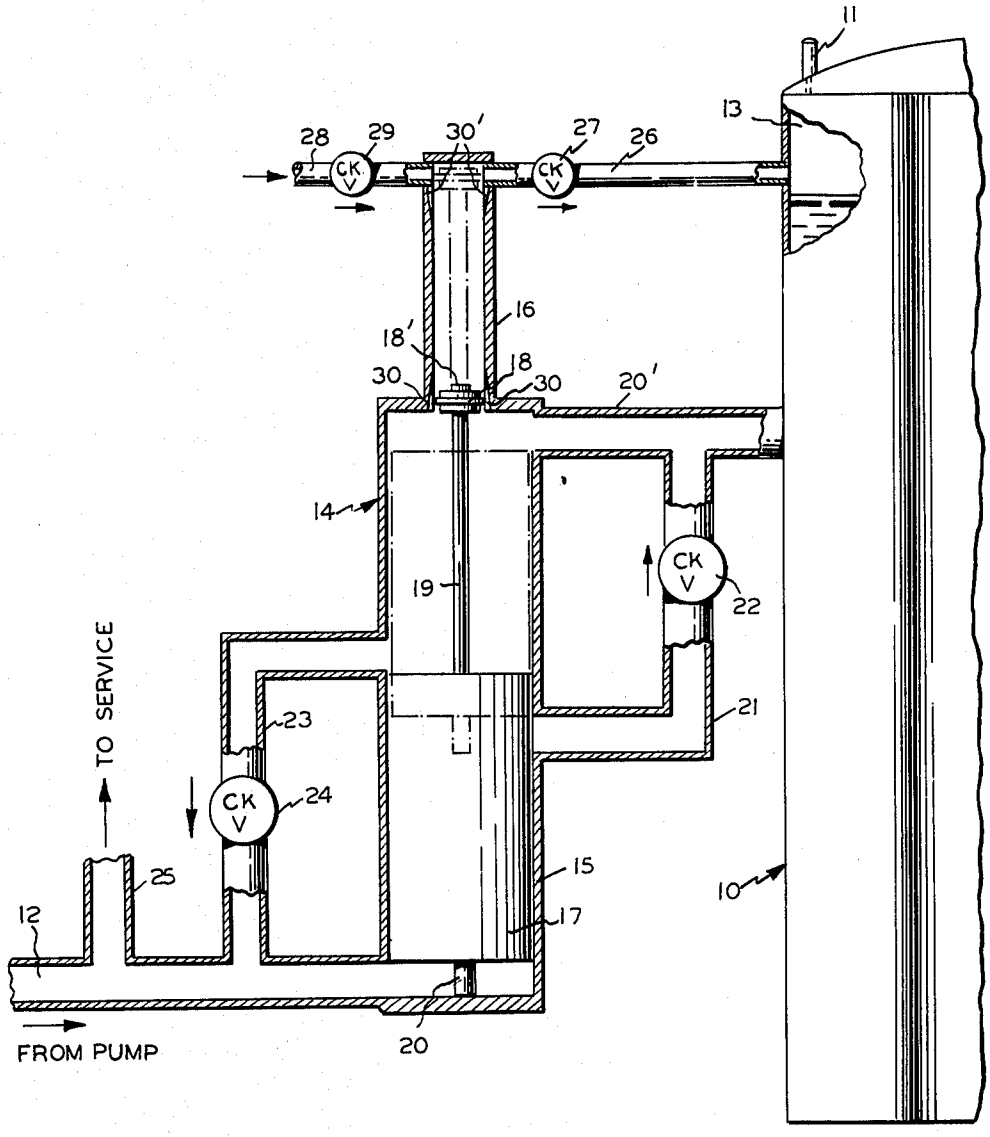
July 5, 1966 L. BRYAN 3,259,067

HYDRAULIC AIR INJECTOR

Filed Dec. 4, 1963



INVENTOR
LLOYD BRYAN

BY Ben Colum

ATTORNEY

United States Patent Office

3,259,067

Patented July 5, 1966

3,259,067

HYDRAULIC AIR INJECTOR

Lloyd Bryan, 1780 Atlas Park Road, Napa, Calif.

Filed Dec. 4, 1963, Ser. No. 327,917

2 Claims. (Cl. 103—6)

The present invention relates to an apparatus for automatically maintaining the required head of air in a pressurized water tank of water systems.

The usual home water system pressure is developed in the lines by pumping water from a water supply into a tank at the top of which is maintained a head of air. As the water in the tank rises under pressure from the pump, the air head is compressed. When a line leading from a tank is opened, the body of air under pressure is effective to force the water out under pressure. With respect to pressure, the tank is usually provided with a switch which turns the pump motor on at around 20 pounds per square inch pressure in the tank and turns the same off when the pressure reaches about 40 pounds. With the advent of the new automatic washers in homes, water pressures are being increased above 40 pounds and a primary object of the present invention is to provide an apparatus in which a greatly increased pressure can be obtained without unduly increasing the size and cost over standard equipment.

A further object of the present invention is to provide an apparatus of the type described wherein maintenance and repair are at a minimum due to the accessibility of the various parts of the assembly.

Other objects and advantages of the present invention will be apparent from the following detailed description taken in conjunction with the accompanying drawing showing a flow diagram of the present hydraulic air injector.

Referring to the drawing in detail, numeral **10** designates a receiver tank which is typical of the usual pressure tank associated with home water systems. On top of the tank and diagrammatically illustrated at **11** is a pressure switch which controls the operation of an electric motor connected to a pump for pumping water into the tank through a line **12**. Pressure is developed in the tank **10** by maintaining a head of air **13** at the top thereof to force the water out of the tank in a manner to be described.

My improved device, indicated by the numeral **14**, is adapted for mounting on the side of the tank. As shown, the same comprises a pair of vertically disposed cylinders **15** and **16** receiving pistons **17** and **18** connected by a connecting rod **19**. A stop **18'**, secured to the upper surface of piston **18**, limits the upper movement in cylinder **16**. A stop **20** secured to the lower end of piston **17** limits the downward movement of piston **17** as shown in the drawing, permitting water flowing through line **12** to flow to the base of piston and force same to a point adjacent the top of the cylinder **15** as shown in dotted lines on the drawing. A pipe **20'** leads from the upper end of cylinder **15** to the tank **10** for flow of liquid to and from line **12** to the tank. Also extending from the cylinder at a point slightly below half the height thereof and connecting with the pipe **20'** is a second pipe **21**, having a check valve **22** mounted therein. As indicated in the drawing, water from line **12** flows to the bottom of piston **17**, forcing it to the dotted line position shown, through pipe **21**, check valve **22**, to pipe **20'** and into the tank **10**. Interposed between the line **12** and the cylinder **15** is a return pipe **23** and check valve **24** for feeding water from the tank back to line **12** to service pipe **25**.

At the upper end of piston **16**, there is provided a pipe **26** connecting the upper end of cylinder **16** with the upper end of the tank **10**. A check valve **27** is

mounted in pipe **26** permitting flow of air and water from the cylinder **16** to the tank **10**. A second pipe **28** extends from the upper end of the cylinder **16** and has a check valve **29** mounted therein to provide air from the atmosphere into the top of the cylinder **16**. Bypasses **30** and **30'** are formed at the lower and upper ends of the cylinder **16** for a purpose to be described.

The operation of the invention is as follows:

When the pump, not shown, is in operation, water is forced through the line **12** into the service line **25** or into the tank **10**. If water is being drawn to service, it will be taken off the line prior to entering the injection apparatus **14**. Otherwise, it will flow to the base of piston **17** and force it to the top of cylinder **15** as shown in dotted lines. The connecting rod **19** will also move piston **18** to the top of cylinder **16**. In this position, the water from line **12** will pass through check valve **22** into the receiver tank **10**. Also water and air trapped above piston **18** will be forced through check valve **27** into the receiver tank.

After the tank has been filled to the point where the pressure switch **11** shuts off the pump or if more water is drawn to service than the pump supplies, a reverse flow will be introduced. Water departing the receiver tank through pipe **20'** will force piston **17** down to the bottom of cylinder **15** and pass through line **23** and check valve **24** to service **25**. The movement of piston **17** downward will move piston **18** downward, thereby drawing air at atmospheric pressure through check valve **29** into cylinder **16**. As piston **18** reaches the bottom of cylinder **16**, it will open up bypasses **30** to allow water at receiver pressure into the bottom of cylinder **16** to fill cylinder **16** with water and pressurize the trapped air. The water washes the air out of cylinder **16** on each stroke of piston **18**. When the tank pressure is reduced again to the minimum range, the pump will start again automatically and as the water starts to flow back into the receiver, piston **17** will be forced up again to repeat the injection cycle.

The upper bypasses **30'** are provided so that piston **18** will become hydrostatically balanced at the extreme top of its stroke to assure that piston **17** is relieved of its load in order to clear the passageway into bypass when in the upper position.

From the foregoing, it will be apparent that the present apparatus is simple and inexpensive to manufacture, positive in operation, easy to maintain, and well adapted to accomplish the objects set forth. While I have shown a preferred embodiment of the invention, it will be obvious to those skilled in the art that minor changes may be made without departing from the spirit of the invention.

Having thus described the invention, what is claimed is:

1. A hydraulic air injector for the pressure tank of a water system or the like comprising a water tank, a water line leading into said tank, a pipe to service mounted in said line, an injection apparatus interposed in said line, between said pipe and said tank, said apparatus comprising a pair of vertically spaced cylinders, connected pistons mounted in said cylinders, a valved passageway from the lower cylinder to the water line for admitting water to said tank when the piston in said cylinder is in its fully raised position and a return valved passageway from said cylinder to said water line for admitting water to said line and to the service pipe when the piston is in its fully lowered position, said upper cylinder having a valved passageway extending into the upper portion of the tank for admitting air and water into the top of the tank, a second valved passageway at the upper end of the upper cylinder for admitting air to the upper end of the upper

cylinder, and a bypass formed at the lower end of the upper cylinder.

2. Apparatus as defined in claim 1, in which the cross sectional view of the lower cylinder is larger than the cross sectional area of the upper cylinder.

References Cited by the Examiner

UNITED STATES PATENTS

1,941,766	1/1934	Thom	103—6
2,215,815	9/1940	Hartmann	103—6
2,362,586	11/1944	Ruth	103—6
2,447,173	8/1948	Gordon	103—6
2,578,050	12/1951	Deters	230—52

FOREIGN PATENTS

885,873	12/1961	Great Britain.

SAMUEL LEVINE, *Primary Examiner.*

DONLEY J. STOCKING, *Examiner.*

W. L. FREEH, *Assistant Examiner.*