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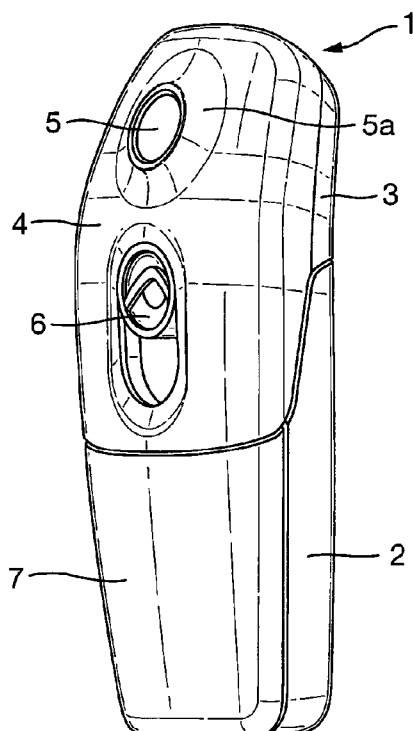
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(54) Title: LIQUID DISPENSING DEVICE WITH REFILL UNIT

Fig. 1



(57) Abstract: A hand held liquid dispensing device (1), particularly suitable for dispensing fragrance sprays, said device (1) comprising a mother unit (2) comprising a source of electrical power and a replaceable refill unit (3) comprising a cartridge holding the liquid to be dispensed, and, typically, an electrically-driven dispensing means (5) for the liquid, the mother unit (2) or refill unit (3) comprising extending angular arms (18) at corner junctions of the rear wall (11) and each side wall (13) of said unit, these arms (18) tapering as they extend outwards and being designed to fit into corresponding recesses (25,26) in the other of the two units (2,3), and one of the two units (2,3) comprising a spline (15,16 or19) extending from its front surface designed to fit into a corresponding slot (25,26 or27) in the front surface (4,7) of the other of the two units (2,3). The resulting device is extremely robust when assembled and yet still has a refill unit (3) that is light and easy to replace.



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Liquid Dispensing Device with Refill Unit

The invention relates to hand held liquid dispensing devices in which the liquid
5 may be changed by means of a replaceable refill unit and in which the liquid is
dispensed using an electrically-driven dispensing means. In particular, the
invention relates to hand held liquid dispensing devices from which the liquid is
dispensed as a spray.

10 Hand held liquid dispensing devices are used in many fields and come in a variety
forms, some of which include a replaceable refill unit containing the liquid to be
dispensed. Certain of these devices dispense the liquid in the form of a spray.

EP 2,172,276 A2 (GOJO Industries Inc.) discloses a portable personal fluid
15 dispenser comprising a refill unit and refill unit casing that includes a means for
preventing accidental dispensing.

US 2010/0243754 A1 (Robert M. Harris) discloses a multi-purpose cartridge-
based liquid dispensing air freshener system that may optionally be micro-sized
20 allowing extreme portability.

When hand held liquid dispensing devices comprise an electrically-driven
dispensing means, there must be a power source and associated circuitry and this
can add considerably to the weight of the total device. In order to keep down the
25 weight of the refill unit, which is bought more frequently than the "mother" unit, it is
desirable to have the power source and much of the associated circuitry as part of
the mother unit.

A problem with hand held liquid dispensing devices comprising a refill unit is the
30 ease with which the refill unit can be replaced. A further problem can be the

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robustness of the total device when assembled, particularly bearing in mind the fact that it is designed to be portable and optionally stored in a trouser pocket, where it may encounter considerable bending moments.

- 5 A further problem with held liquid dispensing devices comprising a refill unit is that of cross-contamination of the liquid being dispensed by residues of the liquid previously dispensed. This is of particular concern when the liquid is to be tasted or smelled. A means of avoiding this problem is to include the dispensing means for the liquid within the replaceable refill unit. In such embodiments, the
10 dispensing means is replaced together with the liquid to be dispensed and the problem of cross-contamination does not arise.

The present invention provides a hand held liquid dispensing device comprising a refill unit which is extremely robust when assembled and yet still has a refill unit
15 that is light and easy to replace. In addition, the present invention provides means for aiding the ease with which the refill unit can be slotted the mother unit.

In a first aspect of the present invention there is provided a hand held liquid dispensing device (1) comprising a mother unit (2) and replaceable refill unit (3),
20 the mother unit (2) comprising a source of electrical power, the refill unit (3) comprising a cartridge holding the liquid to be dispensed, and the mother unit (2) or the refill unit (3) comprising an electrically-driven dispensing means for said liquid comprising an exit orifice (5) for said liquid, the power source in the mother unit (2) providing power for the dispensing means *via* appropriate circuitry, one of
25 the two units (2 or 3) comprising extending arms (18) or splines (15, 16 or 19) protruding from each of upper (4 or 7), lower (10 or 11), and side walls (8 or 13) that are designed or engineered to fit into recesses or slots (25, 26 or 27) in each of the corresponding walls of the other of the aforementioned units, each arm (18) or spline (15, 16 or 19) protruding in substantially the same plane as the wall from
30 which it protrudes.

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In a particular embodiment of the first aspect of the present invention, there is provided a hand held liquid dispensing device comprising a mother unit and replaceable refill unit, the mother unit comprising a source of electrical power, the
5 refill unit comprising a cartridge holding the liquid to be dispensed, and the mother unit or the refill unit comprising an electrically-driven dispensing means for said liquid comprising an exit orifice for said liquid, the power source in the mother unit providing power for the dispensing means *via* appropriate circuitry, one of the two units comprising a first extending arm protruding from the rear and a first side wall
10 of the unit and a second extending arm protruding from the rear and a second side wall of the unit, said arms being of angular cross-section and having one surface that extends the rear surface of the unit and one that extends each of its side surfaces, the extending arms tapering as they extend outwards and being designed to fit into corresponding recesses in the other of the two units, one of the
15 two units comprising an extending spline located at the front of the unit, said spline protruding in substantially in the same plane as a front surface of the unit and being designed to fit into a corresponding slot located in a front surface of the other of the two units.

20 In a further embodiment of the first aspect of the present invention, there is provided a hand held liquid dispensing device comprising a mother unit and replaceable refill unit, the mother unit comprising a source of electrical power, the refill unit comprising a cartridge holding the liquid to be dispensed, and the mother unit or the refill unit comprising an electrically-driven dispensing means for said
25 liquid comprising an exit orifice for said liquid, the power source in the mother unit providing power for the dispensing means *via* appropriate circuitry, the mother unit or refill unit comprising an upper surface from the internal edge of which a spline protrudes substantially in the same plane as said upper surface, said spline being engineered to fit into a slot located immediately within a corresponding upper
30 surface of the other of the aforementioned units, the mother unit or refill unit

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comprising a lower surface from the internal edge of which a spline protrudes substantially in the same plane as said lower surface, said spline being engineered to fit into a slot located immediately within a corresponding lower surface of the other of the aforementioned units, the mother unit or refill unit

5 comprising opposing sidewalls from the internal edges of which splines protrude substantially in the same plane as said sidewalls, said splines being engineered to fit into slots located immediately within corresponding sidewalls of the other of the aforementioned units, and the sidewalls of the mother unit and refill unit contacting the upper surface of the corresponding unit at their respective upper ends.

10

In a second aspect of the present invention, there is provided a method of dispensing a liquid using a dispensing device according to the first aspect of the invention.

15 In a third aspect of the invention, there is provided a hand held liquid dispensing device according to the first aspect of the invention, wherein the liquid to be dispensed from the cartridge is a fragrance composition.

In a fourth aspect of the present invention there is provided a method of
20 dispensing fragrance, particularly as a spray, using a dispensing device according to the third aspect of the invention.

In a particular aspect of the present invention, the electrically-driven dispensing means is part of the refill unit, thereby avoiding any issues of cross-contamination
25 of the liquids to be dispensed.

The present invention is particularly suited for the dispensing of fragrance sprays. Particularly fine sprays may be produced when the spray is generated by means of a vibrating membrane, onto which the liquid is passed, driven by a piezoelectric
30 transducer. Such membranes and transducer are, by themselves, known in the

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art as means to produce fragrance sprays (see, for example FR 2929861 and FR 2929862).

The mother unit comprises the power source for the dispensing means. The
5 mother unit also comprises appropriate circuitry for passing the power towards the dispensing means. When the dispensing means is part of the refill unit, power couplings are present between the mother unit and refill unit and the circuitry links to these. The circuitry is associated with the power source, which is typically a battery, preferably a rechargeable battery.

10 The refill unit comprises a cartridge holding the liquid to be dispensed and may be slotted easily into the mother unit.

The dispensing means necessarily comprises an exit orifice for liquid being
15 dispensed. In a preferred embodiment, this exit orifice is present in the upper surface (as used herein) of the unit of which it is part.

The dispensing means preferably comprises a means for producing a spray from the liquid and an exit orifice for said spray. A particularly suitable means for
20 producing a spray comprises a vibrating membrane, onto which the liquid is passed, the vibrating membrane being driven by a piezoelectric transducer by methods known in the art.

A preferred feature of the dispensing means is an actuator button, which serves to
25 switch on the power. In preferred embodiments, the actuator button is slide-operated. In particularly preferred embodiments, sliding of the slide-operated button causes the closure of an electrical contact and thereby actuates the device. This is of particular value when the dispensing means and associated actuator button are in the refill unit and the actuator button is slid towards the mother unit to
30 close an electrical contact therein and thereby actuate the device. This latter

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feature is of particular value, at least in part, because it reduces the circuitry and associated weight present in the refill unit. The actuator button is preferably located on the upper surface (as used herein) of the unit of which it is part.

- 5 The refill unit and mother unit come together easily to form a robust dispensing device when assembled. Key to this is the manner in which the two units interlink.

It should be noted that the surfaces referred to in this description of the invention may alternatively be referred to as walls.

10

The strength of the two units, when assembled together, comes in large part from the extending arms and/or splines extending from and one unit and closely fitting into slots in the corresponding unit. Extending arms may protrude from the rear and sides of one of the units and act in combination with an extending spline

- 15 located at the front of one of the units and the fact that said extending arms and spline are designed to fit into corresponding recesses and slot, respectively, in the other unit give strength to the assembled device. These latter features provide links between the units in no less than four planes: a front plane, a rear plane, and two side planes.

20

The extending arms referred to in the above paragraph are generally of angular cross-section and have one surface that extends the rear surface of the unit and one that extends each of its side surfaces. Together with the recesses in the other unit into which these fit, they provide links between the units in the rear

- 25 plane and both side planes of the device.

That the extending arms taper as they extend outwards, means that they decrease in at least one dimension as they protrude from the unit which they are part. Preferably, the extending arms taper as they extend outwards in both the

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plane of the surface that extends the rear surface of the unit and the planes of the surfaces that extend the side surfaces of the unit.

In preferred embodiments, the surfaces of the extending arms that extend the rear
5 surface of the unit have internal edges that slope away from each another, thereby producing a tapering of said surfaces. In other or further preferred embodiments, the surfaces of the extending arms that extend the side surfaces of the unit have upper edges that slope towards downwards the rear surface, thereby producing a tapering of the side surfaces.

10 The extending arms preferably comprise a spline protruding from their internal edge substantially in the same planes as those of said extending arms, said splines being engineered to fit into slots located within the unit bearing the corresponding recesses that accommodate the extending arms.

15 When present, the splines protruding from the extending arms are preferably contiguous with a spline protruding the internal edge of the rear of the unit, this latter spline being engineered to fit into a slot located within the unit bearing the corresponding recesses that accommodate the extending arms.

20 The extending spline located at the front of one of the units that protrudes in substantially in the same plane as the front surface of said unit, together with the corresponding slot in the other unit into which it is designed to fit, provide a link between the units in the front plane of the device. Preferably, there are two such
25 splines, each being designed to fit into a corresponding slot located in the other unit. These two splines are preferably located adjacent to the sides of the unit. It is further preferred that the two splines taper in the plane in which they protrude as they protrude and it is especially preferred that they taper away from the side to which each is adjacent.

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The extending splines, which may alternatively be called tabs or blades, are not necessarily present on solely one of the units, although this is a preferred feature. It is particularly preferred that at least one spline is present on the mother unit.

- 5 Each of the arms or splines fits or couples into a corresponding slot in the other unit when the units are brought together. It is preferred that each of the splines fits snugly into its corresponding slot. Usefully, these couplings take place in more than one plane, this adding substantially to the robustness of the design. There is a first coupling between the upper surfaces of the units; a second coupling, in a
10 plane substantially parallel to the first, between the lower surfaces of the units; and third and fourth couplings between the opposing sidewalls of the units, these third and fourth couplings being in planes at a substantial angle to the first and second.
- 15 To clarify, if the upper surfaces were considered to be in a first XY plane and the lower surfaces to be in a second XY plane somewhat below, then the opposing sidewalls should be considered to be in planes at least approaching first and second XZ or YZ planes, using normal Cartesian coordinates. It will be noted that the opposing sidewalls need not actually be in an XZ or YZ plane, although this is
20 a possibility.

In preferred embodiments, the opposing sidewalls slope away from one another in moving from the lower surface of each unit to the upper, the upper surfaces having a somewhat greater breadth than the lower. It has been found that this
25 feature aids the ergonomic handling of the device.

In preferred embodiments, the lower surface of each unit has a concave shape across its breadth and the upper surface of each unit a convex shape across its breadth. It has been found that this feature aids the ergonomic handling of the
30 device.

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In preferred embodiments, the lower surface of each unit has a concave shape across its length and the upper surface of each unit a convex shape across its length. It has been found that this feature aids the ergonomic handling of the device.

In particularly preferred embodiments, the lower surface of each unit has a concave shape across both its length and its breadth and the upper surface of each unit a convex shape across its length and its breadth. It has been found that this combination of features particularly aid the ergonomic handling of the device, especially when combined with the feature that the opposing sidewalls slope away from one another in moving from the lower surface of each unit to the upper.

Throughout this specification the terms “upper” and “lower” should be understood as relative terms. The “upper” and “lower” surfaces may alternatively be referred to as “first” and “second” surfaces, respectively, or “front” and “rear” surfaces, respectively. It should also be understood that the sidewalls of the mother unit and/or refill unit are of lesser surface area than the upper and lower surfaces and link the upper and lower surfaces together.

It should also be understood that the terms “length” and “breadth” refer to the longest and second longest dimensions of the feature being described, respectively. The “top” of the device should be considered the end of the refill unit farthest from the mother unit and the “bottom” of the device should be considered the end of the mother unit farthest from the refill unit. It should also be noted that the term “top” does not equate with the term “upper” and that the term “bottom” does not equate with the term “rear”.

It should also be understood that the terms “length” and “breadth” refers to the longest and second longest dimensions of the feature being described,

- 10 -

respectively. The “top” of the device should be considered the end of the refill unit farthest from the mother unit and the “bottom” of the device should be considered the end of the mother unit farthest from the refill unit.

- 5 The lower surface from which a spline protrudes preferably has said spline protruding and continuing along the full length of said surface.

The lower surface from which the spline protrudes preferably defines a central gap between extending arms that link to the sidewalls, preferably along their full
10 length. It is further preferred that the extending arms or extending arms and sidewalls to which they are linked are engineered to fit into corresponding indentations in the other of the aforementioned units, this further enhancing the robustness of the design.

- 15 The spline protruding from the edge of the lower surface, whether continuing along its full length or not, is preferably contiguous with the splines protruding from the edges of the side surfaces. In particularly preferred embodiments, the lower surface spline links to the sidewall splines in a smooth curve.

- 20 The unit having an upper surface from which a spline protrudes preferably has two such splines protruding from the internal edge of its upper surface, both protruding substantially in the same plane as said upper surface and both being engineered to fit into slots located immediately within the corresponding upper surface of the other unit. Preferably, the two protruding splines are located adjacent to each
25 opposing sidewall of the unit and it is particularly preferred that each of the two splines tapers as it gets closer to the sidewall to which it is adjacent, this later feature aiding the manual correlation of the units when the splines are being inserted into their corresponding slots.

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The edges of each of the splines herein described are preferably bevelled, this feature aiding their insertion into their corresponding slots when the units are brought together.

5 An additional feature that may be advantageously employed is a locking member that functions to provide resistance against removal of the refill unit when it has been slid into place within the mother unit. Such locking members serve to prevent the refill unit from falling from the mother unit in normal use. In certain preferred embodiments, the locking member may need releasing before the units
10 can be pulled apart; whilst in others, a firm pull is sufficient to overcome the resistance of the locking member. Typical of such latter locking members, are locking members comprising a flexible tongue in one unit which fits into a groove in the other when the units are brought together.

15 There follows a detailed description of specific embodiments. The features described with reference to these embodiments may be incorporated independently into the generic description given above and/or as given in the claims. Reference is made to Figures 1 to 15, wherein:

20 Figures 1 to 12 relate to a first embodiment and

Figure 1 is a view of the dispensing device (1) from the front and side,

Figure 2 is a view of the dispensing device (1) from the back and side,

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Figure 3 is a slightly offset front view of the mother unit (2),

Figure 4 is a rear view of a first embodiment the mother unit (2),

30 Figure 5 is a side view of a first embodiment the mother unit (2),

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Figure 6 is a view of the mother unit (2) from the front and side,

Figure 7 is a view of the mother unit (2) from the back and side,

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Figure 8 is a front view of the refill unit (3),

Figure 9 is a rear view of , the refill unit (2),

10 Figure 10 is a bottom/lower surface view of the refill unit (2), inverted such that the lower (back) surface (10) is shown at the top,

Figure 11 is a slightly offset view of the refill unit (2) from the rear and bottom, and

15 Figure 12 is a view of the refill unit (2) from the rear, bottom, and side.

Figures 13 to 15 are schematic views of a second embodiment, and:

Figure 13 is a schematic of the dispensing device (1A) from the front and side.

20

Figure 14 is a schematic of the dispensing device (1A) from the side.

Figure 15 is a schematic of the dispensing device (1A) from the rear.

25 In Figure 1, the mother unit (2) and refill unit (3) are shown in combination. The refill unit's front or upper surface (4) defines an exit orifice (5) for the liquid to be dispensed and a slide-operated actuator button (6) is also present on said surface. The exit orifice (5) has a raised annulus (5a) surrounding it. The mother unit's upper surface (7) is smooth and continuous. The refill unit's upper surface
30 (4) and the mother unit's upper surface (7) both have a convex shape across their

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breadth and length. The convex shape across the length of the mother unit's upper surface (7) continues smoothly into the convex shape across the length of the refill unit's upper surface (4).

5 In Figure 2, the mother unit (2) and refill unit (3) are again shown in combination. It can be seen that the refill unit's sidewall (8) continues and smoothly curves into a top wall (9) between the rear or lower surface (10) and upper surface (4) (not seen in Figure 2) of the refill unit (3). The refill unit's lower surface (10) and the mother unit's lower surface (11) both have a concave shape across their breadth
10 and length. The concave shape across the length of the mother unit's lower surface (11) continues smoothly into the concave shape across the length of the refill unit's lower surface (10).

Figure 2 also illustrates a port (12) in the mother unit's sidewall (13) for the
15 attachment of an electrical cable for charging of the re-chargeable battery (not illustrated) held within the mother unit (2).

Figures 3 to 7 illustrate the mother unit (2) in greater detail. The upper surface (7) and lower surface (11) are linked by sidewalls (13) and a bottom wall (14). From
20 the internal edge of the upper surface (7), two splines (15) protrude; these splines (15) being located adjacent to each sidewall (13) of the mother unit and protruding substantially in the same plane as the upper surface (7). The splines (15) have a ramp shape, increasing in height away from each sidewall (13) before curving into a near vertical drop back to edge of the upper surface (7). Alternatively, each
25 spline (15) may be described as tapering away from the sidewall (13) to which it is adjacent.

The lower surface (11) of the mother unit (2) extends beyond its upper surface (7) across the entire breadth of the unit (2). A portion of the lower surface (11) and
30 each of the sidewalls (13) extends even further in the form of extending arms (18)

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that define a central gap (17) in the lower surface (11). The extending arms (18) are of angular cross-section and have one surface that extends the lower surface (11) of the unit and one that extends each of its sidewalls (13). The extending arms (18) are designed to fit into corresponding recesses in the refill unit (3).

5

The extending arms (18) taper as they extend outwards, both in the plane of the surface that extends the lower surface (11) of the mother unit (2) and the planes of the surfaces that extend its sidewalls (13). The surfaces of the extending arms (18) that extend the lower surface (11) have internal edges that slope away from each another in order to produce a tapering of said surfaces. In addition, the surfaces that extend the side surfaces (11) have upper edges that slope downwards towards the lower surface (11), thereby producing a tapering of each extending arm (18) in a second plane.

10

15 When the refill unit (3) is fitted into the mother unit (2), a tongue (24) of the former fits snugly into the central gap (17) of the latter and the lower surface (11) of the former, including the segments in the extending arms (18), fit snugly into an indentation (23) in the lower surface (10) latter (*vide infra*).

20 Each of the extending arms (18) comprises a spline (19) protruding from its internal edge substantially in the same planes as those of said extending arms (18). Said splines (19) have an angular cross-section and are engineered to fit into corresponding slots (26) located immediately within the lower surface (10) of the refill unit (2) (*vide infra*).

25

The splines (19) protruding from the extending arms (18) are contiguous with a spline (16) protruding the internal edge of the lower surface (11) of the mother unit (2) substantially in the same plane as said lower surface (11). The splines (16) and (19) protrude to approximately the same degree along their full length, this degree being approximately the same for each. The extent to which these latter

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splines (16) and (19) protrude is significantly less than the maximum extent to which the splines (15) on the upper surface (7) protrude (*vide supra*).

5 The spline (16) protruding from the internal edge of the lower surface (11) of the mother unit (2) is engineered to fit into a corresponding slot (25) located within the lower surface (10) of the refill unit (2) (*vide infra*).

10 Figure 3 and to a lesser extent Figure 6, illustrate other features of the mother unit (2). On the inside (11I) of lower surface (11) there is a catch (20) made of flexible plastic. This catch (20) pivots on a hinge (21) and serves as part of a locking member that functions to provide resistance against removal of the refill unit (3) when it has been slid into place within the mother unit (2) (*vide infra*).

15 Internal features of the mother unit (2) are the mother unit ends of electrical power couplings (21M) between the mother unit (2) and the refill unit (2), allowing power from the battery (not illustrated) in the mother unit (2) to pass through to the dispensing mechanism (not illustrated) in the refill unit (3). These are located adjacent to the inside (11A) of the lower surface (11).

20 Figures 8 to 12 illustrate the refill unit (3) in greater detail. The upper surface (4) and lower surface (10) are linked by sidewalls (8) and a top wall (9). Figure 10 illustrates how the opposing sidewalls (8) slope away from one another in moving from the lower surface (10) to the upper surface (4) and that the upper surface (4) is of somewhat greater breadth than the lower surface (10). An analogous
25 situation exists in the mother unit (2) (see Figures 3 to 7).

An internal feature of the refill unit (3) is the reservoir (22) for the liquid to be dispensed. The reservoir (22) defines the shape of lower surface (10) of the refill unit (3) and part of its sidewalls (13).

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The lower surface (10) has an indentation (23) at its end farthest from its top wall (9), said indentation being U-shaped and extending up along the edges of the lower surface (10) for approximately half their length. The indentation (23) also extends approximately half way into the sidewalls (13), retaining the same depth
5 therein. The indentation is designed to accommodate the extended part of lower surface (11) of the mother unit (2) and the extended arms (18), when the two units are brought together.

The central non-indented portion of the lower surface (10) of the refill unit (3)
10 forms a tongue (24) that fits snugly into the central gap (17) in the lower surface (11) of the mother unit (2) when the two units are brought together. In order to promote the robustness of the joining together of the two units, there is a slot (25) under the lower surface (10), including the tongue (24) element thereof, into which the spline (16) projecting from the lower surface (11) of the mother unit (2) fits.
15 This slot (25) is contiguous with slots (26) located immediately within the sidewalls (8). The slots (26) located immediately within the sidewalls (8) are engineered to accommodate, in part, the splines (19) protruding from the extending arms (18) of mother unit (2) when the two units are brought together.

20 The upper surface (4) of the refill unit (3) has two slots (27), each located adjacent to opposing sidewalls (13) of the refill unit (3). These slots (27) are designed to accommodate the ramp-shaped splines (15) protruding from the upper surface (7) of the mother unit (2), this interaction further enhancing the robustness of the joining together of the two units.

25

Figures 10, 11, and 12 additionally illustrate other features of the refill unit (3). Located in the centre of the breadth of the indented portion of the lower surface (10), there is a recess (28), into which the catch (20) of the mother unit (3) fits when the units are brought together. This interaction provides a resistance

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against removal of the refill unit (3) when it has been slid into place within the mother unit (2).

At the end of the refill unit (3) farthest from its top surface (9) are the refill unit
5 ends of electrical power couplings (21R) between the mother unit (2) and the refill
unit (3), allowing power from the battery (not illustrated) in the mother unit (2) to
pass through to the dispensing mechanism (not illustrated) in the refill unit (3).
These couplings (21R) are located adjacent to the lower surface (10) of the refill
unit (3) and link to the electrical power couplings (21M) of the mother unit (2),
10 when the two units are brought together.

Figures 13 to 15 illustrate a second embodiment of the invention. In each of
these schematics, the mother unit (2A) and refill unit (3A) are shown in
combination. The refill unit's front or upper surface (4A) defines an exit orifice
15 (5A) for the liquid to be dispensed and a slide-operated actuator button (6A) is
also present on said surface. The mother unit's upper surface (7A) is smooth and
continuous. The refill unit's upper surface (4A) and the mother unit's upper
surface (7A) both have a convex shape across their breadth and length. The
convex shape across the length of the mother unit's upper surface (7A) continues
20 smoothly into the convex shape across the length of the refill unit's upper surface
(4A).

The refill unit's sidewall (8A) continues and smoothly curves into a top wall (9A)
between the rear or lower surface (10A) and upper surface (4A) of the refill unit
25 (3A). The refill unit's lower surface (10A) and the mother unit's lower surface
(11A) both have a concave shape across their breadth and length. The concave
shape across the length of the mother unit's lower surface (11A) continues
smoothly into the concave shape across the length of the refill unit's lower surface
(10A).

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The refill unit (3A) has a first extending arm (18A) protruding from the rear and a first side of the refill unit (3A) and a second extending arm (18A) protruding from the rear and a second side of the unit (3A). The extending arms (18A) are of angular cross-section and have one surface that extends the rear surface (10A) of the unit and one that extends each of its side surfaces (8A). The extending arms (18A) are designed to fit into corresponding recesses in the mother unit (not shown).

The extending arms (18A) taper as they extend outwards in the plane of the surface that extends the lower surface (10A). The surfaces of the extending arms (18A) that extend the lower surface (10A) have internal edges that slope away from each another in order to produce a tapering of said surfaces.

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CLAIMS

1. A hand held liquid dispensing device (1) comprising a mother unit (2) and replaceable refill unit (3),

5

the mother unit (2) comprising a source of electrical power, the refill unit (3) comprising a cartridge holding the liquid to be dispensed, and the mother unit (2) or the refill unit (3) comprising an electrically-driven dispensing means for said liquid comprising an exit orifice (5) for said liquid,

10

the power source in the mother unit (2) providing power for the dispensing means via appropriate circuitry,

one of the two units (2 or 3) comprising extending arms (18) or splines (15, 16 or 19) protruding from each of upper (4 or 7), lower (10 or 11), and side walls (8 or 13) that are designed or engineered to fit into recesses or slots (25, 26 or 27) in each of the corresponding walls of the other of the aforementioned units, each arm (18) or spline (15, 16 or 19) protruding in substantially the same plane as the wall from which it protrudes.

20

2. A dispensing device (1) according to claim 1, wherein

one of the two units (2 or 3) comprises a first extending arm (18) protruding from the rear and a first side wall of the unit and a second extending arm (18)

25

protruding from the rear and a second side wall of the unit, said arms (18) being of angular cross-section and having one surface that extends the rear wall (11) of the unit and one that extends each of its side walls (13), the extending arms (18) tapering as they extend outwards and being designed to fit into corresponding recesses in the other of the two units,

30

- 20 -

one of the two units (2 or 3) comprising an extending spline (15) located at the front of the unit, said spline (15) protruding in substantially in the same plane as a front wall (7 or 4) of the unit and being designed to fit into a corresponding slot (27) located in a front wall (4 or 7) of the other of the two units.

5

3. A device according to claim 2, wherein the extending arms (18) and extending spline (15) each protrude from the same unit (2 or 3).

10 4. A device according to claim 3, wherein the extending arms (18) and extending spline (15) each protrude from the mother unit (2).

5. A device according to claim 3, wherein the extending arms (18) and extending spline (15) each protrude from the refill unit (3).

15 6. A device according to claim 2, wherein the extending arms (18) taper as they extend outwards in both the plane of the surface that extends the rear surface (11) of the unit and the planes of the surfaces that extend the side surfaces (13) of the unit.

20 7. A device according to claim 2, wherein each extending arm (18) comprises a spline (19) protruding from its internal edge substantially in the same planes as those of said extending arms (18), said splines (19) being engineered to fit into slots (26) located within the unit bearing the corresponding recesses that accommodate the extending arms (18).

25

8. A dispensing device (1) according to claim 1, wherein

the mother unit (2) or refill unit (3) comprising an upper wall (7 or 4) from the internal edge of which a spline (15) protrudes, said spline (15) being engineered

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to fit into a slot (27) located immediately within a corresponding upper wall (4 or 7) of the other of the aforementioned units,

the mother unit (2) or refill unit (3) comprising a lower wall (11 or 10) from the
5 internal edge of which a spline (16) protrudes, said spline (16) being engineered to fit into a slot (25) located immediately within a corresponding lower surface (11 or 10) of the other of the aforementioned units,

the mother unit (2) or refill unit (3) comprising opposing sidewalls (13 or 8) from
10 the internal edges of which splines (19), said splines (19) being engineered to fit into slots (26) located immediately within corresponding sidewalls (8 or 13) of the other of the aforementioned units, and

the sidewalls (13 and 8) of the mother unit (2) and refill unit (3) contacting the
15 upper surface (4, 11) of the corresponding unit at their respective upper ends.

9. A dispensing device (1) according to claim 8, wherein

the mother unit comprises an upper wall from the internal edge of which a spline
20 protrudes substantially in the same plane as said upper surface, said spline being engineered to fit into a slot located immediately within a corresponding upper surface of the refill unit,

the mother unit comprises a lower wall from the internal edge of which a spline
25 protrudes substantially in the same plane as said lower surface, said spline being engineered to fit into a slot located immediately within a corresponding lower surface of the other of the refill unit, and

the mother unit comprises opposing sidewalls from the internal edges of which
30 splines protrude substantially in the same plane as said sidewalls, said splines

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being engineered to fit into slots located immediately within corresponding sidewalls of the refill unit.

10. A device according to any of the preceding claims, wherein the dispensing
5 means is present in the mother unit (2).

11. A device according to any of the preceding claims, comprising two splines
(15) located at the front of the unit adjacent to its sides, said splines (15)
protruding in substantially in the same plane as a front surface (7 or 4) of the unit
10 and being designed to fit into corresponding slots (27) located in a front surface (4
or 7) of the other of the two units.

12. A device according to any of the preceding claims, wherein the dispensing
means comprises an actuator button, actuation of which causes power to pass
15 from the power source and liquid to be dispensed from the device.

13. A device according to any of the preceding claims, wherein the dispensing
means comprises a means of spray generation and an exit orifice for the spray
generated.
20

14. A device according to claim 11, wherein the spray is generated by means
of a vibrating membrane, onto which the liquid is passed, driven by a piezoelectric
transducer.

25 15. A device according to any of the preceding claims, comprising a locking
member that functions to provide resistance against removal of the refill unit when
it has been slid into place within the mother unit.

30

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Fig. 1

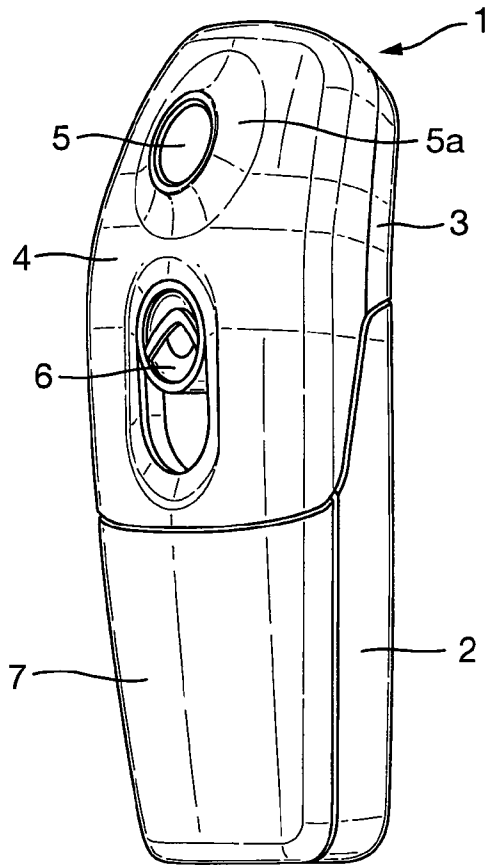
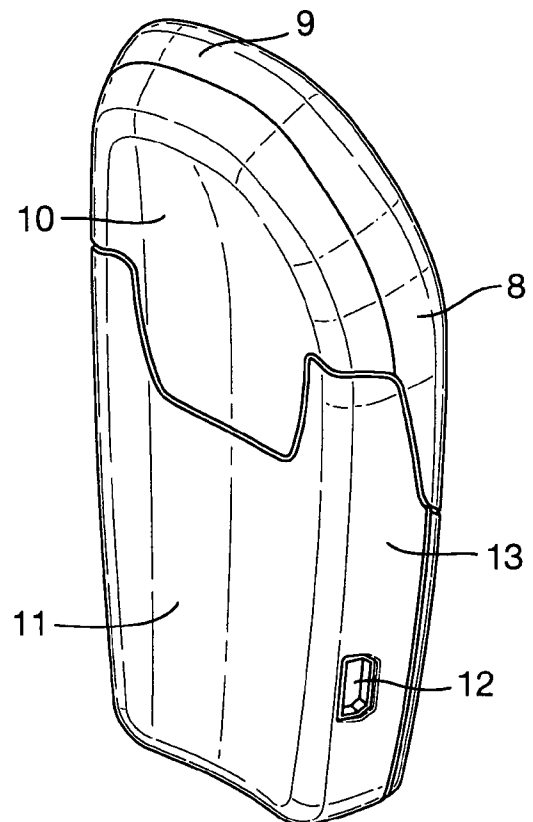


Fig. 2



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Fig. 3

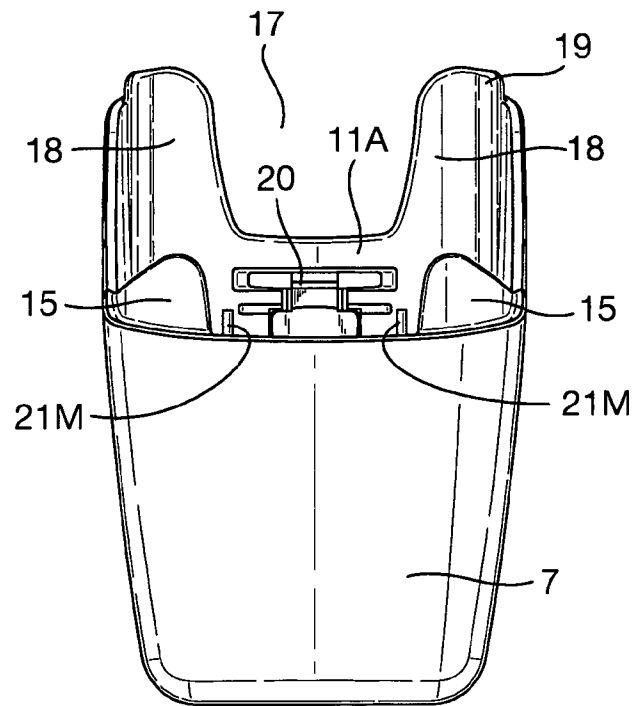


Fig. 4

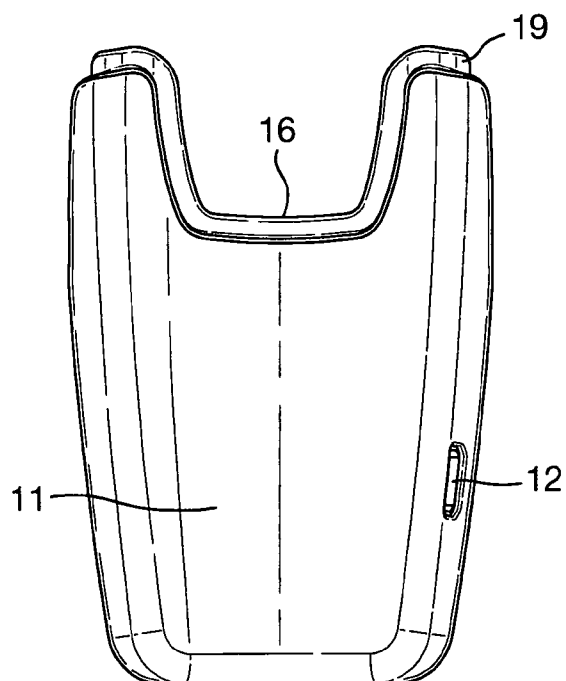
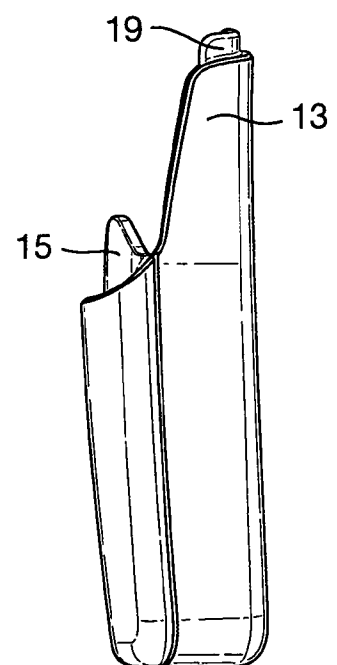


Fig. 5



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Fig. 6

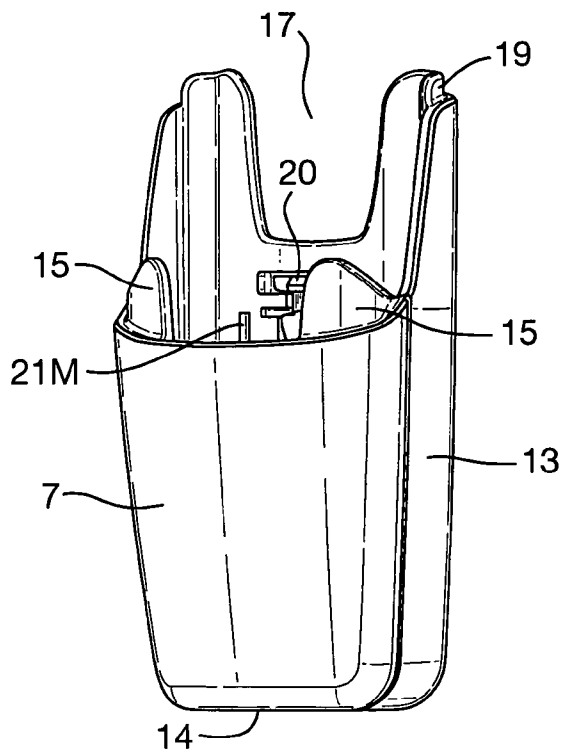
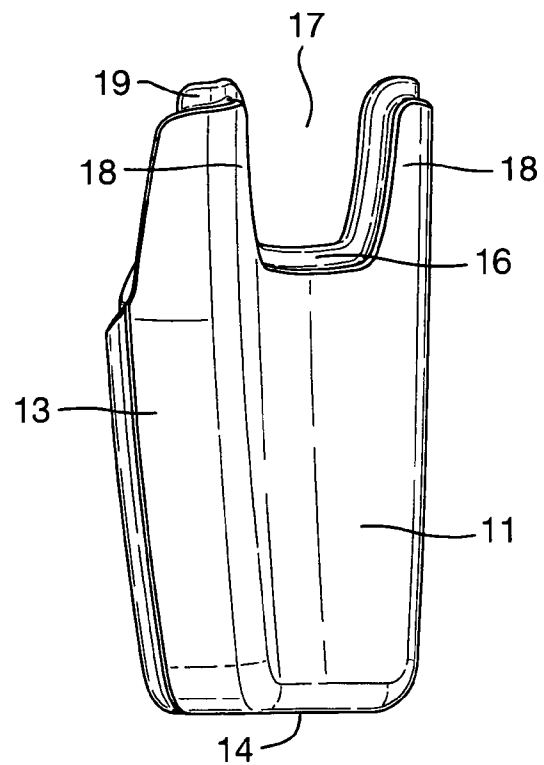


Fig. 7



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Fig. 8

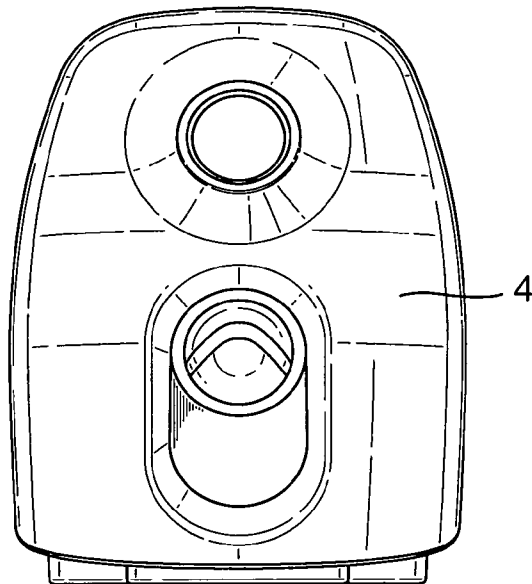
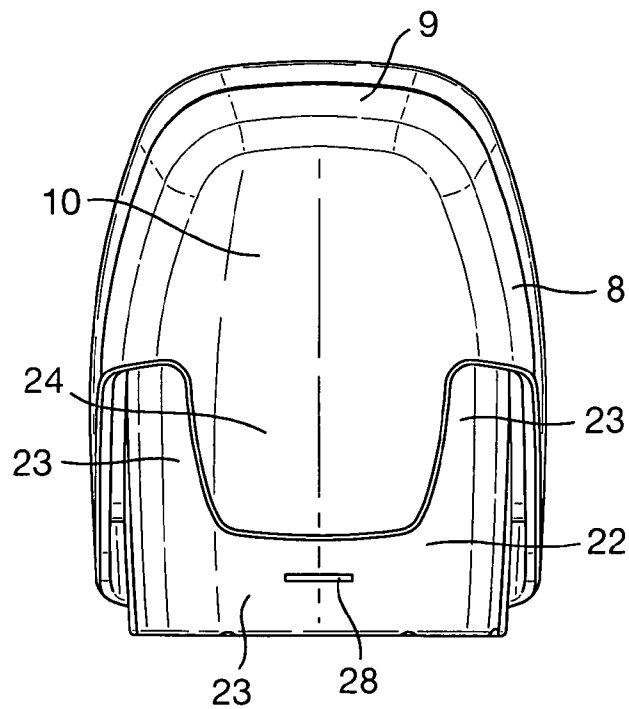


Fig. 9



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Fig. 10

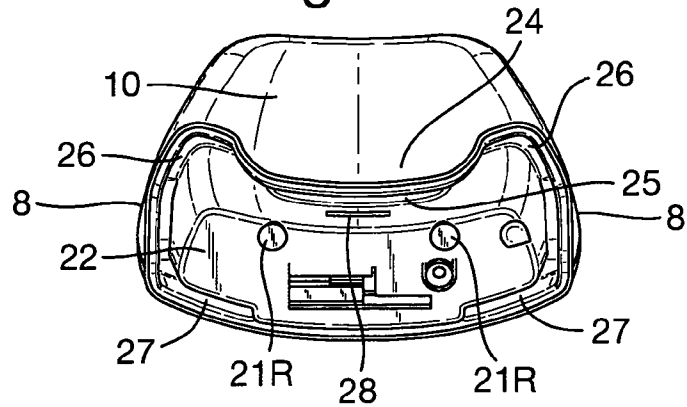


Fig. 11

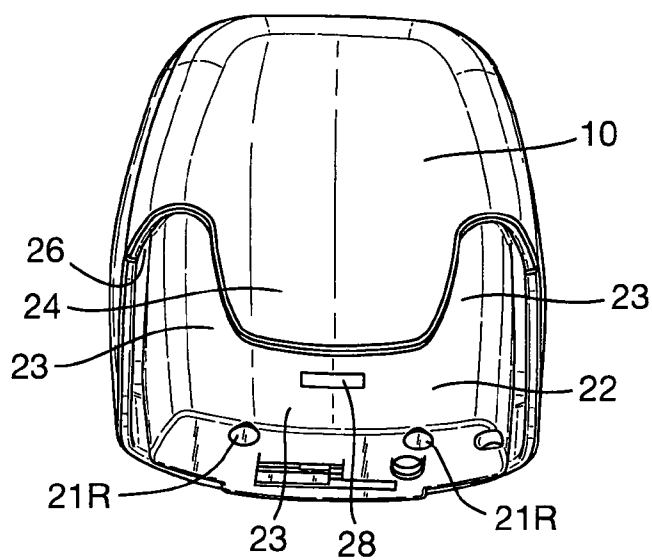
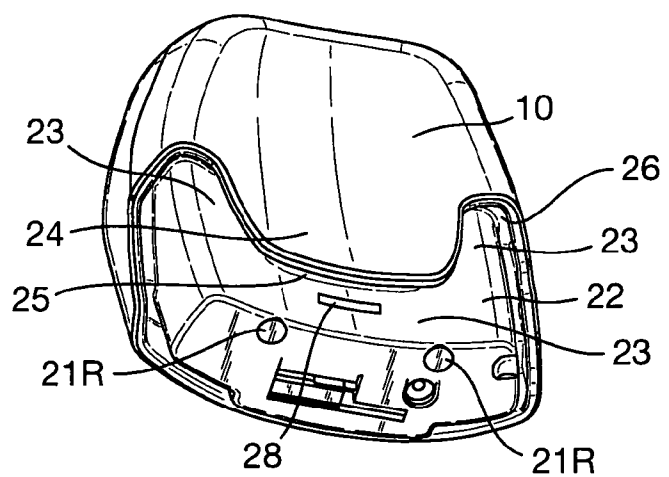


Fig. 12



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Fig. 13

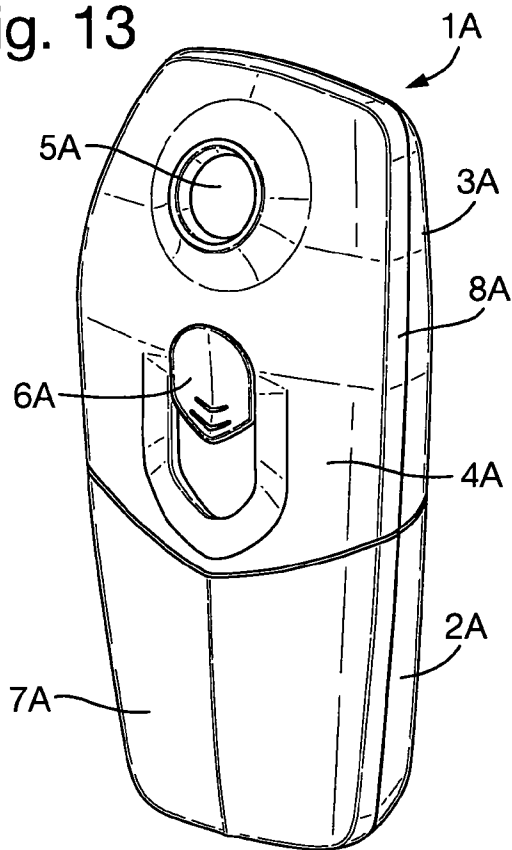


Fig. 14

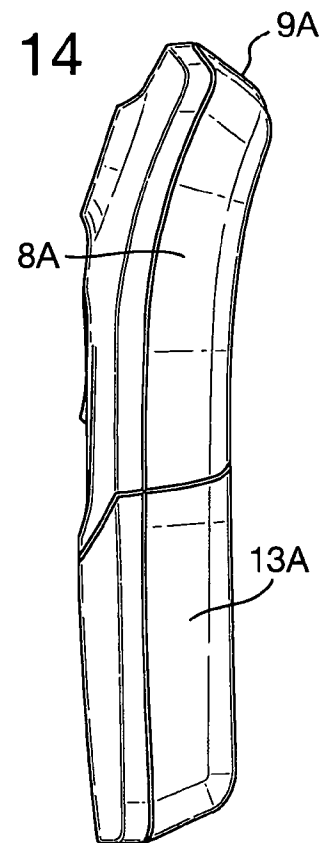
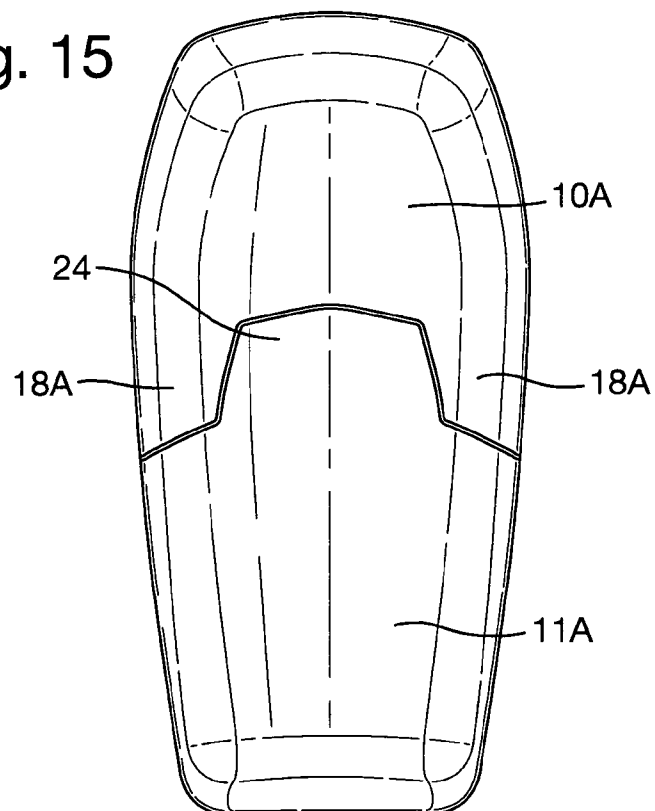


Fig. 15



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/071315

A. CLASSIFICATION OF SUBJECT MATTER INV. A61M11/00 A61M15/00 B05B17/06 ADD.		
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) A61M B05B A61L A01M A61F B65D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2006/087515 A1 (RECKITT BENCKISER UK LTD [GB]; ANDERSON JAMES [GB]; JIN WU [GB]; WOOLL) 24 August 2006 (2006-08-24) page 19, line 1 - page 20, line 6; figures 9-12 -----	1-7, 10-13,15
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A	US 5 893 515 A (HAHN GARY S [US] ET AL) 13 April 1999 (1999-04-13) abstract; figures 1-19, 51-59 ----- -/--	1
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "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 2 March 2012	Date of mailing of the international search report 12/03/2012	
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Endrizzi, Silvio	

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2011/071315

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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