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(54) **LIQUID DISPENSERS**

FLÜSSIGKEITSSPENDER

DISTRIBUTEURS DE LIQUIDE

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Description

[0001] The present invention relates to liquid dispensers of resealable type, that is to say to devices in the nature of taps that may be selectively opened to dispense a liquid from a container and may then be closed again and will then form a reliable seal and prevent further dispensing of liquid until it is desired. More specifically, the invention relates to a liquid dispenser of the type including an outer tube with a discharge opening formed in its side wall and an inner tube which is at least partially accommodated within the outer tube and defines with it an annular space, the outer tube being connected in a sealed manner to a one-piece connection member, which defines an inlet space, for connection to a liquid container, one end of the inner tube being closed and the outer tube being integrally connected to the inner tube by a flexible integral web, whose width in the radial direction is greater than that of the annular space, the outer surface of the inner tube being in sliding sealed contact with the connection member, a liquid flow opening being formed in the wall of the inner tube, the inner tube being movable longitudinally within the outer tube between an open position, in which the inlet space communicates with the discharge opening, and a closed position, in which the inlet space does not communicate with the discharge opening.

[0002] A liquid dispenser of the type referred to above is disclosed in WO 2007/020440. The liquid dispenser disclosed in this prior document is in practice intended for containers such as wine boxes, that is to say containers which progressively collapse as their contents are dispensed, which means that as liquid is dispensed from the container it is not replaced by atmospheric air.

[0003] Whilst there are numerous types of container of this type, there are also numerous types of container which are not collapsible and in which it is therefore necessary for the volume of any liquid displaced to be replaced by atmospheric air. However, the liquid dispenser disclosed in the prior document referred to above is not suitable for this purpose because it is unable to admit air to replace the volume of liquid that is dispensed. The seal of the prior dispenser may also not be of sufficient integrity in all cases because the inner tube is in sliding sealed contact with the connection member over only a small proportion of its length.

[0004] It is therefore the object of the present invention to provide a liquid dispenser with an enhanced sealing integrity. A further object is to provide such a dispenser which is suitable for use with a liquid container of non-collapsible type in which it is necessary that air be admitted to replace the volume of liquid that is dispensed.

[0005] According to the present invention, a liquid dispenser of the type referred to above is characterised in that the connection member includes an integral tubular portion of which one end is closed and the other end communicates with the inlet space, that a liquid flow opening is formed in the tubular portion, that the outer

surface of the tubular portion is in sliding sealed contact with the inner surface of the inner tube, whereby the two flow openings are at least partially in registry in the open position and are out of registry in the closed position.

[0006] Thus in the liquid dispenser in accordance with the present invention the tubular portion of the connection member and the inner tube may be of any desired length and thus the length over which they are in sliding sealed contact may be adjusted to whatever value is appropriate in the circumstances to achieve the desired sealing integrity. Accordingly, the previous potential problem relating to leakage may be eliminated.

[0007] In the preferred embodiment, the inner tube is also provided with an airflow opening circumferentially offset, preferably by about 180°, from the liquid flow opening in it and the tubular portion of the connection member is also provided with an airflow opening positioned so that when the inner tube is in the open position the two airflow openings are at least partially in registry and when the inner tube is in the closed position the two airflow openings are not in registry. Thus when the dispenser is in the open position, liquid can flow out through it via the two overlapping flow openings and the liquid which flows out is replaced by air which flows in through the discharge opening, the annular space between the inner and outer tubes and then through the overlapping air flow openings into the container to which the dispenser is connected.

[0008] Whilst the inner tube may be pulled outwardly to open the dispenser it is preferred that it is pushed inwardly to open it. It will be appreciated that since the integral web has a width greater than that of the annular space between the inner and outer tubes, the inner tube inherently has two equilibrium positions with respect to the outer tube in which the integral web is undeformed. In all other relative positions, the integral web will exert a force on the inner and outer tube which will tend to move it to one of the equilibrium positions. The closed position of the dispenser is preferably one of the equilibrium positions and when the inner tube is moved towards the open position, the web will initially exert a restoring force on the inner tube tending to return it to the fully open position. However, as inward movement of the inner tube continues against the restoring force a "top dead centre position" is reached and thereafter the force exerted by the web will tend to move the inner tube towards the open position. The open position may be the second equilibrium position of the inner tube but it is preferred that the inner tube does not reach the second equilibrium position. This is achieved by the provision of a stop which acts on the inner tube as it moves into the open position and prevents it from reaching an equilibrium position in which the web is unstressed, whereby in the open position of the inner tube the web exerts a force on the inner tube urging into contact with the stop. In the preferred embodiment the inner tube and the connection member are so constructed that one end of the inner tube is in contact with the connection member in the open position of the inner tube, whereby the connection member con-

stitutes the stop. This means that the open position of the inner tube is precisely defined and that movement of the inner member out of the open position is only possible by the application of a relatively large force.

[0009] Whilst the connection member may be permanently connected to the outer tube, it is preferred that it is only connected to it by a snap connection. In one embodiment, the connection member is provided with an annular flange which fits inside the open end of the outer tube and is snap-connected to it, e.g. by means of a co-operating annular recess and projection formed on the two opposed surfaces.

[0010] In use of the liquid dispenser, that is to say when connected to a liquid container, when the dispenser is open liquid will flow out of the discharge opening and air will flow in through the discharge opening in the opposite direction and then through the two airflow openings into the container to replace the volume of liquid that has been dispensed. In order to ensure that air can reliably flow through the discharge opening in one direction at the same time as liquid is flowing through it in the opposite direction, it is preferred that the area of the discharge opening is greater than that of the liquid flow opening in the inner tube.

[0011] Further features and details of the invention will be apparent from the following description of one specific embodiment of liquid dispenser in accordance with the invention which is given by way of example only with reference to Figures 1 and 2 of the accompanying drawings, which are axial sectional views of the dispenser in the open and closed position, respectively.

[0012] The dispenser shown in the drawings comprises two separate injection moulded components of plastic material, such as polypropylene, namely a connection member 2 and a discharge member 4. The connection member 2 comprises an annular cylindrical portion 6, integral with one end of which is an annular flange 8. Integral with the inner edge of the flange 8 is a tubular portion 10, whose axis is parallel to that of the annular portion 6 and which is open at the end closest to the annular portion 6 and is closed at the opposite end. The interior of the tubular portion 10 thus communicates with the inlet space defined by the annular portion 6. Formed in the tubular wall of the portion 10, which will be its lowest portion, in use, is a liquid flow opening 12. Also formed in the wall of the tubular portion 10 at a position diametrically opposed to that of the liquid flow opening 12 is an airflow opening 14. Integral with the surface of the flange 8 on the side opposite to the annular portion 6 and extending parallel to the axis of the annular portion 6 is a short annular flange 16, the outer surface of which is slightly convergent in the direction away from the annular portion 6 and affords an annular recess 18 adjacent to the flange 8.

[0013] The discharge portion of the dispenser comprises an inner tube 20, which is open at one end and is closed at the other end by a cap 23 which extends in the radial direction beyond the inner tube 20 and thus pro-

vides a handle by which the inner tube 20 may be grasped by the fingers of a user. Extending around and spaced from the inner tube 20 is an outer tube 22, which is integrally connected at one end to the inner tube 20 at a point intermediate its ends by a flexible web 24. The width of the web in the radial direction is greater than that of the annular space between the tubes 20 and 22, whereby the web 24 constitutes a bistable connection between the two tubes, as will be discussed in more detail below. Integral with the lowermost portion of the outer tube 22 is a spigot 26, which defines a discharge opening 28. Formed in the lowermost portion of the inner tube 20 is a liquid flow opening 30 and formed in its uppermost portion diametrically opposed to the opening 30 is an airflow opening 32. At its free end, the inner surface of the outer tube 22 is conically divergent towards the free end and adjacent the widest end of this divergent portion is an annular projection 34. It will be appreciated that this divergent surface and the projection 34 correspond closely in shape and size to the convergent surface and the recess 18 on the flange 16 of the connection member. The discharge member 4 is connected to the connection member 2 by a snap connection constituted by the two complementary converging and diverging surfaces on the outer tube 22 and flange 16 and the engagement of the annular projection 34 in the annular recess 18. The dimensioning of these components and the material which is used, in this case polypropylene, ensure that the connection is both firm and liquid-tight. The tubular portion 10 is accommodated within the inner tube 20 with its outer surface in sliding sealed contact with the inner surface of the tube 20.

[0014] Due to the fact that the radial width of the web 24 is less than that of the annular gap between the tubes 20 and 22, the tubes 20 and 22 are connected together in a bistable manner. Thus the two tubes inherently have two positions at which the web 24 is in equilibrium, that is to say is not deformed, and one of these is shown in Figure 2. In the position shown in Figure 2, no force is applied to the inner tube 20 by the web 24, due to the fact that it is relaxed and not deformed, and the airflow openings 14 and 32 are not in registry with one another and the liquid flow openings 12 and 30 are also not in registry with one another. The two sets of openings are sealed from one another by the sealing engagement of the surfaces between them and there is therefore no communication between the inlet space defined by the annular member 6 and the annular discharge space defined by the tubes 20 and 22. If the inner tube 22 were now moved inwardly, that is to say to the right as seen in the drawings, by the application of pressure to the cap 23, the web 24 is progressively deformed and thus exerts, initially, a force on the inner tube 22 tending to return it to the closed position, that is to say to move it to the left. However, as movement of the inner tube 20 to the right continues, the web 24 reaches a "top dead centre" position and thereafter the force which it exerts on the inner tube is to the right as seen in the drawings, that is to say

urging the inner tube towards the open position. As the inner tube 20 moves to the right, the pairs of openings 12, 30 and 14, 32 move into communication with one another. If further movement to the right were permitted, the inner tube 20 would reach a second equilibrium position at which the web 24 is again undeformed. This is, however, not possible in the present construction because the shape of the flange 8 and the length of the inner tube 20 are such that the tube 20 engages the flange 8 before this equilibrium position is reached. This is the position shown in Figure 1 in which the dispenser is in the fully open position. This means that in the open position of the dispenser, there is a force acting on the inner tube 20 tending to urge it to the right against the stop constituted by the flange 8. This means that the dispenser is reliably retained in the fully open position until a sufficient outward force is applied to the cap 23 to overcome the biasing force exerted by the flange 24, whereupon the inner tube 20 will move to the left back through the top dead centre position and then into the fully closed position shown in Figure 2.

[0015] When the liquid flow openings 12 and 30 begin to communicate, liquid will start to flow out of the container to which the dispenser is connected by means of the annular portion 6. This flow is through the inlet space defined by the annular portion 6, the flow opening 12, the flow opening 30, the annular space defined by the tubes 20 and 22 and finally through the flow opening 28 defined by the spigot 26. This initial flow of liquid will cause a reduced pressure in the liquid container and this pressure will act via the airflow openings 14 and 32 on the annular space between the tubes 20 and 22. Air is therefore drawn through the discharge opening 28 into the annular space between the tubes 20 and 22 and then through the airflow openings 32 and 14 into the liquid container. The volume of liquid dispensed from the container is therefore replaced by inflowing air and the pressure within the container is therefore not permitted to fall below atmospheric to any substantial extent or for any significant period of time. It will be appreciated that such a subatmospheric pressure within the container would impede and potentially wholly prevent the discharge of liquid from the container, unless the container were of collapsible type.

Claims

1. A liquid dispenser including an outer tube (22) with a discharge opening (28) formed in its side wall and an inner tube (20) which is at least partially accommodated within the outer tube (22) and defines with it an annular space, the outer tube (22) being connected in a sealed manner to a one-piece connection member (2), which defines an inlet space, for connection to a liquid container, one end of the inner tube (20) being closed and the outer tube (22) being integrally connected to the inner tube (20) by a flex-

ible integral web (24), whose width in the radial direction is greater than that of the annular space, the inner surface of the inner tube (20) being in sliding sealed contact with the connection member (2), a liquid flow opening (30) being formed in the wall of the inner tube (20), the inner tube (20) being movable longitudinally within the outer tube (22) between an open position, in which the inlet space communicates with the discharge opening (28), and a closed position, in which the inlet space does not communicate with the discharge opening (28), **characterised in that** the connection member (2) includes an integral tubular portion (10) of which one end is closed and the other end communicates with the inlet space, that a liquid flow opening (12) is formed in the tubular portion (10), that the outer surface of the tubular portion (10) is in sliding sealed contact with the inner surface of the inner tube (20), whereby the two flow openings (12, 30) are at least partially in registry in the open position and are out of registry in the closed position.

2. A dispenser as claimed in Claim 1 in which the inner tube (20) is provided with an airflow opening (32) circumferentially offset from the liquid flow opening (30) in it and the tubular portion (10) of the connection member (2) is also provided with an airflow opening (14) positioned so that when the inner tube (20) is in the open position the two airflow openings (14, 32) are at least partially in registry and when the inner tube (20) is in the closed position the two airflow openings (14, 32) are not in registry.
3. A dispenser as claimed in Claim 1 or 2 which is so arranged that when in the closed position the inner tube (20) is closer to the inlet space than when it is in the open position.
4. A dispenser as claimed in Claim 3 including a stop (8) which acts on the inner tube (20) as it moves into the open position and prevents it from reaching an equilibrium position in which the web (24) is unstressed, whereby in the open position of the inner tube (20) the web (24) exerts a force on the inner tube (20) urging into contact with the stop (8).
5. A dispenser as claimed in Claim 4 in which the inner tube (20) and the connection member (2) are so constructed that the OTHER end of the inner tube (20) is in contact with the connection member (2) in the open position of the inner tube (20), whereby a portion (8) of the connection member (2) constitutes the stop.
6. A dispenser as claimed in any one of the preceding claims in which the connection member (2) is snap-connected to the outer tube (22).

7. A dispenser as claimed in Claim 2 in which the area of the discharge opening (28) is greater than that of the liquid flow opening (30) in the inner tube (20).

Patentansprüche

1. Flüssigkeitsspender mit einem Außenrohr (22) mit einer in dessen Seitenwand angeordneten Auslassöffnung (28) und einem Innenrohr (20), welches wenigstens teilweise in dem Außenrohr (22) aufgenommen ist und damit einen ringförmigen Raum definiert, wobei das Außenrohr (22) in einer abgedichteten Weise mit einem einteiligen Verbindungselement (2) verbunden ist, welches einen Einlassraum zur Verbindung mit einem Flüssigkeitsbehälter definiert, wobei ein Ende des Innenrohres (20) verschlossen ist und das Außenrohr (22) in einem Stück mit dem Innenrohr (20) über einen flexiblen integrierten Steg (24) verbunden ist, dessen Breite in der radialen Richtung größer als die des ringförmigen Raumes ist, wobei die Innenoberfläche des Innenrohres (20) in einem gleitenden abgedichteten Kontakt mit dem Verbindungselement (2) steht, wobei eine Flüssigkeitsdurchflussöffnung (30) in der Wand des Innenrohres (20) ausgebildet ist, wobei das Innenrohr (20) in Längsrichtung in dem Außenrohr (22) zwischen einer offenen Position, in welcher der Einlassraum mit der Auslassöffnung (28) in Verbindung steht, und einer geschlossenen Position, in welcher der Einlassraum nicht mit der Auslassöffnung (28) in Verbindung steht, bewegbar ist, **dadurch gekennzeichnet, dass** das Verbindungselement (2) einen integrierten rohrförmigen Abschnitt (10) enthält, wovon ein Ende geschlossen ist und das andere Ende mit dem Einlassraum in Verbindung steht, dass eine Flüssigkeitsdurchflussöffnung (12) in dem rohrförmigen Abschnitt (10) ausgebildet ist, dass die Außenoberfläche des rohrförmigen Abschnittes (10) in einem gleitenden abgedichteten Kontakt mit der Innenoberfläche des Innenrohres (20) steht, wodurch die zwei Durchflussöffnungen (12, 30) wenigstens teilweise in der offenen Position zueinander ausgerichtet sind und in der geschlossenen Position nicht ausgerichtet sind.
2. Spender nach Anspruch 1, in welchem das Innenrohr (20) mit einer Luftdurchflussöffnung (32) versehen ist, die in Umfangsrichtung gegenüber der Durchflussöffnung (30) darin versetzt ist, und der rohrförmige Abschnitt (10) des Verbindungselementes (2) ebenfalls mit einer Luftdurchflussöffnung (14) versehen ist, die so positioniert ist, dass, wenn sich das Innenrohr (20) in der offenen Position befindet, die zwei Luftdurchflussöffnungen (14, 32) wenigstens teilweise ausgerichtet sind, und wenn sich das Innenrohr (20) in der geschlossenen Position befindet, die zwei Luftdurchflussöffnungen (14, 32) nicht

ausgerichtet sind.

3. Spender nach Anspruch 1 oder 2, welcher so angeordnet ist, dass, wenn er sich in der geschlossenen Position befindet, das Innenrohr (20) näher an dem Einlassraum angeordnet ist als dann, wenn er sich in der offenen Position befindet.
4. Spender nach Anspruch 3, der einen Anschlag (8) enthält, welcher auf das Innenrohr (20) einwirkt, während es sich in die offene Position bewegt und verhindert, dass dieses eine Gleichgewichtsposition erreicht, in welcher der Steg (24) nicht belastet ist, wodurch der Steg (24) in der offenen Position des Innenrohres (20) eine Kraft auf das Innenrohr (20) ausübt, die es mit dem Anschlag (8) in Kontakt drückt.
5. Spender nach Anspruch 4, in welchem das Innenrohr (20) und das Verbindungselement (2) so aufgebaut sind, dass das andere Ende des Innenrohres (20) mit dem Verbindungselement (2) in der offenen Position des Innenrohres (20) in Kontakt steht, wodurch ein Abschnitt (8) des Verbindungselementes (2) den Anschlag bildet.
6. Spender nach einem der vorstehenden Ansprüche, in welchem das Verbindungselement (2) mit dem Außenrohr (22) durch Schnappverbindung verbunden ist.
7. Spender nach Anspruch 2, in welchem die Fläche der Auslassöffnung (28) größer als die der Flüssigkeitsdurchflussöffnung (30) in dem Innenrohr (20) ist.

Revendications

1. Distributeur de liquide comprenant un tube extérieur (22) avec une ouverture d'évacuation (28) formée dans sa paroi latérale et un tube intérieur (20) qui est au moins partiellement logé à l'intérieur du tube extérieur (22) et définit avec lui un espace annulaire, le tube extérieur (22) étant raccordé de manière étanchéifiée avec un élément de raccordement monobloc (2), qui définit un espace d'entrée, pour le raccordement avec un contenant de liquide, une extrémité du tube intérieur (20) étant fermée et le tube extérieur (22) étant raccordé de façon intégrée avec le tube intérieur (20) par une bande intégrée flexible (24), dont la largeur dans la direction radiale est supérieure à celle de l'espace annulaire, la surface intérieure du tube intérieur (20) étant en contact étanchéifié coulissant avec l'élément de raccordement (2), une ouverture d'écoulement de liquide (30) étant formée dans la paroi du tube intérieur (20), le tube intérieur (20) étant mobile longitudinalement à l'in-

- térieur du tube extérieur (22) entre une position ouverte, dans laquelle l'espace d'entrée communique avec l'ouverture d'évacuation (28), et une position fermée, dans laquelle l'espace d'entrée ne communique pas avec l'ouverture d'évacuation (28), **caractérisé en ce que** l'élément de raccordement (2) comprend une partie tubulaire intégrée (10) dont une extrémité est fermée et l'autre extrémité communique avec l'espace d'entrée, qu'une ouverture d'écoulement de liquide (12) est formée dans la partie tubulaire (10), que la surface extérieure de la partie tubulaire (10) est en contact étanchéifié coulissant avec la surface intérieure du tube intérieur (20), moyennant quoi les deux ouvertures d'écoulement (12, 30) sont au moins partiellement en coïncidence dans la position ouverte et sont hors de coïncidence dans la position fermée.
2. Distributeur selon la revendication 1, dans lequel le tube intérieur (20) est pourvu d'une ouverture d'écoulement d'air (32) décalée de façon circumférentielle par rapport à l'ouverture d'écoulement de liquide (30) dans celui-ci et la partie tubulaire (10) de l'élément de raccordement (2) est également pourvue d'une ouverture d'écoulement d'air (14) positionnée de sorte que, lorsque le tube intérieur (20) est dans la position ouverte, les deux ouvertures d'écoulement d'air (14, 32) soient au moins partiellement en coïncidence et, lorsque le tube intérieur (20) est dans la position fermée, les deux ouvertures d'écoulement d'air (14, 32) ne soient pas en coïncidence.
3. Distributeur selon la revendication 1 ou 2, qui est agencé de sorte que, lorsqu'il est dans la position fermée, le tube intérieur (20) est plus près de l'espace d'entrée que lorsqu'il est dans la position ouverte.
4. Distributeur selon la revendication 3 comprenant une butée (8) qui agit sur le tube intérieur (20) lorsqu'il se déplace dans la position ouverte et l'empêche d'atteindre une position d'équilibre dans laquelle la bande (24) n'est pas contrainte, moyennant quoi, dans la position ouverte du tube intérieur (20), la bande (24) exerce une force sur le tube intérieur (20), le poussant en contact avec la butée (8).
5. Distributeur selon la revendication 4, dans lequel le tube intérieur (20) et l'élément de raccordement (2) sont construits de sorte que l'autre extrémité du tube intérieur (20) soit en contact avec l'élément de raccordement (2) dans la position ouverte du tube intérieur (20), moyennant quoi une partie (8) de l'élément de raccordement (2) constitue la butée.
6. Distributeur selon une quelconque des revendications précédentes, dans lequel l'élément de raccordement (2) est raccordé par encliquetage avec le tube extérieur (22).
7. Distributeur selon la revendication 2, dans lequel la superficie de l'ouverture d'évacuation (28) est supérieure à celle de l'ouverture d'écoulement de liquide (30) dans le tube intérieur (20).

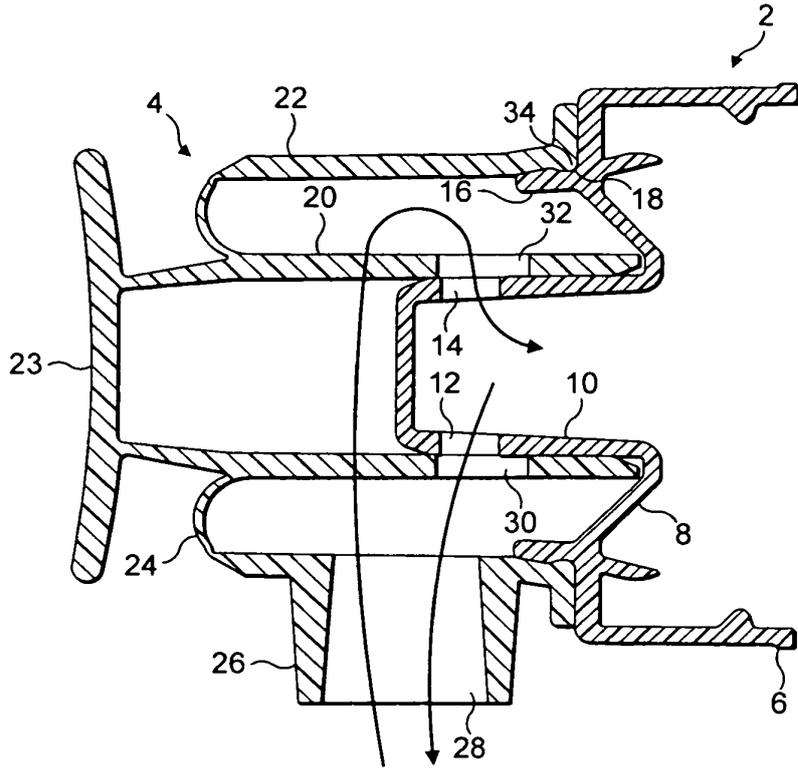


FIG. 1

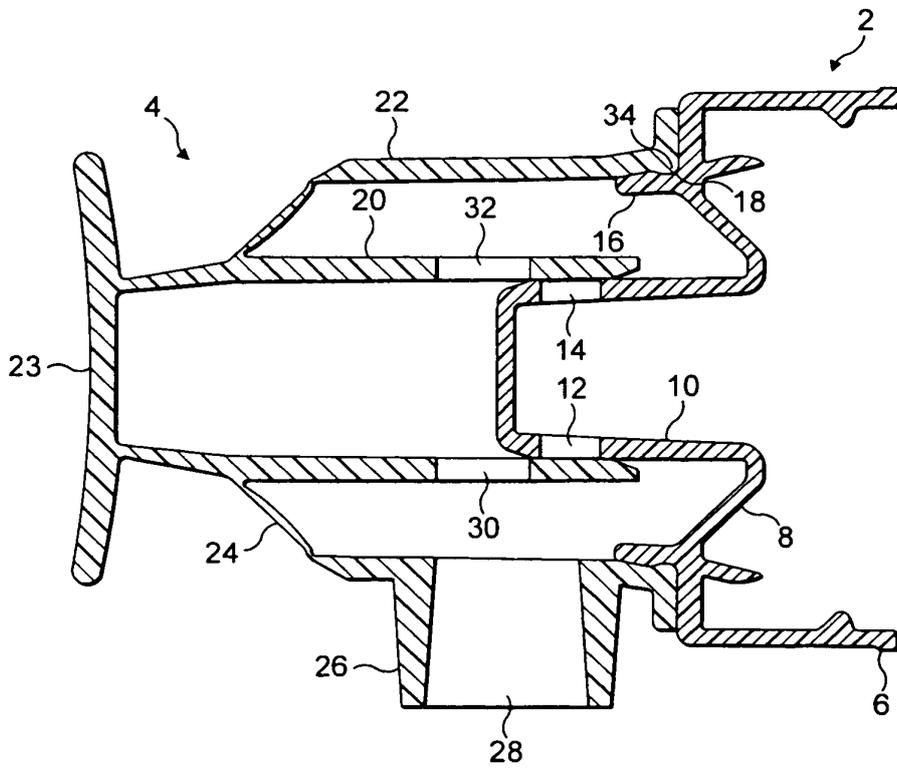


FIG. 2

REFERENCES CITED IN THE DESCRIPTION

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