A hand-held and hand-operated fluid pump capable of inflating recreational equipment, as well as directing a stream of air to clean delicate electronics or hard to reach locations, is provided. The simple design of the inventive fluid pump permits it to be equally useful for creating fluid streams to dislodge foreign particles stuck in difficult to reach areas, such as corners and enclosed pipe structures. Because the inventive pump uses only human energy to transmit fluids or gases, it is ecologically efficient exemplifying a "green technology" design.
PORTABLE HAND OPERATED FLUID PUMP

FIELD OF THE INVENTION

[0001] The present invention relates to devices used to pump fluids, and more particularly to a hand-held and hand-operated fluid pump that can be used to, among other uses, inflate sports and recreational equipment or any device that otherwise is inflatable, in addition to being able to direct a stream of air or other fluid for cleaning hard to reach areas and delicate electronic devices. In a preferred embodiment the pump may also be used to remove or drain fluids from various containers.

BACKGROUND OF THE INVENTION

[0002] The current technology of sports and recreational equipment air pumps includes generally large and cumbersome devices. An example of this prior art is the well-known tube-type bicycle pump with a long plunger and foot support. When extended, the plunger/pump can result in a device that is rather unwieldy to two to three feet in length.

[0003] A smaller version of this type of hand-operated air pump for use to inflate sports balls is, while shorter in length, equally cumbersome when the plunger is extended and during storage. In addition, these small sports balls pumps use a “pin” rigidly attached to the tube. This rigid attachment can result, during the pumping operation, in large shear forces and stresses applied to the ball valve and to the pin that often cause broken valves or broken pins. In either case, broken valves or pins, the ball is destroyed.

[0004] While these plunger air pumps have been used for many years, they suffer from the same restrictions and limitations: they are cumbersome, making storage and portability difficult; they are difficult to use when attempting to inflate delicate recreational equipment; and they are designed for but one use.

[0005] Two examples of this type of hand pump are U.S. Pat. No. 3,907,461 issued Sep. 23, 1975 to Boulder for “Hand Air Pumps,” and U.S. Pat. No. 4,120,614 issued Oct. 17, 1978 to the same inventor for a “Hand Bicycle Pump With Pressure Preselection and Display Means.” Both the ‘461 and ‘614 patents disclose tubular type hand pumps used to inflate bicycle tires and thus exemplify the relatively cumbersome devices noted above. Moreover, they appear to be useful only to inflate recreational and sports equipment.

[0006] The related technology of compressed air devices, that is those devices used to release a stream of air to clean hard to reach or enclosed spaces and to dislodge objects within enclosed areas are often electrical/mechanical devices using motors to increase air pressure, or are containers housing compressed gases, including chloro-flourocarbons (“CFC’s”). These type of compressed gas containers with CFCs are currently under scrutiny as being a cause of the depletion of the ozone atmospheric protective boundary. As part of a trend towards reusable, renewable energy sources, these CFC devices are also simply wasteful as requiring the use of other non-renewable energy to generate the fluid or air stream.

[0007] In comparison to this prior art, it would be desirable to have a hand-held and hand-operated (“green technology”) device which could be used to inflate various recreational equipment, in addition to being able to generate an air stream for cleaning hard to reach areas, as well as generating a fluid stream for dislodging particles stuck in restricted areas or for removing fluids from containers. Such results have not been achieved in combination in the prior art of hand-held and manually operated pumps.

SUMMARY OF THE INVENTION

[0008] The above noted problems inadequately or incompletely resolved by the prior art are addressed and resolved by the present invention.

[0009] In a preferred aspect of the invention, the hand held and manually operated multipurpose fluid pump for forcing fluids into and drawing fluids out of containers comprises a squeezable bladder having a unidirectional intake valve and a unidirectional exhaust valve. Other preferred embodiments further comprise flexible tubing attachable to the exhaust and/or intake valve. Another preferred embodiment comprises a nozzle attached to a connector which in turn is attached to the exhaust valve flexible tubing. In one preferred embodiment, the nozzle may be configured as a pin for use in inflating recreational and sports equipment.

[0010] Another preferred embodiment of the hand held and manually operated fluid pump comprises a connector attached to flexible tubing attached to the exhaust valve and further comprising a controllable release valve coupled between the exhaust valve and the connector. A different preferred embodiment of the pump comprises a pressure gauge instead of the controllable release valve, although a combination of both pressure gauge and release valve would be another preferred embodiment.

[0011] The invention will be best understood by reading the following detailed description of the preferred embodiments in conjunction with the drawings briefly described below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] For the purpose of illustrating the invention, the attached drawings show several embodiments that are presently preferred. However, it should be understood that the invention is not limited to the precise arrangement, instrumentality or embodiment shown in accompanying drawings.

[0013] FIG. 1: is a side perspective view of a preferred embodiment of the hand-operated air pump;

[0014] FIG. 2: is a side view of a preferred embodiment of the hand-operated air pump with a pressure release valve;

[0015] FIG. 3: is a top view of a preferred embodiment of the hand-operated air pump with a pressure gauge;

[0016] FIG. 4: is a side view of a preferred embodiment of the hand-operated air pump with a sports ball inflating pin;

[0017] FIG. 5: is a side view of a preferred embodiment of the hand-operated air pump with an air directing nozzle;

[0018] FIG. 6: is a side cut-away view of a preferred embodiment of the hand-operated air pump showing the intake valve interior; and

[0019] FIG. 7: is a side cut-away view of a preferred embodiment of the hand-operated air pump showing the exhaust valve interior.
DETAILED DESCRIPTION OF THE INVENTION

[0020] The present invention is a hand operated pump for moving gases or fluids. In its broadest embodiment, the primary components of the invention are a squeezeable bladder having a unidirectional intake orifice and a unidirectional exhaust orifice such that a fluid or gas within the bladder may be expelled from the bladder through the exhaust orifice by squeezing the bladder, and thereafter a fluid or gas may be drawn into the bladder through the intake orifice by releasing the bladder. In further preferred embodiments, described in detail herein, various adapters, extender devices or nozzles may be attached to either or both the intake or exhaust orifices to direct the expelled fluid stream or select the source fluid or gas drawn into the bladder.

[0021] In one preferred embodiment, as shown in FIG. 1, the fluid pump 10 comprises a squeezeable bladder 11 with a unidirectional intake orifice 12 located at one end and a unidirectional exhaust orifice 13 located at the opposite end of the bladder. In the embodiment shown in FIG. 1, the intake and exhaust orifices are designed to be unidirectional such that the fluid or gas can only be drawn into the bladder through the intake orifice 12 and thereafter can only be forced out of the bladder through the exhaust orifice 13. The squeezeable bladder 11 may be constructed of a flexible and resilient rubber-type material, although any air-tight material that is flexible and tends to return to an unstressed state may be used.

[0022] The physical mechanism for forcing fluid or gas out of the bladder is to simply squeeze the bladder 11 thereby increasing the pressure in the bladder 11. Due to the unidirectional functionality of the two orifices, the increase in pressure within the bladder forces the fluid or gas out of the exhaust orifice 13. Similarly, upon release of the bladder 11, fluid or air is drawn into the bladder through the intake orifice 12.

[0023] In order to direct and control the fluid or gas forced out of the bladder when the user squeezes the bladder, a flexible tubing 14 may be coupled to the bladder exhaust orifice 13. The coupling should be sufficiently tight to ensure an airtight connection between the bladder 11 and the tubing 14.

[0024] The tubing 14 is not restricted in length. However, if the tubing is too short, the user will experience difficulty in directing the fluid stream. Similarly, if the tubing is too long, it will be cumbersome and may impede the flow of the fluid due to friction within the tubing 14. Experience has shown that for a preferred embodiment useful for sports and recreational equipment, the tubing length that works best is within the approximate range of 12 to 24 inches.

[0025] As noted, in the preferred embodiment shown in FIG. 1, the fluid pump 10 with flexible tubing 14 may be used to inflate sports and recreational equipment, such as soccer balls, basketballs, footballs, beach balls, inflatable beach/water rafts, river tubes and similar items. Sports balls typically are manufactured with a valve designed to accept a “pin” to transmit air into the ball.

[0026] As shown in FIG. 1, the fluid pump 10 may further comprise an adapter 17 attached to the end of the flexible tubing 14 that is designed to accept a sports ball “pin.” In this preferred embodiment, the hand-held fluid pump may be used to easily inflate sports balls by holding the ball under one’s arm and squeezing the hand pump bladder repeatedly until the ball is inflated to the desired or specified air pressure. Moreover, because of the flexible tubing, there is no or limited lateral stress applied to the sports ball valve or the pin during the inflation process. Accordingly, there is less chance of damaging the sports ball valve or breaking the pin. In either case—damage to the valve or the pin the ball is rendered useless.

[0027] In a further preferred embodiment, as shown in FIG. 2, a release valve 15 may be incorporated downstream of the exhaust orifice 13 to allow the user to release the fluid pressure within the object being inflated. As such, and for the use described above, where the hand pump 10 is used to inflate sports balls, the user may pump up the ball to the required pressure, and if over inflated, pressure may be controllably and easily released by opening the release valve 15.

[0028] Moreover, most manufacturers recommend that the air pressure within sports balls be released when the ball is not in use. With the inventive hand pump 10 in the embodiment comprising the release valve, the user can simply and quickly release the air pressure for storage of the equipment. This also helps to reduce the storage needs of the sports equipment by reducing the overall volume of the equipment.

[0029] Another preferred embodiment of the inventive hand pump 10, as shown in FIG. 3, further comprises a fluid pressure gauge 16 incorporated downstream of the exhaust orifice. The pressure gauge measures the fluid pressure within the flexible tubing 14 and accordingly the pressure within the object being inflated. As such, the inventive hand pump with a pressure gauge allows the user to pump up the sports balls or other equipment to the recommended pressure, thereby eliminating any need to guess or estimate the pressure.

[0030] In combination, the pressure release valve 15 and the pressure gauge 16 can both be incorporated to the hand pump 10, making the inventive embodiment ideally suited as a portable device for accurately inflating and deflating sports balls and equipment.

[0031] In addition to inflating sports balls and other sports equipment, in a preferred embodiment, the inventive hand pump is very effective as a cleaning tool capable of dislodging small particles from locations that are difficult to reach, essentially enclosed, or are sensitive to the type of tool used to reach these locations. Examples of these “locations” include computer or terminal keyboards, electronic devices and circuit boards. The current technology for cleaning such devices includes aerosol dispensers containing pressurized air or a gas and often containing CFCs. These CFCs are a known danger to the ozone layer and are the reason for recent legislation attempting to curtail and eventually prohibit the use of CFCs.

[0032] The inventive hand pump in a preferred embodiment provides a simple “green technology” solution to the increasing need to clean and clean difficult to reach and sensitive locations. In this embodiment, as illustrated in FIG. 4, the hand pump 10 comprises the squeezeable bladder 11, an appropriate length of flexible tubing 14 attached to the exhaust orifice 13 and a nozzle 18. This particular embodiment of the inventive hand pump may be used to easily clear
food or other foreign particles from computer keyboards, circuit boards and similar type of devices. By directing the air stream from the nozzle 18 in between the keys of a keyboard and squeezing the bladder repeatedly, the air stream will force foreign particles out of the keyboard area.

[0033] The type of nozzle attached to the flexible tubing 14 may contain a single or multiple orifices. For example, with a single nozzle orifice, the fluid or gas exhaust stream from the hand pump 10 will be directed in a single direction. With multiple orifices in the nozzle, a broader spread of the fluid or gas stream will result and can be used to clear a broader area.

[0034] Because circuit boards often have open circuitry and electrical current, there is a danger of a short circuit or electrical shock if the device used to clear foreign particulars is metallic or is capable of conducting electricity. As such, in a preferred embodiment, the nozzle 18 attached to the adapter 17 attached to the flexible tubing 14 may be manufactured from a nonconductive material such as plastic or rubber.

[0035] The inventive hand pump also provides a “green technology” means of transferring a variety of fluids or gases from one location to another. Instead of an electric powered or gasoline powered pump, the inventive hand operated pump is a simple device using only the strength of the operator to move fluids or gases. For example, the hand pump 10 can be used to empty standing water from a clogged sink. In this preferred embodiment, a length of tubing could be attached to the intake orifice 12 similar to the above described attachment of flexible tubing 14 to the exhaust orifice 13.

[0036] In addition to being capable of emptying a backed-up sink, the hand pump 10 also provides a non-chemical means of dislodging the particles clogged within the drain piping. By guiding the flexible tubing 14 into the enclosed piping to the blockage and forcing the nozzle 18 into the blockage, it has been found that often the blockage is dislodged after pumping air into the blockage.

[0037] The inventive hand pump may also be used to “prime” a powered pumping system. In this embodiment, the inventive hand pump could be used to force water or another fluid into powered pump system cavities, thereby eliminating the air in the system—that is, “priming the system.”

[0038] Accordingly, and as described herein, in various preferred embodiments, the inventive hand pump may be used to transfer a gas from one location to another location (e.g., the sports ball pump), transfer a fluid from one location to another (e.g., the clogged sink pump), or force air or a gas into a fluid medium (e.g., the clogged pipe deblocker).

[0039] While the pressure capable of being generated by the inventive hand pump is a direct function of operator’s strength, it has been determined that the specification pressures for sports balls and recreational beach equipment—generally less than 25 pounds per square inch—are easily attainable with the hand pump by the average child and adult. Similarly, the force required to pump a fluid out of a sink or to dislodge a pipe blockage are generally less than the forces capable of being generated by the inventive hand pump.
through the exhaust orifice by squeezing the bladder, and thereafter may be drawn into the bladder through the intake orifice upon release of the bladder; flexible tubing coupled to the bladder exhaust orifice; a connector attached to the end of the flexible tubing; and means, attached to the connector, for transmitting the air forced from the bladder through the flexible tubing into the object to be inflated without loss of air pressure through the connection.

14. The hand-held and hand-operated air pump of claim 13, wherein the air transmission means is a pin used to inflate sports balls.

15. The hand-held and hand-operated air pump of claim 13, wherein the air transmission means is a screw-type valve used to inflate pneumatic tires.

16. The hand-held and hand-operated air pump of claim 13, wherein the air transmission means is a press fit type valve used to inflate pneumatic tires.

17. The hand-held and hand-operated air pump of claim 13, further comprising an air release valve coupled between the bladder exhaust orifice and the air transmission means to controllably release air from within the inflated object.

18. The hand-held and hand-operated air pump of claim 17, wherein the air release valve is a turn screw mechanism.

19. The hand-held and hand-operated air pump of claim 17, wherein the air release valve is a push button mechanism.

20. The hand-held and hand-operated air pump of claim 13, further comprising an air pressure gauge coupled between the bladder exhaust orifice and the air transmission means to measure the air pressure within the object being inflated.

21. A hand-held and hand-operated air pump for inflating recreational equipment and related air inflatable objects, comprising:

- a squeezable bladder having an intake orifice and exhaust orifice such that air may be drawn into the bladder through the intake orifice and forced out of the bladder through the exhaust orifice;
- a release valve attached to the bladder exhaust orifice for controllably releasing air pressure from within the inflatable object;
- flexible tubing detachably connected to the release valve; and
- a pressure gauge communicating with the object being inflated to measure the air pressure within the object.

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