17
A	EP 0300931 A1 (HEMBERT, CLAUDE LEON), 25 January 1989 (25.01.89), figure 1 --	1-17
A	EP 0752555 A1 (WALTER TOSTO SERBATOI S.P.A.), 8 January 1997 (08.01.97), column 6, line 41 - line 46, figures 1-2 --	1-17

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
4 June 1998	04 -06- 1998
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Mårten Hulthén Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 98/00026

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 1333530 A (THE CORNELIUS COMPANY), 17 June 1963 (17.06.63), figure 1, detail 12 --	15
A	US 3972450 A (TOM WALTERS), 3 August 1976 (03.08.76), figures 1-2, abstract --	1-17

INTERNATIONAL SEARCH REPORT

Information on patent family members

29/04/98

International application No.
PCT/NO 98/00026

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