AUTOMATIC CUT-OFF FOR INTRAVENOUS EQUIPMENT

A valve assembly is positioned in the drip chamber of a conventional intravenous container and includes a steel flotation ball which seals the chamber orifice when the intravenous liquid in the container is expended. A floatation plug floats above the ball and serves as a hold-down means for clamping the ball against the orifice when the fluid is almost expended. In order to prevent the ball and plug from floating to an upper portion of the drip chamber, a retaining ring is fastened near the orifice end of the chamber. The valve assembly goes into operation when the last few drops of intravenous fluid remain at the drip chamber orifice.

5 Claims, 4 Drawing Figures
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The present invention relates to intravenous apparatus and more particularly to a safety cut-off valve for terminating flow of intravenous fluids in the drip chamber of a conventional intravenous apparatus.

At the present time, the process of intravenous feed requires the attendance of a nurse during a protracted period when an intravenous procedure is being terminated. However, often her services are more urgently needed elsewhere. Accordingly, it would be desirable to equip conventional intravenous equipment with a suction valve assembly which would seal the intravenous fluid drip chamber when only a few last drops of the fluid are all that is left.

The present invention is directed to such a cut-off valve assembly that can be conveniently inserted into conventional intravenous equipment. The present device is a safety apparatus which prevents the possibility of air or harmful gases from entering a patient's veins in the event that intravenous fluid becomes expended before a nurse can properly discontinue the fluid flow. By using the instant device, a nurse can care for more urgent needs and come back at a later time to terminate the procedure. By stopping the flow of fluid from the drip chamber as soon as the last few drops are sensed in the chamber, a column of fluid remains in the feed line that is connected to the patient's vein. This column seals the circulatory system from unwanted air and harmful gases.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is an elevational view illustrating a conventional intravenous device equipped with the automatic cut-off cut-off valve assembly.

FIG. 2 is an exploded view illustrating the three components of the suction valve assembly.

FIG. 3 is a sectional view illustrating the disposition of the valve components during normal flow of intravenous fluid through the drip chamber.

FIG. 4 shows the sealing position of the valve components after substantially all of the fluid has been expended from the drip chamber.

Referring to the figures and more particularly FIG. 1, a conventional intravenous dispenser equipped with the present valve invention is generally indicated by reference numeral 10 and includes a main pump 12 which stores the intravenous fluid. The neck 16 of the bottle communicates with the usual vent 18 for producing smooth and continuous flow to a drop chamber 20 positioned downwardly from the neck of the bottle. The orifice of the drip chamber 20 mounts the usual feed line 22 which is connected at an opposite end thereof to a needle (not shown) that is inserted into a patient's vein.

Considering FIGS. 2 and 3, the components of the present suction valve assembly are seen to be three in number. The assembly is generally indicated by reference numeral 24 and includes retaining means in the form of a split ring 26 having a gap 28 therein that allows fluid to flow freely past the ring. The peripheral outward edge of the ring 26 has a number of spike-like projections 30 extending outwardly which space the ring from the interior wall of the drip chamber 20. The projections serve to increase the flow of fluid past the ring and also insures the proper horizontal orientation of the ring within the chamber. A hold-down means in the form of an elastomeric plug 32 normally floats in the fluid 14 and remains clear of the chamber orifice 33 as long as a substantial amount of fluid is in the chamber. As seen in FIG. 2, the plug includes a disc-like base 34 extending downwardly and inwardly to a boss-like projection 36 having a central underlying hemispherical recess 38 therein which is adapted to reside in registry with a steel ball 40, the latter serving as the actual seal against the upper end or inlet 41 of feed line 22. Although the ball 40 remains clear of the line inlet 41 when a substantial quantity of fluid 14 resides in the chamber, the ball will become displaced into sealing engagement with the inlet end 41 when the level of fluid falls below the lower surface of plug 32. However, prior to this situation, ring 26 serves as a stop limit for the upward displacement of the plug 32 and prevents the plug from floating upwardly into an upper portion of the drip chamber 20. Of course, since the plug 32 is restrained, the steel ball 40 will likewise be restrained from floating upwardly into the chamber 20.

FIG. 4 illustrates the condition of the valve components when the last few drops of liquid remain in the drip chamber 20. This state of affairs causes the ball 40 to fall into sealing engagement with the inlet end 41 of line 22 thereby sealing the line and causing a column of fluid to remain in the line 22 thereby sealing the patient's vein from air or harmful gases. The figure clearly illustrates how the ring 26 remains in position due to its biased engagement with the chamber wall while plug 32 receives ball 40 in recess 38 and clamps the ball into sealing engagement with the inlet end 41 of line 22. Actually, a small suction force is exerted on the underside of the plug which enhances its hold-down capability.

If, after automatic cut-off as just described, additional fluid is to be introduced into the patient, a fresh supply is introduced into the intravenous apparatus which will cause the plug 32 and ball 40 to maintain their clear position as discussed in connection with FIG. 3.

The ring 26 and plug 32 have been particularly designed so that they do not interfere or impede the normal flow of intravenous fluid through the drip chamber 20 and feed line 22. By way of example, the conventional intravenous container 12 and drip chamber 20 may be of the type currently marketed by Abbott Laboratories, Inc.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed is as new as is follows:

1. An automatic flow cut-off assembly for intravenous equipment comprising a vertical drip chamber conduit of constant cross-section throughout a major portion of its height, said conduit including a downwardly converging lower portion terminating in an outlet orifice, an intravenous patient feed tube connected to the orifice, normally open valving means in the conduit responsive to the absence of intravenous fluid in the conduit for sealing the orifice, buoyant hold-down means above the valving means for selective downward movement into a position clamping the valving means against the orifice when fluid is absent, and retaining means in spaced relation above said orifice for limiting the upward displacement of the hold-down means in the presence of fluid whereby fluid is free to flow from the conduit through the orifice until a preselected minimal quantity remains at which time the orifice is sealed, said hold-down means comprising an imperforate disc-like suction plug having a downwardly directed recess therein for centrally receiving the valving means and clamping the valving means against the drip chamber orifice when fluid is absent in the conduit, said plug being of a cross-section less than that of the conduit at the retaining means to allow free flow past the upwardly displaced plug, and greater than that of the conduit in its valving means clamping position for a sealing of the conduit in conjunction with a clamping of the valving means against the orifice.

2. The assembly of claim 1 wherein the valving means is a ball having a diameter exceeding that of the drip chamber outlet orifice.

3. The assembly of claim 2 wherein the retaining means comprises a ring member having peripherally spaced projections extending outwardly therefrom, said projections engag-
3. The assembly of claim 3 wherein said ring member is in the nature of a split ring including spaced ends defining a fluid passage therebetween.

4. The assembly of claim 3 wherein said ring member is in the nature of a split ring including spaced ends defining a fluid passage therebetween.

5. The assembly of claim 1 wherein the retaining means comprises a ring member having peripherally spaced projections extending outwardly therefrom, said projections engaging the interior wall of the drip chamber conduit to mount and center said ring in the conduit.

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