The present invention relates to reciprocating pumps for use in atomizers for distributing perfumes or pharmaceutical products.

The object of the present invention is to provide an atomizer head which is better adapted to meet the requirements of practice than those known up to this time.

Atomizers of the present invention the device comprises a diaphragm made of a flexible material which, on the one hand, is fixed in a fluidtight manner at its center to a piston rod and at its periphery to the end of a cylinder cooperating with said piston rod, in order to prevent any leak between the cylinder and the piston, and, on the other hand, in the position of rest of the atomizer, toward which the piston is urged by a spring or other resilient member, is tightly applied against an air inlet orifice through which air can be admitted into the atomizer.

A preferred embodiment of our invention will be hereinafter described with reference to the appended drawings, given merely by way of example, and in which:

FIG. 1 is an axial sectional view of an atomizer head made according to the invention.

FIG. 2 and 3 are perspective views of some elements of the atomizer head illustrated by FIG. 1.

In the drawings, an atomizer head is fixed to the neck of a container 1 so that, by operating a push button 2 mounted on said head, liquid is delivered from container 1 through an atomizer nozzle 3.

Axially with respect to the cap 4 of the atomizer head, secured by means of screw threads on the neck of container 1, there is fixed a cylinder 6 cooperating with a piston 7 carried by a rod 8 fixed to push button 2. Between piston 7 and the lower end of cylinder 6 there is interposed a spring 9.

The lower end of cylinder 6 is connected to a plunger tube 10 extending into container 1. A ball 11 is provided at the bottom of cylinder 6 to prevent the liquid sucked into cylinder 6 from flowing back into container 1.

A passage 12 extends axially in piston 7 and its rod 8 to lead to nozzle 3. In this conduit there is provided a check valve consisting of a ball 13 urged against its seat by a spring 14, thus preventing air or liquid from flowing back from nozzle 3 into cylinder 6 during the suction stroke of piston 7.

Nozzle 3 forms the end of a conduit provided with a helical groove 15 adapted to cause the liquid on its way to said nozzle to whirl and thus to ensure the desired atomizing.

In order to obtain a good operation of the device, an air intake must be provided so as to prevent vacuum from being produced in container 1.

According to a feature of the present invention, on the one hand leakage of liquid to the outside between piston 7 and cylinder 6 is prevented and, on the other hand, the air intake is closed in a fluidtight fashion at the end of the atomizing stroke owing to the provision of a single diaphragm 16 made of a flexible material such as synthetic or natural rubber or a plastic substance.

For this purpose, diaphragm 16, which is of annular shape, has its inner edge secured in a fluidtight manner to the rod 8 of piston 7 whereas the outer edge of said diaphragm 16 is secured, also in a fluidtight manner, to an annular extension 17 of cylinder 6, said diaphragm 16 being applied by spring 9 against the end wall of cap 4.

This end wall is for instance in the form of a portion of a sphere provided with a central aperture 18 through which the rod 8 of piston 7 extends and which serves to prevent the inflow of air from the atmosphere to the inside of container 1.

The inner edge of diaphragm 16 is tightly held between two annular parts 19 and 20 carried respectively by piston 7 and rod 8, said piston being engaged with a force fit into said rod.

The outer edge of diaphragm 16 is applied against the periphery of the cylinder extension 17 and it is tightly held against this periphery by a ring 21.

The outer wall of cylinder extension 17 is provided with a groove 22 adapted to receive a corresponding projection of diaphragm 16.

The whole of piston 7, rod 8, cylinder 6, its extension 17, ring 21 and diaphragm 16 is forced into cap 4 and kept in position therein by a sleeve 23 provided with a central hole 24 to accommodate cylinder 6. This sleeve 23 is driven into cap 4 until said end wall 25, bearing against extension 17 and a ring 21, keeps them tightly applied against the top end wall of cap 4.

The periphery of ring 21 is provided with a longitudinal groove 26 and the end wall 25 of sleeve 23 is provided with radial slots 27, one of said slots and the longitudinal groove 25 forming a portion of a passage opening into the neck of container 1 and in communication with inlet 18 when diaphragm 16 is not applied against the concave face of the end wall of cap 4 by spring 9.

This atomizer head is secured to the neck of container 1 owing to screw threads 5 provided in the cilindrical wall of sleeve 23. An annular packing member 27 is interposed between the edge of the neck of container 1 and the inner face of sleeve 23.

The atomizer head according to the invention works as follows: When push piece 2 is moved toward container 1, piston 7 moves down in cylinder 6 and liquid to be atomized contained in this cylinder is thus driven into passage 12, lifts ball 13 against the action of spring 14, flows along helical groove 15 and is expelled through nozzle 3.

During this movement, diaphragm 6 has prevented any leakage of liquid between cylinder 6 and piston 7. But it has also opened, since the beginning of the movement, the communication between aperture 18 and groove 25.

Subsequently, during the upward movement of piston 7 in cylinder 6, produced by return spring 9 when push piece 2 is released, the liquid sucked from the bottom of container 1 through plunger tube 10, and which lifts ball 11 from its seat when entering cylinder 6, is replaced in container 1 by air from the outside. The arrows of FIG. 1 show that this air flows through the space between push piece 2 and cap 4, through aperture 18, through the space between the inner surface of the end wall of cap 4 and diaphragm 16 moved away from said end wall (position shown in dot-and-dash lines in FIG. 1), through groove 25 and through slot 26.

At the end of the suction stroke of piston 7, diaphragm 16 is tightly applied against the concave face of the end wall of cap 4 around the air intake orifice 18, thus closing said orifice in fluidtight manner.

If the container is accidentally overturned there is no risk of its emptying through the air intake.

In a general manner, while we have in the above description disclosed what we deem to be a practical and efficient embodiment of the present invention, it should be well understood that we do not wish to be limited thereto as there might be changes made in the arrange-
ment, disposition and form of the parts without departing from the principle of the present invention as comprehended within the scope of the appended claims.

What we claim is:

1. An atomizer head for use on a container which comprises, in combination, a cap adapted to be fixed on the neck of the container, said cap comprising a top end wall and a cylindrical skirt extending downwardly from said top end wall, a cylinder carried by said cap coaxially on the inside thereof so as to extend downwardly inside said container neck, a plunger tube carried by said cylinder to form an extension thereof into said container, a check valve in said cylinder opening in the upward direction, a piston slidably in said cylinder so as to be movable between two positions, a bottom one and a top one, said piston being provided with a passage extending longitudinally therethrough, a push-piece rigid with said piston slidable with respect to said cap, said push-piece being provided with a discharge nozzle in communication with said passage, a flexible fluidtight annular diaphragm having its outer edge secured in a fluidtight manner to said cylinder and its inner edge secured in a fluidtight manner to said piston and such that, in the top position of said piston, said diaphragm is applied tightly against the top end wall of said cap, means forming an air passage in said cap opening into said container neck, said cap end wall being provided with an aperture in communication with the atmosphere and forming the inlet of said air passage and said aperture being adapted to be tightly closed by said diaphragm in the top position of said piston, and spring means between said piston and said cylinder urging said piston upwardly with respect to said cylinder.

2. An atomizer head for use on a container which comprises, in combination, a cap adapted to be fixed on the neck of the container, said cap comprising a top end wall and a cylindrical skirt extending downwardly from said top end wall, a cylinder carried by said cap coaxially on the inside thereof so as to extend downwardly inside said container neck, said cylinder having an enlarged top end, a plunger tube carried by said cylinder to form an extension thereof into said container, a check valve in said cylinder opening in the upward direction, a ring housed in said cap and coaxially surrounding said cylinder enlarged top end, a piston slidable in said cylinder so as to be movable between two positions, a bottom one and a top one, said piston being provided with a passage extending longitudinally therethrough, a push-piece rigid with said piston slidable with respect to said cap, said push-piece being provided with a discharge nozzle in communication with said passage, a flexible fluidtight annular diaphragm having its inner edge secured to said piston, the outer edge of said diaphragm being tightly caught between said enlarged cylinder top end on said ring, so that in the top position of said piston, said diaphragm is applied tightly against the top end wall of said cap, said ring being provided with an air passage communicating with said container neck and said cap end wall being provided with an aperture in communication with the atmosphere so as to form the inlet of said air passage and said aperture being adapted to be tightly closed by said diaphragm in the top position of said piston, and spring means between said piston and said cylinder urging said piston upwardly with respect to said cylinder.

3. An atomizer head according to claim 2 further comprising a sleeve fitting tightly around the neck of the container and forced in said skirt so as to hold said cylinder enlarged top end and said ring in position in said cap.

4. An atomizer head according to claim 3, said ring being provided with a longitudinal passage in its outer wall and said sleeve being provided with a radial slot in its top wall, said passage and said slot forming said air passage.

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