TRANSFER NEEDLE ASSEMBLY

ABSTRACT: A transfer needle assembly for transferring fluid from a fluid source to a fluid collection container. The assembly includes support means adapted at its rear end to be associated with the collection container and at its forward end to the fluid source. A first cannula is mounted on the support means and is adapted to be connected at its forward end to the fluid source and at its rear end to the collection container. A second cannula is mounted on the support means and is adapted to be connected at its forward end to the fluid source and at its rear end to the atmosphere. In this manner, fluid is permitted to be transferred from a fluid source to a collection container by atmospheric pressure when the volume within the collection container is sufficiently increased.
TRANSFER NEEDLE ASSEMBLY

BACKGROUND OF THE INVENTION

In the hospital art today it is common to use a prefilled unit dose syringe which may be disposed of after the dose is administered. The efficiency of such a device is readily apparent. The prefilled syringe can be particularly useful to a doctor who has to administer one dose of a particular medication to one patient while not having to administer a multiplicity of doses to a multiplicity of patients within a reasonable short period of time.

In large hospitals where there are many patients, a particular medication may be stored or lodged in a large container. This container would naturally contain a large number of doses in a common-volumetric storage unit. It would therefore be very advantageous for a large hospital to be able to quickly and efficiently remove single doses from the storage unit and locate them individually in a large number of syringes. In this way, both disposable and nondisposable syringes may be used to receive a particular dose from the large container for administration rather than the use of a particular patient. This would be a cost saving for the hospital and an economical advantage in that a large volume of a particular medication may be stored in one container rather than in a large number of prefilled syringes. The storage and cost savings are readily apparent.

It is also important that each syringe be quickly and efficiently filled from the vat or container without having to go through an exciting, difficult and time-consuming filling procedure. Naturally, if a rapid and efficient filling process could be perfected, it would be unnecessary to maintain a large supply of prefilled syringes readily at hand. This type of arrangement would be particularly advantageous to the art and would be extremely useful in large hospitals where great numbers of doses of an individual medication are often needed within a short period of time. Furthermore, a cost saving would be present in that the medication could be purchased in large volume units and reusable syringes as well as unfilled disposable syringes may be employed. Certainly it is readily apparent that the purchase of a large volume of a particular medication in one container would be less costly than purchasing a similar volume of medication contained in individual prefilled syringes.

One of the major problems currently existent with filling an individual syringe from a large container is the necessity that the syringe and container be inereted so that fluid may be drawn in a downward direction from the container into the syringe. The problem is aggravated when a particularly large type of container for the medication is employed. It would certainly be time-saving and advantageous if the container could simply be placed on a surface such as a table and fluid drawn upwardly from the container into a syringe. In this arrangement it would not be necessary for the operator to hold the container in most instances since the natural weight thereof would retain it in a steady position while the syringe is being filled. This is contrary to known practice in the filling of syringes and would certainly add to the advantages of a system when a large number of syringes are filled from a single container rather than the filling of a large number of previously prefilled and sealed syringes.

SUMMARY OF THE INVENTION

It is therefore a primary objective of the invention to provide a syringe-filling system containing the above-discussed advantageous features whereby a large container may be placed upright on a surface, a transfer needle assembly attached thereto and a syringe in turn attached to the transfer needle assembly so that the three elements are aligned vertically and then as the plunger of the syringe is withdrawn within the syringe barrel, passages within the structure of the transfer needle assembly will permit the atmosphere to force fluid from the container upwardly through the transfer needle assembly into the syringe until the desired dose is extracted. This operation may be accomplished accurately, quickly and efficiently.

In summary, it is accomplished by the use of a transfer needle assembly for transferring fluid from the fluid source to a fluid collection container. The assembly includes a support means that extends rearwardly to be associated with the collection container and at its forward end to the fluid source. A first cannula is mounted on the support means and is adapted to be connected at its forward end to the fluid source and at its rear end to the collection container. A second cannula is mounted on the support and is adapted to be connected at its forward end to the fluid source and at its rear end to the atmosphere.

When assembled in this manner, fluid is permitted to be transferred from the fluid source to the collection container by atmospheric pressure when the volume within the collection container is sufficiently increased.

With the above objects, among other, in mind, reference is had to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is an exploded sectional elevation view of the transfer needle assembly of the invention shown in alignment with a fluid collection container and a fluid source;

FIG. 2 is a sectional elevation view thereof shown in alignment with a fluid collection container and a fluid source with arrows showing direction of flow of the fluid from the source to the container and the direction of flow of air from the atmosphere into the fluid source;

FIG. 3 is an exploded sectional elevation view of an alternative embodiment of a transfer needle assembly of the invention shown in alignment with a fluid collection container and a fluid source; and

FIG. 4 is a sectional elevation view thereof shown in assembled position with a fluid collection container and a fluid source with arrows showing direction of flow of fluid from the fluid source to the fluid container and the direction of flow of air from the atmosphere into the fluid source.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

An initial embodiment of the invention is depicted in FIGS. 1 and 2. The transfer needle assembly of this embodiment includes a first cannula 21, a second cannula 22, a first part 23 and a second molded part 24. Cannulas 21 and 22 may be constructed of a common type of material such as normally utilized stainless steel. Cannula 21 is also of a much narrower gauge than second cannula 22 so that it may be extended through the bore 27 thereof. Cannula 22 has a forward pointed end 28. Bore 27 extends through the entire length of cannula 22 and cannula 21 likewise has a bore 29 which extends its entire length.

Molded portions 23 and 24 may be constructed of any common type of solid material commonly utilized in this environment such as a plastic, for instance, polypropylene.

Shown in position to be connected to the transfer needle assembly is a fluid collection container 30. Container 30 includes a plunger 32 attached to a stopper 33 withing the barrel of the container and sealingly engaging the interior walls thereof. A reduced forward tip portion of the syringe barrel contains an opening at the forward tip of the barrel through which to receive fluid into an enlarged collection chamber 49 provided between stopper 33 and the reduced forward tip portion of the container when plunger 32 is retracted. Naturally, the transfer needle assembly of this embodiment and all other embodiments shown or suggested are readily adaptable for use with many other types of commonly used fluid collection containers.

Positioned below the transfer needle assembly in an upright position is a fluid source 34. This may be any large container containing a large volume of medication having a pierceable sealing member 35 sealing its upper end and it may be placed in normal upright position on any flat surface such as a table or laboratory working surface area.

First member 23 has a body portion 36 and an upwardly cylindrical portion 37. Upstanding portion 37 has a hollow in-
terior with the interior surface thereof 38 having a frustocon-
cial configuration with the wider portion at the top. Commu-
nicating with the hollow center of upsetting portion 37 is a
bore 39 in body portion 36 of first member 23. Mounted on
bore 39 is second cannula 22. The bore 27 of cannula 22 com-
municates with the hollow interior of upsetting portion 37 to
form a continuous passage through first member 23.
Second member 24 contains a body portion 40, an upstanding
cylindrical hollow portion 41 extending upwardly from
body portion 40 and a frustoconical shaped downwardly ex-
tending portion 42 which tapers inwardly as it extends
downwardly from body portion 40. A continuous passageway
43 extends through body portion 40 and frustoconical portion
42 and communicates with the hollow interior 44 of upward-
ly extending cylindrical portion 41. This provides a continuous
passageway through second member 24. A plurality of
downwardly extending ribs 45 surround the circumferential
outer surface of portion 42 which facilitates proper engage-
ment with the tapered inner surface of upsetting portion 37
of member 23 when members 23 and 24 are properly con-
ected.
Cannula 21 is mounted in passageway 43 of member 24 by
any convenient means such as an epoxy resin and similarly
cannula 22 is mounted in passageway 39 of member 23 by a
similar type of epoxy resin to provide a firm mounting for both
cannulas in their respective members. It may also be noted
that the upper internal surface of cylindrical hollow portion 41
has an outward bevel 46 to facilitate the reception of collection
container 30 therein when transfer needle assembly is as-
sembled thereto.
FIG. 2 of the drawing shows the respective elements in as-
sembled position so that a fluid dose of a medicament is being
transferred from fluid source 34 into collection container 30.
In operation, to achieve this position, member 24 is inserted
into member 23 so that cannula 21 passes through the bore of
cannula 22 and the top 25 of cannula 21 extends beyond the
tip 28 of cannula 22. Ribs 45 of frustoconical-shaped portion
42 of member 24 engage with the inner surface 38 of member
23 so as to restrict the movement of portion 42 within portion
37 so that it will not seat at the bottom surface thereof but will
leave a small air passageway 47 as shown in FIG. 2. Passageway
47 communicates with bore 27 cannula 22 and spaces 48 which exist between each successive pair of ribs 45 to provide a series of passageways around the circumference of the respective members 23 and 24 from the atmosphere through the space 48' between the bottom surface of body
portion 40 and the top surface of upsetting portion 37 and
communicating passageways 45, 47, and 27. This completes
assembly of transfer needle assembly 20 which then may be in-
serted through the puncturable top 34 of container. Pointed
tips 25 and 28 on the two cannulas facilitate en-
trance into the fluid source 34. As seen in FIG. 2, tip 25 ex-
tends well down within the fluid source while tip 28 is posi-
tioned near the upper portion of fluid source 34. Assembly 20
is lowered into fluid source 34 until the bottom surface of
body 36 engages the top of fluid source 34 and is seated thereon.
A collection container such as container 30 is then inserted
into hollow center 44 of portion 41 until the tip 26 of cannula
21 in the upper portion extends through the opening in the
reduced forward tip portion of the container and into the
interior of container 30. In this position, a continuous passageway is now provided through bore 29 of cannula 21 into container 30. Since stopper 33 sealingly engages the inner
walls of container 30, a collection chamber 49 is now provided
between stopper 33 and the forward tip portion of the con-
tainer to receive the required dose.
Plunger 32 is then withdrawn within the barrel of container
30 until the desired volume for chamber 49 is attained.
Atmospheric pressure will then cause air to pass through the
passageway between the top of member 23 and the tip of top
through bore 27 of cannula 22 into fluid source 34. The at-
mospheric pressure causing the air to flow in this manner will
be greater than the pressure within chamber 49 in collection
container 30 and therefore the air will force fluid through bore
29 in cannula 21 into chamber 49 of collection container 30
until the desired amount of liquid is present therein. Container
30 may then be removed from tip 26 of cannula 21 and a con-
ventional sealing plug (not shown) may be positioned on the
forward end of container 30 to seal the opening at the forward
tip thereof thereby providing a collection container 30 in sub-
stantially the same condition as a prefilled syringe would
be prior to use. In the above-discussed manner, a great number of
syringes may be quickly and efficiently filled as the need oc-
curs from one large fluid source 34. Therefore, there is no
need to store for a lengthy period of time a great number of
prefilled containers. The needle assembly of this invention
renders it possible to quickly and efficiently fill a multiplicity of containers similar to collection container 30 from one large
fluid source such as indicated by container 34.
An alternative embodiment is illustrated in FIGS. 3 and 4.
The operation of this transfer assembly 20' is similar to that of
the previously discussed embodiment in member 52 of transfer
preparation of a large number of predetermined doses in in-
dividual collection containers such as the one illustrated in
FIG. 3 and designated by the reference numeral 50 from a
fluid source such as that shown in FIG. 3'. The transfer assembly
20' itself is once again constructed of parts 51 and 52 which
when assembled and connected to fluid source 34 and collect-
ion container 50 facilitates the transfer of a predetermined
dose to a large number of successive collection containers.
Member 51 of the transfer needle assembly 20' may be con-
structed of a molded plastic material such as polypropylene or
any one of a number of other plastics which will operate
satisfactorily as well as other types of materials including
metallic materials. Member 51 includes a body portion 52 and
a vertically upwardly extending hollow cylindrical portion 53.
Cylindrical portion 53 is open at the top as in the case of the
previous embodiment and its hollow interior 54 contains a
plurality of vertical spaced ribs 68 extending inwardly. Each
rib 68 has an annular shoulder 55 near the lower end thereof
and a beveled annular shoulder 56 on its interior surface ad-
jacent the upper edge thereof. The shoulders 55 and 56 form
positions for retaining member 52 of transfer needle assembly
20' as shown in the assembled configuration of FIG. 4.
Member 52 is generally constructed of a flexible
punctureable material such as rubber or any other variety of
similar materials which will operate satisfactorily. Member 52
includes a flat circular body portion 57 and an annular up-
wardly projecting portion 58. The interior surface of portion
58 tapers outwardly extending toward the hollow interior 59 which has a frustoconical configuration adapted to receive a frustoconical forward portion of a collect-
ion container such as that shown in FIGS. 3 and 4. Naturally,
the interior surface of portion 58 may assume the configura-
tion desired for the particular collection container 50 to be
utilized with the transfer needle assembly.
Returning to the structure of member 51 there are two sub-
stantially parallel bores or passageways 60 and 61 in portion
52 thereof. These bores 60 and 61 are of substantially the
same diameter and have mounted therein cannulas 61' and
60' respectively. Naturally, the mounting of cannulas 61' and
60' may be accomplished by any common means such as by
one of many different types of epoxy resin. In this embed-
ment, it will be noted that cannulas 61' and 60' are of substan-
tially the same diameter and do not extend concentrically with
respect to each other. However, cannula 60' is similar in size
to cannula 21 in the previous embodiment and is a cannula
having two pointed ends 62 and 63. Cannula 60' is con-
siderably longer than cannula 61' so that the upwardly extend-
ing point 62 extends well within hollow chamber 54 in member
51 and the second point 63 extends a considerable distance beyond point 64 of cannula 61' in a downward direction. Cannula 52 has only one pointed end 64.
at its lower end and the upper end thereof is substantially flush with the upper surface of portion 52 of member 51. When transfer needle assembly 20' is assembled, flexible member 52 is positioned within rigid member 51 so that point 62 and the upper portion of cannula 60' extend therethrough. When properly positioned, the rounded portion 57 of member 52 has its lower surface resting on shoulder 55 and its vertical exterior surfaces contacting parallel ribs 68 on the inner surface of cylindrical portion 53 of member 51. The spaces between these vertical ribs form passageways 69 between flexible member 52 and the inner walls of cylindrical portion 53 to allow air to pass therethrough between passageways 69 and into bore 70 extending the full length of cannula 61'. Beveled shoulders 56 and shoulder 55 of each rib serve to maintain member 52 in position. Therefore, when transfer needle assembly 20' is thus connected, it will operate similar to transfer needle assembly 20 of the previously discussed embodiment. The coupling assembly 20' to fluid source 34' and collection container 50 and the flow of air and fluid resulting therefrom is illustrated in FIG. 4. It will be noted that after members 51 and 52 have been assembled, assembly 20' is projected through pierceable top 35' until the bottom surface of portion 52 of member 51 becomes flush with the top surface of fluid source 34'. Cannulas 60' and 61' will then extend within fluid source 34' with tip 63 of cannula 60' extending to a considerably greater depth than tip 64 of cannula 61'. This is to facilitate the flow of air into fluid source 34' and fluid from source 34' into collection container 50 similar to the previously discussed embodiment. A collection container 50 may then be attached to the upper portion of assembly 20'. As in the previous embodiment, with this particular embodiment, a collection container such as that shown in FIGS. 3 and 4 will operate most effectively although other common types of containers are readily adaptable or use in this environment. This assembly includes a plunger 65 attached to a stopper 66 within the barrel of the container and sealingly engaging the interior walls thereof. An opening 67 is positioned at the lower or forward tip of collection container 50 thereby permitting communication to a fluid collection chamber 71 between stopper 66 and opening 67. Therefore when collection container 50 is attached to transfer needle assembly 20' by inserting the forward portion thereof into the hollow tapered opening 59 in member 52, tip 62 and the upper portion of cannula 60' will enter opening 67 to provide a communication between fluid source 34' and collection fluid chamber 71. When the elements are thus assembled, plunger 65 may be upwardly withdrawn within the barrel of collection container 50 to increase the volume of chamber 71 by enlarging chamber 71 to the desired size thereby permitting atmospheric pressure to project fluid into chamber 71. This is accomplished by air passing through passageways 69 between member 52 and portion 53 of member 51 and into the bore of cannula 61' where it will pass therethrough out through tip 64 and into fluid source 34'. Shoulder 55 prevents member 52 from being projected to the full depth of portion 53 and cooperate in providing a space or passage area 72 to permit communication and flow between passageways 69 and the bore of cannula 61'. Fluid is then forced into tip 63 of cannula 60' upwardly out through tip 62 into collection chamber 71 until collection chamber 71 within container 50 is filled with the desired dosage. It can be readily seen that the operation is quite similar to that described in connection with the previous embodiment. When the desired dosage is drawn in chamber 71 the collection container 50 may be removed and another container attached thereto and the operation repeated quickly and efficiently to attain the desired number of containers for immediate use. This assembly may be readily adapted so that member 52 forms the sealing plug for opening 67 in container 30 when it has been filled and removed, in which case a new member 52 would be utilized with each container 50 to be filled. Alternatively, member 52 may be retained as part of the permanent transfer needle assembly for the filling of a succession of containers and a separate plug be provided for each filled container as in the previously discussed embodiment. When the desired number of filled containers has been obtained, the assembly 20' may be removed from fluid source 34' and top 35' will seal to maintain whatever fluid is still present in source 34' in condition for use when needed at a later date. In this manner, the above-mentioned advantageous features of such a transfer needle assembly such as assemblies 20 and 20' are adequately achieved. It should be noted once again that there is no need to invert the fluid source 34' or 34' at any time and that assemblies 20 and 20' permit fluid to be withdrawn in a vertically upward direction quickly and efficiently in repeated doses. Thus the above-discussed objects of the invention, among other, are effectively attained. 1. A transfer needle assembly for transferring a predetermined amount of fluid from the interior of a fluid source to a plurality of successive syringes, with each syringe including a barrel having an opening at the forward end thereof and a plunger slidably mounted therein in sealing engagement with the interior walls of the barrel so that movement of the plunger varies the volume interior of the syringe, said assembly comprising: support means adapted at its rear end to be removably connected to the forward open end of a syringe barrel and at its forward end to be removably connected to a fluid source; a first cannula having a passage therethrough mounted on said support means and adapted to be connected a5 its forward end to the interior of a fluid source and at its rear end to the interior of the syringe barrel; said first cannula being elongated so as to extend into the fluid of the fluid source when the fluid source is in an upright position; a second cannula having a passage therethrough mounted in said support means and adapted to be connected at its forward end to the interior of said fluid source and at its rear end to the atmosphere; said second cannula being shorter in length than said first cannula so that the forward tip thereof does not extend into the fluid in said fluid source when the fluid source is in an upright position; the fluid source, transfer needle assembly and syringe being arranged in ascending vertical order and the forward end of the syringe being in sealing engagement with said assembly so that, when the plunger of the syringe is withdrawn, the volume in said barrel is increased and atmospheric pressure will cause fluid to flow from the fluid source to the syringe to the desired level therein thereby facilitating the transfer of fluid from the fluid source upwardly into the syringe without the necessity of inverting the engaged fluid source, assembly and syringe; and said assembly permitting the filling of a plurality of successive syringes in the same manner from the same fluid source without the necessity of inverting the fluid source. 2. The invention in accordance with claim 1 wherein said support means includes a first member having an annular portion tapering outwardly and upwardly therefrom, the opening in said annular portion communicating with a bore in the remainder of said first member to form a continuous passage therethrough, said second cannula mounted in said bore of said first member and extending downwardly therefrom, a second member having a frustoconical portion extending downwardly and inwardly therefrom, and upstanding hollow cylindrical portion extending upwardly from said second member, a passageway extending through the said second member and communicating with the opening in said hollow cylindrical portion, said first cannula having a smaller outer diameter than the inner diameter of said second cannula mounted in said second member so as to extend upwardly into the opening of said cylindrical portion and downwardly from said second member beyond the lower end of said second can-
nula, said hollow cylindrical portion and said upwardly extending portion of said first cannula adapted to be connected to said fluid collection container, said frustoconical portion of said second member adapted to be mounted in said annular portion of said first member with said first cannula extending through the passage in said second cannula and beyond, means on said first and second members to provide a continuous passageway from said fluid source to the atmosphere when said support means is connected with a fluid source with said cannulas inserted therein and is connected with a fluid collection container.

3. The invention in accordance with claim 2 wherein said means on said first and second members to provide a passageway includes a plurality of spaced downwardly extending ribs on the circumference of said frustoconical portion of said second member which engage with the inner surface of said annular portion of said first member to restrict the placement of said frustoconical portion into said annular portion to less than its entire length so that when said support is connected to a fluid source and a fluid collection container and the volume is increased in said collection container, air from the atmosphere will pass through the space between the upper rim of said annular portion and the second member, between the ribs on said frustoconical portion, and through the passageway in said second cannula into the fluid source thereby forcing the desired amount of fluid through the first cannula into the fluid collection container.

4. The invention in accordance with claim 1 wherein said support means includes a first member having a hollow cylindrical portion extending upwardly therefrom, a first bore in the remainder of said first member communicating with the opening in said cylindrical portion of form a first continuous passage therethrough, a second bore in said first member substantially aligned with and spaced from said first bore and also communicating with the opening in said cylindrical portion to form a second continuous passage therethrough, said second cannula mounted in said second bore in said first member and extending downwardly therefrom, said first cannula mounted in said first bore so as to extend upwardly into the opening of said cylindrical portion and downwardly from said first member beyond the lower end of said second cannula, a second flexible punctureable member adapted to be mounted in the hollow cylindrical portion of said first member and to receive the upper end of said first cannula therethrough, said second member and the upper portion of said first cannula extending therethrough adapted to be connected to said fluid collection container, means on said second member and said first member to provide a continuous passageway from said fluid source to the atmosphere when said support means is connected with a fluid source with said cannulas inserted therein and is connected with a fluid container.

5. The invention in accordance with claim 4 wherein said means on said first member and second member to provide a passageway includes a plurality of spaced upwardly extending ribs on the inner circumference of said cylindrically shaped portion of said first member, said ribs depressing said second member at points around its outer circumference when said second member is inserted into said first member to provide a series of air passageways between the engaging surfaces of said first and second members, a circumferential shoulder formed on the interior surface of said cylindrically portion of said first member adjacent the lower end thereof to restrict the downward extension of said second member into said first member so that when said support is connected to a fluid source and a fluid collection container and the volume is increased in said collection container, air from the atmosphere will pass through the passageways between the first and second members and through the passageway in said second cannula into the fluid source thereby forcing the desired amount of fluid through the first cannula into the fluid collection container.

6. The invention in accordance with claim 1 wherein the needle assembly is connected to a syringe and is connected to a fluid source.

7. A method of transferring a predetermined amount of fluid from the interior of a fluid source to a plurality of successive syringes, with each syringe including a barrel having an opening at the forward end thereof and a plunger slidably mounted therein in sealing engagement with the interior walls of the barrel so that movement of the plunger varies the volume interior of the syringe and utilizing a transfer needle assembly including support means, a first cannula mounted thereon and extending upwardly and downwardly therefrom into the fluid in the fluid source and a second cannula mounted thereon and being longer than the first cannula and extending downwardly therefrom into the fluid source and not the fluid contained therein and the second cannula being open to atmosphere at its upper end comprising:

- connecting the lower ends of said cannulas to the fluid source;
- connecting the upper end of said first cannula and said support means to the syringe;
- withdrawing the plunger of the syringe so as to provide an increase in volume within said syringe so that air enters the upper end of the second cannula and passes into the fluid source to force fluid through the first cannula into the syringe;
- arranging said fluid source, transfer needle assembly and syringe in ascending vertical order so that when the volume is increased within the syringe, fluid will flow from the fluid source to the syringe thereby facilitating the transfer of fluid from the fluid source upward into the syringe to collect fluid from the fluid source without the necessity of inverting the engaged fluid source, transfer needle assembly and syringe; and
- removing the syringe and filling a successive number of additional syringes consecutively in the same manner from the same fluid source without the necessity of inverting the fluid source.