

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in Siphonic Means for Discharging Liquids from Cisterns or like Vessels

We, CLAIMCOM PATENTS LIMITED, of York House, Lytham St. Annes in the County of Lancaster, a British Company, 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:—

Siphonic liquid discharging means are required for a number of purposes, for example for the flushing systems of water closets and also for providing periodical automatic flushing from a cistern or like vessel when the water in a vessel reaches a pre-determined level.

Siphonic liquid discharging means for these or similar purposes are necessarily somewhat complex in that they usually comprise a double siphon and hydrostatic valve means for priming the siphon when the water reaches the pre-determined level, and in the arrangements at present in use the fabrication of the double siphon is such that the manufacture of the liquid-discharging means requires skilled labour and is not readily adapted for quantity production. The present invention is designed to provide an arrangement which is capable of being manufactured by quantity production methods, and which will be efficient in use.

According to the invention, a siphonic liquid discharging apparatus has a double siphon, and hydrostatic valve means is provided for priming the double siphon, the hydrostatic valve means including a siphon adapted to become primed when the water level in a cistern or like vessel reaches a pre-determined level and when primed to withdraw air from the top of the first part of the double siphon so as to enable priming of the double siphon to take place. The double

siphon and hydrostatic valve means for priming the double siphon may have the axes of all its water-ways or passages lying substantially on a single plane either flat or curved, or two or more abutting planes angularly disposed relatively to one another. With such an arrangement the said waterways or passages can be formed in one side of a block, each water-way or passage comprising an open channel in the said block, and a plate can be secured over the said side of the block to close the channels thus completing the waterways or passages. It will therefore be appreciated that the siphonic liquid discharging apparatus can be readily constructed by quantity production methods, for example by a moulding or casting process for the said block, and so minimise operations which require skilled labour.

One particular construction and also modified arrangements, will now be described, by way of example only, with reference to the accompanying drawings in which:—

Figure 1 is a diagrammatic view of one arrangement, and

Figure 2 is a view similar to Figure 1, but showing an alternative arrangement, and

Figure 3 is a perspective view of a siphonic liquid discharging means formed by a blow moulding process.

Referring to Figure 1 of the drawings, 10 indicates the bottom of a cistern or like vessel, within which the apparatus is mounted, and the passages or water-ways of the siphonic apparatus are formed in a block indicated generally by the reference 11. The passages 12, 13, 14 and 15 comprise the double siphon and the passages 16, 17, 18, 19 and 20 comprise the hydrostatic valve means. The upper ends of the passages 12 and 13 are connected by a passage 21 with the upper ends of

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the passages 19 and 20, and the upper ends of the passages 14 and 15 are connected by a passage 22 with the upper end of the passage 18. The upper ends of the passages 16 and 17 are in communication with one another and a secondary siphon is formed by two passages 23 and 24 interconnected at their upper ends, and associated with the siphon formed by the passages 14 and 15. The outlet from the cistern or vessel is indicated at 25, and the lower ends of the passages 15, 16 and 24 lead to the said outlet 25.

Assuming that water is being fed into the cistern or vessel, as the water level rises the water will enter through the open lower ends of the passages 12 and 20, air displaced thereby passing through the interconnecting passages to the outlet 25 which can be regarded as open to atmosphere. Water will also enter a chamber 26 through a small opening 27, the lower ends of the passages 17, 18 and 19 opening into the chamber 26.

First considering the double siphon formed by the passages 12, 13, 14 and 15, the water will rise in the passage 12 and will flow over the top of the dividing wall 28 into the passage 13, and the lower end of the passage 14, and when the water level in the passage 13 reaches the lower ends of the dividing walls 29 and 30, the lower ends of the passages 13, 14 and 23 will be sealed and assuming that the passages to which the communicating passage 21 leads are also sealed, then air will be trapped in the passage 13 and the water level will not rise in the passage 12 above the dividing wall 28.

At the same time, the water level will have risen in the passages 17, 18, 19 and 20, the water having entered through the lower end of the passage 20 and the opening 27, forming seals at the lower ends of the dividing walls 31 and 32. The water level will, however, continue to rise in the passages 17 and 18 until water flows over the top of the weir 33 into the passage 16 thus priming the siphon formed by the passages 16 and 17 so that water will flow from the chamber 26 through the siphon 16, 17. When this takes place, the pressure in the chamber 26 and the passages 18 and 19 will be reduced as the rate of flow through the siphon 16, 17 will be greater than that through the small opening 27, so that the air trapped in the passage 13 will flow through the communicating passage 21, thus permitting water to fill the passage 13 and flow through the passages 14 and 15, so that the double siphon will be primed and will discharge water from the cistern or vessel through the outlet 25.

Simultaneously water will rise in the passage 20 and will flow over the weir 34 into the passage 19 to the chamber 26 so as to re-seal the hydrostatic valve, at 32, thus stopping air from flowing back from the top of the passages 14 and 15 to the top of the pas-

sages 12 and 13 through the passages 22, 18 and 21, as such flow of air would break the siphon, before the top of the passage 14 is completely filled with water. When the water level then falls below the lower end of the passage 12, or the lower end of passages 20 and 27, the double siphon will be broken, but the auxiliary siphon comprising the passages 23 and 24 will serve to discharge most of the water remaining in the passages 13 and 14. This is desirable to ensure that the double siphon will always be primed when the water is at the same pre-determined level in the cistern or container in which the apparatus is fitted. It also ensures that the auxiliary siphon 23, 24 would not be primed before the starting siphon 16, 17 was primed. It is not necessary to completely drain the passages 13 and 14, but if an excessive quantity of water is left in these passages after the double siphon has been broken, then there is a risk that when the water level rises in the cistern, the double siphon would operate continuously, not as a siphon, but in a manner to permit continuous flow to the outlet, i.e. the difference in the water levels between the passages 14 and 13 would be too great to prevent flow from the passage 14 to the passage 15 as the water rises in the passage 12 and spills over into the passage 13.

It will be seen therefore, that the hydrostatic valve section of the apparatus serves to cause the double siphon to become primed immediately the water level in the cistern or the like vessel reaches a pre-determined level, that is above the level of the weir 33 between the passages 16 and 17.

In the modification shown in Figure 2, the construction is somewhat simplified to provide a more compact unit than the one of Figure 1, but the apparatus functions in a similar manner. In Figure 2, the double siphon comprises the passages 40, 41, 42 and a space 43 between the wall 44 and a cover member or bell 45 in which there is an opening 55 connecting the space 43 of the double siphon to the water in the cistern and through which substantially all the water is drained in flushing. The auxiliary siphon comprises the two passages 46 and 47 associated with the passages 40 and 41 respectively, the lower ends of the passages 40 and 46 leading into the cistern outlet 39. The passages 48, 49, 50, 51 and 52 comprise the hydrostatic valve and correspond with the passages 16, 17, 18, 19 and 20 of Figure 1, the water entering this valve from the space 43 through the open upper end of the passage 52 and also from the space 43 through a small opening 53 which corresponds with the opening 27 of Figure 1. It will be seen that the various passages are interconnected in a similar manner to the corresponding passages of Figure 1, and the operation will be similar in that the double siphon will be primed when the water

level has risen above the level of a weir 54 between the two passages 48 and 49 which together serve as a priming siphon similar to the siphon formed by the passages 16 and 17 of Figure 1.

When the level of the water in the cistern falls below the level of the opening 53 the double siphon is broken, the auxiliary siphon withdrawing most of the water from the passages 41 and 42.

All the passages, with the exception of the passage 43 which is the first leg of the double siphon, are formed as open channels in a base block, and are completed as passages when a cover plate is secured over the base block.

It will be appreciated that open channels can be formed in one side of each of two blocks, so that when the channelled surfaces of the blocks are secured together the channels of the two blocks are in register with each other so as to complete the passages as desired. The block or blocks can be formed by a pressing operation and the two halves, or the channelled portion and its sealing plate, secured together in any convenient manner.

It is desirable, in automatic siphonic liquid discharging apparatus, that the initial discharge should be rapid, and for this purpose, there may be a constriction with a flared exit portion at or close to the outlet end of the final leg of the double siphon, providing a venturi tube effect which will have the effect of speeding up the priming of the double siphon.

The arrangement of the siphonic apparatus described above is very suitable for quantity production methods, e.g. by a blow-moulding method when the apparatus is made from one of the synthetic resinous materials, and apparatus formed by such a method is shown in Figure 3. The arrangement of passages is of a similar general layout to that shown in Figure 1, and the corresponding reference numerals are used. The water ways are in the form of tubes connected together and these are supported in position by webs such as the web 56 disposed between each tube so as to make the apparatus more rigid.

It will be appreciated that the blow moulding process will lend itself to producing the apparatus, with the axes of its tubes lying on a single plane either flat or curved or substantially on two or more planes that are arranged in an angular formation, so as to make the apparatus more compact. In other words, the apparatus can be considered as having tubular axes lying substantially on a single plane that is then bent along one or more lines. Whilst the curved or angular arrangement is particularly suitable for blow moulding, it can also be employed with other forms of construction, such as the block arrangement formed by moulding, or in any other

convenient manner, e.g. as a sheet metal pressing.

It is also possible to use pre-formed inserts such as metal and synthetic resinous tubes or channels as liners for some or all the passages to improve the results obtainable from the moulding processes, by ensuring the dimensions of the passages and imparting greater rigidity to the apparatus.

It will be understood that instead of moulding or casting, the apparatus may be constructed from a series of tubes connected together.

WHAT WE CLAIM IS:—

1. Siphonic liquid discharging apparatus, in which hydrostatic valve means is provided for priming a double siphon, the hydrostatic valve means including a siphon adapted to become primed when the water level in a cistern or like vessel reaches a pre-determined level and when primed to withdraw air from the top of the first part of the double siphon so as to enable priming of the double siphon to take place.

2. Siphonic liquid discharging apparatus according to claim 1, in which water is fed to the said priming siphon through a small aperture communicating with the interior of the cistern, and the priming siphon is adapted to discharge water directly to the cistern outlet when the priming siphon is primed.

3. Siphonic liquid discharging apparatus according to claim 1 or claim 2, in which the apparatus has the axes of all its water ways or passages lying substantially on a single plane, either flat or curved, or two or more abutting planes angularly disposed relatively to one another.

4. Apparatus according to claim 1 or claim 2, or claim 3, in which the water ways or passages are in the form of open channels in one side of a block, a plate being adapted to be secured to the block over the open sides of the channels so as to complete the formation of the water ways or passages.

5. Apparatus according to claim 1 or claim 2, or claim 3 in which the water ways or passages are in the form of open channels in one side of each of two blocks, the blocks being adapted to be secured together with the open channels of the two blocks in register with each other to complete the formation of the water ways or passages.

6. Apparatus according to claim 4 or claim 5, in which the block, or each block, comprises a plate or sheet in which the open channels are provided by indentations in the plate or sheet.

7. Apparatus according to any one of claims 4, 5 and 6, in which the said block or each block with the open channels in one side is produced by a moulding process.

8. Apparatus according to claim 1 or claim 2, or claim 3, in which the said apparatus is

level has risen above the level of a weir 54 between the two passages 48 and 49 which together serve as a priming siphon similar to the siphon formed by the passages 16 and 17 of Figure 1.

When the level of the water in the cistern falls below the level of the opening 53 the double siphon is broken, the auxiliary siphon withdrawing most of the water from the passages 41 and 42.

All the passages, with the exception of the passage 43 which is the first leg of the double siphon, are formed as open channels in a base block, and are completed as passages when a cover plate is secured over the base block.

It will be appreciated that open channels can be formed in one side of each of two blocks, so that when the channelled surfaces of the blocks are secured together the channels of the two blocks are in register with each other so as to complete the passages as desired. The block or blocks can be formed by a pressing operation and the two halves, or the channelled portion and its sealing plate, secured together in any convenient manner.

It is desirable, in automatic siphonic liquid discharging apparatus, that the initial discharge should be rapid, and for this purpose, there may be a constriction with a flared exit portion at or close to the outlet end of the final leg of the double siphon, providing a venturi tube effect which will have the effect of speeding up the priming of the double siphon.

The arrangement of the siphonic apparatus described above is very suitable for quantity production methods, e.g. by a blow-moulding method when the apparatus is made from one of the synthetic resinous materials, and apparatus formed by such a method is shown in Figure 3. The arrangement of passages is of a similar general layout to that shown in Figure 1, and the corresponding reference numerals are used. The water ways are in the form of tubes connected together and these are supported in position by webs such as the web 56 disposed between each tube so as to make the apparatus more rigid. However, the webs may be omitted if desired. It will be appreciated that the blow moulding process will lend itself to producing the apparatus, with the axes of its tubes lying on a single plane either flat or curved or substantially on two or more planes that are arranged in an angular formation, so as to make the apparatus more compact. In other words, the apparatus can be considered as having tubular axes lying substantially on a single plane that is then bent along one or more lines. Whilst the curved or angular arrangement is particularly suitable for blow moulding, it can also be employed with other forms of construction, such as the block arrangement formed by moulding, or in any other

convenient manner, e.g. as a sheet metal pressing.

It is also possible to use pre-formed inserts such as metal and synthetic resinous tubes or channels as liners for some or all the passages to improve the results obtainable from the moulding processes, by ensuring the dimensions of the passages and imparting greater rigidity to the apparatus.

It will be understood that instead of moulding or casting, the apparatus may be constructed from a series of tubes connected together.

WHAT WE CLAIM IS:—

1. Siphonic liquid discharging apparatus, in which hydrostatic valve means is provided for priming a double siphon, the hydrostatic valve means including a siphon adapted to become primed when the water level in a cistern or like vessel reaches a pre-determined level and when primed to withdraw air from the top of the first part of the double siphon so as to enable priming of the double siphon to take place.

2. Siphonic liquid discharging apparatus according to claim 1, in which water is fed to the said priming siphon through a small aperture communicating with the interior of the cistern, and the priming siphon is adapted to discharge water directly to the cistern outlet when the priming siphon is primed.

3. Siphonic liquid discharging apparatus according to claim 1 or claim 2, in which the apparatus has the axes of all its water ways or passages lying substantially on a single plane, either flat or curved, or two or more abutting planes angularly disposed relatively to one another.

4. Apparatus according to claim 1 or claim 2, or claim 3, in which the water ways or passages are in the form of open channels in one side of a block, a plate being adapted to be secured to the block over the open sides of the channels so as to complete the formation of the water ways or passages.

5. Apparatus according to claim 1 or claim 2, or claim 3 in which the water ways or passages are in the form of open channels in one side of each of two blocks, the blocks being adapted to be secured together with the open channels of the two blocks in register with each other to complete the formation of the water ways or passages.

6. Apparatus according to claim 4 or claim 5, in which the block, or each block, comprises a plate or sheet in which the open channels are provided by indentations in the plate or sheet.

7. Apparatus according to any one of claims 4, 5 and 6, in which the said block or each block with the open channels in one side is produced by a moulding process.

8. Apparatus according to claim 1 or claim 2, or claim 3, in which the said apparatus is



made from a synthetic resinous material and is produced by a blow-moulding process.

5 9. Apparatus according to claim 1 or claim 2, or claim 3, formed by a blow moulding process, in which the passages comprise tubes connected by webs.

10 10. Apparatus according to any one of the preceding claims, in which means are provided for removing most of the water left in the double siphon after the double siphon has been broken.

11. Apparatus according to claim 10, in which the means for removing water from the double siphon comprises an auxiliary siphon.

15 12. Apparatus according to any one of the preceding claims, in which the hydrostatic valve means is adapted to be primed when the level of the water surrounding the apparatus rises above and flows over a weir.

20 13. Apparatus according to any one of the preceding claims in which the hydrostatic valve means includes a siphon, one leg of which communicates with the outlet leg of the

double siphon, and a water inlet opening communicates with the lower end of the other leg of the said hydrostatic valve siphon. 25

14. Apparatus according to any one of the preceding claims, in which pre-formed inserts are used to form at least part of the system of water-ways or passages. 30

15. Apparatus according to claim 1, in which the said water ways or passages comprise a series of tubes connected together.

16. Siphonic liquid discharging apparatus according to claim 1, substantially as herein described with reference to Figure 1 or as modified by Figure 3 of the accompanying drawings. 35

17. Siphonic liquid discharging apparatus according to claim 1, substantially as herein described with reference to Figure 2 of the accompanying drawings. 40

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