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(54) Disposable filtering bag for vacuum cleaners

(57) Disposable filter bag for a vacuum cleaner, comprising two sheets (1, 2) of flexible filter material, which are arranged on top of each other and joined together along their perimetral edge, or in the vicinity thereof, there being envisaged means for joining said bag to the suction pipe of a vacuum cleaner; the perimetral edge (101) of said bag is a convex closed line, along the greater part of which it is possible to define wide-angle adjacent sections (111, 121) so that the axial expansion of the bag caused by the entry of the sucked-in air allows at the same time radial expansion thereof.

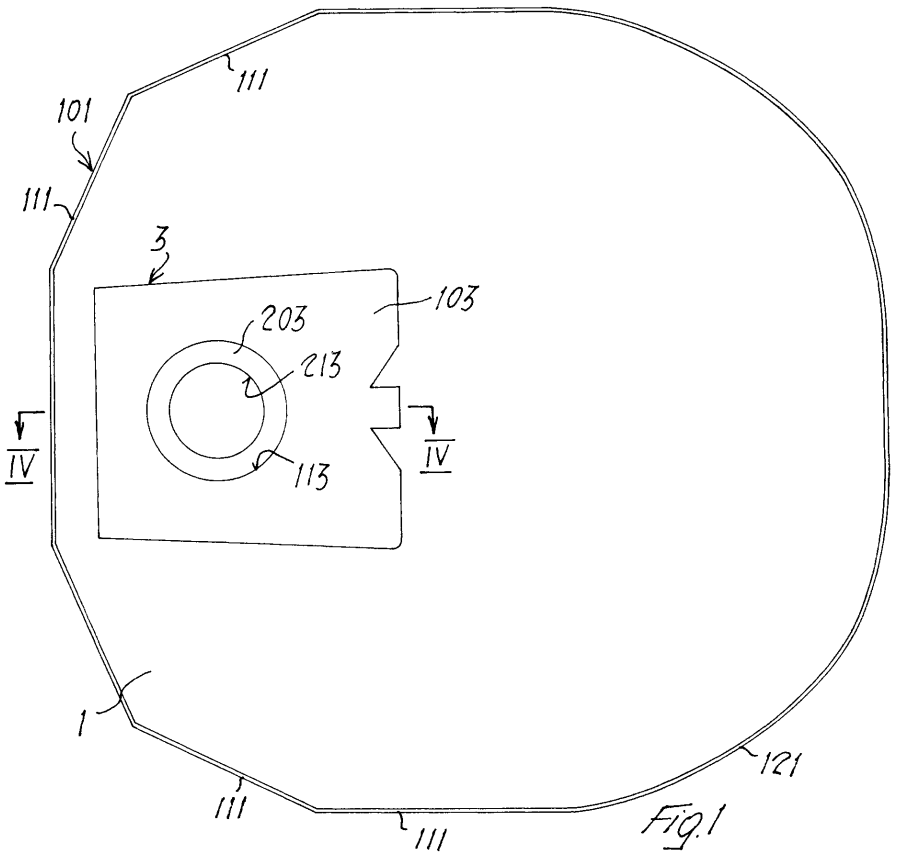

Fig.1

EP 1 661 500 A1

Description

[0001] The present invention relates to filter bags for vacuum cleaners and in particular relates to bags which are disposable, i.e. are intended to be thrown away together with their contents.

[0002] The majority of vacuum cleaners are currently equipped with bags which are able to filter the air reaching them via the suction mouth; the dust conveyed by the forced air flow lays inside the bag which, once it has reached its maximum capacity, is replaced.

[0003] During the production of these bags, the manufacturers of vacuum cleaners must take into consideration three separate requirements: the first requirement relates to the filtering capacity of the bag per unit of surface area, which must be very high; the second requirement relates to the air flow which must be correlated both to that necessary for the suction capacity of the vacuum cleaner and, in most cases, to the necessity to cool the electric motor of the vacuum cleaner; the third requirement relates to the structural properties of the bag, which must ensure on the one hand that the bag remains intact during the whole operating period inside the vacuum cleaner and on the other hand to allow the bag to be inflated so that it occupies most of the compartment inside which it is housed.

[0004] The structural properties are mostly influenced by the materials from which the bag is made and by the shape which is imparted to the said bag. Most of the bags for vacuum cleaners are made of materials with hybrid properties, often multi-layer materials, which pose problems and have a fairly high manufacturing cost. The shape which is imparted to the bag is usually the result of a compromise between the shape which is most suitable for the maximum possible inflation inside the suction compartment and the shape which is most useful for the purposes of mass production; quite frequently preference is given to the shape which is easiest to produce, to the detriment, therefore, of the functional effectiveness of the bag.

[0005] The object of the present invention is thus to provide a disposable filter bag for a vacuum cleaner in which the manufacturing costs are significantly reduced, with regard to both the choice of materials and use thereof, while nevertheless maintaining a high filtering capacity and high degree of adaptability in terms of shape.

[0006] The present invention therefore relates to a disposable filter bag for a vacuum cleaner, comprising two sheets of flexible filter material, such as for example non-woven fabric or the like, which are arranged on top of each other and joined together along their perimetral edge, there being envisaged means for joining said bag to the suction pipe of a vacuum cleaner, characterized in that the perimetral edge of said bag is a convex closed line, along the greater part of which it is possible to define wide-angle adjacent sections so that the axial expansion of the bag caused by the entry of the sucked-in air allows at the same time radial expansion thereof.

[0007] In particular, the perimetral edge is a convex polygon having at least five sides; alternatively it may be a profile comprising one or more straight lines and one or more curved lines or a profile comprising one or more curved lines or also an ellipse.

[0008] The sheets may each comprise one or more layers of different material or the same material. The various layers may have a specific weight which is the same or different from each other; in particular, the layers will preferably consist of synthetic material and in particular synthetic non-woven fabric.

[0009] In one embodiment of the invention, the portion of the sheets for joining together has a width substantially ranging between the sum of the thicknesses of the two sheets and twice said sum; in particular a width corresponding to the sum of the said thicknesses is preferable. Joining together may be performed by means of gluing, stitching or also, where permitted by the material used, it may be performed by means of welding, and from among the various welding methods ultrasound welding is preferred.

[0010] The means for joining the bag to the suction pipe of the vacuum cleaner may envisage a hole formed in one of the two sheets or an opening provided along the perimetral edge of the said bag.

[0011] Further advantages and characteristic features of the device according to the present invention will emerge from the following detailed description of some embodiments thereof provided, by way of a non-limiting example, with reference to the accompanying plates of drawings in which:

Figure 1 is a plan view of an embodiment of the bag according to the present invention;
Figure 2 is a side elevation view of the bag according to Figure 1 shown during expansion:
Figure 3 is a plan view of a detail from the inside of Figure 1;
Figure 4 is a view of an enlarged detail cross-sectioned along the line IV-IV of Figure 1;
Figure 5 is cross-sectional view along the line V-V of Figure 4;
Figure 6 is a view of an enlarged detail of Figure 4;
Figures 7 to 12 are further embodiments of the bag according to the invention.

[0012] Figure 1 shows a disposable filter bag for a vacuum cleaner according to the present invention; 1 denotes one of the two sheets of flexible filter material, such as for example non-woven fabric, from which said bag is made. The welding edge 101 is formed along the perimeter of the sheet 1; the perimetral edge of the sheet 1 has the straight sections 111 and the curved section 121. The cardboard tag 3 is positioned on the sheet 1 and allows joining with the suction pipe of the vacuum cleaner; the tag has, passing through its upper layer 103 shown here, a substantially axial hole 113 inside which the rubber seal 203 is positioned, said seal also being provided

with an axial hole 213 which is coaxial with the hole 113.

[0013] Figure 2 shows the bag according to the embodiment of Figure 1 during inflation, in order to illustrate the situation which occurs when the suction pipe of a vacuum cleaner, schematically shown as a broken line indicated by the number 10 in the figure, is inserted into the hole 203 of the tag 3; identical parts are indicated by the same numbers. The sheet 1 and the sheet 2 are shown symmetrically inflated owing to the action of the air which is sucked in.

[0014] Figure 3 shows a detail of the bag according to Figure 1, namely the side of the sheet 1 of the bag directed towards the inside thereof; the sheet 1 is provided with a hole 201 which corresponds to the hole 313 in the base layer 303 of the tag 3. The sheet 1 is fixed to the base layer 303 of the tag 3 by means of metal staples 323 which are arranged in form of a ring around the axial holes 201 and 313.

[0015] Figure 4 shows a detail cross-sectioned along the line IV-IV of Figure 1; identical parts have been indicated by the same numbers. The figure shows fixing of the tag 3 to the sheet 1 of the bag; the bottom cardboard layer 303 is secured to the sheet 1 by means of the metal staples 323 and is connected to the upper layer 103 of the tag 3 by means of glue 333. The seal 203 is gripped between the bottom layer 303 and the upper layer 103 of the tag 3, with the hole 213 positioned coaxial with the holes 113 and 313. Figure 5 shows more clearly the position and the form of the metal staples 323.

[0016] Figure 6, which is an enlarged detail of Figure 4, shows more clearly the join between the sheets 1 and 2, which form the bag according to the invention; the width 20 of the welding edge 101 is shown as being substantially equal to the sum 30 of the thicknesses of the two sheets 1 and 2. The welding edge 101' is shown as a dot-dash line and has a width 40 substantially equal to twice the sum 30 of the thicknesses of the sheets 1 and 2.

[0017] Figures 7 to 12 show a corresponding number of constructional variants of the bag according to the present invention; the bag according to Figure 7 is open along one side edge and the sides 131 of the sheet 1 and 112 of the sheet 2 form the edges of the opening intended for connection to the suction pipe of the vacuum cleaner. In this type of bag the connection is performed by means of an elastic band or a circumferential strap able to surround the said pipe. The bag according to Figure 8 instead has a perimetral edge consisting of two arcs of a circle which are diametrically opposite and spaced by parallel straight sections. The bag according to Figure 9 has a circular perimetral edge, the bag according to Figure 10 has an irregular, polygonal, perimetral edge and the bag according to Figure 11 has an elliptical perimetral edge. Finally, the bag according to Figure 12 has a perimetral edge formed by curved sections in which, as in the bag according to Figure 7, the opening intended for connection to the suction pipe of the apparatus is formed by the edge 112 of the sheet 2 and by the edge 131 of the sheet 1, which along that section are connected together.

[0018] The operating principle and the constructional design of the bag according to the present invention will become clear from the following description. With reference to Figure 1, the bag according to the invention is formed by two sheets, only one of which is visible in the Figure and which are identically shaped. The shape of the sheets is of particular importance in particular in relation to the possibility of expansion of the bag during use thereof and therefore the actual volume which the bag may acquire. It has been noted that geometrical figures in which two consecutive sections of the perimetral edge are joined together with a wide angle, as for example in the case shown here or in the cases illustrated in Figures 7 to 12, allow extremely effective expansion of the bag. On the other hand, in the case where the said consecutive sections form for example a right angle, as in the case of a square or rectangular perimetral edge, the portions in the vicinity of the corners are limited greatly with regard to expansion, and in particular the axial expansion prevents radial expansion and vice versa. This situation creates structural stresses in the bag, which becomes more susceptible to damage, and reduces considerably the actual volume which can be used by the vacuum cleaner. Shapes which are able to achieve the objects of the invention are therefore considered to be those which have a convex polygonal perimetral edge with a number of sides greater than or equal to five, shapes which have an elliptical perimetral edge and shapes which have a circular perimetral edge; moreover, the shapes which have a perimetral edge formed by straight sections and curved sections are considered likewise suitable for use, provided that these sections are joined together with a wide angle.

[0019] Another factor which influences considerably the functional capacities of the bag according to the invention is the position of the area for joining together the sheet 1 and the sheet 2 of flexible filter material. As shown in Figure 6, the two sheets are joined together along the respective perimetral edges over a width which essentially is not greater than twice the sum of the thicknesses of the said two sheets and in particular is substantially equal to the said sum. The joined portion must not exceed in terms of width twice the sum of the said thicknesses, otherwise it would result in the bag being rigid during expansion; moreover, it is best for the width not to be less than the sum of the said thicknesses since the join would not be strong enough. In this way, the resistance offered by the joining zone of the two sheets to expansion of the bag is minimal, without adversely affecting in any way the strength of the bond between the said sheets. The join may be achieved in various ways; in the case where the sheets of flexible filter material are made of non-woven fabric of the synthetic type, a preferred joining method uses welding and, among the welding techniques, welding based on ultrasound is particularly effective. The sheets which form the bag may each be made as a single layer or may comprise several layers

of materials which are the same or different from each other; moreover a different specific weight may be envisaged for the layers which compose each sheet of a same bag.

[0020] The connection between the tag 3, which allows joining with the suction pipe of the vacuum cleaner, and one of the two sheets of flexible material of the bag has some characteristic features. This connection must in fact be stable vis-a-vis the tensile load which is exerted by the air introduced inside the bag; for this purpose, the tag 3 comprises a base layer 303 which is connected to the upper layer of the tag 3 by means of an adhesive 333 or the like and it is said base layer which is joined by means of the metal staples 323 to the sheet 1 in the vicinity of the respective holes 313 and 201. The metal staples, which could also be made of plastic material or the like, ensure a fixing action which is of decidedly better quality than simple gluing and at the same time require a decidedly small joining surface area. The tag 3 will be shaped according to the different type of connection required by the vacuum cleaner inside which the bag must be positioned. Clearly, the tag could be joined to the bag in any other way; in particular, a tag of plastic material could be glued to the said bag or welded thereto and preferably welded by means of ultrasound.

[0021] Obviously, as shown in Figures 7 and 12, it is not always the case that the connection with the vacuum cleaner is performed via a hole formed in one of the sheets which form the bag, but it may also be established by means of an opening situated along the edge of the said bag.

Claims

1. Disposable filter bag for a vacuum cleaner, comprising two sheets (1, 2) of flexible filter material, which are arranged on top of each other and joined together along their perimetral edge, or in the vicinity thereof, there being envisaged means for joining said bag to the suction pipe of a vacuum cleaner, **characterized in that** the perimetral edge (101) of said bag is a convex closed line, along the greater part of which it is possible to define wide-angle adjacent sections (111, 121) so that the axial expansion of the bag caused by the entry of the sucked-in air allows at the same time radial expansion thereof.

2. Bag according to Claim 1, in which the perimetral edge is a convex polygon having at least five sides.

3. Bag according to Claim 1, in which the perimetral edge is a profile comprising one or more straight lines and one or more curved lines.

4. Bag according to Claim 1, in which it is a profile comprising one or more curved sections.

5. Bag according to Claim 4, in which the perimetral edge is an ellipse.

6. Bag according to Claim 5, in which the perimetral edge is a circumference.

7. Bag according to any one of the preceding Claims 1 to 6, in which the portion (101; 101') of the sheets (1, 2) for joining together has a width (20; 40) substantially ranging between twice the sum of the thicknesses (30) of the two sheets (1, 2) and the said sum (30).

8. Bag according to any one of the preceding Claims 1 to 7, in which said sheets (1, 2) of flexible filter material each consist of one or more layers of flexible filter material, said layers being made of materials which are the same or different from each other and having gramme weights which are the same or different from each other.

9. Bag according to any one of the preceding Claims 1 to 8, in which said sheets (1, 2) of flexible filter material are made of synthetic material.

10. Bag according to Claim 9, in which said sheets (1, 2) of flexible filter material are made of synthetic nonwoven fabric.

11. Bag according to Claim 9 or 10, in which the join between said sheets (1, 2) is performed by means of welding.

12. Bag according to Claim 11, in which the join is performed by means of ultrasound welding.

13. Bag according to any one of the preceding Claims 1 to 12, in which said means for joining to the suction pipe comprise a hole (201) formed through one (1) of said sheets (1, 2).

14. Bag according to any one of the preceding Claims 1 to 12, in which said joining means comprise an opening (112, 131) provided along the perimetral edge of the said bag.

15. Bag according to Claim 13, in which said means for joining to the suction pipe comprise a tag (3) of rigid material joined to one (1) of the sheets (1, 2) of said bag in the region of said hole (201), said tag being shaped in a suitable manner and provided with a through-hole (113; 114) having sealing means (203; 204).

16. Bag according to Claim 15, in which said tag (3) is joined to said sheet (1) by means of mechanical joining means (323).

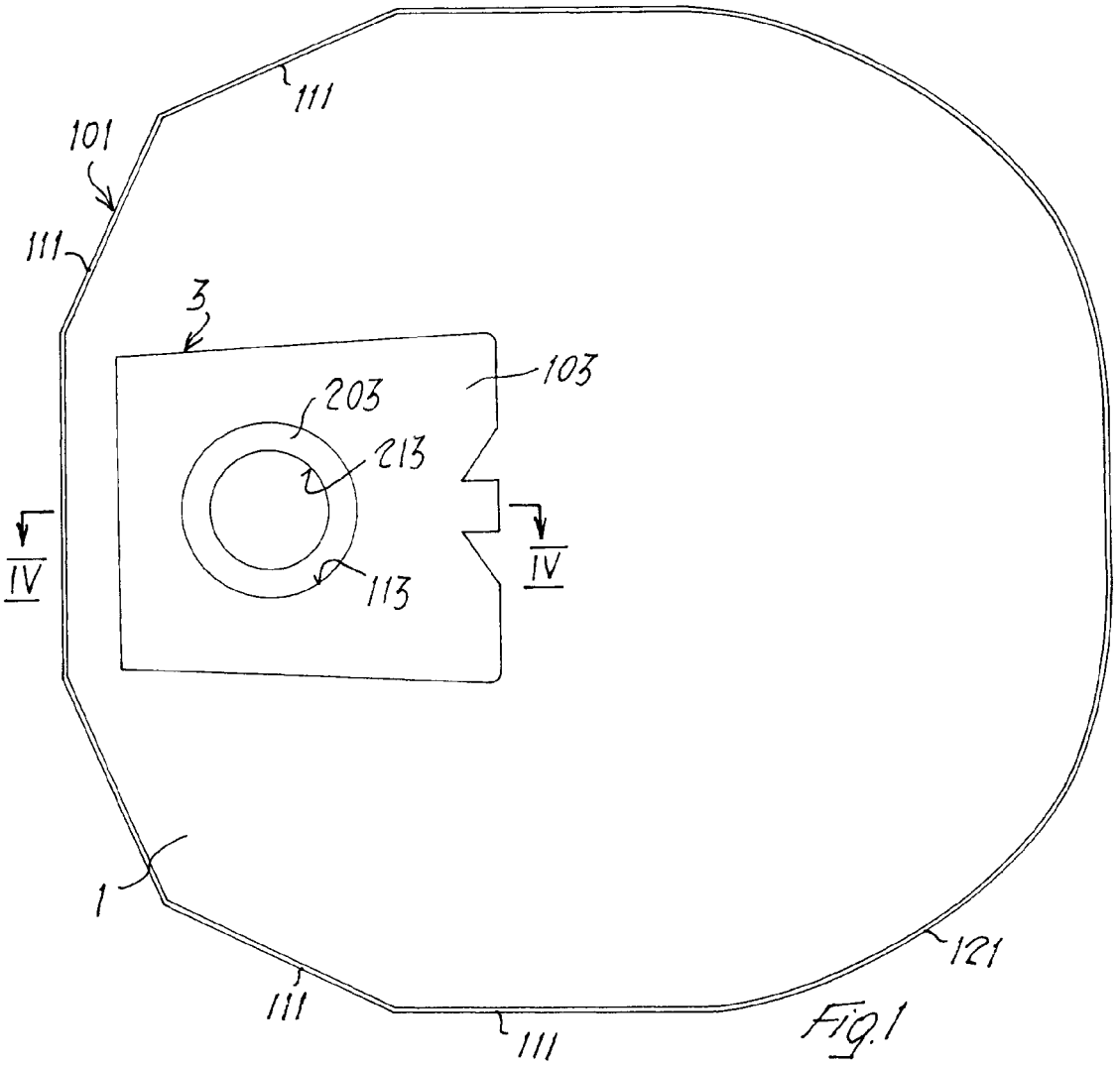

Fig.1

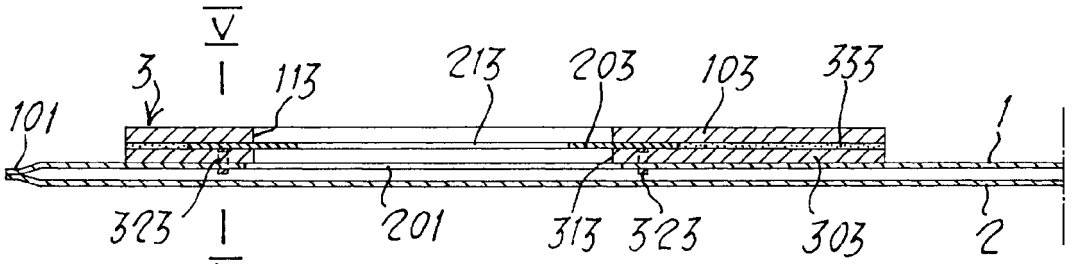

Fig.4

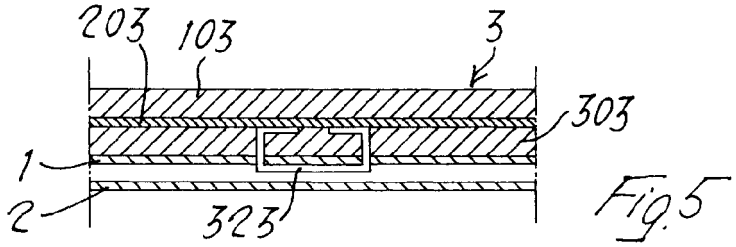

Fig.5

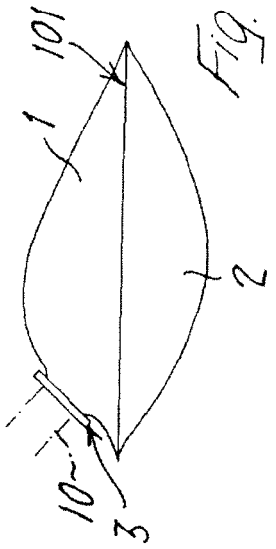

Fig. 2

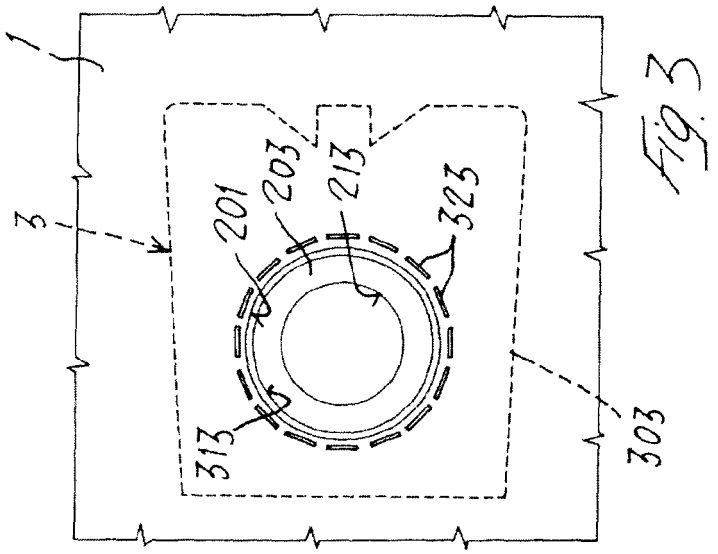

Fig. 3

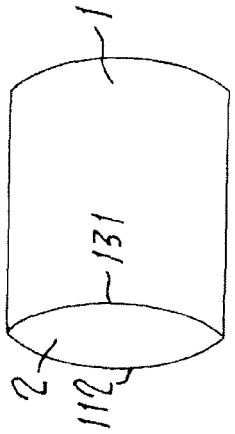

Fig. 7

Fig. 6

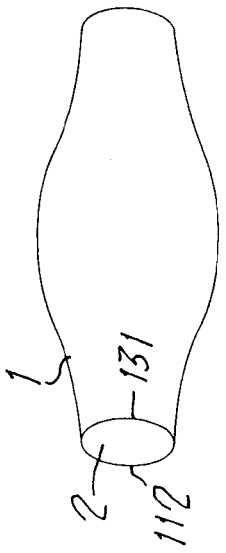

Fig. 12

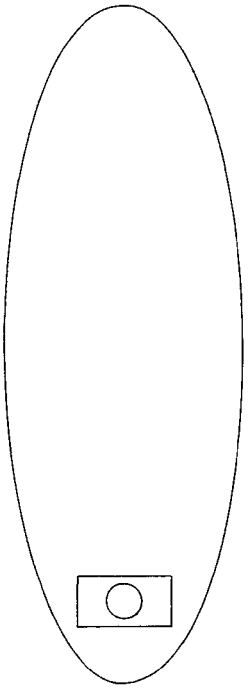

Fig. 11

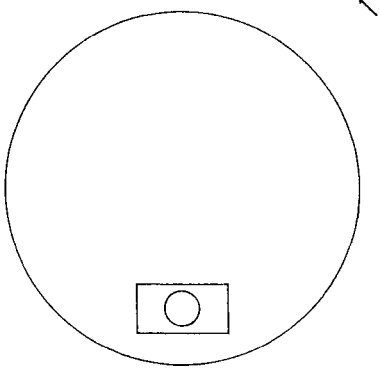

Fig. 9

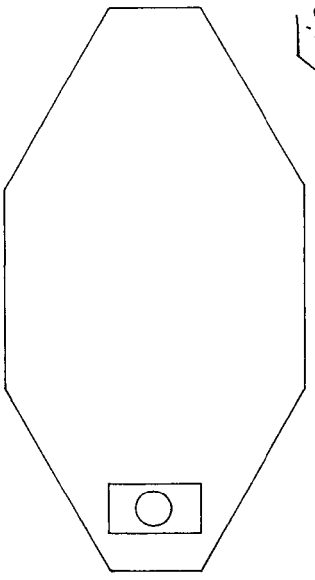

Fig. 10

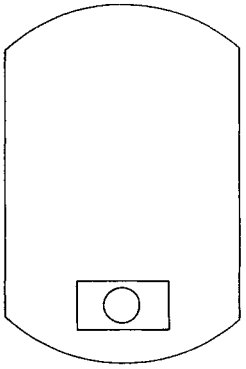

Fig. 8

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Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 March 2006	Bourseau, A-M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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