



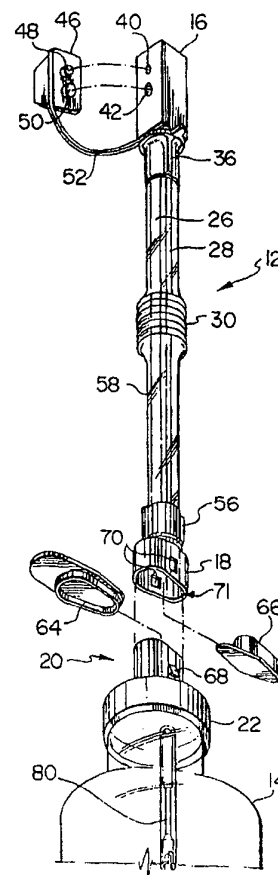
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(54) Title: A SYSTEM FOR FILLING AN ANAESTHETIC VAPORIZER

(57) Abstract

The invention provides a quick and efficient system for connecting and disconnecting an anaesthetic container to a vaporizer without opening the container in the operating room. In accordance with the invention, a flexible, kink-resistant tube is provided with coupling means at both ends. The vaporizer end of the tube is provided with a vaporizer adaptor that engages with an anaesthetic vaporizer. The closure end of the tube is provided with a closure adaptor that engages with a closure on an anaesthetic container. The closure is preferably connected to the supply container prior to use in the operating room.



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A SYSTEM FOR FILLING AN ANAESTHETIC VAPORIZER

FIELD OF THE INVENTION

This invention relates to devices for use in safely handling anaesthetics in operating rooms. The invention provides a closed system that enables the transfer of anaesthetic from a container to a vaporizer minimizing the escape of vapour or liquid to the atmosphere.

BACKGROUND OF THE INVENTION

Anaesthetics are typically highly volatile substances with relatively low boiling points and high vapour pressures. They are generally highly flammable and explosive substances in both their liquid and vapour states. Further, inhalation by personnel using them can cause drowsiness. The use of anaesthetics in operating rooms therefore requires safe handling in order to minimize the risk of inhalation by medical personnel as well as to minimize the risk of fire or explosion. Preferably, the anaesthetic should be used in a way which will ensure that there is no contamination of the atmosphere at all stages of handling during normal surgical procedures.

In the past, devices that have been used for the transfer of an anaesthetic from a supply container to a vaporizer have not provided a closed system that eliminates the escape of anaesthetic gases to the atmosphere. Typically, during set-up procedures, a supply container of anaesthetic is opened in the operating room and attached to a feed line leading to a vaporizer thereby resulting in a period of time during which the open container of anaesthetic is exposed to the atmosphere. Similarly, during disassembly of the container from the vaporizer, the feed line is disconnected for disposal from the supply container also exposing the anaesthetic in the feed line and the open container to the atmosphere.

US Patent 5,144,991 discloses a filling device for an anaesthetic vaporizer with a temperature sensitive switching member. US Patent 4,867,212 discloses a safety arrangement for filling and emptying an anaesthetic vaporizer with a joint piece at the vaporizer end of the device. Difficulties with these devices include the fact that the supply container must be opened before it is connected to the vaporizer, therefore allowing anaesthetic to escape to the atmosphere.

SUMMARY OF THE INVENTION

The invention provides a quick and efficient system for connecting an anaesthetic container to and disconnecting it from a vaporizer without opening the container in the operating room.

In accordance with the invention, a connector tube is provided with adaptors at both ends. Preferably, the tube is flexible and is kink-resistant. The vaporizer end of the tube is provided with a vaporizer adaptor that engages with an anaesthetic vaporizer. The end of the tube to attach to the anaesthetic container is provided with a closure adaptor that engages with a closure on the anaesthetic container. The closure is preferably connected to the supply container prior to use in the operating room. The closure is also provided with a frangible seal adapted to be perforated by a piercing means within the closure adaptor. Following perforation of the frangible seal by the piercing means, the closure adaptor and closure remain locked together, permitting the transport of anaesthetic between the supply container and vaporizer through the tube. The system remains closed to the atmosphere throughout the assembly or disassembly procedures.

The invention also preferably provides dust covers to aid in maintaining internal surface cleanliness and in

preventing any anaesthetic in the tube after use from escaping to pollute the atmosphere.

Preferably, the invention is constructed of inexpensive, plastic components which are disposable.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a perspective drawing of the connector tube according to the invention and an anaesthetic container having a closure adapted to mate with the tube.

Figure 2 shows a cross-sectional view of the connector tube of the invention.

Figure 3 shows a cross-sectional view, on a larger scale than Figure 2, of the end of the connector tube which mates with the closure of the anaesthetic bottle, and of the anaesthetic bottle closure.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Figure 1 shows a system for filling an anaesthetic vaporizer of conventional type (not shown) by using a connector tube 12 and an anaesthetic supply container 14. The tube 12 is provided with a vaporizer adaptor 16 and a closure adaptor 18.

As shown in more detail in Figure 3, closure 20 is mounted on the supply container 14 with collar 22 retaining the closure 20 on the container 14. Collar 22 is designed to snap-fit over the upper flange 24 of container 14. Alternatively, closure 20 can be retained on container 14 by a metal crimp (not shown). A lower portion 21 of closure 20 seats within the open neck of container 14. Downward pressure from collar 22 effectively seals the contents of supply

container 14 from the atmosphere.

As best shown in Figure 2, the connector tube 12 houses two tubes which are designed to connect the container 14 to the vaporizer. In the embodiment shown, these are a filling member 26 and a venting member 28, both positioned internally to a cover member 58. However, it is within the scope of the invention for the cover member 58 also to fulfil the function of either the filling tube or the venting tube, in which case there would be only one tube within cover member, 58 and cover member 58 would be appropriately connected to the vaporizer adaptor 16 and the closure adaptor 18 to fulfil the function of the other tube. Preferably, filling member 26 and venting member 28 cross over one another between the closure adaptor 18 and vaporizer adaptor 16, in order to reduce the likelihood of kinking or twisting of these tubes (not shown). A corrugated flexible region 30 is also preferably provided on cover tube 58 to provide flexibility so that the cover tube will flex at that region rather than twisting or kinking. This reduces the likelihood of kinking of filling and venting tubes 26 and 28 and to provide flexibility for the connecting tube as a whole. The material of the filling and venting tubes is preferably polytetrafluoroethylene because of its inertness and its resistance to permeation by anaesthetic vapours. The cover tube 58 is preferably polyvinylchloride for flexibility and ease of forming corrugated flexible region 30.

Vaporizer adaptor 16 is attached to one end of cover member 58 and is of a standard configuration to mate with a vaporizer. In Figures 1 and 2 it is shown as being a rectilinear solid, but it is shaped to fit the particular shape of connector on the vaporizer. Often, vaporizers are designed with connectors of a specific shape to minimize the possibility of error when attaching anaesthetic containers. The connector tube 12 can therefore be provided with a

specific vaporizer adaptor which is specific to the vaporizer with which it is to be used. The vaporizer adaptor 16 has a circular cylindrical portion 38 extending from one end. In the particular embodiment, it is also provided with a recessed groove (not shown) along one corner edge thereby providing an asymmetric shape to ensure correct orientation within the corresponding connector portion of the particular vaporizer with which it is to be used. The vaporizer adaptor 16 is matingly attached to cover tube 58 by means of a metal piece 36 externally crimped over and constricting the cover tube 58 around the cylindrical portion 38 of the vaporizer adaptor 16. The vaporizer adaptor 16 is also provided with filling channel 32 and venting channel 34 in direct communication with filling member 26 and venting member 28 respectively. Filling member 26 is press fitted within filling channel 32, and venting member 28 is press fitted within venting channel 34. Exit hole 40 of filling channel 32 and exit hole 42 of venting channel 34 are positioned in a standard orientation for the vaporizers with which the invention is to be used so as to communicate respectively with the portion to be filled of the vaporizer and with the portion of the vaporizer from which air is to be evacuated.

A blocking cap 46 with stubs 48 and 50 is provided for blocking exit holes 40 and 42 prior to and following use of the system. Stubs 48 and 50 may be inserted within exit holes 40 and 42 respectively to block them. Retaining leash 52 extends between tube 12 and blocking cap 46 and is provided to prevent separation of the blocking cap 46 from tube 12 when said blocking cap 46 is removed from vaporizer adaptor 16.

Closure adaptor 18 is generally an ovate cylinder in shape with a circular cylindrical portion 54 (Figure 2) extending from one end. Cylindrical portion 54 is sized to fit within tube 58 and to mate to it by means of a metal piece 56 which is crimped externally over cover tube 58 to constrict

the cover tube 58 around the cylindrical portion 54 of the closure adaptor 18. The closure adaptor 18 is also provided with filling channel 61 in direct communication with filling member 26 and venting channel 63 in direct communication with venting member 28 through closure adaptor 18. Filling member 26 and venting member 28 are press fitted respectively within filling channel 60 and venting channel 62.

Filling and venting channels 61 and 63 terminate at piercing members 72 and 74 respectively. Piercing members 72 and 74 are hollow, needle like members preferably formed as part of closure adaptor 18, although they could be separate inserts of metal or a hard plastic if desired.

The generally ovate shape 71 of the end of closure adaptor 18 is chosen to mate with a corresponding shape of closure 20, it being understood that containers of anaesthetic may have closures of particular shapes to avoid accidents whereby the container is hooked up to an incorrect vaporizer.

Two seals 60 and 62 are marginally recessed from the upper surface of the closure 20. The two seals 60 and 62 are generally round, frangible disks and are integrally formed with closure 20. A one-way check valve 80 can be press fit within venting channel 76 if desired to ensure that no liquid can flow through it into vent tube 28.

Also located on closure 20 and closure adaptor 18 are locking means 68 and 70 respectively. Closure locking means 68 are located on the exterior surface of closure 20 and generally are of the form of an outwardly projecting wedge. Closure adaptor locking means 70 are located on corresponding positions on the closure adaptor 18 and are generally of the form of a recessed edge. Engagement of the closure 20 with the closure adaptor 18 causes said wedge to engage with said recessed edge, thereby preventing separation of the connector

tube 12 from closure 20.

Dust caps 64 and 66 are provided to cover the open ends of closure 20 and closure adaptor 18 respectively to maintain internal surface cleanliness until it is desired to mate the closure adaptor 18 to the closure 20.

OPERATION

In the operating room, the anaesthetist chooses the appropriate anaesthetic for administration from various supply containers each fitted with closure 20, check valve 80 and dust cap 64. A connector 12 which has a closure adaptor to mate with the particular closure 20 of the chosen anaesthetic is removed from its packaging. Dust caps 64 and 66 are removed and closure adaptor 18 is inserted over closure 20 such that locking means 68 and 70 are engaged. The engagement action causes the piercing means 72 and 74 to engage with seals 60 and 62 respectively, thereby causing perforation of said seals. The blocking cap 46 is removed and the vaporizer adaptor 16 inserted within the vaporizer. Suitably it can be removably locked in place by having a strap attached to the vaporizer (not shown) passed around it and secured so it cannot fall out of its connection with the vaporizer. Anaesthetic may then be transported between said container 14 and the vaporizer.

During use in an operation, the anaesthetist may also elect to administer other anaesthetics. In changing anaesthetics, the vaporizer adaptor 16 is removed from the vaporizer and the blocking cap 46 is reinserted into holes 40 and 42. Another anaesthetic may then be administered using a second system of a connector 12 and an anaesthetic bottle 14, the connector having a vaporizer adaptor 16 sized to mate with the same vaporizer.

To disassemble the system following use, the vaporizer

adaptor 16 is removed from the vaporizer and the blocking cap 46 is reinserted into holes 40 and 42. The entire system including the anaesthetic container is then thrown away without further disassembly.

Although the invention has been shown and described with reference to particular preferred embodiments, it will be understood that a person skilled in the art may make modifications while not departing from the scope and spirit of the invention. The invention is therefore not to be construed as limited by the particular embodiments shown, but rather by the fairly construed scope of the appended claims.

CLAIMS

What is claimed is:

1. A system for connecting an anaesthetic vaporizer to an anaesthetic container to enable transport of an anaesthetic therebetween comprising:

a closure for engagement and sealing with an open end of an anaesthetic container, said closure with at least two pierceable seals;

at least two carrying members with respective piercing means for piercing said seals and matingly sealing with said closure, said members also with coupling means for coupling to the vaporizer;

whereby engagement of said closure with said members causes perforation of said seals by said piercing means thereby enabling transport of anaesthetic between said anaesthetic container, said members and said vaporizer.

2. A device for connecting an anaesthetic vaporizer to an anaesthetic container to enable transport of an anaesthetic therebetween comprising:

at least two carrying members for engagement and sealing with an anaesthetic container with at least two pierceable seals, said carrying members with respective piercing means for piercing said seals, said members also with coupling means for coupling to the anaesthetic vaporizer;

whereby engagement of said members with said anaesthetic container causes perforation of said seals by said piercing means thereby enabling transport of anaesthetic

between said anaesthetic container, said members and said vaporizer.

3. An anaesthetic container closure for mounting on an anaesthetic container comprising:

a closure for engagement and sealing with an open end of an anaesthetic container, said closure with at least two pierceable seals.

4. The closure of claim 3 further comprising a check valve in cooperation with at least one of said pierceable seals.

5. The system of claim 1 where said piercing means are unified within a closure adaptor.

6. The system of claim 1 where said coupling means are unified within a vaporizer adaptor.

7. The system of claim 1 where said closure is adapted to snap fit over and seal against an upper flange of an anaesthetic container.

8. The system of claim 2 where said closure adaptor and said closure are provided with locking means that prevent separation of said closure adaptor from said closure after engagement.

9. The system of claim 5 where said closure has at least two seals recessed within said closure and said closure adaptor adapted to engage with said closure around the periphery of said closure.

10. The system of claim 1 where said piercing means comprise hollow, truncated cylinders and said seals comprise

frangible disks.

11. The system of claim 1 where said members have integral means of kink-resistance.

12. The system of claim 2 where said closure adaptor and said closure are keyed for correct connection orientation.

13. The system of claim 1 further comprising a blocking cap for sealing said vaporizer adaptor prior to and following use of said system.

14. A system for connecting an anaesthetic vaporizer to an anaesthetic container to enable transport of an anaesthetic therebetween comprising:

a closure for sealing and locking with an upper flange of an anaesthetic container with two integral frangible disks and a check valve in cooperation with one of said frangible disks;

a tube with integral kink-resistance and with two internal carrying members, said tube with a closure adaptor for matingly engaging, sealing and locking with said closure, said closure adaptor with two piercing cylinders for piercing said frangible disks as said closure adaptor is engaged with said tube, said tube with a coupling means for matingly engaging and sealing with an anaesthetic vaporizer;

whereby engagement of said closure adaptor with said closure causes perforation of said frangible disks by said piercing cylinders thereby enabling transport of anaesthetic between said anaesthetic container, said members and said vaporizer.

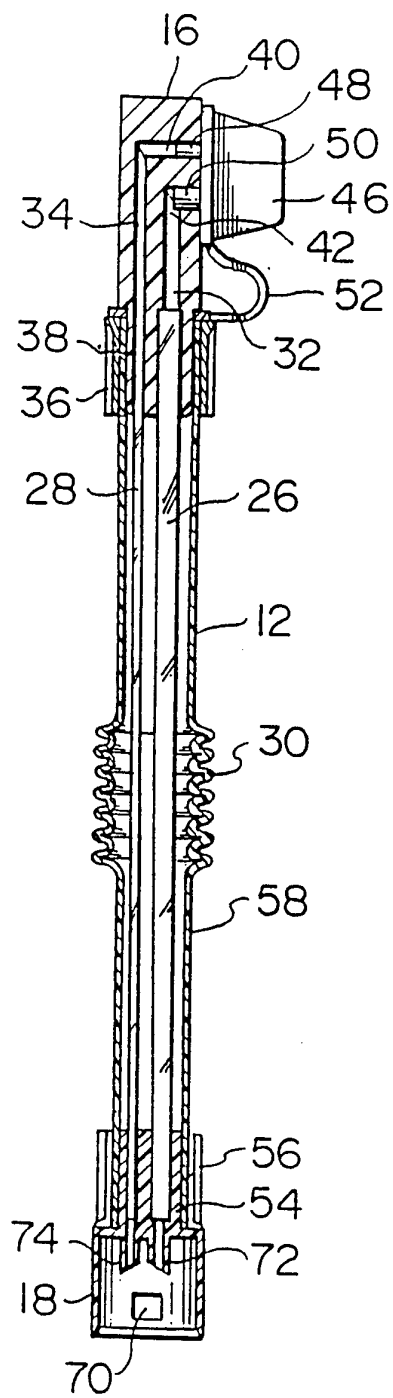


FIG. 2

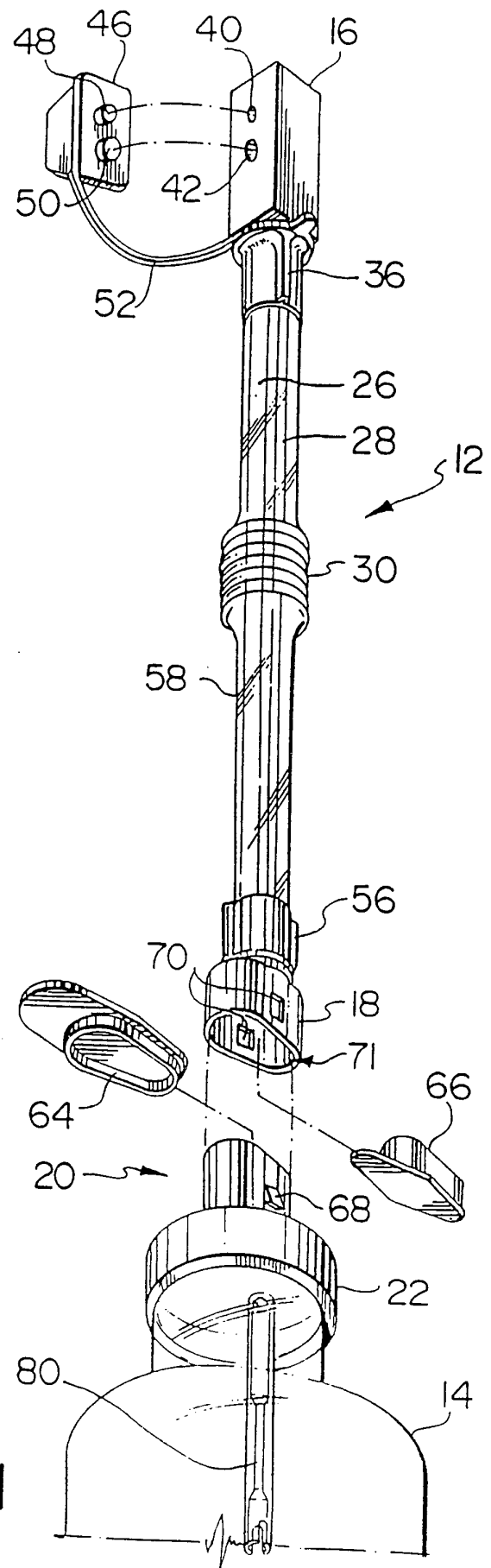


FIG. 1

