3,207,372
INTRAVENOUS FEEDING APPARATUS
Robert P. Evans, Kenmore, N.Y., assignor, by mesne assignments, to Sterilon Corporation, a corporation of Delaware
Filed Sept. 21, 1962, Ser. No. 225,326
3 Claims. (Cl. 222—67)

This invention relates to apparatus for the administering of intravenous solutions, and more particularly to an improved apparatus as aforesaid which includes a safety valve device assuring that a head of the solution being administered is maintained at all times in the feeding line, although the supply flask may run empty.

When administering intravenous solutions it is imperative that a supply of solution be maintained in the feed line until after the needle be withdrawn from the vein, because in the absence of solution, the patient's blood becomes exposed to air and may coagulate. This can cause clots which can stuff off into the blood stream causing embolisms. Furthermore, where two or more flasks of solution are to be successively administered, if the changeover is not made before air enters the needle feed line a second needle must be used and a second venipuncture made. This is of course painful to the patient and costly and time consuming. Hospital personnel are frequently called upon to make secondary veni-punctures and to reset solutions. Therefore, constant vigilance when administering solutions has been heretofore necessary to prevent such hazards and problems from occurring.

The primary object of the present invention is to provide a system including means which automatically stops the flow of solution when the feeder vessel is empty and holds a head of solution between the vessel and the vein, thereby preventing the patient's blood from entering the needle and/or being exposed to air. With this system it is no longer critical to be in attendance as the supply flask empties, the administering unit may remain dwelling in the vein for an extended period without harm, such as until hospital personnel can conveniently attend to the patient. If an additional flask of solution is then required, the feed line can be uncoupled from the empty flask, and coupled to a new flask whereupon feeding may be immediately resumed.

The present invention is also of great use wherever smaller than full flask size doses of intravenous fluids are prescribed to be administered at intervals. Intravenous fluids are usually packaged in minimum size flasks of 500 cc., which heretofore has necessitated constant vigilance in order to stop the feeding when the prescribed amount has been administered. Or, as is the practice in most hospitals, the flask is first emptied except for the prescribed amount which is then administered, and this practice is wasteful and time consuming. Here again, if the flask is allowed to empty in the absence of an attendant the same problems arise as described heretofore.

In the device of the present invention, a full, large volume, flask may be coupled into the system and only the prescribed amount of fluid will be administered. At that point the flow will be stopped automatically, and solution will be held in the feed line above the vein. The device may then be readily adjusted to provide for another feeding from the same flask, as may be prescribed.

Other objects and advantages of the present invention will become apparent from the detailed description hereinafore and the accompanying drawings wherein:

FIG. 1 is a fragmentary elevational view of an administering apparatus incorporating a specific embodiment of the device of the invention with parts thereof broken away;

FIG. 2 is a fragmentary sectional view on enlarged scale of a portion of the device of FIG. 1;

FIG. 3 is a sectional view taken substantially along III—III of FIG. 1; and

FIG. 4 corresponds to FIG. 2 but shows a modified form of some of the details of construction.

In the specific embodiment of the invention shown and described herein, FIG. 1 shows a flask 10 such as is conventionally used as a container for fluid to be administered to a patient. A stopper 12 is provided with an air inlet tube 14. In accord with the present invention a novel valve cell or drip chamber device as indicated generally at 16 is connected in communication with the interior of the flask. The device 16 comprises a tubular body 18 having at its upper end an end plug 20 which terminates in a hollow stem portion 22 having a sharpened end 23 for driving insertion through the stopper 12 and projection up into the flask. The size of the dosage to be administered will determine to what distance the stem 22 is inserted into the flask.

As shown in FIG. 2 the lower end of the body portion 18 is fitted with a plug member 24. The plug 24 is formed with an outlet nipple portion 26 which is adapted to receive the end of a feed line as indicated at 28 (FIG. 1). The inner end of the plug 24 is formed with a collar 29 and a valve seat member 32 is slip-fitted thereover. A ball check 34 is disposed within the body 18 and is designed to seal off the valve opening when seated on the valve seat. In the construction shown in FIG. 2, the plug 24 is provided with upstanding rib portions 36 which serve to guide the ball 34 so that it will drop into properly seated position when the body 18 is empty of fluid. The ball is made of such weight and buoyancy as to float in the fluid passing through the device, but is heavy enough to rest upon the collar 32 and provide a firm seal when lack of fluid in the device allows it to settle upon the valve seat.

Thus it will be appreciated that in order to set the equipment for administration purposes, the unit 16 is coupled into communication with the contents of the flask by driving the stem 22 through the stopper and to a level therewithin which leaves above the top end of the stem the volume of fluid prescribed to be administered. The device is then hung in flask upside down attitude as shown in FIG. 1, whereupon fluid will start to drip through the stem 22 and into the cell 16. As the fluid accumulates in the bottom of the cell, the ball check floats off the valve seat thus permitting fluid to flow down through the conduit 28 for feeding to the patient. Whenever the level of fluid in the flask lowers below the top end of the stem 22, the supply of fluid to the cell 16 ceases. When the level of fluid in the cell 16 lowers sufficiently to permit the ball check 34 to settle back down on the valve seat 32, the feed supply to the patient is terminated. It is of course an important feature of this device that upon setting of the ball check it automatically precludes any entrance of air into the feeding conduit 28, and maintains a head of fluid within conduit 28 insuring against backward flow of fluid to the administering needle. Thus, upon initially setting the apparatus to provide a prescribed feeding, the attendant may go off on other duties with the assurance that the apparatus will automatically stop the feeding operation at the proper time, and without any risk of permitting the entrance of air into the administering needle and/or the vein. Then, if it is subsequently desired to repeat the operation and to administer another feeding, the attendant reprepares the apparatus by simply pulling the cell unit 16 downward so that the upper end of the stem 22 lowers into the flask fluid to such a level as to now make available the prescribed quantity of fluid for the next feeding.

During this adjustment of the apparatus the air within
the cell 16 escapes upwardly into the flask, replacing the fluid flowing downwardly therefrom; and thus under no circumstances is the air permitted to enter the feeding conduit 28 by virtue of the operation of the ball check 34 as explained hereinabove.

In any case whenever the contents of the flask have been exhausted and it is desired to continue the feeding from another flask, the unit 16 is simply withdrawn from the stopper 12 and reinserted through the stopper of the fresh flask.

As shown in FIG. 4, the valve seat portion of the apparatus may be constructed in somewhat different manner. Although the end plug structure 24 is of substantially similar design as in the case of FIG. 2, the valve seat device is of somewhat different construction. In the case of FIG. 4 the valve seat member comprises a cylindrical collar portion 40 formed at its upper end with a radially enlarged shoulder 42 which is conically counterbored at its top end as indicated at 44 so as to provide a conically shaped concave valve seat into which the ball check is free to float in automatically centered relation. Thus, no external guides of the type indicated at 36—36 in FIG. 2 are required.

Thus it will be apparent that the objects and advantages of the invention as mentioned hereinabove are accomplished in the case of the present invention by means of a structurally simple and dependable arrangement; and that although only two specific examples of construction have been illustrated and described hereinabove, various changes may be made therein without departing from the spirit of the invention or the scope of the accompanying claims:

I claim:

1. An apparatus for intravenous administration of fluid comprising in combination, a flask adapted to contain the fluid to be administered and having an air inlet into the upper level thereof, a fluid feed line adapted to carry the fluid to be administered by gravity from said flask to the point of administration, a tubular member defining a drip chamber and having inlet and outlet means at its ends adapted for connection to form a portion of said feed line, said inlet means including a rigid hollow stem adapted to be pushed into said flask to any desired level therein, and said tubular member having a valve seat adjacent said outlet end thereof, and a check valve disposed within said tubular member and adapted to be buoyed by fluid accumulated within said chamber and to lower by gravity upon said valve seat in the absence of buoyant fluid to close said feed line and thereby maintain at all times a head of fluid in the apparatus below said valve seat and prevent entrance of air therebelow.

2. An apparatus for intravenous administration of fluid comprising in combination, a flask adapted to contain the fluid to be administered and having an air inlet into the upper level thereof, a fluid feed line adapted to carry the fluid to be administered from said flask by gravity to the point of administration, a drip chamber comprising a tubular member having inlet and outlet means at its ends adapted for connection into said apparatus to form a portion of the flow path of said administering apparatus, said inlet means including a rigid hollow stem adapted to be pushed into said flask to any desired level therein, and a ball valve disposed within said chamber adapted to be buoyed by fluid accumulated within said chamber and to close by gravity in the absence of buoyant fluid to close said flow path and thereby maintain at all times a head of fluid in the apparatus below said valve seat and prevent entrance of air therebelow.

3. An apparatus for intravenous administration of fluids comprising in combination, a flask adapted to contain the fluid to be administered and having a closure device at the mouth thereof, a cell unit comprising a chamber having a hollow stem rigidly attached to one end thereof and adapted to extend through said closure in fluid sealing relation thereto so that said stem may be pushed into said flask to any desired level therein, said cell unit terminating at its other end in an outlet connection for fluid tight coupling with a fluid gravity delivery conduit, said cell unit having therewithin a valve device adapted to be buoyed by fluid within said cell unit to open position and to close in the absence of buoyant fluid, thereby to at all times maintain a head of fluid in the device below said valve and to prevent entrance of air therebelow.

References Cited by the Examiner

UNITED STATES PATENTS

1,825,775 10/31 Brubaker 222—66 X
2,679,140 5/54 Burchett 222—67 X
2,850,211 9/58 Fernandez 222—481 X

FOREIGN PATENTS

116,797 1/00 Germany.

LOUIS J. DEMBO, Primary Examiner.