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(54) **Nozzle head for liquid spray.**

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Description

This invention relates to a means for effecting the spray of a liquid from a tank and pump means, and more particularly to means for increasing the area of spread of a liquid spray from a nozzle head fastened to a tank and pump means. Such a nozzle head attached to a tank and pump means is intended to reduce the distance between the nozzle head and the receiving area.

The nozzle heads presently available on the market are fastened to a tank and pump means by means of a connecting pipe or hose. To operate such equipment, the tank is filled with liquid and the contents are subsequently subjected to an increase in atmospheric pressure, usually by means of activating the pump means. The contents of the tank being subjected to increased atmospheric pressure, is forced out through the nozzle head. The nozzle head typically comprises of a drum with one open end. The other end accommodates a hollow cylindrical shaft in a sealingly engageable manner. The said hollow cylindrical shaft is cooperably movable along the longitudinal axis of the said cylindrical body. The terminal end of the shaft inside the drum is fastened to a flange which is sealingly engageable and movable along the said longitudinal axis, thereby altering the spacious volume between the flange and the nozzle cover.

The open end of the drum is typically demountably and sealingly fastened to a planar cover; the said cover includes at least one orifice. The said cover is of two portions, the first portion is a cylindrical and of sufficient thickness so as to enable the portion to be sealingly engageable to the open end of the drum; and the second portion is usually of larger/equal diameter to the drum to facilitate the mounting of the cover onto the drum.

To have a spray effect of the liquid, the presently available nozzle include the following configuration or features. The nozzle cover includes at least one chamber terminating in an orifice and the said chamber communicating to a central chamber by means of a duct, whose width is substantially equal to the diameter of the orifice. The said duct is positioned tangentially to the central chamber. The said central chamber is axially placed in registration with the terminal opening of the shaft hereinbefore described, and the diameter of the central chamber is marginally smaller than the diameter of the said terminal opening. Further, the said central chamber does not include any orifice connecting the chamber to the outside. Typically the central chamber is connected to a plurality of secondary chambers with orifices.

The above described nozzle heads currently available in the market suffer from a number of disadvantages. The secondary chamber is of two portions. The first portion is frusto-conical whose apex terminates in an orifice connecting the chamber to the outside, and the second portion is cylindrical with a connecting duct to the central chamber. The height of the secondary chamber comprising of the frusto-cone and the cylinder equals the thickness of the nozzle cover. In some embodiments, the secondary chamber consists only of one frusto-conical portion and whose height equals the thickness of the nozzle cover. The liquid from the drum is introduced into the central chamber from where the liquid is subsequently introduced into the secondary chamber via the connecting duct. The said liquid at pressure is ejected out of the nozzle via the orifice in a spray form. The angle at the vertex of the cone of spray is a function of the height of the chamber.

The size of the angle of spray cone is inversely proportional to the height of the chamber and to the distance of the flange from the nozzle cover. Thus, the angle of spray cone is relatively small when the height of the secondary chamber is relatively large and conversely the angle of the spray cone is large when the said height is relatively small. Thus, it is advantageous to reduce the height of the secondary chamber to facilitate a wide angle of spray cone. Further, angle of spray is increased as the distance between the flange and the nozzle cover is reduced. Optimally the flange should be in close contact with the nozzle cover.

In the presently available nozzle covers, the height of the secondary chamber equals the total thickness of the nozzle cover. The problem has been how to reduce the height of the secondary chamber without in any way limiting the mountability of the nozzle cover onto the open end of the drum.

It is an object of the present invention to provide a new and improved sealingly mountable nozzle cover to facilitate the ejection of the liquid from the container tank in a wide angle spray cone.

It is another object of the present invention to provide such a nozzle cover, which when employed in nozzle heads facilitates the ejection of the liquid from the container tank in a wide angle spray cone.

These and other objects of the invention are achieved by a nozzle head means for effecting broad-angle cone-of-liquid spray comprising:

a) a drum body having a hollow cylindrical shaft coaxially movable along its longitudinal axis and a flange fastened to the terminal end of the shaft inside the drum body, sealingly engageable with the drum body and coaxially movable along the said axis, the flange including a coaxially placed aperture;

b) a nozzle cover having a first portion and a second portion sealingly mountable onto the open end of the drum body, the nozzle cover

having a circular primary chamber and at least one secondary chamber in communication with the primary chamber via a duct positioned tangentially with respect to both chambers, the secondary chamber being tapered, terminating in an orifice opening to atmosphere, the diameter of which being substantially less than the width of the communication duct, wherein the secondary chamber is in part delimited by the flange, and the height of the secondary chamber and thus the angle of the spray cone may be adjusted by movement of the flange along the said axis relative to the nozzle cover.

The invention accordingly provides a nozzle head means for effecting broad-angle cone-of-liquid spray comprising:

a) a drum body having a hollow cylindrical shaft coaxially movable along its longitudinal axis and a flange fastened to the terminal end of the shaft inside the drum body, sealingly engageable with the drum body and coaxially movable along the said axis, the flange including a coaxially placed aperture;

b) a nozzle cover having a first portion and a second portion sealingly mountable onto the open end of the drum body, the nozzle cover having a circular primary chamber and at least one secondary chamber in communication with the primary chamber via a duct positioned tangentially with respect to both chambers, the secondary chamber being tapered, terminating in an orifice opening to atmosphere, the diameter of which being substantially less than the width of the communication duct, wherein the secondary chamber is in part delimited by the flange, and the height of the secondary chamber and thus the angle of the spray cone may be adjusted by movement of the flange along the said axis relative to the nozzle cover.

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

Fig 1 illustrates a perspective views of a nozzle head.

Fig 2 is a plan view of the inside surface of the nozzle corresponding to the invention.

Fig 3 is a plan view of the outside surface of the nozzle cover.

Fig 4 is a cross-section view of the nozzle cover along line AA in Fig 2.

Fig 5 is a cut-out view showing nozzle cover in position in nozzle head and diagrammatical representing the flow of liquid inside the nozzle head.

The illustrated nozzle (1) includes a nozzle cover (2) sealingly mounted onto to a nozzle drum body (3). The drum body (3) further includes a hollow shaft (4), the terminal end of which is fastened to a flange (5). The flange (5) is sealingly engageable and movable along the longitudinal axis preferably by screw means. Accordingly, the inner circumferential side of the drum body (3) has corresponding thread to accommodate the flange (5) (Fig 5).

The nozzle cover (2) is of two portions (7, 8). The first portion (7) is sealingly mountable onto the open end of the drum body (3). It is a preferred embodiment of the present invention that the circumferential edge of the first portion includes threads to cooperate with the threads in the inner circumferential surface of the drum body. This facilitates the mounting of the nozzle cover (2) onto the nozzle drum body (3) in a sealing manner. The said first portion (7) includes a primary chamber (9), positioned co-axially with the open end of the shaft (4). The diameter of the primary chamber is marginally smaller than the diameter of the open end of shaft. The first portion (7) further includes at least one other secondary chamber (10). It is another preferred embodiment of the present invention that first portion (7) includes a plurality of secondary chambers positioned symmetrically to the outside of the primary chamber (9) (Fig 2). The secondary chambers (10a, b, c, d) communicate to the primary chamber (9) via connecting ducts (11a, b, c, d). The said duct is positioned tangentially to both the primary and secondary chambers (Fig 2). The width of the communicating duct (11) is preferably larger than the diameter of the orifice opening (13). It is a preferred embodiment of the present invention that the width of the said duct and the diameter of the orifice opening be in the ratio 3:1.

The secondary chamber (10) includes a fructoconical chamber (12), the vertex of which chamber terminates in an orifice (13). The height of the secondary chamber (10) is equal to the thickness of the first portion (7). It is to be understood that the height of the secondary chamber is a function of the thickness of the first portion. As will described hereafter, the said height must be kept to an optimum dimension to achieve the desired objectives of the invention.

The nozzle cover (2) includes a second portion (8) which is integrally connected to the first portion (7) to form an annular ring. The circumferential edge of the portion (8) is preferably grooved or serrated to provide a slip resistant surface. Advantageously a sealing ring washer (14) can be mounted onto the internal surface of the second portion to facilitate a leak-proof mounting.

In the present invention, the thickness of the first portion is approximately one half of the total thickness of the nozzle cover, thereby substantially reducing the height of the secondary chamber as compared to the height of such chambers in con-

ventional nozzle covers.

The flow of liquid during the operation of the nozzle head will now be described. The liquid is introduced into the drum body of the nozzle head from the pressurized tank holding the liquid. Typically the tank body is connected to the nozzle head by means of a flexible tube. The liquid travels through the hollow shaft (4) through force of pressure to the primary chamber (9) from where it travels into the secondary chamber (10) via the connecting duct (11). The travel of the liquid from the primary chamber to the secondary chamber via the said duct creates a churning effect in the liquid contained in the secondary chamber (10). The liquid is ejected out through the orifice (13) in a conical spray. The vertex angle of the spray (α) is a function of the height of the secondary chamber. In the present invention, the said height is smaller than in presently available nozzles. Accordingly, the angle of the vertex of the spray cone (α) is substantially broader than in conventional nozzles. The angle is largest when the planar surface of the flange is in contact with surface of the first portion (7) of the nozzle cover (2) at a given pressure. In this operating position, the liquid from the shaft (4) directly impinges on the primary chamber and is directly ejected into the secondary chamber in a tangentical direction, thereby creating a churning effect. As the liquid is introduced into the nozzle head at substantially above atmospheric pressures, the liquid contained in the secondary chamber (10) is ejected out through the orifice (13) in a conical spray.

It is to be understood that for a given orifice size, the angle of spray (α) is a function of the pressure applied on the liquid. Accordingly, the pressure can be reduced by moving the flange (5) away from the nozzle cover, thereby reducing the angle spray (α). Conversely to increase the angle of spray (α) the flange is moved forward in the direction of the nozzle cover. The angle (α) is widest when the flange is in contact with the nozzle cover. In this operating position, all the liquid in the shaft is ejected into the primary chamber. All the said liquid is subsequently forced into the secondary chambers via the communicating ducts. As the width of the ducts is substantially larger than the diameter of the orifice, larger volume of the liquid enters the chamber, thereby ejecting the liquid in the chamber via the orifice at a pressure. The liquid leaves the chamber in a spray form.

Claims

1. A nozzle head (1) means for effecting broad-angle cone-of-liquid spray comprising:
   a) a drum body (3) having a hollow cylindrical shaft (4) coaxially movable along its longitudinal axis and a flange (5) fastened to the terminal end of the shaft (4) inside the drum body (3), sealingly engageable with the drum body and coaxially movable along the said axis, the flange (5) including a coaxially placed aperture;
   b) a nozzle cover (2) having a first portion (7) and a second portion (8) sealingly mountable onto the open end of the drum body (3), the nozzle cover (2) having a circular primary chamber (9) and at least one secondary chamber (10) in communication with the primary chamber (9) via a duct (11) positioned tangentially with respect to both chambers (9, 10), the secondary chamber (10) being tapered, terminating in an orifice (13) opening to atmosphere, the diameter of which being substantially less than the width of the communication duct, wherein the secondary chamber is in part delimited by the flange (5), and the height of the secondary chamber (10) and thus the angle of the spray cone may be adjusted by movement of the flange (5) along the said axis relative to the nozzle cover.

2. A nozzle head means according to claim 1 wherein the flange (5) and the inner surface of the drum body (3) are provided with cooperating threads by means of which movement of the flange (5) may be effected.

Patentansprüche

1. Düsenkopfmittel (1) zum Erzeugen einer Breitwinkel-FlüssigkeitskegelZerstäubung, welche beinhalten:
   a) einen Trommelkörper (3) mit einem hohlen zylindrischen Schaft (4), weicher koaxial entlang seiner Längsachse bewegbar ist, und einem Flansch (5), welcher an dem Ende des Schafts (4) innerhalb des Trommelkörpers (3) befestigt ist, und zwar dichtend in Eingriff bringbar mit dem Trommelkörper und koaxial bewegbar entlang der Achse, wobei der Flansch (5) eine koaxial angeordnete Öffnung beinhaltet;
   b) eine Düsenabdeckung (2) mit einem ersten Abschnitt (7) und einem zweiten Abschnitt (8), welcher abdichtend an das offene Ende des Trommelkörpers (3) anbringbar ist, wobei die Düsenabdeckung (2) eine kreisförmige primäre Kammer (9) und mindestens eine sekundäre Kammer (10) aufweist, welche mit der primären Kammer (9) mittels eines tangential bezüglich beiden Kammern (9, 10) angeordneten Kanals (11) verbunden ist, wobei die sekundäre Kam-

mer (10) verjüngt ist und bei einer Öffnung (13), welche sich zur Atmosphäre öffnet, endet, deren Durchmesser wesentlich kleiner als die Breite des Verbindungskanals ist, wobei die sekundäre Kammer zum Teil durch einen Flansch (5) abgegrenzt ist und die Höhe der sekundären Kammer (10) und somit der Flüssigkeitskegelwinkel durch Bewegung des Flansches (5) entlang der Achse bezüglich der Düsenabdeckung eingestellt werden kann.

2. Düsenkopfmittel gemäß Anspruch 1, wobei der Flansch (5) und die innere Fläche des Trommelkörpers (3) zusammenwirkende Gewinde aufweisen, durch welche die Bewegung des Flansches (5) durchgeführt werden kann.

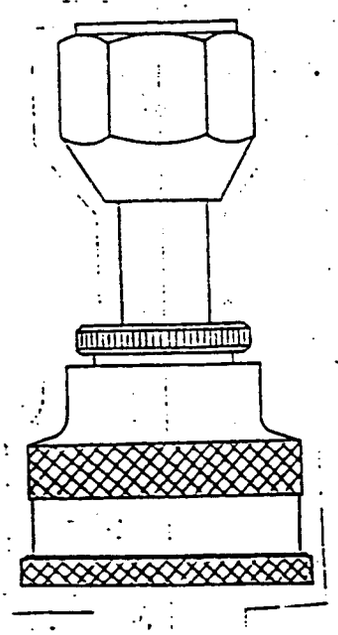
Revendications

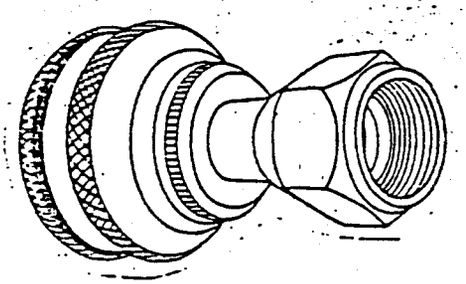
1. Dispositif formant tête de gicleur (1) pour effectuer une diffusion d'un cône de liquide ayant un grand angle comprenant :

a) un corps de tambour (3) ayant un arbre cylindrique creux (4) se déplaçant coaxialement le long de son axe longitudinal et un rebord (5) fixé à une extrémité terminale de l'arbre (4) à l'intérieur du corps de tambour (3) susceptible d'être en prise de façon étanche avec le corps du tambour et mobile coaxialement le long dudit axe, le rebord (5) comprenant une ouverture placée coaxialement ;

b) un couvercle de gicleurs (2) ayant une première partie (7) et une seconde partie (8) qui peut être montée de façon étanche sur l'extrémité ouverte du corps de tambour (3), le couvercle de gicleur (2) ayant une chambre principale circulaire (9) et au moins une chambre secondaire (10) en communication avec la chambre principale (9) par l'intermédiaire d'un conduit (11) positonnné tangentiellement par rapport aux deux chambres (9,10), la chambre secondaire (10) étant évasée, se terminant par un orifice (13) s'ouvrant sur l'atmosphère, dont le diamètre est sensiblement inférieur à la largeur du conduit de communication, dans lequel la chambre secondaire est en partie délimitée par le rebord (5), et la hauteur de la chambre secondaire (10), et donc l'angle du cône de diffusion, peut être ajustée par le déplacement du rebord (5) le long dudit axe par rapport au couvercle du gicleur.

2. Dispositif formant tête de gicleur selon la revendication 1, dans lequel la bride (5) et la surface interne du corps du tambour (3) sont pourvus de filetages coopérant au moyen desquels le déplacement du rebord (5) peut être effectué.





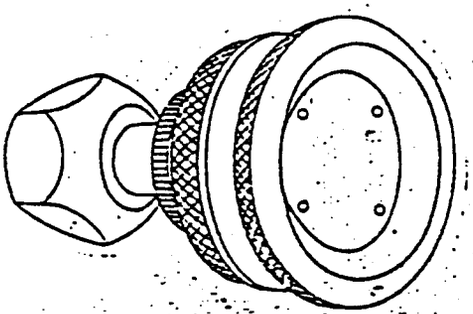


FIGURE 1

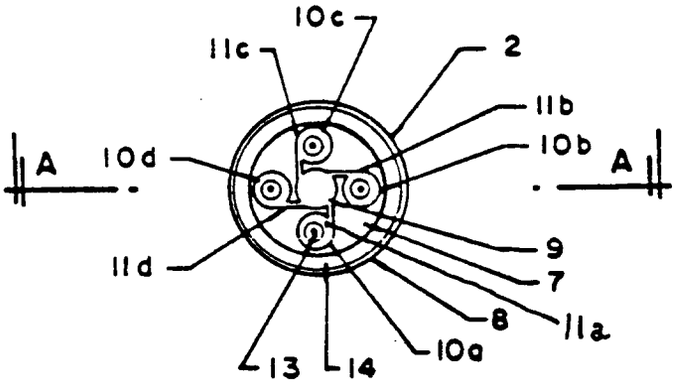


FIG. 2 PLAN VIEW OF THE SURFACE OF THE NOZZLE COVER

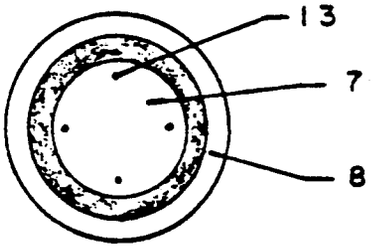


FIG. 3 VIEW OF THE OUTSIDE SURFACE OF THE NOZZLE COVER

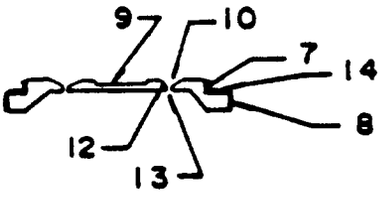


FIG. 4 CROSS SECTION OF THE NOZZLE CUT ALONG LINE AA IN FIG. 2

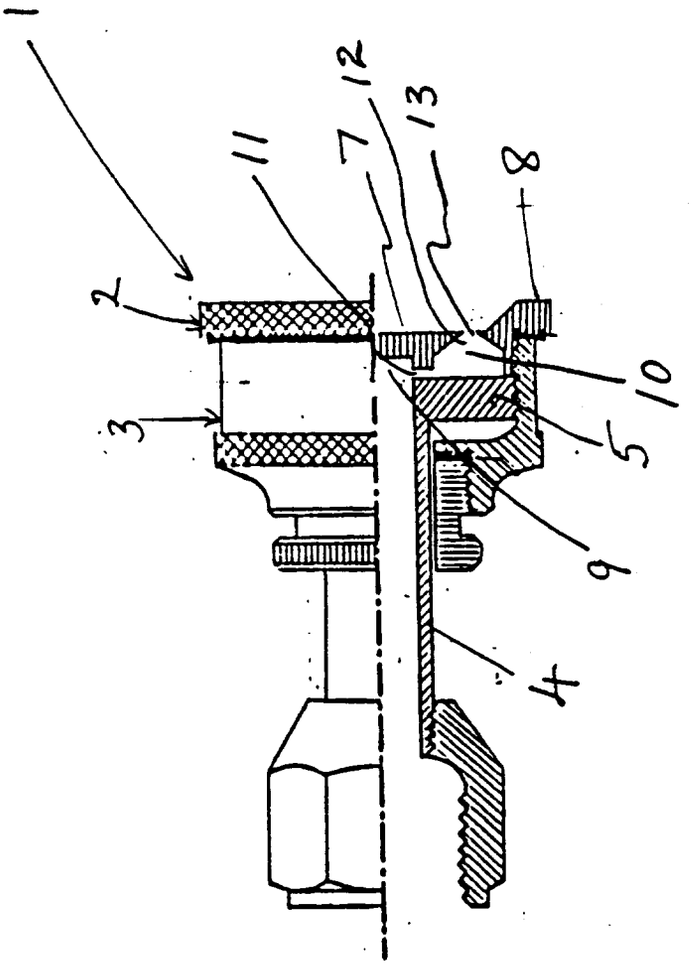


FIGURE 5