

Apparatus for forming soap lather with a lever-operated liquid soap dosing means

The present invention relates to an apparatus for forming soap lather, having a lever-operated liquid soap dosing means and a built-in device for compressing and introducing pressurised gas or compressed air into a mixing chamber through closable openings and/or ducts, the apparatus comprising at least one supply container for liquid soap.

As is known, soap dispensers are used in a plurality of embodiments in public and private washing facilities. Amongst others, lather-forming soap dispensers are known, which use a propellant gas of dichlorodifluoromethane (Freon 12), and the distribution of which may only be made with great reserve for reasons of enviromental protection.

A soap lather dispenser is known from US-PS 2 871 058 which comprises a mixing chamber, a lever-operated liquid soap dosing means which feeds the said mixing chamber, and a built-in manually operated device for compressing and introducing compressed air into the mixing chamber. The valve is used to close the compressed air line. The liquid soap is stored in a

container. The known dispenser also comprises a heating means.

This arrangement requires a lot of space and a regular replacement of the compressed air container.

It is the aim of the invention disclosed in claim 1, to provide an arrangement which is not harmful to the enviroment, which requires little space and no replacement of a replaceable compressed air source.

The above aim is attained by means of an apparatus of the above type in that the liquid soap dosing means is a dosing pump with a piston, which is arranged in a cylinder compartment and can be displaced in a reciprocal manner by the lever, and in addition the lever is connected to the device for compressing and introducing the pressurised gas or compressed air so as to be mechanically reciprocally movable and actuates the said device.

Advantageous further embodiments of the invention are described in the subclaims.

Using the apparatus according to claim 2, the maximum dosing amount can be limited to portions. The formation of lather can be effected again after each manual operation and independently of the speed at which the lever is operated.

The embodiment according to claim 3 provides a particularly simple and maintenance-free compressed air source.

The embodiment according to claim 4 is particularly space-saving and provides a kinematically favourable sequence of motions in the drive mechanism of both pumps.

The variant according to claim 5 has the advantage that the return movement, and thus the formation of pressure with the resulting formation of lather, is effected by means of the return spring and is thus constant and independent of the operator.

The embodiment according to claim 6 allows particularly favourable volume ratios of liquid soap to air of approximately 1:15 to be obtained in the lather.

The embodiment according to claim 7 acts as a gas spring* for the liquid soap and effects a rapid flowing of the liquid soap out of the dosing means into the mixing chamber.

As a result of an embodiment according to claim 8, the inlet opening or duct is immersed in the metered liquid soap, which results in a more vigorous formation

*literal translation. Reference appears to be made here to the air cushion.

of bubbles.

The further embodiment according to claim 9 provides the advantage of a large number of smaller bubbles.

With the embodiment according to claim 10, the bubbles are transformed into a homogeneous high density lather.

The embodiment according to claim 11 allows the lather which passes through the porous body to expand freely, thus producing a lather of consistent high quality, even in the case of repeated compression to a smaller outflow cross section.

The embodiment according to claim 12 is expedient with respect to manufacture and very easy to service.

An operating lever formed according to claim 13 allows for the versatile application of the apparatus and requires little force for operation.

The further embodiment according to claim 14 has the advantage that force used for operation is primarily available for the subsequent compression of the air in the diaphragm pump.

A further embodiment according to claim 15 is

particularly expedient for private use.

The embodiment according to claim 16 ensures completely hygienic conditions even when used in public toilets or other washing facilities used by a large number of people.

The embodiment according to claim 17 allows for an easy assembly and operation and is also intended for washing facilities which are frequently used.

An embodiment formed according to claim 18 offers the advantage of an even higher level of comfort during operation.

The variant according to claim 19 is particularly suitable for use in hairdressing salons etc. By preheating the liquid soap and/or the supplied air, the soap lather can be optimally warmed.

The further embodiment according to claim 20 is particularly advantageous with respect to energy.

An advantageous further embodiment of an energy-saving solution is described in claim 21.

Another variant according to claim 22 has the advantage of further design possibilities for the

arrangement, which are suited to the respective area of application.

Embodiments of the subject of the invention are represented in the following drawings, in which:

Fig. 1 is a section of a preferred embodiment of a soap dispenser,

Fig. 2 shows the operating mechanism of the arrangement according to Fig. 1,

Fig. 2a shows the handle of the operating lever from Figs. 1 and 2,

Fig. 3 shows a variant of an operating lever for foot operation,

Fig. 4 shows an arrangement for forming warm soap lather with an electrical heating means for preheating the air and an electrical flow-through heater for the soap lather, and

Fig. 5 shows a further variant with a hot water heat exchanger in the liquid soap supply container and two examples which are integrated in the diagram of a foot operation according to Fig. 5a and Fig. 5b.

In the drawings, G indicates the housing of a soap dispenser. An operating lever 1 with a hand lever 1' projects from the housing G. Above the housing G, a supply container V, filled with aqueous liquid soap, is

arranged, the lower part of which extends into the housing G and is connected via chamber-like additional lateral supply containers and via a supply line 6 to a cylinder compartment 4 of a liquid soap dosing pump 3. A piston 2 having a cylindrical blind-end bore and a piston outlet opening 7 is arranged in the soap dosing pump 3. The said piston 3 is formed in the manner of a slide element and is sealed on one side by means of a O-ring 52. A journal 50 is inserted through the end part of the piston 2, which is non-positively inserted at both end faces in a drive bracket 1a. The cylinder compartment 4 is connected via a connection opening 7 to a mixing chamber 8. The end of a duct 18 projects into the lower part of the mixing chamber 8, into which duct compressed air D flows via a compressed air line 5 and can escape through apertures 19.

The compressed air is created by actuating the lever 1 by means of a force F in a diaphragm pump 9. The cylinder 13 of the said diaphragm pump 9 comprises a rubber diaphragm 14a, which is guided by a diaphragm piston 14, and is centred on the diaphragm piston 14 by means of a bolted diaphragm mounting 59. A return spring 12 is arranged around a piston rod 14b and presses the diaphragm piston 14 and the operating elements which are attached thereto into the upper position illustrated.

The diaphragm piston 14 can experience a maximum

stroke H (downwards), and thereby draws air via an air inlet 56 and a flap valve 55 into the cylinder 13. The flap valve 55 is made of rubber and is secured on one side in the cover of the cylinder 13 by means of a mounting 57.

If the lever 1 is now no longer pressed, i.e. the force F ceases, the diaphragm piston 14 moves relatively quickly under the effect of its return spring 12 into the upper, illustrated position. As a result, the flap valve 55 is closed and compressed air D is created, which, via the compressed air line 5 made of connecting passages, acts upon a ball 60, which is prestressed by means of a valve spring 61, and allows the compressed air D to flow into the mixing chamber 8 via the duct 18 and the apertures 19.

In the inoperative position illustrated, the cylinder compartment 4 is filled with liquid soap, with the exception of a small, defined dead space 15, which is essentially defined by a blind volume 16. When the operating lever 1 is pressed, the slide-like piston 2 moves to the end of the cylinder compartment 4 and thereby creates an air cushion 17 by means of the air in the dead space 15 and in the blind volume 16, as a result of which the liquid soap is pressurised and, in the final position of the piston 2, is pressed into the mixing chamber 8 via the piston outlet opening 7', the

connection opening 7 and a flap valve 54 which is thereby opened.

The compressed air D now flows in the aforesaid manner into the mixing chamber 8 where it produces a large-bubbled lather, which is pressed through a porous body 20, of a so-called fritted filter, and then flows via a subsequent expansion chamber 21 in a lather deflection body 22 through an outlet opening A where it is available for cleaning purposes as a fine, walnut-sized soap lather.

In this arrangement, the axes 10 and 11 of the pistons 2 and 14 are arranged horizontally opposite each other. The power transmission from the lever 1, which is formed with two arms, is effected via journals 50 and 51 to a drive bracket 1a or to the piston rod 14b.

Fig. 1 also shows assembly boring locks 62 and a recess 23 for assembly purposes. Furthermore, the lather deflection body 22 comprises a centering lug 22' and an O-ring seal 53. The flap valve 54 is manufactured from synthetic rubber and is centred on the edge side by a partially circumferential securing ring 58.

All parts are manufactured from materials which are common to the trade. A fritted filter made of PTFE (polytetrafluorethylene) has proved expedient as the porous body 20. The diaphragm 14a is preferably a

so-called roll diaphragm which has not been woven, with an acrylonitrile-butadiene rubber base (Carl Freudenberg, D-6101 Reichelsheim).

In the followings drawings like references have been selected for like parts.

In a partial section, Fig. 2, the operating mechanism is shown in detail with its component parts. The operating lever 1 is formed with two arms and has, at its bend, in each case a journal 50a on the outside, and on its inside an operating bracket 1a is mounted inside in recess 1", which can be seen from Fig. 2a, over two further journals 50' in each case, which are arranged at the edges, a journal 50 being inserted in turn into the drive bracket, via which journal the power transmission to the piston 2 is effected.

As can be seen from the drawing, a force F leads to a sectional rotational movement of the operating lever 1, and pulls the diaphragm piston 14 (not illustrated) downwards via its piston rod 14b and the journal 51, which is inserted through the piston rod. At the same time, the piston 2 is brought into its forward final position by means of a much smaller force, which is transmitted via the journal 50' and the drive bracket 1a and the additional journal 50, to the piston 2.

Fig. 2 also shows the operating area 1', which is designed for manual operation.

Fig. 3 shows an operating lever 1b, which leads to a soap dispenser (not shown) mounted on the wall and which is longer and narrower with respect to Figs. 1 to 2a, and extends through masonry M. A guide bush 63 is sunk into the masonry M and comprises a slot 63' for the operating lever 1b, and has on the inside a journal 64, which is convex on one side and is arranged so as to slide. The journal 64 comprises a blind hole boring 65 into which the end of the operating lever 1b projects and through which a rotatable journal 66 is inserted. If a force F is now exerted on the journal as illustrated, the operating lever 1b operates in the manner described above. The return of the operating lever 1b and the journal 64 is also effected in this case by the return spring 12 described above.

This variant has the advantage that operation can be effected at a distance from the actual arrangement. It is particularly suitable for a completely hygienic foot operation.

In the arrangement according to Fig. 4, two heating means are integrated which allow for the formation of warm soap lather and are preferably used for shaving purposes.

In this connection, a heating element 29 is arranged in the compressed air line 5 and heats the compressed air D flowing through before it enters the mixing chamber B. A flow-through heater 33 is provided as a second variant, which heats the soap lather as it emerges.

The heating element 29 and the flow-through heater 33 are preferably actuated by means of a safe heating voltage UH of 12 to 24 volts. For the correctly timed switching of the said voltage UH, a microswitch 34 is used, which is shown in the switched off position and the operation of which is determined by the upper end of the operating lever 1.

The terminal connections designated with plus and minus may of course also be supplied with alternating voltage and be controlled via thermostatic or electronic switches and delay networks. Electro-optical circuit elements (light barriers) may be used in place of electro-mechanical circuit elements. Furthermore, the heating means may be switched on and off by means of room lighting or room ventilation via relays.

In this connection, the heating element 29 for preheating the air has proved particularly advantageous, since this produces soap lather which is approximately 15 times the volume of the liquid soap.

Fig. 5 shows a further variant which is used to preheat the liquid soap. The supply container V, which is formed as a chamber on both lateral faces of the housing G, comprises a pipe 30 leading from a hot water source B (boiler) to a hot water tap 31 (mixer tap) - or a by-pass thereof. A laminated heat exchanger 32, which is arranged on the pipe 30, is used for an improved transmission of heat to the liquid soap.

In addition, Fig. 5 shows in symbolic form various drive mechanisms for a foot operation of the lever 1. A stressing device 28 (pneumatic, hydraulic, electrical or electro-mechanical) is arranged at an angle, such that, in one final position of the lever 1 (return spring 12 tensioned), its maximum force F' produces a maximum torque.

As a further possibility, the use of a traction cable 25 with a reversing pulley 26 is illustrated in the lower end region of the lever 1.

Fig. 5a shows a practical embodiment in connection with a stressing device operating at a pressure P' . A hydraulic cylinder 28 with a foot rest 24 is embedded in masonry M and creates the force P' , which is necessary for operating the stressing device 28.

As an alternative to this, Fig. 5b shows a cylinder 27, which is mounted in masonry M, which can be

rotated by means of a further foot rest 24', and which, via the traction cable 25, provides the said cable 25 with the force F", which is necessary for operating the lever 1.

All embodiments require little space and can be integrated into or combined with the housings of conventional soap dispensers. The moulded parts of the arrangement are preferably manufactured in an injection moulding process from thermosetting synthetics material.

In order to reduce the force F which is to be applied to the operating lever 1, the compressed air could also be precompressed by other pneumatic auxiliary means (CO₂-capsules, rotating small-capacity compressor, etc).

Using the invention, it is possible to construct washing and shaving facilities in a completely hygienic and economic manner. Furthermore, the consumption of soap or liquid soap is considerably reduced when compared with known systems on account of the high proportion of air in the soap lather produced, as a result of which the waste water contains less soap on the one hand and there is no loss of ozone-destroying propellant gas to the atmosphere on the other hand.