

PUMP

FIELD OF THE INVENTION

The present invention relates to devices for drawing fluid.

5

BACKGROUND OF THE INVENTION

There are a wide range of circumstances in which fluid must be transferred from one place to another. For instance, in a scientific laboratory, a pipette is commonly used to transfer a fluid (such as blood) from a beaker to a test tube, or
10 from one test tube to another.

Current devices for drawing fluid generally include a reservoir for storing the fluid, a fluid inlet /outlet orifice through which fluid can be drawn, and a compressible hand pump. In use, the pump is compressed, which forces air out
15 through the inlet /outlet orifice. The orifice is then inserted into the fluid source (from which fluid is to be drawn), and the pump allowed to decompress. This draws air from the reservoir, reducing the pressure in the reservoir and thereby drawing fluid in through the inlet /outlet orifice. To expel fluid from the device, the pump is compressed again. This increases the pressure in the reservoir and forces fluid back
20 out through the inlet /outlet orifice.

Current devices suffer from the disadvantage that the pump cannot be repeatedly compressed and decompressed, to draw more fluid, because each compression will force the drawn fluid out of the inlet /outlet orifice. These devices
25 are not capable of retaining fluid which has been drawn, which makes it difficult to draw an exact volume as required.

It is an object of the present invention to reduce or eliminate some or all of the disadvantages of conventional devices for drawing fluid.

SUMMARY OF THE INVENTION

The present invention accordingly provides a device for drawing fluid comprising:

5 a reservoir to store the fluid, having an orifice through which fluid can enter or exit the reservoir;

a hand pump connected to the reservoir and arranged, in use, to draw fluid into the reservoir, said hand pump including:

a squeeze bulb in fluid communication with the reservoir;

10 an air release valve in the wall of the bulb to permit release of air from the bulb to atmosphere when the bulb is compressed (e. g. by squeezing), and

an air intake valve to allow flow of air into the bulb from the reservoir when the bulb decompresses, thereby reducing the pressure in the reservoir to draw fluid through the orifice into the reservoir,

15 arranged so that when the bulb is compressed the air release valve is open and the air intake valve is closed, while when the bulb decompresses the air release valve is closed and the air intake valve is open to allow air to be drawn into the bulb from the reservoir; and

20 a plunger slidably housed within the reservoir and connected to the wall of the bulb, actuable to expel drawn fluid through the orifice, said plunger including a tubular rod extending between the air intake valve and the reservoir, thereby allowing air flow between the reservoir and the bulb when the air intake valve is open.

25 Desirably, the air release valve is a one-way valve moveable between an open position to permit the release of air when the bulb is compressed, and a closed position when the bulb is released and decompresses.

30 Desirably, the air intake valve is a one-way valve which is closed when the bulb is compressed, and is open when the bulb is released and decompresses, thereby allowing air to be drawn into the bulb from the reservoir.

The plunger is preferably actuated whilst simultaneously closing the air release valve. This helps to prevent the intake of air to the bulb from the reservoir, which would hinder the operation of the plunger to expel the fluid. Preferably, therefore, the air release valve is positioned at the top of the device, and actuation of the plunger can occur by applying downward pressure at or adjacent the air release valve, which assists the user to easily expel fluid. For this purpose, the plunger may include a bridging piece connecting the air intake valve and the air release valve, and forming a coaxial extension of the tubular rod. Once the fluid is expelled, the device can then be reused by returning the plunger to its original position. The plunger can be spring loaded if required.

The reservoir may take any form, provided it can receive and store fluid. It may include a capillary tube terminating in the orifice, to assist in drawing in fluid, and a larger cylindrical tube which can accommodate the slidable plunger. Preferably, the plunger will sealingly engage the inner surfaces of the larger cylindrical tube. The reservoir will typically be formed from plastic or glass, but there may be other suitable substances.

BRIEF DESCRIPTION OF THE DRAWINGS

An illustrative embodiment of the present invention will be discussed with reference to the accompanying drawings wherein:

FIGURE 1 is a view of a fluid drawing device according to a preferred embodiment of the present invention, with the pump compressed;

FIGURE 2 is a view of the fluid drawing device of Figure 1, wherein the pump is allowed to decompress; and

FIGURE 3 is a view of the fluid drawing device of Figure 1, wherein fluid is being expelled.

DESCRIPTION OF PREFERRED EMBODIMENT

Figure 1 shows a fluid drawing device 10 comprising a hand pump 11 connected to a fluid reservoir 12. The hand pump 11 comprises a squeeze bulb 13, with an air release valve 14 in the wall of the squeeze bulb 13, and an air intake valve 15. The air release valve 14 and air intake valve 15 are rigidly connected by bridging piece 16, which does not interfere with air flow between the valves 14, 15 and the bulb 13.

The fluid reservoir 12 has an inlet / outlet orifice 18 through which fluid can be drawn into and expelled from the reservoir 12. The reservoir 12 further comprises a capillary tube 20 extending from the orifice 18 and a larger cylindrical tube 22. The tubes 20, 22 will typically be formed from glass or plastic.

A plunger 24 is slidably fitted and sealingly engages within the cylindrical tube 22. The plunger 24 is connected to the hand pump 11 through the bridging piece 16, at the air intake valve 15. The plunger 24 includes a central tubular rod 25 connected to the plunger head 24', the tubular rod 25 allowing the pump 11 and the reservoir to remain in fluid connection with each other, when the air intake valve 15 is open.

Operation of the fluid drawing device 10 is shown sequentially through Figures 1 to 3. When the bulb 13 is compressed, as shown in Figure 1, the air release valve 14 opens and air is therefore forced out through the air release valve 14 to atmosphere. However, the air intake valve 15 remains closed, thereby preventing the release of air into the fluid reservoir 12.

The orifice 18 is then inserted into the fluid source, from which fluid is to be drawn, and the bulb 12 is allowed to decompress, as shown in Figure 2. As will be understood, the orifice 18 can of course be inserted into the fluid source at an earlier time. In any case, upon decompression of the bulb 13, the air release valve 14 closes thereby preventing air intake from the atmosphere. However, the air intake valve 15

opens allowing air flow into the bulb 13 from the reservoir 12. This reduces the air pressure in the reservoir, and accordingly fluid is drawn in through the orifice 18, up through the capillary tube 20 and into the larger cylindrical tube 22.

5 This procedure can be repeated as required, in order to allow the required volume of fluid to be stored in the reservoir. If the bulb 13 is squeezed again, the air intake valve 15 remains closed. This prevents air from being forced into the reservoir 12, which would force out the drawn fluid. Instead, the air release valve 14 is open, which allows air to be released to the atmosphere.

10 The larger cylindrical tube 22 serves as an overflow compartment, thereby helping to prevent the fluid from flowing into the squeeze bulb 13. It also serves to prevent the flooding of the air intake valve 15.

15 Once the required volume of fluid has been stored, it can be expelled by actuation of the plunger 24, as shown in Figure 3. The bridging piece 16 forms a coaxial extension of the tubular rod. Accordingly, by holding down the air release valve 14 (e. g. with the thumb) and pushing down on bridging piece 16, the plunger 24 is slidably actuated to expel the drawn fluid. Air intake through the air intake
20 valve 15 is minimal, since the air release valve 14 is closed. The bulb 13 may also be compressed during actuation of the plunger 24.

 Although a preferred embodiment of the present invention has been described in the foregoing detailed description, it will be understood that the invention is not
25 limited to the embodiment disclosed, but is capable of numerous rearrangements, modifications and substitutions without departing from the scope of the invention. Modifications and variations such as would be apparent to a skilled addressee are deemed within the scope of the present invention.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A device for drawing fluid comprising:
 - a reservoir to store the fluid, having an orifice through which fluid can enter
5 or exit the reservoir;
 - a hand pump connected to the reservoir and arranged, in use, to draw fluid into the reservoir, said hand pump including:
 - a squeeze bulb in fluid communication with the reservoir;
 - an air release valve in the wall of the bulb to permit release of air from the
10 bulb to atmosphere when the bulb is compressed; and
 - an air intake valve to allow flow of air into the bulb from the reservoir when the bulb decompresses, thereby reducing the pressure in the reservoir to draw fluid through the orifice into the reservoir,
 - arranged so that when the bulb is compressed the air release valve is open
15 and the air intake valve is closed, while when the bulb decompresses the air release valve is closed and the air intake valve is open to allow air to be drawn into the bulb from the reservoir; and
 - a plunger slidably housed within the reservoir and connected to the wall of the bulb, actuatable to expel drawn fluid through the orifice, said plunger including a
20 tubular rod extending between the air intake valve and the reservoir, thereby allowing air flow between the reservoir and the bulb when the air intake valve is open.
2. A device as in claim 1, wherein the air release valve is a one-way valve
25 moveable between an open position to permit the release of air when the bulb is compressed, and a closed position when the bulb is released and decompresses.
3. A device as in claim 1 or 2, wherein the air intake valve is a one-way valve
30 moveable between a closed position when the bulb is compressed, and an open position when the bulb is released and decompresses.

4. A device as in any preceding claim, wherein the plunger further includes a bridging piece connecting the air intake valve and the air release valve, the bridging piece forming a coaxial extension of the tubular rod whereby actuation of the plunger can occur by applying downward force at or adjacent the air release valve.
5. A device as in any preceding claim, wherein the plunger is sealingly engaged within the reservoir.
- 10 6. A device as in any preceding claim, wherein the reservoir includes a large diameter tube which joins to a coaxial capillary tube which terminates at its distal end in the orifice.