

# PATENT SPECIFICATION

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## DRAWINGS ATTACHED

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## (54) FLUID FLOW PASSAGE AND VALVE ASSEMBLY FOR BALL COCKS

(71) We, ADOLF SCHOEPE and FREDRIC EDWARD SCHMUCK of 1620 North Raymond Avenue, Fullerton, California, and 535 Century Drive, Anaheim, California, both of United States of America and both citizens of the United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a ball cock primarily for use in controlling the water inflow and water level in a water or flush tank. More particularly, but not especially, this invention relates to a construction and assembly of water inlet member, valve and water outlet member of a ball cock providing sealing between the valve and water outlet member, and providing a connection between the outlet member and a refill hose normally used in conjunction with such a ball cock.

In the assembly of a lower unit of ball cocks of this general type a lower housing portion of the valve assembly is pressed onto an end of an inlet member and, at the same time, a lower surface of this valve housing portion is received downwardly tightly abutting an annular end of an outlet member telescoped with the inlet member. During this pressed assembly, difficulties have been occasioned by the fact that a refill hose connection has been formed at the upper end of the outlet member having a relatively small supplementary outlet chamber projecting outwardly from the outlet member with filtering spaced finger positioned in said supplementary chamber. Although the major portion of the outlet member upper end is circular, at the refill hose connection and the supplementary outlet chamber therefor, an outward projection must be formed at this upper end so that when the valve assembly is pressed onto the

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inlet member upper end and it is attempted to seat valve housing portions squarely on the upper end of the outlet member, this irregular shape caused by the refill hose connection permits misalignment between the various components creating production assembly difficulties and, on occasion, defective final assemblies.

Still further difficulties have been encountered with this lower assembly of the ball cock occasioned by the particular projection of the refill hose connection from the water outlet member. In a prior ball cock construction the refill hose connection in the form of a nipple to which the refill hose is connected projects horizontally outwardly from the water outlet member requiring one end of the refill hose to be similarly positioned in this horizontal projection. From the refill hose connection of this lower assembly, however, the refill hose must extend upwardly by the valve assembly to above the ball cock float with the other end thereof positioned for directing water into the upper end of the refill tube.

Obviously, with such required extension of the refill hose, such hose must first project horizontally from the refill hose connection, then curve sharply upwardly to beyond a vertical extension of the refill tube and then reversely near vertically downwardly toward the end of the refill tube. Furthermore, the constant water flow and interruptions in water flow caused by the required operation of the valve assembly creates flexing of the refill hose in this relatively severe curved extension thereof. The overall result is that there have been occasions of refill hose failure at the solid connection thereof to the refill hose connection of the ball cock lower assembly.

It is, therefore, an object of this invention to obviate or mitigate the stated difficulties with the prior ball cock construction.

According to the present invention there

is provided a ball cock for use with a water tank, said ball cock including a water inlet member, a valve assembly pressed onto an end of said water inlet member and including a valve housing, an annular valve seat and housing outlet openings; a float operably connected to sealing means of said valve assembly; a water outlet member surrounding said water inlet member, having an annular end underlying a part of said valve housing lying outwardly of said housing outlet openings, and abutting said valve housing to seal thereagainst, said inlet and outlet members together with said valve assembly forming a water outlet chamber communicating with said valve housing outlet openings and with said tank by way of water outlet openings through said water outlet member, said outlet openings being spaced from said valve housing, and refill hose outlet means through said water outlet member spaced from said outlet member end and between said valve housing and said outlet member outlet openings, said refill hose outlet means directing a portion of water from said outlet chamber and being adapted for connection to a refill hose extending generally by said valve assembly and into a refill tube of said water tank for directing said water portion into said refill tube.

An embodiment of the present invention will now be described with reference to the accompanying drawings, in which:

Fig. 1 is a side elevational view of an embodiment of ball cock incorporating the principles of the present invention and shown mounted in a water or flush tank with the refill hose thereof connected to a refill tube;

Fig. 2 is an enlarged, fragmentary, part vertical sectional and part side elevational view of the lower assembly of the ball cock of Fig. 1;

Fig. 3 is a horizontal sectional view looking in the direction of the arrows 3-3 in Fig. 2;

Fig. 4 is a horizontal sectional view looking in the direction of the arrows 4-4 in Fig. 2; and

Fig. 5 is enlarged, fragmentary, vertical sectional view looking in the direction of the arrows 5-5 in Fig. 3.

Referring particularly to Fig. 1 of the drawings, a ball cock is generally indicated at 10 and is mounted in a usual water or flush tank 11 for controlling the water inflow and water level therein, as well as the water flow into an upper open end of a refill tube 12. As shown, the ball cock 10 includes a lower assembly generally indicated at 14 having an upright mast or guide 16 secured thereto with said guide receiving a vertically movable float 18 thereon. The float 18 is operably connected through a connecting arm 20 and a valve operating

lever 22 to a valve assembly generally indicated at 24 and forming a part of the lower assembly 14.

Thus, a dropping of the water level in the water tank 11 results in a downward movement of the float 18 causing the valve assembly 24 to open and permit an inflow of water through the lower assembly 14 into the interior of the water tank. At the same time, a portion of the water flowing through the lower assembly 14 is directed into a refill hose 26 and into the refill tube 12. As the water level rises in the water tank 11, the float 18 will ultimately close the valve assembly 24 and stop the flow of water into the water tank and refill tube 12.

Figs. 2 to 5, show that the ball cock lower assembly 14 is comprised of a metal water inlet member generally indicated at 28, the valve assembly 24 having a metal lower housing portion generally indicated at 30 and a plastics material water outlet member generally indicated at 32. The water inlet member 28 is secured extending upwardly into the tank 11 sealed therewith by an annular flange 34 thereof downwardly compressing a usual resilient seal 36. Furthermore, the water inlet member 28 includes a frustoconical portion 38 extending upwardly from the annular flange 34, then an enlarged cylindrical portion 40, and finally a reduced cylindrical portion 42 terminating upwardly in an upper open end 44 of the water inlet member.

The lower housing portion 30 of the valve assembly 24 is formed centrally with a downwardly opening inlet neck 46 telescoping the reduced cylindrical portion 42 of the water inlet member 28, the particular assembly thereof to be hereinafter described more in detail. An integral annular valve seat 48 is formed on the valve lower housing portion 30 surrounding the inlet neck 46, and a series of water outlet openings 50 are formed through the valve lower housing portion 30 outwardly of the valve seat 48 and opening downwardly, outwardly around the water inlet member 28. The valve lower housing portion 30 is formed with an annular, flat, sealing surface 52 outwardly continuously circularly surrounding the water outlet openings 50 and directly overlying a continuously circular upper end 54 of an annular wall 56 of the water outlet member 32.

As described more in detail in our said prior patent No. 3,429,333, the valve assembly 24 also includes internally thereof a resilient material sealing member 58 having an annular portion movable toward and away from the annular valve seat 48 of the lower housing portion 30 by operation of the valve assembly through the valve operating lever 22 by its controlling connected float 18. As shown in Fig. 2, the

resilient sealing member 58 is in sealing position downwardly against the annular valve seat 48 and preventing the flow of water from the water inlet member 28 over this valve seat. As previously briefly described, when the water level in the tank 11 drops sufficiently permitting the float 18 to move downwardly and opens the valve assembly 24 through movement of the valve operating lever 22, the resilient sealing member 58 moves upwardly away from the valve seat 48 and permits the flow of water from the water inlet member 28 over the valve seat 48 and downwardly outwardly of the valve lower housing portion 30 through the water outlet openings 50.

The water outlet member 32 as previously stated is formed of plastics material by injection moulding, in view of the complex configuration thereof. More particularly, the water outlet member 32 is generally tubular in configuration outwardly telescoping the water inlet member 28 with the continuously circular upper end 54 thereof tightly sealingly abutting the sealing surface 52 of the valve lower housing portion 30, as previously described. A lower end 60 of the water outlet member 32 rests on the annular flange 34 of the water inlet member 28, thereby retaining the water outlet member secured surrounding the water inlet member 28.

As best seen in Figs. 3 and 5, the wall circular upper end 54 of the water outlet member 32 is formed with a relatively thin cross section, continuously circular sealing ring portion 62 which serves as the abutment against the annular sealing surface 52 of the valve lower housing portion 30 as shown in Fig. 2 and accomplishes the outward sealing between the water outlet member and the valve lower housing portion. Directly underlying the valve lower housing portion 30, the annular wall 56 of the water outlet member 32 forms an upper water outlet chamber 64 communicating inwardly through a slotted flange 66 with the outer sides of the inlet neck 46 on the valve lower housing portion 30 and the reduced cylindrical portion 42 on the water inlet member 28, then downwardly along the enlarged cylindrical portion 40 of the water inlet member 28 through a series of spaced slots 68 shown in Fig. 4, and then outwardly into a lower water outlet chamber 70 over a baffle 72 into the interior of the tank 11 through a series of spaced outlet openings 74.

An integral refill hose connection nipple 76 is formed on and through an annular wall 56 of the water outlet member 32 spaced below the wall upper end 54 and between this upper end and the lower outlet openings 74 from the lower water outlet chamber 70. The refill hose connecting nipple 76 communicates inwardly with the upper water

outlet chamber 64 and outwardly of the water outlet member wall 56 is telescoped by the end of the refill hose 26. This refill hose connection nipple 76 is positioned angling upwardly from the water outlet member wall 56 generally in the direction of the valve assembly 24 with the refill hose 26 extending angularly upwardly by the valve assembly in a relatively gentle curve. Also, the inner end of the refill hose connection nipple 76 is guarded by a series of spaced, water straining or filtering fingers 78 within the upper water outlet chamber 64, spaced slightly inwardly from the water outlet member wall 56 and spaced downwardly from the wall upper end 54, said fingers being downwardly integrally connected to said wall as best seen in Figs. 2 and 3 and serving to prevent debris carried by the water from passing into the refill hose.

In production assembly of the ball cock lower assembly 14, the water outlet member 32 is positioned telescoped downwardly over the water inlet member 28 and the valve lower housing portion 30 is forced downwardly with the housing portion inlet neck 46 pressed tightly telescoping the reduced cylindrical portion 42 of the water inlet member 28. Simultaneously with this pressed fit between the water inlet member 28 and the valve lower housing portion 30, the annular sealing surface 52 of the valve lower housing portion is seated downwardly tightly abutting the continuously circular sealing ring portion 62 on the wall upper end 54 of the water outlet member 32. In view of the fact that the water outlet member upper end 54 and the sealing ring portion 62 thereon are continuously circular and are unbroken in configuration by the refill hose connection nipple 76, this pressed fit assembly may be quickly and easily accomplished without danger of misalignment and with the virtual elimination of the possibility of misaligned defective parts.

After the press fit assembly between the water inlet member 28, the valve lower housing portions 30 and the water outlet member 32, if it is desired to provide further securement to assure the retainment and the sealing engagement, additional metal forming operations between the water inlet member and the valve lower housing portion may be accomplished. Also, if circumstances dictate, soldering or brazing of the usual forms may be placed between the water inlet member 28 and the valve lower housing portion 30, again for a more secure retainment therebetween. In most instances, however, neither form of additional securement will be required and the mere described press fit assembly will retain the various components properly positioned for the described functioning.

In general, operation of the ball cock

of the present invention, when the float 18 is maintained at the upper end of its vertical movement by a proper water level in the tank 11, the valve assembly 24 is maintained closed with the resilient sealing member 58 thereof positioned tightly downwardly against the valve seat 48 of the valve lower housing portion 30 and preventing the flow of water from the water inlet member 28. Upon a dropping of the water level in the tank 11, the float 18 moves vertically downwardly, opening the valve assembly 24 as previously described and permitting movement of the valve resilient sealing member 58 upwardly away from the valve seat 48. The water then flows from the water inlet member 28, over the valve seat 48, downwardly through the water outlet openings 50 into the upper water outlet chamber 64 of the water outlet member 32, and circuitously downwardly along the water outlet member through the lower water outlet chamber openings 74. At the same time, a portion of the water entering the upper water outlet chamber 64 of the water outlet member 32 passes outwardly through the filtering fingers 78 and the refill hose connection nipple 76, through the refill hose 26 and into the upper end of the refill tube 12. The portion of the water in the refill tube is directed into the toilet bowl after it has been flushed by the contents of the tank, this portion serving to provide a predetermined level of water in the toilet bowl after flushing. According to the embodiment described above, therefore, a ball cock 10 is provided having an improved sealing between a preferably metal valve lower housing portion 30 and a preferably plastics material water outlet member upper end 54. By removing the refill hose connection nipple 76, downwardly away from the water outlet member upper end 54 so as to maintain this upper end continuously circular, it is possible to production-assemble the ball cock lower assembly 14 virtually without the occurrence of defectively assembled parts. Furthermore, by positioning the refill hose connection nipple 76 angling upwardly from the water outlet member 32, the refill hose 26 connected thereto is not required to severely curve upwardly past the valve assembly 24 to the upper end of the refill tube 12, thereby greatly reducing the chances of failure caused by flexing of the resilient refill hose as a result of impulses caused by the water control and movement.

#### WHAT WE CLAIM IS:—

1. A ball cock for use with a water tank, said ball cock including a water inlet member, a valve assembly pressed onto an end of said water inlet member and including a valve housing, an annular valve seat and housing outlet openings; a float operably connected to sealing means of said valve

assembly; a water outlet member surrounding said water inlet member, having an annular end underlying a part of said valve housing lying outwardly of said housing outlet openings, and abutting said valve housing to seal thereagainst, said inlet and outlet members together with said valve assembly forming a water outlet chamber communicating with said valve housing outlet openings and with said tank by way of water outlet openings through said water outlet member, said outlet openings being spaced from said valve housing, and refill hose outlet means through said water outlet member spaced from said outlet member end and between said valve housing and said outlet member outlet openings, said refill hose outlet means directing a portion of water from said outlet chamber and being adapted for connection to a refill hose extending generally by said valve assembly and into a refill tube of said water tank for directing said water portion into said refill tube.

2. A ball cock as claimed in claim 1, in which said water inlet member and said valve housing are formed of metal; in which said water outlet member is formed of plastics material and in which said outlet member end includes a continuously circular, thin sealing ring formed integrally thereon and forming a part of said annular end tightly abutting said valve housing and sealing against said valve housing.

3. A ball cock as claimed in claim 1 or claim 2, in which said refill hose outlet means includes a series of closely spaced fingers within said water outlet chamber of said outlet member overlying a refill hose outlet communicating through said outlet member, said fingers being positioned in said outlet member outlet chamber spaced from said outlet member end and between said valve housing and said outlet member outlet openings.

4. A ball cock as claimed in any one of claims 1 to 3, in which said refill hose outlet means includes a refill hose outlet extending angularly through said outlet member and angularly generally toward said valve assembly.

5. A ball cock substantially as hereinbefore described with reference to the accompanying drawings.

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Reference has been directed in pursuance of Section 9, subsection (1) of the Patents Act, 1949, to patents Nos. 1,151,114 and 1,151,115.



of the present invention, when the float 18 is maintained at the upper end of its vertical movement by a proper water level in the tank 11, the valve assembly 24 is maintained closed with the resilient sealing member 58 thereof positioned tightly downwardly against the valve seat 48 of the valve lower housing portion 30 and preventing the flow of water from the water inlet member 28.

Upon a dropping of the water level in the tank 11, the float 18 moves vertically downwardly, opening the valve assembly 24 as previously described and permitting movement of the valve resilient sealing member 58 upwardly away from the valve seat 48. The water then flows from the water inlet member 28, over the valve seat 48, downwardly through the water outlet openings 50 into the upper water outlet chamber 64 of the water outlet member 32, and circuitously downwardly along the water outlet member through the lower water outlet chamber openings 74. At the same time, a portion of the water entering the upper water outlet chamber 64 of the water outlet member 32 passes outwardly through the filtering fingers 78 and the refill hose connection nipple 76, through the refill hose 26 and into the upper end of the refill tube 12. The portion of the water in the refill tube is directed into the toilet bowl after it has been flushed by the contents of the tank, this portion serving to provide a predetermined level of water in the toilet bowl after flushing.

According to the embodiment described above, therefore, a ball cock 10 is provided having an improved sealing between a preferably metal valve lower housing portion 30 and a preferably plastics material water outlet member upper end 54. By removing the refill hose connection nipple 76, downwardly away from the water outlet member upper end 54 so as to maintain this upper end continuously circular, it is possible to production-assemble the ball cock lower assembly 14 virtually without the occurrence of defectively assembled parts. Furthermore, by positioning the refill hose connection nipple 76 angling upwardly from the water outlet member 32, the refill hose 26 connected thereto is not required to severely curve upwardly past the valve assembly 24 to the upper end of the refill tube 12, thereby greatly reducing the chances of failure caused by flexing of the resilient refill hose as a result of impulses caused by the water control and movement.

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4. A ball cock as claimed in any one of claims 1 to 3, in which said refill hose outlet means includes a refill hose outlet extending angularly through said outlet member and angularly generally toward said valve assembly.

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