COMMONWEALTH OF AUSTRALIA

Patent Act 1952

CONVENTION APPLICATION FOR A STANDARD PATENT

B/WE, RECKITT & COLMAN PRODUCTS LIMITED, a British company of One Burlington Lane, London, W4 2RW, Great Britain

hereby apply for the grant of a Standard Patent for an invention entitled FLUID DISPENSER

which is described in the accompanying complete specification.

This application is made under the provision of Part XVI of the Patents Act 1952 and is based on an application for a patent or similar protection made in Britain on 9 November 1985

No. (8527695)

Our address for service is F.B. RICE & CO.,
28A Montague Street,
Balmain N.S.W. 2041

Dated this 6th day of November 1986

RECKITT & COLMAN PRODUCTS LIMITED

By: _______________

Registered Patent Attorney

To: The Commissioner of Patents

COMMONWEALTH OF AUSTRALIA
Commonwealth of Australia
The Patents Act 1952

DECLARATION IN SUPPORT

In support of the (Convention) Application made by:

RECKITT & COLMAN PRODUCTS LIMITED
One Burlington Lane, London W4, 2RW, Great Britain
for a patent for an invention entitled: FLUID DISPENSER

(1) PETER ROSS MILLIGAN, Joint Secretary
of and care of the applicant company do solemnly and sincerely declare as follows:

a) 

b) I am (W) authorised by the applicant(s) for the patent to make this declaration on its behalf.

Delete the following if not a Convention Application.
The basic application(s) as defined by section 141 (A2) of the Act was (W) made
in UNITED KINGDOM on 9 November 1985

by Reckitt & Colman Products Limited

The basic application(s) referred to in this paragraph is (W) the first application(s) made in
a Convention country in respect of the invention the subject of the application.

a) 

b) GEOFFREY ROBERT HAMMOND A British Subject of
574 James Reckitt Avenue, Hull
North Humberside, UNITED KINGDOM HU8 0LG

is (W) the actual inventor(s) of the invention and the facts upon which
RECKITT & COLMAN PRODUCTS LIMITED
is (W) entitled to make the application are as follows:

The Company is an Assignee of the said invention from the
said inventors

Hull, England Declared at this 29 day of August 1986

Signed Status Joint Secretary

Declarant’s Name

F. B. RICE & CO PATENT ATTORNEYS
This form is suitable for any type of Patent Application. No legalisation required.
Claim 1. A fluid dispensing device for dispensing controlled doses of fluid from an inverted bottle into a cistern, each time the cistern is flushed, comprising a product feed tube which is adapted in use to open at one end into the interior of the bottle and which defines at the other end an air trap, characterised in that the fluid dispensing device further comprises a chamber which is open to the air trap end of the product feed tube, a siphon connecting the chamber to an outlet port in the exterior of the fluid dispensing device and an air vent connecting the chamber to the exterior of the fluid dispensing device at a point above the outlet port.
The following statement is a full description of this invention including the best method of performing it known to us:

FLUID DISPENSER

RECKITT & COLMAN PRODUCTS LIMITED

One Burlington Lane,
London W4 2RW, Great Britain

Geoffrey Robert Hammond

F.B. RICE & CO.,
Patent Attorneys,
28A Montague Street,
BALMAIN 2041

The following statement is a full description of this invention including the best method of performing it known to us: -
The present invention relates to a fluid dispensing device for dispensing substantially constant doses of fluid from a bottle or similar container into a cistern or the like each time the cistern is flushed. The fluid dispensing device is especially, but not exclusively, suited for dispensing a treatment fluid containing an active ingredient, such as disinfectant or detergent, into the cistern of a toilet installation during each flushing thereof.

The fluid dispensing devices hitherto known for such purposes, as described for example in U.S. Patent Nos. 2688754, 3073488, 3864763, 3895739, 3965497 and 4131958, incorporate a generally bell-shaped chamber which opens at the bottom into the neck of a bottle filled with fluid to be dispensed. In use, the bottle is inverted, so that the fluid dispensing device lies below it, and is mounted in the cistern to ensure that the bottle is at least partially immersed when the cistern is full. In this position the bell-shaped chamber defines an air trap in which a volume of air is caught as the cistern re-fills after each flushing. As the head of fluid in the cistern above the air trap increases it eventually forces the volume of air into the bottle. The additional volume of air in the head space above the fluid in the bottle slightly increases the internal pressure within the bottle and thus, when the cistern is flushed and the level of fluid therein drops, a small dose of fluid is dispensed from the bottle through the
fluid dispensing device.

It can be shown that the volume of fluid dispensed at each flushing of the cistern is proportional to the volume of air previously forced into the bottle. It can further be shown that as the volume of air in the bottle increases, so the volume of air entering the bottle, each time the cistern fills, increases. Thus, as the bottle empties of fluid, increasing volumes of fluid are dispensed. This is undesirable and, if the initial doses of fluid were adequate, unnecessary.

It is an object of the present invention to provide a fluid dispensing device for dispensing controlled doses of fluid from a bottle or similar container into a cistern or the like each time the cistern is flushed, which fluid dispensing device ensures that the amount of each controlled dose of fluid remains substantially constant as the bottle is progressively emptied.

According to the first aspect of the present invention there is provided a fluid dispensing device for dispensing controlled doses of fluid from an inverted bottle into a cistern, each time the cistern is flushed, comprising a product feed tube which is adapted in use to open at one end into the interior of the bottle and which defines at the other end an air trap, characterised in that the fluid dispensing device further comprises a chamber which is open to the air trap end of the product feed tube, a siphon connecting the chamber to an outlet port in the exterior of the fluid dispensing device and an air vent connecting the
chamber to the exterior of the fluid dispensing device at a point above the outlet port.

In use the fluid dispensing device is secured in the mouth of a bottle or similar container filled with fluid, usually a treatment fluid, to be dispensed, with the product feed tube opening into the interior of the bottle. The bottle is then inverted so that the fluid dispensing device lies below it and is at least partially immersed in a cistern into which the treatment fluid in the bottle is to be dispensed each time the cistern is flushed.

When the cistern is flushed for the first time, the level of water in it starts to fall, thus reducing the water pressure surrounding the device, and as the external pressure drops, the head of treatment fluid within the bottle becomes greater than can be supported by the partial vacuum which existed in the headspace above the treatment fluid in the bottle prior to the start of the flush sequence so that treatment fluid will start to descend down the product feed tube into the chamber. Treatment fluid entering the chamber will in turn displace fluid through the siphon but initially, this fluid will be the cistern fluid which remained in the lower reaches of the siphon from when cistern fluid first entered the device during immersion of the bottle.

The falling cistern water level will eventually expose the air vent so that air can re-enter the chamber, thereby allowing the level of fluid in the chamber (which is all the time being supplemented with the treatment fluid emerging
from the product feed tube) to also start to fall. In so doing, the fluid in the chamber and siphon will be displaced through the siphon.

Eventually, the level of cistern water will fall clear of the bottom of the fluid dispensing device. At this stage fluid from the chamber will continue to be displaced through the siphon under the pressure of its own head until the surface of the fluid in the chamber falls below the level of the top of the siphon. At this point, fluid feed from the chamber switches from being a pressure feed to being a siphon feed system and the level of fluid in the chamber will continue to fall until eventually air enters the siphon and the siphon effect is broken (Fig 16). A measure of treatment fluid from the bottle will therefore have been dispensed into the chamber, held, and then released into the cistern in the latter part of the cistern emptying cycle.

As the cistern starts to refill after being flushed the rising level of cistern fluid will cause air caught in the siphon to bubble through the fluid which remains in the chamber around the bottom edge of the siphon.

Once the air from the siphon has bubbled through the fluid remaining in the bottom of the chamber, then cistern fluid starts to enter the chamber raising the level of fluid in the chamber. Initially air will be released from the chamber through the air vent, but as the fluid in the cistern rises above it a point will be reached where air will be driven from the air trap into the bottle. As the volume of air in the headspace above the treatment fluid is
now fractionally larger than on the previous occasion, then the amount by which it can be compressed or expanded will also be minutely increased so that there is potential to drive a slightly larger amount of air into the bottle.

Once the cistern has finished filling, the fluid dispensing device will adopt a substantially stable state, until the cistern is flushed again, when the treatment fluid will dispense in exactly the same way as described before.

Each time the cistern is flushed, a small quantity of treatment fluid will leave the bottle via the product feed tube, be caught and diluted in the chamber and then dispensed in the latter part of the flush.

During each refilling operation, a small quantity of air will be driven into the bottle, increasing the volume of the headspace above the treatment fluid, thereby increasing the volume by which this headspace can be compressed and hence increasing the volume of air which can enter on the next cycle.

Eventually, the volume of air which can be driven into the bottle will exceed the volume of the air trap (if the trap is suitably sized) and thereafter all subsequent filling cycles will drive, firstly air, but then fluid from the chamber into the bottle via the product feed tube. The composite effect of these two parameters is that as the bottle empties, increasing volumes of fluid will be dispensed from it, but at the same time these increased volumes will become increasingly diluted by the fluid driven into the bottle from the chamber. By this means and by
careful design of the proportions of the fluid dispensing device, it is possible to ensure that a substantially constant dose of treatment fluid is dispensed from the bottle each time the cistern is flushed.

An advantage of the present invention is that it discharges treatment fluid only during the latter part of the flushing operation. Thus, when the cistern forms part of a toilet installation, a substantial amount of the treatment fluid dispensed remains in the toilet bowl after flushing. It also results in none or virtually none of the dispensed treatment fluid remaining in the cistern following completion of the flushing operation. It also avoids unnecessary dissipation of any active material in the fluid such as a perfume constituent and unnecessary or undesirable dilution of active material in the fluid. It also permits the amount of fluid dispersed on each flushing to be pre-determined within tolerable limits of variation of the amount.

Preferably, the fluid dispensing device comprises a plug member which is adapted in use to be secured in the mouth of a bottle and the product feed tube is formed in said plug member.

Preferably, the fluid dispensing device further comprises a cap member which fits over the plug member so as to define therebetween said chamber, said siphon and said air vent.

Conveniently, the cap is mounted relative to the plug so as to be moveable between a first position in which the
fluid dispensing device is inoperative and a second position in which the fluid dispensing device is operative. This allows a bottle filled with fluid and fitted with the fluid dispensing device to be transported without spillages occurring by moving the cap relative to the plug to said first position.

Preferably, the dispensing device is provided with internal seals comprising surfaces which mutually engage respectively on the cap and the plug when the cap is in said first position to close the siphon and the air vent to passage of fluid from the bottle.

Preferably, the end of the air trap opening into the chamber lies above the level of the bottom edge of the siphon where it opens into the chamber. This ensures that as air enters the chamber through the siphon and bubbles up through the surface of the residual fluid in the chamber the fluctuating surface of the residual fluid cannot strike the end of the air trap and cause momentary fluctuations in the pressure of air within the air trap.

In practice it has been found that friction losses within a simple siphon tend to cause the siphon to jam and not empty completely. In order to overcome this problem a siphon propagation chamber can be formed at or towards the external end of the siphon. This siphon propagation chamber houses a body of liquid which, when the level of water in the cistern falls below it starts to drain and draws water through the siphon, thus promoting siphon action.
Preferably, the siphon propagation chamber is defined by an external upstanding peripheral wall around the outlet port.

According to a second aspect of the present invention there is provided a fluid dispensing agent in accordance with the first aspect of the present invention in combination with a bottle to hold fluid to be dispensed.

The bottle may be formed with a screw-threaded neck and the cap with an internal screw thread to permit it to be screwed onto the neck.

The cap may be rendered captive by forming with an inwardly directed annular rib or bead to ride over a circumferential rib or bead is formed with a neck having a cam surface, and the cap is formed with a complementary cam surface so that when the two surfaces are circumferentially displaced the cap assumes the said first position in which the fluid dispensing device is inoperative, and so that, by then relatively rotating the neck and cap to assume said second position, one cam surface can be made to ride up on the other axially to displace the cap in relation to the bottle neck and render the fluid dispensing device operative. An arrangement of this kind is disclosed in U.K. Patent No. 1260128.

Preferably, the cap, in this arrangement, is held on the neck by a circumferential rib formed on the bottle neck to act against the inner surface of the cap.

Conveniently, the air vent is formed between the cap and the bottle by providing one or more axial slits in the ribs/or screw threads securing the cap to the bottle.
The volumetric capacity of the internal air trap is chosen to determine the volume of air forced into the bottle by water rising in the cistern.

In practice, it is convenient to form the bottle of a thin plastics material, but if it is so formed, the bottle in view of its volumetric capacity is likely to have too great a flexibility. The disadvantage of having too great a flexibility is that it gives rise to difficulties in controlling the amount of fluid dispensed.

In a third aspect of the present invention therefore, there is provided a bottle for use with a fluid dispenser, comprising an internal stay made integral with the bottle wall and passing between diametrically opposed locations thereon, or other means of rendering the bottle wall more rigid, e.g. by ribbing.

The present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is a longitudinal cross-section of a fluid dispenser according to the present invention shown attached to the bottle,

Figure 2 is an exploded view of a pack comprising a further fluid dispenser according to the present invention and the bottle formed for use with the dispenser,

Figures 3, 4 and 5 show sectioned views of the front and side of the pack with Figure 3 showing the dispenser in the closed condition and Figures 4 and 5 showing it open, and
Figure 6 is an elevation of a bottle according to the present invention.

Referring now to Figure 1, the dispenser comprises a cap 1 having an internal screw thread 3 by which it is screwed onto a screw-threaded neck of a bottle, part of which is shown and indicated at 5. The neck is formed with a circumferential bead or rib 7, and the cap is formed with an internal complementary circumferential bead 9. The cap is formed of a material having some resilient flexibility and the bead 9 is forced over the bead 7 to keep the cap captive on the neck but to permit the cap to be screwed up and down to some extent on the neck while keeping the cap captive on the neck. In the position as shown in Figure 1, the cap is stationed to permit the dispenser to operate, that is, to permit fluid contained in the bottle to be dispensed from the device when the bottle is inverted.

The cap comprises an internal transverse web 11 supporting a central tube 13 forming part of a siphon generally indicated at 15. The tube 13 may be regarded as being the "external" tube of the siphon in that it provides direct access for liquid from the siphon to the exterior of the dispenser. The dispenser also comprises a plug 17 which seats with a force fit into the neck of the bottle. The plug comprises a sleeve 19 surrounding the tube 13, concentric therewith and spaced from the tube; the sleeve being closed by an end wall 21 at its top end as seen in Figure 1 and forming the "internal" tube of the siphon. The plug also comprises an access tube 23 providing access
between the interior of the bottle and the siphon; and the tube opens into an air trap, generally indicated at 25, formed by an annular wall 27 and the sleeve 19.

As will be evident from figure 1, the siphon comprises an access for fluid from the bottle via access tube 23, and consequently access for air to pass into the bottle, and access from the siphon to the exterior via tube 13.

The cap is formed with an upstanding peripheral wall 29, which, when the bottle is inverted as shown in Figure 1, depends below the level of the web 11 and forms a siphon starter chamber generally indicated at 31.

The bead 7 of the bottle neck is formed with an axial slot (not shown) to constitute an air vent and the thread on the bottle neck is interrupted to permit air from the exterior of the bottle to pass between the bottle exterior and the interior of the dispenser via the air vent.

The web 11 is also formed with an annular rib 33 which, when the cap is screwed fully home on the bottle neck from the position shown in Figure 1, is forced into the annular wall 27 of the internal air trap to prevent fluid from the bottle exiting via the slot in the bead 7 and the interrupted screw thread on the bottle neck. Additionally, the plug comprises a central projection 34 to close off the siphon to fluid from the bottle. The cap is screwed to this position for transit and storage of the device when attached to a bottle of fluid.

For the purpose of using the device, the cap is screwed to the position shown in Figure 1, and the bottle to which
it is attached, inverted and suspended in the cistern of the toilet installation. On inversion, fluid drains from the bottle onto the upper surface (as seen in Figure 1) of web 11, although not in a sufficient amount to cause it to escape through the siphon and, as a result, no fluid exits from the dispenser. Further, air within the starter chamber 31 is compressed by the head of water in the cistern and passes through the siphon to the air vent to permit water to enter the cap via the siphon. The air compressed by the head of water is able to escape via the air vent for as long as the air vent is exposed to the ambient atmosphere, but once the vent is covered by the cistern water, air can then only escape as air bubbles until the air pressure in the cap is insufficient to overcome the surface tension forces arising on formation of an air bubble. This pressure, and hence the height of the airspace remaining trapped in the cap, are an inverse function of the cross-sectional area of the air vent. The bottle is filled with the fluid to be dispensed to leave a headspace therein, and air forced into the air trap thus passes to the headspace (not shown) to permit fluid to flow into the cap later. Water from the cistern enters the siphon and cap to mix with and dilute the fluid. When the cistern is flushed, the water level in the cistern falls and the point is reached where the head of fluid in bottle becomes insupportable by the reduced pressure in the headspace (it being understood that when the bottle is first inverted some fluid drains from the bottle into the cap). As a result, fluid exits via the tube 23
into the cap displacing liquid down the siphon tube. As the water level in the cistern continues to fall, the air vent becomes exposed to the ambient atmosphere to admit air to the cap and allow the level of liquid in the cap to fall and drain out via the siphon under gravity. However, when the water level in the cistern falls below the lower edge of the starter chamber (as seen in Figure 1) the body of liquid therein abruptly falls and draws with it the fluid in the siphon thus operating the siphon. Thus, fluid is deposited into the cistern during the latter part of the flushing operation. Further withdrawal of fluid from the bottle ceases when the partial vacuum which consequently develops in the bottle headspace is able to support the head of liquid in the bottle. The siphon therefore discharges a discrete amount of the fluid in a flushing operation. Following emptying of the siphon, the partial vacuum in the bottle headspace causes air again to pass through the dispenser into the bottle headspace as the water level rises above the bottom edge of the annular wall 29 as explained above, to leave the dispenser ready for a further operation so that again there is a discharge of fluid from the bottle when the cistern level again falls.

The dispenser shown in Figures 2 to 5 is the presently preferred form of the present invention, but it is generally the same as the device of Figure 1 and like reference numerals in the two figures represent similar parts. The cap comprises a sleeve 41 formed with diametrically opposed triangular teeth 43 constituting cam surfaces; and the neck
of the bottle is formed with complementary teeth 45. The inner surface of the wall of the cap surrounding the neck is smooth except for an annular bead 46 at its inner surface at the extremity thereof, and the bottle neck is formed or has fitted thereon an annular rib 47 to engage with the bead 46 on the cap wall normally to keep the cap in place on the bottle neck. The neck is also formed or fitted with two further annular beads 48, 50 and both these beads are interrupted as at 52 to provide the air vent (see Figure 2).

The plug in this embodiment is formed to provide an axial hole 49 to receive the part, indicated at 51, of the tube 13, but of greater axial length than part 51, and hole 49 interrupts a parallel axial hole 53, so that air or liquid can pass therebetween and part 51 of tube 13. The plug, as in the embodiment of Figure 1, also comprises an access between the bottle interior and the siphon, but in this instance, it is in the form of a tube 55 formed on the plug; and the internal air trap in this embodiment comprises an internal boss 57 formed in the plug at the siphon end of the tube 55 and tapered to provide a lead to the tube.

The cap is moved in the embodiment of Figure 2 from the inoperative to the operative position by rotating the cap relatively to the neck by a full 90° and this causes the respective cam surface to engage and force the cap axially outwardly of the neck to the position shown in Figures 4 and 5.
The cap may be formed as a one piece moulding of plastics material or it may be divided into component parts separately formed and subsequently assembled.

In the second embodiment, the air trap is formed so that the bottom edge 59 (as viewed with the dispenser inverted) of the radially outer wall 60 of the air trap is spaced from the bottom edge 62 (as viewed with the dispenser inverted) of the internal siphon tube 64 so that it is spaced from the surface of residual liquid in the cap following emptying of the siphon, whereby air subsequently entering the dispenser can pass to the air vent without having to bubble through the residual liquid. By this means, a smoother flow of air is achieved and this helps to avoid "pumping" the bottle when formed of thin plastics material, due to the action of disturbed liquid in the internal air trap.

In Figure 6 such a bottle, made in this instance of transparent material, and generally indicated at 63, is shown provided with an internal stiffening member or stay 65. This may be integrally formed with the bottle by extrusion/blow moulding of a suitable plastics material. As is evident from Figure 6, the stay is integral with the wall 67 of the bottle as diametrically opposed locations thereon.

In use of the preferred embodiment, the consumer rotates the cap through the full 90°. This causes the cap bead 46 first to "click" over the neck bead 47 and then over the neck bead 48 to lodge between neck beads 48 and 50.
This gives the consumer a definite indication that the cap has been rotated by the required amount. The consumer then inverts the pack and immerses the bottle in the cistern to leave the bottom of the bottle (now uppermost) substantially level with the top edge of the cistern tank (not shown). This may be done by a suitable clip. As mentioned above, due to the head of fluid in the bottle, fluid passes into the dispenser to gather around the siphon tube. Simultaneously, water enters from the cistern, driving air out of the dispenser initially via the air vent until the water level rises to trap air in the air trap and drive air into the bottle to relieve the partial vacuum in the head-space thereof.

The fluid from the bottle is thus diluted with cistern water, and the air trap and the labyrinth nature of the passageway to the exit of the siphon tube prevent diffusion of the dilute fluid into the cistern. The dispenser is now in a stable condition and is ready for its first operation. When the cistern is flushed, the external water pressure drops and the head of liquid in the bottle now becomes greater than the partial vacuum can support so that product starts to descend into the dispenser via the air trap. This causes displacement of liquid down the siphon tube, but initially this is just cistern water which entered the siphon tube on immersion of the pack. When the falling water level exposes the air vent to re-open access for air therethrough, the dispenser begins to drain and diluted fluid starts to emerge from the siphon tube although the
siphon itself is not yet active as a siphon. When the water level then falls clear of what is in the inverted position the bottom edge of the siphon starter chamber, the diluted fluid continues to drain under its pressure head until the level falls below the top end of the siphon tube. The siphon then operates, the action being promoted by the fall of the body of liquid in the siphon starter chamber. As a result of this operation, a discrete amount of the active fluid is dispensed into the cistern during the latter part of the flushing cycle.

When the cistern now refills, the rising water level will again drive cistern water into the dispenser via the siphon. This expels air via the air vent with the water bubbling through residual liquid in the dispenser. This disturbs the surface of the liquid and in order to prevent the liquid from lapping the mouth of the internal air trap, this is located a distance from surface 61 of the dispenser so as to be well clear of the surface of the residual liquid. Otherwise, the liquid lapping the mouth of the air trap tends to "pump" air into the bottle and cause extra product to be wastefully dispensed. The sequence of operations already described then takes place again to leave the dispenser in a stable condition and ready for further operation. However, the headspace in the bottle will have increased, due to the fact that some of the product has been dispensed from it, and this gives rise to a slightly greater amount of air entering the headspace. This happens on each subsequent operation until the point is reached where the
air trap is feeding the air to its maximum capacity to the headspace. When this happens, diluted fluid from the dispenser is also forced into the bottle and this has the effect of diluting the fluid in the bottle. This effect, however, is compensated for by the fact that the diminishing head of fluid in the bottle results in a larger volume of diluted fluid being dispensed from it on each successive operation. The dispenser accordingly delivers progressively increasing quantities of a fluid which is itself becoming progressively increasingly dilute. The overall effect therefore is that the amount of fluid per se i.e. of product originally in the bottle, dispensed remains substantially constant throughout operation.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A fluid dispensing device for dispensing controlled doses of fluid from an inverted bottle into a cistern, each time the cistern is flushed, comprising a product feed tube which is adapted in use to open at one end into the interior of the bottle and which defines at the other end an air trap, characterised in that the fluid dispensing device further comprises a chamber which is open to the air trap end of the product feed tube, a siphon connecting the chamber to an outlet port in the exterior of the fluid dispensing device and an air vent connecting the chamber to the exterior of the fluid dispensing device at a point above the outlet port.

2. A fluid dispensing device according to claim 1, characterised in that the fluid dispensing device comprises a plug member which is adapted in use to be secured in the mouth of a bottle and the product feed tube is formed in said plug member.

3. A fluid dispensing device according to claim 2, characterised in that the fluid dispensing device further comprises a cap member which fits over the plug member so as to define therebetween said chamber, said siphon and said air vent.

4. A fluid dispensing device according to claim 3, characterised in that the cap is mounted relative to the plug so as to be moveable between a first position in which the fluid dispensing device is inoperative and a
second position in which the fluid dispensing device is operative.

5. A fluid dispensing device according to claim 4, characterised in that the fluid dispensing device is provided with internal seals comprising surfaces which mutually engage respectively on the cap and/or the plug when the cap is in said first position to close the siphon and the air vent to passage of fluid from the bottle.

6. A fluid dispensing device according to any preceding claim, characterised in that the end of the air trap opening into the chamber lies above the siphon where it opens into the chamber.

7. A fluid dispensing device according to any preceding claim, characterised in that a siphon propagation chamber is formed at or towards the external end of the siphon.

8. A fluid dispensing device according to claim 9, characterised in that the siphon propagation chamber is defined by an external upstanding peripheral wall around the outlet port.

9. A fluid dispensing device according to any preceding claim in combination with a bottle to hold fluid to be dispensed.

10. A fluid dispensing device according to claim 9 and any preceding claim depending on claim 3, characterised in that the bottle is formed with a screw-threaded neck and the cap
with an internal screw thread to permit it to be screwed onto the neck.

11. A fluid dispensing device according to claim 10, characterised in that the gap is rendered captive by forming it with an inwardly directed annular rib or bead to ride over a circumferential rib or bead on the bottle neck.

12. A fluid dispensing device according to claim 9 and any preceding claim depending on claim 4, characterised in that the bottle is formed with a neck having a cam surface, and the cap is formed with a complementary cam surface so that when the two surfaces are circumferentially displaced the cap assumes the said first position in which the fluid dispensing device is inoperative, and so that, by then relatively rotating the neck and cap to assume said second position, one cam surface can be made to ride up on the other axially to displace the cap in relation to the bottle neck and render the fluid dispensing device operative.

13. A fluid dispensing device according to claim 12, characterised in that the cap is held on the neck by a circumferential rib formed on the bottle neck to act against the inner surface of the cap.

14. A fluid dispensing device according to any one of claims 10 to 13, characterised in that an air vent is formed between the cap and the bottle by providing one or more axial slits in the ribs and/or screw threads securing the cap to the bottle.
15. A bottle for use with fluid dispenser, comprising an internal stay made integral with the bottle and passing between diametrically opposed locations thereon, or other means of rendering the bottle wall more rigid.

Dated this 6th day of November 1986

RECKITT & COLMAN PRODUCTS LIMITED
Patent Attorneys for the Applicant
F.B. RICE & CO.