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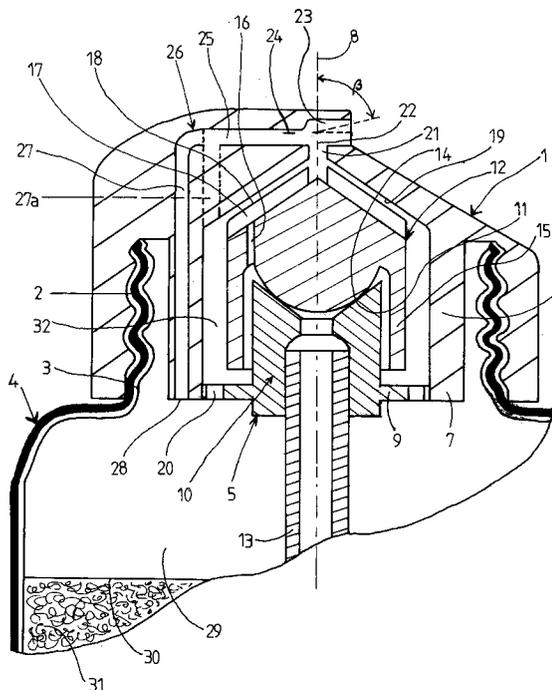
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Spraying device for deformable container.

Spraying device for a deformable container (4), comprising a closing cap (1) with supporting means (5) to which a dip tube (13) is fastened. The liquid coming from the dip tube (13) upon squeezing the container is mixed with the air from the container and the mixture is led through an opening (21) situated in the cap (1), which opening laterally connects to a bore (23) which is open at one end for discharge of the mixture to the outside, while an air duct (25) ends in the bottom of the bore, situated opposite the open end, with the axis of the air duct running parallel to that of the bore and which air duct is connected to a space (29, 32) which is normally situated above the highest liquid level (30).



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The invention relates to a spraying device for a deformable container, which device comprises a closing cap for the container and supporting means directly or indirectly connected therewith to which a dip tube projecting in the container is mounted through which, on squeezing the container, liquid will be forced into a chamber situated within the cap, in which chamber the liquid is mixed with air flowing from the container into the chamber, from which chamber the mixture is discharged outwardly through an opening present in the cap, which encloses an angle with the axis of the cap and the container, through which opening air can flow into the container, when the container takes up its original shape again after discharge of the formed mixture.

Such a device is known from US-A-4.673.110. When with this known device the angle, which the opening in the closing cap encloses with the axis of the cap, is too large, spraying of the liquid will be adversely affected.

Thus, with increasing deflection of the mixture or the spray, the liquid drops will unite so that the size of the drops will increase. The sprayed mixture, e.g. the spray will also have a less uniform composition.

In order to obviate this difficulty and adapt the device for spraying a liquid-air-mixture in several directions, according to the invention it is provided for, that an opening situated in the closing cap ends laterally in a bore made in the cap, which bore is open at one end for discharge of the formed mixture outwardly, while an air duct ends in the bottom of the bore, situated opposite the open end, the axis of the air duct extends substantially parallel to that of said bore and which air duct on the other hand is connected to a space in the container which is normally situated above the highest liquid level in the container.

Owing to the fact that the opening ends laterally in the bore, it is achieved, that the mixture arriving in the bore is subjected to an air flow emerging from said air duct and being substantially square to the direction of flow of the mixture, which air flow produces the deflection of the mixture, the spray, while maintaining its quality.

According to a preferred embodiment of the invention, it can be provided for, that a duct section, running practically parallel to the axis of the cap and of the container, connects to the section of the air duct running practically parallel to the axis of the bore, which first mentioned section extends through a substantially cylindrical part of the cap, such that the inner end of the air duct connects directly to the space in the container which is normally situated above the highest liquid level.

The air duct can then simultaneously serve for sucking in air into the container when, after a

5 spraying has taken place, it is released and will take up its original shape again. Due to this, the inflowing air will have a considerable velocity, by which a good cleaning of the narrow discharge bore is guaranteed.

10 There is also the possibility that a duct section running substantially parallel to the axis of the cap and of the container connects to the section of the air duct running practically parallel to the axis of the bore, which first mentioned section extends as far as into the space which is situated within a substantially cylindrical part of the cap, which cylindrical part, near its innermost edge, is connected to a substantially radially extending part of the supporting means, in which radially extending part one or more openings are situated for receiving air in the container when after discharge of the formed mixture, it takes up its original shape again.

20 Naturally, both air ducts could be applied simultaneously, but this only leads to a more complicated and thus more expensive spraying device.

25 Although the axis of the bore can be square to the axis of the container and of the cap, according to the invention it can also be provided for, that the axis of the bore encloses an angle between 10° to 150° with the extension of the axis of the container and of the cap. The discharged mixture or the spray can thus then be directed upward or downward, depending on the intended application of the deformable container.

30 Further, it will be obvious, that the features applied with the invention are also useful with other embodiments of spraying devices, than described in the US patent specification mentioned above.

35 The invention will now be explained on the basis of embodiments, shown in the drawing, which shows a vertical section through a spraying device according to the invention. In the drawing, a first embodiment is depicted in full lines and another possible embodiment in dash lines.

40 The spraying device shown in the drawing comprises a closing cap 1, which is provided with screw-thread 2 for applying it onto the neck 3 of a deformable container 4, of which only a small part is shown in the drawing.

45 The supporting means 5 are connected to the innermost edge 7 of the substantially cylindrical part 6 of the cap 1. The part 9 of the supporting means 5 running radially in relation to the axis 8 of the container 4 carries a valve support 10. The valve support 10 is provided with the valve seat 11 on which the movable valve 12 rests. Opposite to the valve seat 11 the support 10 is provided with the dip tube 13, which extends as far as near the not illustrated bottom of the container 4.

50 The valve 12 consists of the part 14 sealing in relation to the valve seat 11 and the cylindrical part 15 extending downwardly with an opening 16 in the

transition between both parts. The opening 16 ends in a chamber 17, which is formed in the upper plane 18 of the valve 12. It is also possible that more than one opening 16 and chamber 17 are present.

Upon applying pressure on the container 4 by hand, liquid will be forced under the valve 12 through the dip tube 13 and the valve 12 will then be lifted from its seat 11 and with its upper plane 18 come to lie against the inner plane 19 of the cap 1. The liquid will then flow through the opening 16 into the chamber 17 and there be mixed with air which is forced from the container 4 into the chamber 17 through at least one opening 20 in the radial part 9 of the supporting means 5.

The formed mixture will leave the chamber 17 through an opening 21, the axis 22 of which can extend in the direction of the axis 8. The bore 23 connects to the opening 21, the axis 24 of which bore is practically square to the axis 22 of the opening 21.

A section 25 of an air duct 26 connects to the bore 23, which section 25 runs substantially parallel to the axis 24 of the bore 23. The further section 27 of the air duct 26 extends through the cylindrical part 6 of the cap 1. The inner end 28 of the air duct 27 ends in the space 29 of the container 4, which space is in general above the level 30 of the liquid 31 present in the container 4.

As already mentioned above, a liquid-air-mixture will be formed in the chamber 17 upon squeezing the container 4. This mixture leaves the chamber 17 through the opening 21 and arrives in the bore 23. Simultaneously, air is forced to the inner end of the bore 23 through the duct 25, so that the mixture flowing from the opening 21 in the direction of the axis 22 is deflected in the direction of the axis 24 of the bore 23.

When the pressure on the container 4 is relieved, the container 4 will take up its original shape again. Hereby, the valve 12 will be closed and air will be sucked into the container 4 through the bore 23, the air duct 26, the opening 21, along the upper plane 18 of the valve 12, through the chamber 17 and through the openings 16 and 20. This will contribute to cleaning of the naturally small openings 16, 21 and 23, so that these will not easily get jammed by any possible curing liquid.

With dash lines it is indicated, that the section 27 of the air duct 26 can also extend as far as into the space 32, which is formed between the cylindrical part 6 of the cap 1 and the cylindrical part 15 of the valve 12. The section 27 will then be replaced by the section 27a.

As already mentioned above, it is possible to apply both a duct 27 and a duct 27a in the cap 1.

When one does not want to use the device described above for discharging a mixture, vapour,

liquid particles, but for discharging foam, means known per se can be applied. For example, the mouth of the bore 23 can be enlarged and a sieve or other means can be mounted in the enlarged part. By the presence of the air duct 26, a better cleaning of the sieve or other means will be obtained here as well, when the container 4 takes up its original shape again after a deformation.

Although in the drawing the axis 24 of the bore 23 is square to the axis 8 of the cap 1 and the container 4, it will be obvious, as already mentioned above, that this axis 24 can also enclose an acute angle β with the axis 8. For example, this angle β can be between 10° and 150° , depending on the intended application of the deformable container. Therein, the air duct 25 will remain parallel to the axis 24 of the bore 23.

It will be obvious, that only one possible embodiment of a device according to the invention is illustrated in the drawing and discussed above, and that many modifications can be made without falling beyond the inventive idea.

Thus, the inventive idea can also be applied with a spraying device which is not provided with a shut-off valve. In general, the application of such a valve has the advantage, that upon squeezing the container, the mixture immediately flows out, since the level of the liquid in state of rest is up to beneath the valve.

Claims

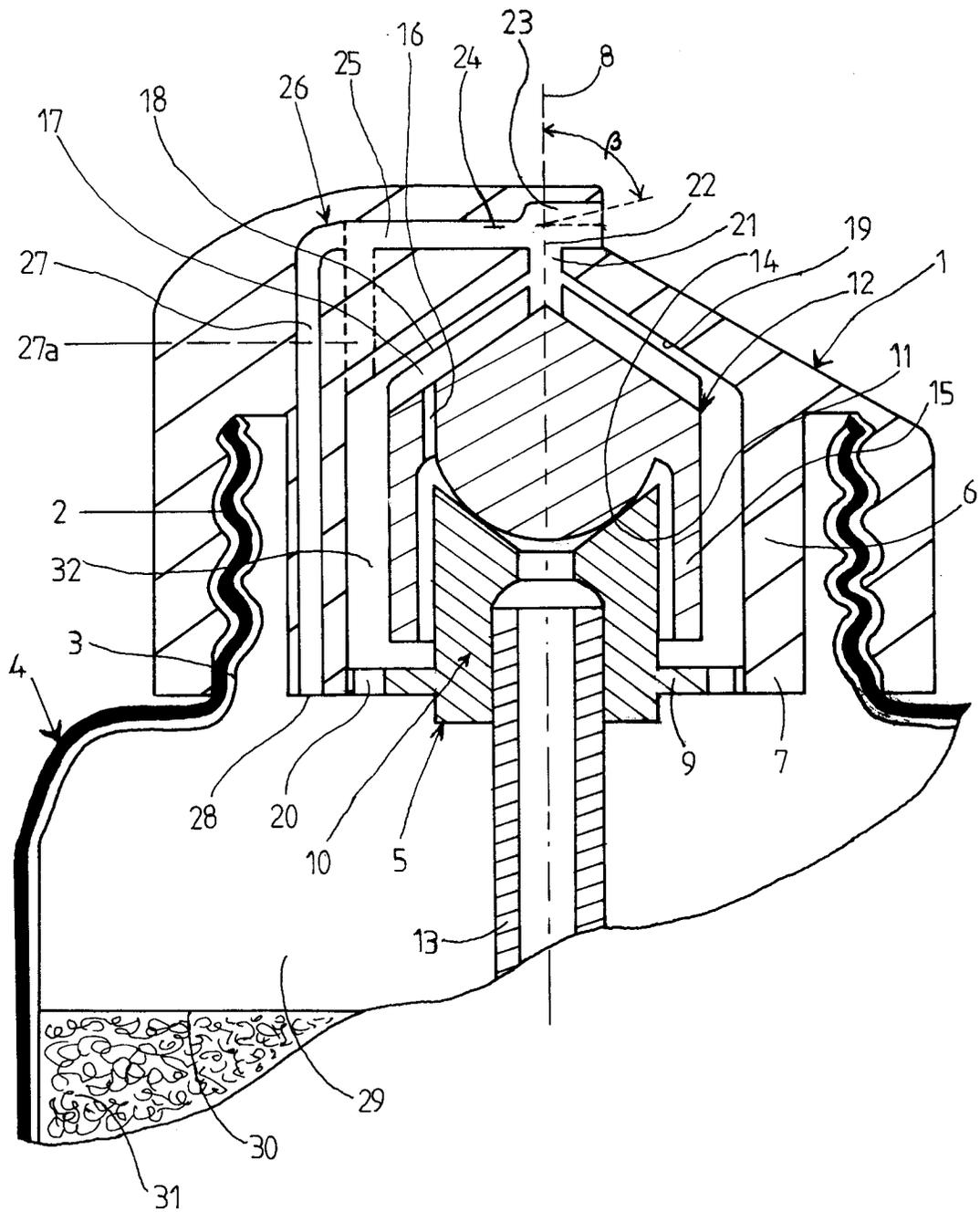
1. Spraying device for a deformable container (4), which device comprises a closing cap (1) for the container and supporting means (5) directly or indirectly connected therewith to which a dip tube (13) projecting in the container is mounted through which, on squeezing the container (4), liquid (31) will be forced into a chamber (17) situated within the cap (1), in which chamber the liquid is mixed with air flowing from the container into the chamber, from which chamber (17) the mixture is discharged outwardly through an opening (21, 23) present in the cap, which encloses an angle with the axis (8) of the cap (1) and the container (4), through which opening air can flow into the container (4), when the container (4) takes up its original shape again after discharge of the formed mixture, **characterized** in that an opening (21) situated in the closing cap (1) ends laterally in a bore (23) made in the closing cap, which bore is open at one end for discharge of the formed mixture outwardly, while an air duct (25) ends in the bottom of the bore, situated opposite the open end, with the axis of the air duct extending substantially parallel to that of said bore and which air duct (25)

on the other hand is connected to a space (29, 32) in the container which is normally situated above the highest liquid level (30) in the container (4).

- 5
2. Device according to claim 1, **characterized** in that a duct section (27) running practically parallel to the axis (8) of the cap (1) and of the container (4) connects to the section (25) of the air duct (26) running practically parallel to the axis (8) of the bore, which first mentioned section extends through a substantially cylindrical part (6) of the cap, such that the inner end (28) of the air duct connects directly to the space (29) in the container which is normally situated above the highest liquid level (30). 10 15
3. Device according to claim 1, **characterized** in that a duct section (27a) running substantially parallel to the axis (8) of the cap (1) and of the container (4) connects to the section (25) of the air duct (26) running practically parallel to the axis (24) of the bore (23), which first mentioned section extends as far as into the space (32) which is situated within a substantially cylindrical part (6) of the cap (1), which cylindrical part (6), near its innermost edge (7), is connected to a substantially radially extending part (9) of the supporting means (5), in which radially extending part one or more openings (20) are situated for receiving air in the container (4) when after discharge of the formed mixture, it takes up its original shape again. 20 25 30
4. Device according to one of the preceding claims, **characterized** in that the axis (24) of the bore (23) encloses an angle (β) between 10° to 150° with the extension of the axis (8) of the container (4) and of the cap (1). 35 40
5. Device according to one of the preceding claims, **characterized** in that in the discharge opening of the bore (23), a sieve or other means have been mounted for forming foam from the mixture formed in the mixing chamber (17). 45

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EUROPEAN SEARCH REPORT

Application Number

EP 92 20 1043

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
D,A	US-A-4 673 110 (WORKUM) * the whole document * ---	1,2	B05B11/04
A	US-A-4 415 122 (LAAUWE) * the whole document * -----	1,2,4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B05B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 30 JUNE 1992	Examiner JUGUET J. M.
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