A FOAM DISPENSER

BACKGROUND

This disclosure relates to foam dispensers and in particular to dispensers that may have a resiliently deformable dome piston and dispensers that may have an improved mixing chamber.

The present disclosure relates to foam dispensers and more specifically non-aerosol foam dispensers or unpressurized foam dispensers. The popularity of these type of foam dispensers has increased dramatically over the last decade and they are now used widely throughout the world. The advantage of foam dispensers over conventional liquid dispensers is that they use substantially less liquid for each use or shot. For example if the foam dispenser is being used for hand hygiene either as a soap dispenser or an alcohol foam dispenser, each hand cleansing event uses substantially less liquid than would be used with a straight liquid dispenser.

However, there are always opportunities for reducing the cost of production, whether that be by way of reducing the number of parts or simplifying the manufacturing process. As well there are opportunities for improving the quality of the foam or in the alternative producing a commercially acceptable foam in a device that may be produced at a reduced cost.

SUMMARY

~~A foam assembly connectable to a liquid container includes a main pump body, a piston dome, an air chamber, a liquid chamber, a mixing zone and a porous member. The main pump body has an exit nozzle. The piston dome is attached to the main pump body, whereby the piston dome is a resiliently deformable piston dome and has an at rest position and a depressed position. The air chamber is defined by the piston dome and the main pump body. The liquid chamber is defined by the piston dome and the main pump body and has a liquid inlet valve and a liquid outlet valve. The mixing zone is in flow communication with the air chamber and is in flow communication with the liquid chamber. The porous member is in the exit nozzle downstream of the mixing zone. The volume of the air chamber and volume of the liquid chamber is dependent on the position of piston~~

~~dome and during an activation stroke the piston moves from the at rest position to the depressed position and responsively the volume of the air chamber and the volume of the liquid chamber are reduced.~~

According to a first aspect of the present invention, there is provided a foam assembly connectable to a liquid container comprising: a main pump body having an exit nozzle; a piston dome attached to the main pump body, wherein the piston dome comprises a resiliently deformable dome and a liquid piston portion, and has an at rest position and a depressed position; an air chamber defined by the piston dome and the main pump body; a liquid chamber defined by the liquid piston portion and the main pump body and having a liquid inlet valve and a liquid outlet valve; a mixing zone in flow communication with the air chamber and in flow communication with the liquid chamber; and a porous member in the exit nozzle downstream of the mixing zone; and whereby the volume of the air chamber is dependent on the position of the piston dome and volume of the liquid chamber is dependent on the position of the liquid piston portion of the piston dome and during an activation stroke the piston dome moves from the at rest position to the depressed position and responsively the volume of the air chamber and the volume of the liquid chamber are reduced.

~~A foam dispenser includes a liquid container; a main pump body, a piston dome, an air chamber, a liquid chamber, a mixing zone and a porous member. The main pump body has an exit nozzle. The piston dome is attached to the main pump body, whereby the piston dome is a resiliently deformable piston dome and has an at rest position and a depressed position. The air chamber is defined by the piston dome and the main pump body. The liquid chamber is defined by the piston dome and the main pump body and has a liquid inlet valve and a liquid outlet valve. The mixing zone is in flow communication with the air chamber and is in flow communication with the liquid chamber. The porous member is in the exit nozzle downstream of the mixing zone. The volume of the air chamber and volume of the liquid chamber is dependent on the position of piston dome and during an activation stroke the piston moves from the at rest position to the depressed position and responsively the volume of the air chamber and the volume of the liquid chamber are reduced.~~

According to a second aspect of the present invention, there is

provided a foam dispenser comprising: a liquid container; a main pump body having art exit nozzle; a piston dome attached to the main pump body wherein the piston dome comprises a resiliently deformable dome and a liquid piston portion, and has an at rest position and a depressed position; an air chamber defined by the piston dome and the main pump body; a liquid chamber defined by the liquid piston portion and the main pump body and having a liquid inlet valve and a liquid outlet valve; a mixing zone in flow communication with the air chamber and in flow communication with the liquid chamber; and a porous member in the exit nozzle downstream of the mixing zone; and whereby the volume of the air chamber is dependent on the position of the piston dome and volume of the liquid chamber is dependent on the position of the liquid piston portion of the piston dome and during an activation stroke the piston dome moves from the at rest position to the depressed position and responsively the volume of the air chamber and the volume of the liquid chamber are reduced.

The main pump body may include a main pump body portion and a liquid and air bore. The liquid inlet valve may be integrally formed in the liquid and air bore. The liquid and air bore may further include an air path integrally formed therein wherein the air path extends between the air chamber and the mixing zone.

The foam assembly may further include an air inlet valve in flow communication with the liquid container. The air inlet valve may be integrally formed in the liquid and air bore.

The mixing zone may include an elongate mixing channel and the mixing channel may have an upstream end and a downstream end and the liquid chamber may be in flow communication with the upstream end of mixing channel via the liquid outlet valve. The foam assembly may further include a chamfer at the downstream end of the mixing channel whereby the chamfer expands in a downstream direction. The mixing channel may further include a plurality of air ports spaced downstream from the upstream end of the mixing channel.
The foam assembly may further include a mixing tube and the mixing channel and

chamfer may be formed in the mixing tube. Further the air ports may also be formed in the mixing tube. There may be a plurality of air ports. The plurality of air ports may be four air ports equally spaced around the mixing channel. The plurality of air ports may be two air ports equally spaced around the mixing channel.

The foam assembly may further include one foam tube wherein the foam tube has a porous member attached to one end thereof. The foam tube may have a second porous member attached to the other end thereof. The foam assembly may further include a second foam tube wherein the second foam tube has a porous member attached to one end thereof.

The liquid container may be an upright liquid container, an inverted liquid container, an inverted pouch, or an upright pouch.

The mixing zone may include at least one air port upstream of the elongate mixing channel.

The foam dispenser may include a dispenser housing having a push bar for engaging the piston dome.

~~A mixing tube for use in a foam assembly having an air chamber and a liquid chamber and a means for pressurizing the air chamber and the liquid chamber includes an elongate mixing channel and an exit zone. The elongate mixing channel has an upstream end and a downstream end. The exit zone is at the downstream end of the mixing channel whereby the exit zone chamfer expands in a downstream direction.~~

According to a third aspect of the present invention, there is provided a mixing tube for use in a foam assembly wherein the foam assembly has an air chamber, a liquid chamber, a means for pressurizing the air chamber and the liquid chamber and a porous member, the mixing tube comprising a mixing channel having an upstream end and a downstream end, the mixing channel being of an elongate shape having a cross sectional area substantially the same from the upstream end to the downstream end,; an exit zone being a chamfer expanding from the downstream end of the elongate mixing channel to a cross sectional area that is larger than the cross sectional area of the elongate mixing channel; the elongate mixing channel having a length greater than the exit zone; and the upstream end of the elongate mixing channel is configured for flow communication with the liquid chamber such that liquid is pushed into the elongate mixing channel

under pressure from the liquid chamber, and the elongate mixing channel is configured for flow communication with the air chamber such that air is pushed into the elongate mixing channel under pressure from the air chamber.

The exit zone may be a chamfer that expands in a downstream direction.

The elongate mixing channel and the exit zone may form an elongate venturi tube.

The mixing tube may include at least one air port in the elongate mixing channel and the air port is in flow communication with the air chamber.

The air port may be a plurality of air ports spaced around the mixing channel.

~~A foam assembly connectable to a liquid container includes a pump, a mixing zone and a porous member. The pump has an air chamber and a liquid chamber. The pump has an activation stroke wherein the pump moves from an at~~

~~rest position to a compressed position and a return stroke wherein the pump moves from the compressed position to an at rest position. The volume of the air chamber and liquid chamber are each substantially smaller in the compressed position. The mixing zone is in flow communication with the air chamber and in flow communication with the liquid chamber. The mixing zone has an elongate mixing channel having a cross sectional area and an exit zone downstream of the elongate mixing channel. The exit zone has a cross sectional area larger than the mixing channel cross sectional area. The porous member is downstream of the mixing zone.~~

According to a fourth aspect of the present invention, there is provided a foam assembly connectable to a liquid container comprising: a pump having an air chamber and a liquid chamber, the pump having an activation stroke wherein the pump moves from an at rest position to a compressed position and a return stroke wherein the pump moves from the compressed position to an at rest position, the volume of the air chamber and liquid chamber are each substantially smaller in the compressed position; a mixing zone in flow communication with the air chamber and in flow communication with the liquid chamber, the mixing zone having a mixing channel being of an elongate shape having a cross sectional area substantially the same from an upstream end to a downstream end, and an exit zone being a chamfer expanding from the downstream end of the elongate mixing channel to a cross sectional area larger than the cross sectional area of the elongate mixing channel, the elongate mixing channel having a length greater than the exit zone; a porous member downstream of the mixing zone; and when the pump is compressed air is pushed into the elongate mixing channel under pressure from the air chamber and liquid is pushed into the elongate mixing channel under pressure from the liquid chamber.

The exit zone may be a chamfer that expands in a downstream direction.

The elongate mixing channel and the exit zone together may form an elongate venturi tube.

At least one air port may be formed in the elongate mixing channel and each air port is in flow communication with the air chamber. The at least one air port may be a plurality of air ports spaced around the elongate mixing channel.

The volume of the liquid chamber to the air chamber may be between 1:2 and 1:50.

The volume of the liquid chamber to the air chamber may be between 1:8 and 1:9

Further features will be described or will become apparent in the course of the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

The foam dispenser and improved mixing chamber will now be described by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of an embodiment of a foam dispenser;

Fig. 2 is a sectional view of the foam dispenser of figure 1;

Fig. 3 is a blown apart perspective view of the foam dispenser of figures 1 and 2;

Fig. 4 is a sectional view of the assembled pump body including a