

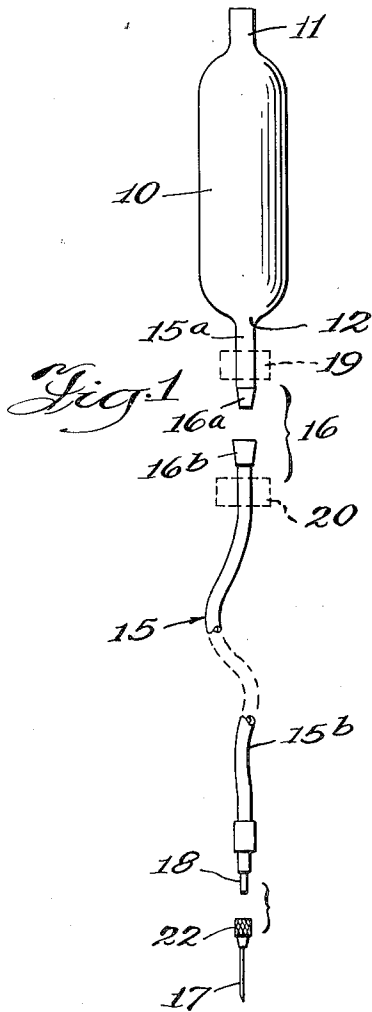
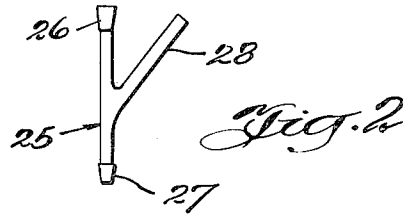
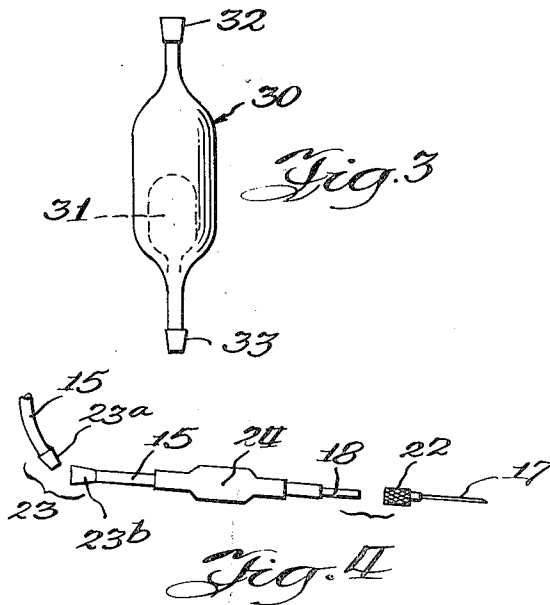
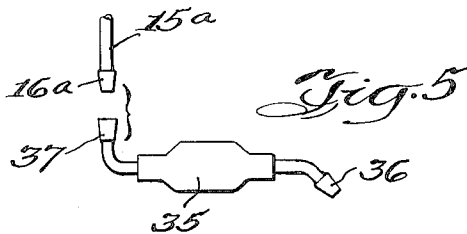
July 27, 1965

D. KATZ
PARENTERAL INFUSION APPARATUS HAVING
A SEPARABLE, COUPLING MEANS

3,196,872

Filed Nov. 15, 1963

2 Sheets-Sheet 1



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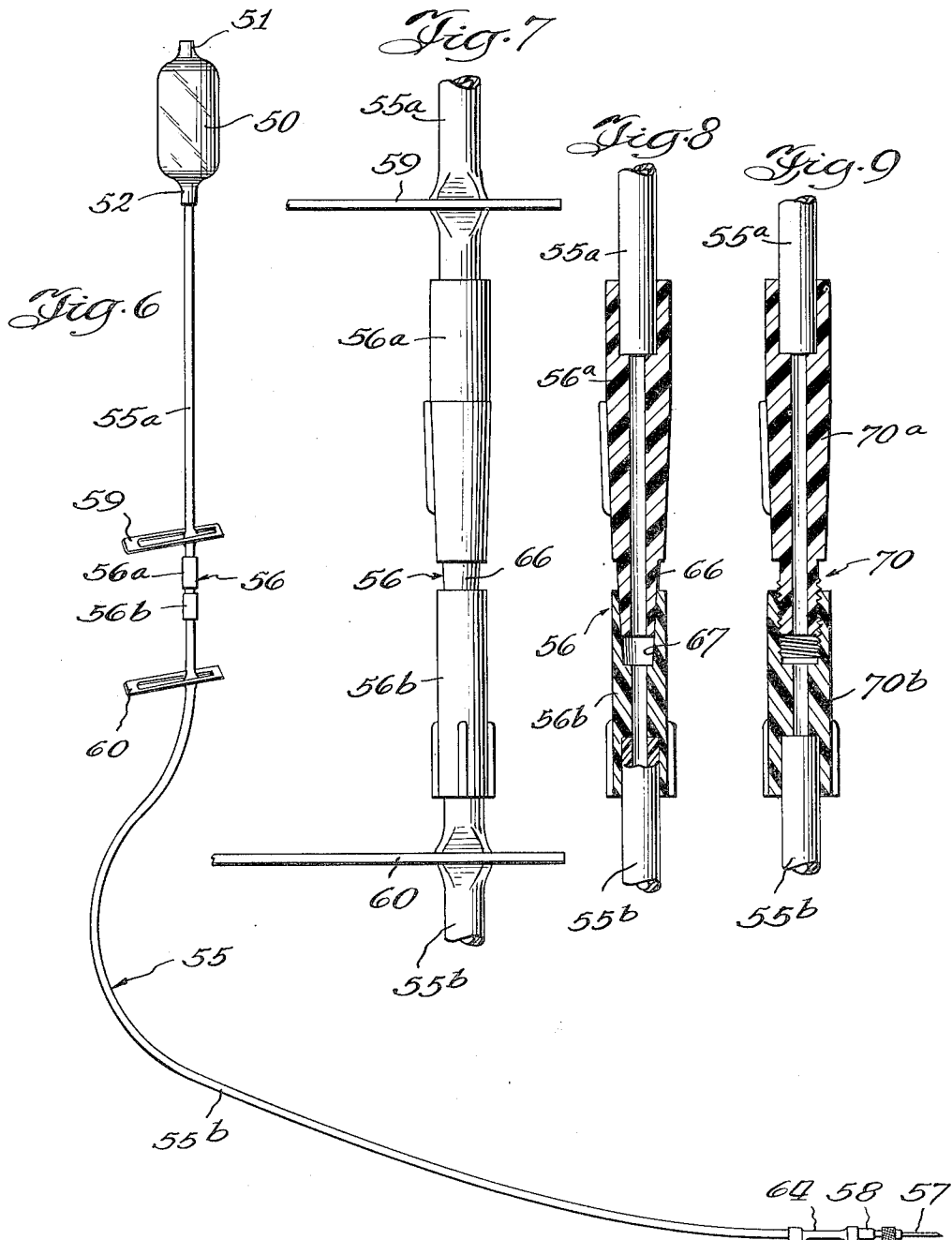
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PARENTERAL INFUSION APPARATUS HAVING A SEPARABLE, COUPLING MEANS

David Katz, 1417 Dundee Road, Northbrook, Ill.

Filed Nov. 15, 1963, Ser. No. 323,981

5 Claims. (Cl. 128-214)

This application is a continuation-in-part of application Serial No. 158,252 filed Dec. 11, 1961, now abandoned.

This invention relates to a parenteral infusion apparatus for infusion of blood and other liquids whenever parenteral therapy is required, as for example during the carrying out of surgery.

Disadvantages of existing apparatus

The existing types of apparatus used for carrying out intravenous infusions are quite complicated and, when employed for certain special purposes, quite expensive. In addition, the known types of apparatus do not lend themselves to modification, expandability or flexibility in use, and this fact oftentimes introduces an added risk when the apparatus is employed in connection with a surgical operation.

In many operations, it is necessary for the person responsible for parenteral therapy to have various types of infusion apparatus available to meet any of several possible emergencies. Thus, it may be necessary to have apparatus available not only for infusion of blood, but also glucose solution, saline solution or the like. It may be necessary to have apparatus available for the introduction of supplementary medication of various sorts. It may be necessary to introduce the liquid in question under pressure rather than relying upon gravity flow. The equipment required for each of these purposes may be entirely different, and with existing types of apparatus it is necessary to substitute an entire new system every time a new function is to be performed.

The result is not only increased cost because of the substitution of whole systems, and because of the necessity of having apparatus in standby condition even if it is not ultimately required, but, more important, the substitution of an entirely new system will oftentimes increase very markedly the risks to the patient on the operating table. Substitution of an entire system increases the risk of contamination, interrupts or distracts the surgeon, distracts the anesthesiologist from care of the patient, and often necessitates making a new puncture in the patient's vein, which may delay restarting the infusion if the patient's veins are difficult to locate, and in an extreme case may even lose for the anesthesiologist the last remaining usable site for such a puncture. When time is of the essence, such delays can be fatal.

Summary of this invention

Complete expandability and flexibility of use, greater economy, continued attention to the patient on the part of the surgeon and anesthesiologist in the operating room; and reduction of the danger of infection to the practicable minimum are all achieved by the present invention.

An essential component of any intravenous infusion apparatus is the drip chamber into which the liquid is first introduced for purposes of metering. The typical drip chamber is formed of light transmitting or transparent material through which discrete drops of the liquid which is to be administered with the infusion apparatus can be observed as they are introduced into the drip chamber through the inlet at the top of the chamber. (Ordinarily the entire drip chamber is formed of the same material, but this is not necessary so long as at least a portion of the side walls of the chamber is made of light transmitting or transparent material.) The drip chamber is

formed of shape retaining material so it will not collapse when empty. As the liquid drips into the chamber, the flow of liquid may be metered by observing the rate at which the drops fall to the bottom of the drip chamber, from whence they can flow out through the outlet at the bottom of the chamber. If desired, the flow of liquid through the drip chamber may be made a straight flow, rather than drop by drop, but the drip chamber may always be used for metering discrete drops when necessary.

In the existing types of infusion apparatus, it has been believed necessary to have a long, unbroken length of flexible tubing descending from the bottom or outlet end of the drip chamber. Thus, it has been felt necessary to have an unbroken flexible tubing long enough (1) to extend from the drip chamber located high enough above the patient (a) to produce a head of pressure that will adequately overcome the patient's venous pressure, and (b) to provide ease of observation of the drip rate at about eye level of the person responsible for the parenteral therapy (who customarily stands nearby), (2) to pass under any draping cloths used, and (3) to reach the site of the infusion. A common length of tubing that is adequate for these three purposes and involves no substantial extra length of tubing is about five to six feet. It is seen that the flexible tubing must terminate in an adapter by means of which the needle for the infusion can be connected to the tubing.

It has also been considered necessary, in those cases in which some more complicated component such as a filter or an in-line pump is to be used in conjunction with the drip chamber, that the additional component and the drip chamber be incorporated together in one unseparable unit. This fact has resulted in costly and unnecessary duplication of apparatus, including duplication of the drip chamber and the length of tubing leading to the adapter for the infusion needle.

In the apparatus of the present invention, such duplication has been eliminated by incorporating in the flexible tubing leading from the outlet of the drip chamber a secure but readily separable junction located in an exposed and easily accessible portion of the tubing, before it passes under any draping cloths which may be spread over the patient with whom the apparatus is used. In other words, the secure but readily separable junction is located in that portion of the tubing that ordinarily lies between the drip chamber and the draping cloths over the patient.

The junction may be located immediately at the outlet of the drip chamber. Or it may be located adjacent to the outlet, in close proximity thereto, or in the near vicinity of the outlet. Or it may be as far from the drip chamber outlet as, say, two to two and a half feet or so, if desired.

A distance of less than about two and a half feet is the distance preferably employed between the drip chamber outlet and the secure but readily separable junction of this invention. A vertical distance from the drip chamber down to the patient of about two and a half to three feet ordinarily produces a sufficient head of pressure in the liquid being administered to overcome the patient's venous pressure and provide an additional margin of pressure as well. It also permits one to hang the drip chamber at usual eye level of about five and a half feet or six feet or so, compared to the usual patient height of about three to four feet above the floor, and at the same time bring the secure but readily separable junction to a location just outside any draping cloths that may be spread over the patient.

If the secure but readily separable junction were located more than about two and a half feet below the drip chamber, it would either be too close to the floor for convenient access and safe use, or would have to follow the flexible

tubing as it was bent to extend toward the patient and would thus be likely to be covered by any draping cloths employed. In addition, in the latter case, if the junction were slanted or extended horizontally because the portion of the flexible tubing above it was too long, it would cause undesirable tipping of certain inserted components, such as an in-line pump, which must be kept vertical for safe or optimum operation.

Since a common length of flexible tubing leading from the drip chamber of a conventional parenteral infusion apparatus is about five feet or so, to locate the secure but readily separable junction of the apparatus of this invention in an easily accessible portion of the flexible tubing, and to avoid the disadvantages just described that are present if the junction is too far below the drip chamber, it is desirable to space the junction from the drip chamber outlet at a distance less than half the length of the flexible tubing.

The secure but readily separable junction located in the apparatus of the present invention as just described permits the apparatus to be employed as an integral and yet an entirely expandable and flexible, multiple-component system in which only the very minimum number of necessary components are employed if and when needed. All unnecessary duplication is avoided. The maximum speed of installation is achieved, with minimum distraction of the surgeon and anesthesiologist, and the minimum risk of contamination of the operative area.

In a preferred form of this invention, the junction in the flexible tubing leading from the drip chamber is comprised of a male connector means, and a complementary female connector means which forms a snug slip fit therewith. In other embodiments the two connector means comprising the junction may be joined by a lock fit, screw fit, or any other secure but readily separable junction desired.

The over-all length of the flexible tubing of this apparatus may be of any conventional length suited to providing communication between the source of the liquid for the infusion and the site of the infusion for the patient. The over-all length may suitably be, for example, about five feet. This length will usually provide sufficient tubing for the junction to be located at the proper vertical distance below the drip chamber, and sufficient additional tubing to pass under the draping cloths to the infusion site.

The flexible tubing of the apparatus of this invention terminates in an adapter to which the needle for the infusion may be connected.

The drawing

The invention will now be further described by reference to the accompanying drawing, in which:

FIGURE 1 is an exploded side elevation of one embodiment of the intravenous infusion apparatus of this invention, with the extension tube broken to represent a tube of any desired length;

FIGURE 2 is a side elevation of a Y-connector which may be employed with the embodiment of FIGURE 1 to provide greater flexibility of use;

FIGURE 3 is a diagrammatic representation of an in-line pump which may be employed with the apparatus of this invention shown in FIGURE 1;

FIGURE 4 is a side elevation of a self-sealing type supplementary medication site which can be employed in one manner with the embodiment of FIGURE 1;

FIGURE 5 is a side elevation of a self-sealing type supplementary medication site used in another manner with the invention;

FIGURE 6 is a side elevation of a second embodiment of the intravenous infusion apparatus of this invention;

FIGURE 7 is an enlarged elevation view of the secure but readily separable junction of the embodiment of FIGURE 6 that joins the two portions of the flexible tubing leading from the drip chamber;

FIGURE 8 is a sectional view of the junction of FIGURE 7; and

FIGURE 9 is an enlarged sectional view of another secure but readily separable junction, comprised of complementary connector means in threaded engagement with each other, that may be used with the apparatus of this invention.

Detailed description of invention

In FIGURE 1, component 10 is a conventional drip chamber having an inlet 11 and an outlet 12.

Attached to drip chamber 10 at outlet 12 is flexible tubing 15. The over-all length of tubing 15 in the embodiment of this invention illustrated in FIGURE 1 may be five feet or more, as desired, the central portion of flexible tubing 15 being shown in phantom in that figure.

Five feet or more of flexible tubing will in the ordinary case provide sufficient tubing to space secure but readily separable junction 16 (shown in exploded view in FIGURE 1) at a suitable vertical distance below drip chamber 10, and in addition provide sufficient additional tubing to pass under any draping cloths employed at the infusion site.

Needle 17, connected to adapter 13 at the distal end of flexible tubing 15, is inserted at the infusion site for the patient with whom this parenteral infusion apparatus is being employed. The flexible tubing then extends outwardly and upwardly from the infusion site, to cause drip chamber 10 to be spaced above the patient at the approximate eye level of the person standing nearby who is responsible for the parenteral therapy.

As is shown in FIGURE 1, flexible tubing 15 is divided by secure but readily separable junction 16 into an upper portion 15a and a lower portion 15b. In the figure in question, an exploded view of junction 16 is given, with male connector 16a and female connector 16b adapted to form a snug slip fit. It is preferred that the female connector means be the lower of the two means, in order to utilize the effect of gravity as much as possible to avoid the possibility of leakage and the resulting separation or contamination at the junction.

Connectors 16a and 16b may be any complementary connector means desired in addition to those shown in FIGURE 1. As an example, connectors 16a and 16b may be threaded for engagement with each other if a connection is desired which will be entirely reliable and secure under any possible stress. Alternatively, they may be adapted, if desired, to form any conventional lock fit. They may also be any other form of connectors to produce a secure but readily separable junction.

When the parenteral infusion apparatus of this invention is in use, flexible tubing 15 extends downwardly a distance of about two and a half feet or a little more, then begins to bend and extend laterally to pass under any draping cloths that are employed to cover the patient. With junction 16 located at a distance from drip chamber outlet 12 of less than about two and a half feet, junction 16 will be located in an exposed and easily accessible portion of flexible tubing 15.

In the embodiment shown in FIGURE 1, junction 16 is located adjacent, or in close proximity to, drip chamber outlet 12. When junction 16 is located immediately at outlet 12, the user of the apparatus may grasp drip chamber 10 to press connector means 16a into engagement with its complementary connector means 16b. In the embodiment shown, however, a length of tubing 15a long enough to be grasped by the user is utilized between the drip chamber and junction 16.

Clamp 19, shown diagrammatically, is provided for controlling the flow of fluids through the upper portion of flexible tubing 15, lying between drip chamber 10 and junction 16. Use of this clamp permits one to selectively stop the flow of liquid from drip chamber outlet 12 through flexible tube portion 15a.

When element 19 is a flow control means of the type

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that forms a clamping engagement with flexible tubing 15a, the tube must of course be long enough, say, one inch to four inches, to provide for a purchase on the tube by the clamp means. Tube portion 15a seen in the embodiment of this apparatus disclosed in FIGURE 1 is about one inch to one and a half inches in length, as compared to the drip chamber, which component is conventionally about two inches to six inches in length.

Second flow control means, clamp 20 (also shown diagrammatically), is provided for selectively stopping the flow of liquid through portion 15b of flexible tubing 15, which lies between junction 16 and adapter 18 at the distal end of tubing 15. Adapter 18 shown in FIGURE 1 is of a conventional type designed to receive base socket 22 of needle 17.

As seen in FIGURE 4, a second secure but readily separable junction (seen in exploded view and designated by the numeral 23) may be included near the distal end of flexible tubing 15. Junction 23 may be comprised of male connector 23a and female connector 23b adapted to form a snug slip fit therewith. Junction 23 permits the insertion in flexible tubing 15 of a conventional self-sealing type supplementary medication site such as puncturable, resilient, rubber chamber 24 shown in the drawing. As before, flexible tubing 15 may then be terminated in adapter 18 designed to receive base socket 22 of needle 17.

The device shown in FIGURE 4 illustrates how the basic feature of this invention—a secure but readily separable junction located in an exposed and easily accessible portion of the flexible tubing—may be combined, if desired, with a conventional location of a self-sealing supplementary medication site. However, greater flexibility and ease of substitution can be achieved in accordance with this invention if the self-sealing type supplementary medication site is adapted (as shown in FIGURE 5) for insertion high in the infusion apparatus as, for example, between junction members 16a and 16b in FIGURE 1, or at any other exposed and easily accessible site where junction 16 may be located. To accomplish this, component 35 is provided with a male connector means 36 at its outlet end (instead of needle adapter 18 as in FIGURE 4), and with a female connector 37 at its inlet end.

The conventional position for such a supplementary medication site is, as shown in FIGURE 4, immediately adjacent the vein puncture location. It is common knowledge among manufacturers and users of infusion systems that the rubber ordinarily used in the supplementary medication sites leaves much to be desired since this rubber is supposed to be self-sealing, but rarely is this consistently so. When multiple punctures of these sites are performed, the sites may display a sieve-like leaking and thus with conventional infusion apparatus require changing the entire set; this result is not only costly, but also endangers the safety of the vein puncture, since changing the supplementary medication site component so close to the needle may dislodge the needle. Paradoxically, it is usually the patient in the most critical condition who needs the greatest number of supplementary medications, and this in turn endangers the safety of the vein puncture, distracts the anesthiologist and the surgeon from the needs of the patient to the needs of the leaking tubing, and thus further endangers the life of the patient.

FIGURE 2 shows a Y-joint type supplementary medication site designated as component 25, with female connector means 26 at the upper end of one of the arms of the Y and male connector means 27 at the bottom of the leg of the Y. The second arm 28 of supplementary medication site 25 can be terminated in any type of fitting desired for communication with a source of liquid for supplementary use. Like the component shown in FIGURE 5, this component is adapted for insertion in any exposed portion of flexible tubing 15 where secure but readily separable junction 16 is located—if desired, high

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in the infusion system, as, for example, between connectors 16a and 16b in FIGURE 1.

FIGURE 3 illustrates diagrammatically an in-line pump 30 (including filter element 31) which can be employed as one component of the system of this invention. As will be seen, this pump (which has female connector means 32 at its top and male connector means 33 at its bottom end) can be inserted in an exposed and readily accessible portion of the apparatus of this invention between, for example, connector means 16a and 16b at junction 16 in FIGURE 1.

FIGURE 6 illustrates another embodiment of the intravenous infusion apparatus of this invention.

Drip chamber 50 has inlet 51 and outlet 52. Attached to drip chamber 50 at outlet 52 is flexible tubing 55. Tubing 55 is slightly more than five feet in length.

Secure but readily separable junction 56 is located about 15 to 16 inches below drip chamber 50. Junction 56 divides flexible tubing 55 into upper portion 55a and lower portion 55b.

Tapered, sliding clamp 59 is provided to selectively stop the flow of liquid from drip chamber 50 through flexible tubing 55, when it is moved into its tightened position around upper flexible tubing portion 55a. A similar flow control means 60 is provided to selectively stop the flow of liquid through lower flexible tubing portion 55b. Flow control means 59 and 60 are shown in convenient locations for ready access by the user of the apparatus, but their location may be changed as desired.

The parenteral infusion apparatus of FIGURE 6 terminates in adapter 58 to which needle 57 may be connected when the apparatus is in use.

In the embodiment shown, resilient, self-sealing rubber tubing 64 is attached at one end to flexible tubing 55 and at the other to adapter 58. This short length of self-sealing rubber tubing provides a chamber which can be used as a supplementary medication site if desired.

Mating members 56a and 56b, which together make up the secure but readily separable junction 56 of the embodiment shown in FIGURE 6, are seen in more detail in the enlarged elevation view of the junction provided in FIGURE 7. As there seen, male connector means 56a terminates in tapered portion 66 which mates with the recess in female connector means 56b to form a snug slip fit therewith.

One of the two elements 56a and 56b is formed of a slightly harder material than the other, so that some resilient expansion can take place in the slightly softer material to help insure the security of the attachment of these two connector means which comprise junction 56. Male connector means 56a may be formed, for example, of polystyrene, while female connector means 56b may be formed, for example, of polypropylene.

Junction 56 is seen in cross section in FIGURE 8. As shown, the outer tapered wall of the terminal portion of male connector means 56a forms a snug slip fit with the inner tapered wall of recess 67 in female connector means 56b.

FIGURE 9 shows another embodiment of a secure but readily separable junction that may be used with the apparatus of this invention. As seen, junction 70 is comprised of upper member 70a and lower member 70b, which are threaded for engagement with one another to join upper portion 55a and lower portion 55b of flexible tubing 55.

Advantages of the apparatus of this invention

The many advantages of the apparatus of this invention—which employs a secure but readily separable junction in the flexible tubing leading from the drip chamber, which junction is located (preferably at a distance from the drip chamber less than half the length of said flexible tubing) in an exposed and readily accessible portion of the tubing—will be immediately apparent.

When a change in conditions during an operation re-

quires the use of some equipment in addition to the conventional drip chamber which is always present, the apparatus of this invention makes this possible in the safest, easiest and most economical manner. Such a change may be a change in the condition of the patient which requires blood transfusion or multiple additional or supplementary medication. It may also be a change in the condition of the equipment being employed, such as the clogging of a filter element resulting from repeated transfusions of whole blood.

Because the apparatus of this invention is a separable, multiple component system rather than one unseparable unit, whenever it is necessary substitution of a new drip chamber with a fresh filtering element can be made at junction 16, 56, or 70, or insertion of a component such as supplementary medication site 25 or 35, or in-line pump 30, can be quickly and readily effected between the connectors which comprise junction 16, 56, or 70. There is thus no need to disturb the draping and interfere with maintenance of sterile conditions, and there is in addition no need to disturb the needle in the patient's vein. Because of this latter fact the need for replacement of the needle, and in extreme cases the actual destruction of the last available superficial vein location, will be avoided. The insertion of the new component into the infusion system will be accomplished at a sufficient distance from the patient that neither the surgeon nor his assistants will be distracted from the surgical problems to which they are directing their attention, nor will the sterility of the operating field be compromised.

The substitution or insertion of a new component in the infusion system can be accomplished very quickly and easily. There will be no unnecessary loss of time. The additional infusion liquid will be made available immediately, when it is needed.

All the advantages just listed are important in and of themselves, but in addition they combine to reduce markedly the chance of contamination at the place where a new component is substituted or inserted in the parenteral infusion apparatus employed. With the apparatus of the present invention, the junction at which the substitution or insertion of a new component is to be made is preferably located at the drip chamber or within about two to two and a half feet of the drip chamber, and in any event in an exposed and easily accessible location where the person responsible for the parenteral therapy can see and reach it easily, and where any draping cloths used will not interfere with him, nor will he interfere with the surgeon at the operating table, as he substitutes or inserts the new component. Hence the substitution or insertion will proceed quickly, surely, and with a minimum risk of contamination.

With the apparatus of the prior art, on the other hand, the necessity of changing the connection at the needle site greatly increases the risk of contamination for several reasons. Such a change is awkward to carry out because of interference from the draping cloths, the lack of light under the draping cloths, and the need to avoid interfering with the surgeon in his work. Under these conditions, it is difficult to effect the change rapidly or surely. Because of the closer proximity to the patient, there is greater danger of contact with the skin of the patient. Because it is difficult to hold the needle quite still during the change of components (which is necessary to avoid loss of the needle site, as, for example through puncturing the vein), the person making the change is under greater tension and is thus likely to be less certain in his handling of the components. The new type of plastic needle, which would obviate this disadvantage to an extent, is expensive, requires special skills, and is thus not routinely utilized. All these factors markedly increase the chance of contamination with the prior art apparatus as compared to the parenteral apparatus of the present invention.

In addition to these functional advantages accruing from the use of the apparatus of this invention, there are

also resulting savings in cost which are not inconsiderable in magnitude. As will be seen, the same drip chamber (10 or 50) lower portion of the flexible tubing (15b or 55b) adapter (13 or 53) and needle (17 or 57) can be used throughout an operation as are included in the basic infusion system. Instead of having available several expensive, complicated bulky units which constitute whole system integral unto themselves, the anesthesiologist or other person responsible for parenteral therapy need have at hand only a group of relatively inexpensive, simple, single components which can be introduced into the basic system whenever they are needed. He can thus have available everything necessary for any foreseeable emergency, but at a minimum of cost and inconvenience.

Further economic waste is avoided by the apparatus of the present invention in two other situations. With existing infusion devices, when a single needle insertion is to be relied upon throughout an operation, the anesthesiologist must use a device complicated enough to meet the worst eventuality which is foreseeable. Obviously, if the worst eventuality which was foreseen does not arise, the device employed was too elaborate and too expensive.

Another example of avoidance of economic waste is presented by the situation in which a unit of a particular type must be employed at two different times during the same operation, with a unit of another type being employed for this patient in some intervening step. Under these circumstances, it is difficult and often unsafe to try to keep an entire integral unit sterile during the intervening period when it is not in use, while with the apparatus of this invention it would be entirely safe and feasible to keep the drip chamber 10 or 50 (or other comparable component) with its relatively short length of tubing, if any, between outlet 12 or 52 and junction 16 or 56, respectively, in a sterile condition.

Finally, use of the apparatus of this invention will result in important advantages in the planning and purchasing of equipment for use by the anesthesiologist. The flexibility achieved by this invention should permit the anesthesiologist to select the best available components made by different manufacturers and to insert these separate components in the system as needed. The hospital will need to purchase only (1) the basic apparatus as an integral but separable unit, plus (2) a drip chamber containing a filter, (3) an in-line blood pump, (4) a self-sealing type supplementary medication site, (5) a hypodermoclysis device for subcutaneous injection of fluids such as saline or glucose solution, (6) general purpose Y-joints, and (7) a needle, in order to meet every need that may arise for parenteral infusion therapy throughout the hospital.

With this simplified system of interchangeable components it will be easier to inform the anesthetist, other physicians, nurses, aides, and other hospital personnel as to the available equipment, the business aspects of procurement of the equipment will be simplified, and fewer different items need be carried in inventory with resulting savings in money and space.

All these advantages accruing from the apparatus of this invention make this invention one of great importance to the hospital, to physicians, and to the patient. Many of the advantages specified above have been discussed as accruing to the anesthesiologist, but these advantages may also benefit the nurses, students and other technicians participating in the parenteral therapy, as well as other physicians practicing anesthesia—in rural areas, for example—on a part time basis.

The above detailed description of this invention has been given for clearness of understanding only. No unnecessary limitations should be understood therefrom, since modifications will be obvious to those skilled in the art.

I claim:

1. Parenteral infusion apparatus which comprises: a drip chamber, said chamber being formed of shape re-

taining material and having an inlet at its top through which the liquid to be administered with the infusion apparatus may be introduced at a variable rate, said chamber having an outlet at its bottom, at least a portion of the walls of said chamber being formed of light transmitting material through which said liquid can be observed; a flexible tubing, one end of said tubing being attached to the drip chamber at said outlet, said tubing being at least about five feet in length; an adapter for an injection needle attached to the distal end of said flexible tubing; a secure but readily separable junction in said flexible tubing, said junction communicating directly with the portions of said flexible tubing on either side of the junction, said junction being spaced from said drip chamber outlet at a distance less than about two and a half feet, so that said junction is located in an exposed and easily accessible portion of said flexible tubing between the drip chamber and the portion of the tubing that, when the tubing is in use, lies under any draping cloths employed to cover the patient; first flow control means, operatively associated with said drip chamber and the portion of said flexible tubing positioned between said drip chamber and said junction, for selectively stopping the flow of liquid from said drip chamber outlet through said flexible tube; and second flow control means positioned on the portion of said flexible tubing lying between said junction and said distal adapter, for selectively stopping the flow of liquid therethrough, whereby said infusion apparatus may be used for a patient requiring a routine parenteral infusion, and if other needs arise another component may be quickly substituted at said junction for the component of the apparatus extending above said junction, or another component may be quickly inserted at said junction between the two components of said apparatus which are joined by said junction.

2. The parenteral infusion apparatus of claim 1 in which said junction is comprised of a male connector means and a female connector means.

3. The parenteral infusion apparatus of claim 1 in which said junction is comprised of complementary connector means which form a snug slip fit.

4. The parenteral infusion apparatus of claim 1 in which said junction is comprised of complementary connector means in threaded engagement with each other.

5. Parenteral infusion apparatus which comprises: a drip chamber, said chamber being formed of shape retaining material and having an inlet at its top through

which the liquid to be administered with the infusion apparatus may be introduced at a variable rate, said chamber having an outlet at its bottom, at least a portion of the walls of said chamber being formed of light transmitting material through which said liquid can be observed; a flexible tubing, one end of said tubing being attached to the drip chamber at said outlet, said tubing being at least about five feet in length; an adapter for an injection needle attached to the distal end of said flexible tubing; an injection needle removably attached to said adapter; a secure but readily separable junction in said flexible tubing, said junction communicating directly with the portions of said flexible tubing on either side of the junction, said junction being located adjacent said drip chamber outlet; first flow control means, operatively associated with said drip chamber and the portion of said flexible tubing positioned between said drip chamber and said junction, for selectively stopping the flow of liquid from said drip chamber outlet through said flexible tube; and second flow control means positioned on the portion of said flexible tubing lying between said junction and said distal adapter, for selectively stopping the flow of liquid therethrough, whereby said infusion apparatus may be used for a patient requiring a routine parenteral infusion, and if other needs arise another component may be quickly substituted at said junction for the component of the apparatus extending above said junction, or another component may be quickly inserted at said junction between the two components of said apparatus which are joined by said junction.

References Cited by the Examiner

UNITED STATES PATENTS

1,084,753	1/14	Owens	128—214
2,471,623	5/49	Hubbell	128—214
2,668,533	2/54	Evans	128—214
2,674,265	4/54	Dennis	128—213 X
2,702,034	2/55	Walter	128—214
2,704,544	3/55	Ryan	128—214
3,127,892	4/64	Bellamy et al.	128—214

OTHER REFERENCES

Gardner et al.: "Platelet Transfusions Utilizing Plastic Equipment," J. Lab. & Clin. Med., vol. 43, No. 2, pp. 196—207.

RICHARD A. GAUDET, *Primary Examiner*.