A device which helps secure the gas supply lines which deliver a supply of a specialized gas, such as oxygen, to a cannula. The device is a holding structure which includes a cannula tubing retainer attached to a clamping device. The cannula tubing retainer is positioned relative to the clamping device so that a centerline running along an upper surface of said tubing retainer is approximately parallel, if not parallel to a centerline which runs through a clamping mechanism of the clamping device. The clamping device is actuated by a lever with an over center cam action that forces the jaws of the clamp together, and the lever locks the clamp in place when the lever is in a closed position. When the cannula wearer is walking, the clamping device is typically clamped to an article of clothing.
Fig. 2A

Fig. 2B

Fig. 2C
SECURE CANNULA CLAMPING DEVICE

BACKGROUND

[0001] 1. Field of the Invention

[0002] Apparatus and Method related to a nasal cannula, where a method of attachment and support is required for the device to function properly while providing advantageous comfort to the wearer.

[0003] 2. Description of the Background Art

[0004] This section describes the basic problem to be solved and provides background subject matter related to the disclosed embodiments of the present invention. There is no intention, either express or implied, that the background art discussed in this section legally constitutes prior art.

[0005] The present invention relates to a device and a method which help prevent the application of stresses to the body of the wearer of a cannula, particularly stresses about the head of the wearer. The invention assists hospitals in avoiding injury to a patient and assists persons who need the nasal cannula on a daily basis after leaving a hospital or doctor’s office, perhaps throughout their life.

[0006] It is a life-changing event when a doctor prescribes the use of oxygen for his patient on an “outpatient” basis in particular. The patient must adapt to a new, restrictive environment. Some users are tethered to an oxygen tube 24 hours a day. Learning to navigate indoors between rooms and around furniture without catching the oxygen tube is an ever constant challenge. Kitchen and bathroom cabinet drawer pulls frequently catch the tube and stop the person’s movement. Stepping on the tubing leading from an oxygen concentrator or other gas container to the head of the wearer while bending over and then straightening is likely to pull the cannula off the ears. Sudden involuntary movement stops can cause severe ear irritation, which is a major complaint associated with using an oxygen cannula, for example.

[0007] Applicant, who wears an oxygen nasal cannula, has concluded that the most important problem with the use of a cannula is the system used in combination with the cannula to deliver a gas, such as oxygen, to the cannula. The system relies on the ears to support the weight of the cannula, associated oxygen tubing, and connectors, for example. The flexible ear cartilage is not intended to support weight. For those who wear glasses, the problem of weight on the ears is even more compounded. The use of a cannula, for even short periods of time, can cause ear and nose irritation and soreness. The major source of pain occurs at the junction where the ear joins the head. Small diameter tubes wrap around the top of the ears in a 90 degree arc. The constant weight and tugging action associated with the air tubing and connectors causes a sawing action that can cause open sores. In addition, when the cannula is accidentally pulled down, the user also experiences discomfort when the air flow prongs are forced up into the nostrils.

[0008] Over the years, there have been many attempts to reduce the pain and damage to tissues which is caused by the wearing of a cannula, but there has been only marginal success. Foam tubes are available to fit over the cannula tubes around the ears (See U.S. Pat. No. 4,949,773 to Sampson, issued Aug. 21, 1990 and U.S. Pat. No. 5,025,805 to Nutter, issued Jun. 25, 1991). The foam tubes prevent open sores, but do not alleviate the pull down weight on the ears and the physical appearance of “chumbo” ears. There are eyeglasses frames and clips designed for glasses that can hold the tubing so that the ears do not directly contact the tubing (See U.S. Pat. No. 4,708,446 to Timmons et al., issued Nov. 24, 1987). However, when the wearer of the cannula moves, particularly during walking about a premises, the supply tubes from a gas source to the cannula get caught on a table leg or the like and the glasses may be pulled off the head.

[0009] In one of the related art publications discovered, there is a description of an effort to provide support around the neck area, to reduce the amount of weight on the ears by directing the weight to a support placed around the wearer’s neck (See U.S. Pat. No. 4,995,384 to Keeling, issued Feb. 26, 1991). A number of cannula attachment devices are available on the market, but they do not seriously address the many related problems which are encountered in every day life by the wearer of a cannula. The present invention is useful in a wide variety of environments, including hospital rooms, convalescent and assisted living, hospice facilities, retirement communities, within the home in general, for outdoor use, and for sports training, by way of example and not by way of limitation.

SUMMARY

[0010] The present invention relates to a device which secures a gas supply line which delivers a supply of a specialized gas, such as oxygen, by way of example, to a cannula. In particular, the invention relates to a device and a method of securing gas supply lines which prevents painful forces from being applied to the head area of a cannula wearer when tubing located between a gas supply source and the cannula is pulled or jerked. The air supply clamping device is basically a holding structure which holds the tubing between the holding structure and the head of the wearer at a relatively constant length, even though tubing between an attachment point to a gas supply cylinder (or an oxygen concentrator, for example) and the holding structure is jerked. This prevents the cannula from pulling down on the ears, scraping the interior of the nose, and causing pain in general. The device includes two principal elements, a cannula tubing retainer which is directionally oriented relative to a clamping device; and the clamping device. The use of a clamp rather than a clip to hold the device to clothing or another article attached to a body part of the cannula wearer provides a firm grip so that tubing above the clamp remains relatively unaffected and provides a shock absorber while the wearer is in motion. Preferably the location at which the clamp is attached is located between a shoulder and hip, ideally near the elbow, of the cannula wearer.

[0011] When the gas tubing encounters an obstruction, the tugging action of the clamp on the clothing (or other article attached to a body part of the cannula wearer) alerts the wearer to take action to free the tubing from the obstruction. For example, when the cannula wearer is walking, he/she is alerted to stop walking until the obstruction of the tubing is cleared. A clamp with at least 3 pounds of clamping pressure is recommended to prevent the clamp from being pulled from the clothing or other article attached to the body part of the cannula wearer. The clamp has two positions, open and closed, and is actuated by a lever with an over center cam action that forces the jaws of the clamp together, firmly gripping the clothing or other article. In the final stage of closing the clamp, the lever locks the clamp. Within the jaws of the clamp are two rubber or plastic parts that have a male/female pattern that grips the clothing or other article. Clothing is the preferred article to which the clamp is attached under all instances, e.g. reclining, sitting, standing, or walking.
[0012] The device is used to prevent forces from being applied to the head and ears of a cannula wearer when tubing beneath the tubing retainer becomes restricted by an encumbering body, causing said tubing to be pulled or jerked. The device includes at least a cannula tubing retainer and a mechanism for clamping the tubing retainer to clothing or another article fastened to the body of the cannula wearer. The tubing retainer is generally positioned relative to the clamping mechanism so that the opening through the retainer (into which the tubing is placed) is perpendicular to a centerline of the retainer body, and the retainer body centerline is parallel to a centerline which runs through a clamping mechanism of the clamping device. The clamping device is typically actuated by a lever with an over center cam action that forces jaws of the clamping mechanism together. The lever locks the clamp in place when the lever is in a closed position. Typically, the cannula tubing retainer is a plastic molded part of a housing structure which includes a flat bed into which the clamping device is placed.

[0013] The clamping device jaws typically include a male member and a female member which are locked together when the clamp is closed. It is advantageous when the male members and female members of the clamp are formed from rubber or plastic, or a combination of these materials. In some instances one of the male member or female members is formed from a rubber or plastic. The male and female members are designed so that a strong gripping surface holds the material in place without slipping.

[0014] There is a method of using the device in a manner to best reduce the forces which would be transferred to a head area of a wearer of the cannula. The method includes inserting the tubing into the tubing retainer portion of the device either before or after the clamping jaws of the device are attached to clothing (or other device) present on the body of the cannula wearer. The attachment location is most frequently between a shoulder and a hip, ideally adjacent the elbow, of the cannula wearer. The clamping device is lifted and held in a manner such that the centerline of the jaws of the clamping device is positioned parallel to the surface of a floor. When the clamping device is held in this manner, the tubing generally runs parallel to an approximate centerline of the central body structure of the cannula wearer. The cannula wearer can then easily adjust the length of the cannula tubing present above the tubing retainer. The length of the tubing is adjusted so there is some slack in the tubing, allowing the cannula wearer to twist his/her head in various directions without transferring force to the ears or nose, for example.

[0015] When the cannula wearer is standing or walking, with the gas supply tubing clamp in place, the cannula may be adjusted or readjusted in length at any time by holding the clamping device parallel to the floor and proceeding as described above. While standing, the wearer squeezes the gas supply tubing and forces it into the retainer through the tapered slot. The length of tubing to the ears may then be adjusted. This is achieved by holding the clamp in one hand and either pulling the tubing up for more slack or down for less slack. The goal is to achieve a near weightless feel. The fit of the clothing to which the clamp is attached must be considered in determining the best length for the tubing to the ears. The weight of the tubing between the clamp and head ranges from approximately 1/4 of an ounce to about 1/4 of an ounce per ear. This relatively short segment of cannula gas supply tubing has some rigidity, and when in place between the clamp and the ear, added slack lifts the upper portion of the tubing, and the weight becomes less around the ears.

[0016] Proper location of the clamping device upon the body of the wearer is very important for maximum comfort during use. When the cannula wearer is walking, it is helpful when the clamp is positioned on either the left or right side of the body at about elbow height. The clothing is then pinched with the thumb and forefinger with one hand and the open clamp is positioned and clamped onto the pinched clothing surface. As mentioned above, the clamp has a lever which locks the clamp in place. Placing the clamp at a middle position of the front of the body is not normally recommended for ambulatory users; however, for those who are bed-ridden, placing the clamp at the middle position may be useful at times.

[0017] When the tubing is in place in the retainer and set for the desired amount of slack in the tubing above the retainer, the clamp centerline position relative to the floor does not need to be horizontal. The clamp centerline may drop from the clothing, as long as a sufficient amount of slack remains between the top of the tubing retainer and the head of the wearer. When the tubing beneath the tubing retainer is jerked or pulled, the tubing is pulled against and folds over the lower edge of the tubing retainer, locking the tubing present within the tubing retainer in place. This, in combination with the transfer of force through the clamp to the clothing, stops the transfer of forces to the tubing above the upper surface of the tubing retainer.

[0018] While no maintenance is required for the clamp, which may be used in the shower or bathtub, cannula manufacturers recommend that the cannula be replaced every one or two weeks since the nose inserts begin to harden and the tubes around the ears become stiff. Further, an old cannula makes it difficult to achieve proper slack.

[0019] The present invention relates to a device which helps secure the gas supply lines which deliver a supply of a specialized gas, such as oxygen which is provided through a cannula at a concentration which, when the gas supply is mixed with a person’s breathing intake, generates about 24% up to about 40% oxygen by volume to the user. However, one of skill in the art will recognize that the gas supplied may be any gas required for a particular application. For example, a medication suspended in air might be administered through a cannula.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] FIGS. 1A through 1D, show basic component parts which make up a device, and the assembled device which helps secure the gas supply lines leading to a cannula.

[0021] FIG. 1A shows an expanded view 100 of the elements which make up a safe cannula clamping device. A plastic molded housing structure 101 of the device includes a flat bed 106 into which other elements of the device are installed. Cannula tubing retainer 102 has a tapered entrance 108 which is typically formed as a part of the housing structure 101. An adhesive-comprising insert 110 is placed into the flat bed 106 of housing structure 101, as illustrated in FIG. 1A. A clamping structure 112 including a lever arm 114 is also attached to insert 110.

[0022] FIG. 1B shows another expanded view 120 illustrating clamping structure 112 positioned above insert 110 and ready to be attached to housing bed 106.
FIG. 1C shows an orthogonal view 130 of the assembled device 112, including tube retainer 102, flatbed housing 132, clamping device 112 and clamp lever arm 114.

FIG. 1D shows a top view 140 of the clamping device 112, including tubing retainer 102, with clamp lever arm 114.

FIG. 2A shows a top view 200 of the completed clamping device 112 assembly, where the clamping device 112 includes a pivoting arm 216, an upper jaw 218 with clamping teeth 221 of clamping device 112, and a lower jaw 222 with clamping teeth 223. The clamping device 112 also includes the lever arm 114. Clamping device 112 has been applied over the adhesive covered insert 110 and against housing supports (not shown), to rest within housing bed 106. Tubing retainer 102 is shown in this embodiment as being a molded portion extending from housing bed 106.

FIG. 2B shows a bottom view 230 of the completed assembly shown in FIG. 2A.

FIG. 2C shows a side view 240 of the completed assembly shown in FIG. 2A, illustrating the lever arm motion which brings together upper jaw 218 and lower jaw 222.

FIG. 3A shows a three-dimensional view 300 of the clamping device 112 with tubing retainer 102 attached to a piece of gas supply tubing 303. Clamping device 112 is waiting to be attached to tubing (or other article) 304 which is connected to the body of the wearer (not shown) of the cannula (not shown).

FIG. 3B shows another three-dimensional view 320 of clamping device 112 attached to clothing (or other article) 304, where tubing 303 is connected through a fitting 322 into a tank 324 which contains a gas supply (not shown).

FIG. 4A shows a view 400 of a cannula wearer 403 with the secure cannula clamp device 112 in place. The portion of the tubing 304 beneath the lower surface of the secure cannula clamp device 112 has become ensnared by an unexpected contact 405 which is jerking the tubing. However the slack in the tubing 302 above the cannula clamp device 112 remains.

FIG. 4B shows a close up view 420 of the cannula clamp device 112 and the tubing 302 directly above and tubing 304 directly below the cannula clamp device 112 at the time the tubing is being jerked.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

The present invention relates to a device which helps secure the gas supply lines which deliver a supply of a specialized gas, such as oxygen, by way of example, to a cannula. However, one or skill in the art will recognize that the gas supplied may be any gas required for a particular application. For example, a medication suspended in air might be administered through a cannula.

In particular, the invention relates to a device and a method of securing a gas supply line which prevents the application of forces to the head area of a cannula wearer when tubing located between a gas supply canister or oxygen concentrator and the cannula is pulled or jerked. The secure cannula clamping device uses design and positioning of a cannula tubing retainer relative to a clamping mechanism, so that when the tubing is pulled or jerked, at a location beneath the clamping device, the force from the pulling or jerking is transferred to the clamping device and/or to clothing to which the clamping device is attached. When the tubing is jerked or tugged, it bends at an angle relative to the bottom surface and bottom edge of the cannula tubing retainer causing the tubing to lock in place. The force applied to the tubing, which normally would be transmitted to the head, is now absorbed by the clamp which is attached to an article of clothing. For example, the slack tubing present above the top surface of the tubing retainer remains slack. The secure cannula clamping device insures that the transfer of forces prevents pain and skin damage which normally would occur when the tubing leading to the cannula is jerked.

When the cannula wearer initially sets up the cannula for use in combination with the secure cannula clamp, proper location of the device upon the body of the wearer is essential for maximum comfort during use. A correct location of the clamp requires that the clamp is positioned on either the left or right side of the body at about elbow height. The clothing is then pinched with the thumb and forefinger with one hand and the open clamp is positioned and clamped onto the pinched cloth surface. As mentioned above, the clamp has a lever which locks the clamp in place. The clamp should be in a horizontal plane when the clamp is locked into place. Placing the clamp on the left or right side keeps the air tube from getting between the legs of the cannula wearer. Placing the clamp at a middle position of the front of the body is not normally recommended for ambulatory gas users; however, for those who are bed-ridden, placing the clamp at the middle position may be useful at times.

With the gas supply, e.g. oxygen, tubing clamp in place, the cannula may be adjusted to body height. While standing, the wearer squeezes the gas supply tubing and forces it into the retainer through the tapered slot. The length of tubing between the clamp and the ears may then be adjusted. This is achieved by holding the clamp in one hand and either pushing the tubing up for more slack or down for less slack. The goal is to achieve a near weightless feel. The type of clothing (close or loose fit) to which the clamp is attached must be considered in determining the best length for the tubing to the ears. The weight of the cannula tubing between the clamp and head ranges from approximately ¼ of an ounce to about ½ of an ounce per ear. This relatively short segment of cannula gas supply tubing has some rigidity, and when in place between the clamp and the ear, added slack lifts the upper portion of the tubing, and the weight becomes less around the ears.

When the clamping device is attached or held so that the centerline of the clamping jaws are parallel to the floor upon which the wearer is standing, the tubing can move smoothly in a vertical direction relative to the centerline of the body of the cannula wearer. This permits the cannula wearer to adjust the length of the tubing to have proper slack between the head and the clamp. Once the cannula tubing is adjusted for body height, the clamping device is permitted to dangle from the clothing in a manner such that the centerline of the clamping device jaws is not parallel to the floor. The tubing is then no longer free to move, since the tubing retainer and the tubing surfaces tend to lock the tubing in place in the tubing retainer.
[0039] The present advantageous device is a holding structure which holds the tubing at a location between the attachment point to a gas supply cylinder, or oxygen concentrator, for example, and the cannula attachment points on the head of the wearer. The device includes two principal elements, a cannula tubing retainer which is directionally oriented relative to a clamping device; and the clamping device. The use of a clamp rather than a clip to hold the device to the clothing provides better gripping of clothing of a wearer of the cannula. When the air tubing encounters an obstruction, the tugging action on the clothing, by way of example and not by way of limitation, alerts the user to stop walking. A clamp with the ability to hold about 3 pounds is recommended to prevent the clamp from being pulled from the clothing. The clamp has two positions, open and closed, and is actuated by a lever with an over center cam action that forces the jaws of the clamp together, firmly gripping an article of clothing, for example. In the final stage of the closure, the lever locks the clamp. Within the jaws of the clamp are two rubber or plastic parts that have a male/female pattern that grips the clothing. Because of the lever’s mechanical advantage, the clamp is easy to install and remove, even by a child or elderly person.

[0040] The cannula tube retainer portion of the device is such that the centerline of the tube retainer is typically in the same plane or a parallel plane to that of the centerline of the clamping jaws. The cannula tube retainer portion of the device is typically formed from a plastic material having a flat, no gloss interior contact surface with the tube. The cannula tube retainer has a contact surface which typically ranges in height from about 0.10 inch to about 0.11 inch, but this height may be adjusted in some designs of the safe cannula clamp device, depending on the activities to be carried out by the cannula wearer. The diameter of the retainer opening is slightly less in diameter than a standard cannula tube. This interference fit provides a slight resistance when adjusting the cannula length between the clamp and the ears. The gas tube is inserted through an open area in the sidewall of the cannula tube retainer. The open area is typically tapered, and is located toward the back side of the cannula tube retainer structure, adjacent the portion of the device which makes up the clamp. This reduces the possibility that the tube will be bumped out of the cannula tube retainer. The open area in the retainer side wall is typically in the form of a slot which has a tapered entry. The gas tube is compressed and inserted into the tapered entry of the slot. The retainer gas tube shape is very near its original shape, being slightly oval when it is present in the retainer. It is advantageous to have the gas tube locked into position within the cannula tube retainer portion of the device when the gas tube encounters an obstruction.

[0041] When a person is moving, the drag of the gas supply tubing causes the flexible cannula tubing to bend about the cannula tube retainer. This bending action causes the tubing to bend about the cannula tube retainer. This bending action causes the tubing to form an “oval” shape on both sides of the cannula tube retainer, causing the tubing to lock in place. When a jerk or tug on the tubing is encountered due to contact with an obstruction, the size of the oval on both sides of the cannula tube retainer is increased even more, thereby further locking the tubing present within the cannula tube retainer.

[0042] When the gas tubing becomes wedged under, within, or otherwise obstructed by an object, the clamp tugs on the clothing, which tends to pull the cannula tube retainer in a horizontal direction relative to the tubing direction, even further locking the tubing in place in the cannula tubing retainer. When the cause of the obstruction is removed, freeing the tubing, the tubing returns to its generally vertical gravitational position.

[0043] FIGS. 1A through 1D, show basic component parts which make up a device, and the assembled device which helps secure the gas supply lines leading to a cannula. FIG. 1A shows an expanded view 100 of the elements which make up a safe cannula clamping device. A plastic molded housing structure 101 of the device includes a flat bed 106 into which other elements of the device are installed. Cannula tubing retainer 102 has a tapered entrance 108. The cannula tubing retainer 102 is typically formed as a part of the housing structure 101 using a plastic processing technique such as rotational or injection molding, for example and not by way of limitation. An adhesive comprising insert 110 is placed into the flat bed 106 of housing structure 101, as illustrated in FIG. 1A. The adhesive comprising insert 110 typically has a reinforcing center layer (not shown) with a heavy, weather-resistant contact adhesive (not shown) present on all sides. A clamping structure 112 including a lever arm 114 is attached to the upper, adhesive-covered, surface of insert 110, in a direction such that the lever arm 114 extends away from tubing retainer 102, as illustrated in FIGS. 1A through 1D.

[0044] FIG. 1B shows another expanded view 120 illustrating clamping structure 112 positioned above insert 110 and ready to be attached to housing bed 106.

[0045] FIG. 1C shows an orthogonal view 130 of the assembled device 112, including tube retainer 102, flatbed housing 132, clamping device 112 and clamp lever arm 114. FIG. 1D shows a top view 140 of the clamping device 112 which is shown in FIG. 1C.

[0046] FIG. 2A shows a top view 200 of the completed clamping device 112 assembly, where the clamping device 112 includes a lever arm 114 attached to provide a pivoting arm 216. An upper jaw 218 of the clamping device 112, with clamping teeth 221 is designed to mate with lower jaw 222 clamping teeth 223. Clamping device 112 has been applied over the adhesive covered insert 110 and against housing supports (not shown), to rest within housing bed 106. Tubing retainer 102 is shown in this embodiment as being a molded portion extending from housing bed 106.

[0047] FIG. 2B shows a bottom view 230 of the completed assembly shown in FIG. 2A. FIG. 2C shows a side view 240 of the completed assembly shown in FIG. 2A, illustrating the lever arm motion which brings together upper jaw 218 and lower jaw 222.

[0048] FIG. 3A shows a three-dimensional view 300 of the clamping device 112 with tubing retainer 102 attached to a piece of gas supply tubing 303. Clamping device 112 is waiting to be attached to clothing (or other article) 304 which is connected to the body of the wearer (not shown) of the cannula (not shown).

[0049] FIG. 3B shows another three-dimensional view 320 of clamping device 112 attached to clothing (or other article) 304, where tubing 303 is connected through a fitting 322 into a tank 324 which contains a gas supply (not shown).

[0050] FIG. 4A shows a view 400 of a cannula wearer 403 with the secure cannula clamp device 112 in place. The portion of the tubing 304 beneath the lower surface of the secure cannula clamp device 112 has become ensnared by an unexpected contact 405 which is jerking the tubing. However the slack in the tubing 302 above the cannula clamping device 112 remains, as the force acting on the tubing retainer 102 has caused the lower portion 304 of the tubing to bend 424 against
the lower edge 422 of tubing retainer 112 in a manner which locks the upper tubing section 302 in place within tubing retainer 102. This prevents the tubing section 302 from moving downward, while simultaneously transferring forces caused by the jerking into the clamping device 112, which further transfers the forces to the clothing 402. The forces applied to clothing 402 alert the cannula wearer that the lower tubing section 304 has become ensnared. FIG. 4B shows a close up view 420 of the cannula clamp device 112 and the tubing 404 directly above and tubing 304 directly below the cannula clamp device 112 at the time the tubing is being jerked.

As previously mentioned, the use of a clamp rather than a clip to hold the secure gas device to clothing, or to another article attached to the body, acts as a shock absorber while the user is walking. When the air tubing encounters an obstruction, the tugging action on the clothing, for example, alerts the user to stop walking. It was determined that a typical metal spring clip is not adequate to prevent the clip from pulling away from the clothing when an obstacle was encountered. A clamp with a lock which is able to hold approximately 3 lbs. was determined to be adequate to protect a wide variety of people with various health conditions, motor skills, astuteness, sensitivity to pull, and the obese. Use of a clamp which will hold more than 3 lbs. may be permitted, depending on the circumstances. If a device can be pulled off the body, the device is not functioning to its full extent, and that a clamp which can hold about 3 lbs. will typically prevent the device from being pulled off the body.

The tube retainer portion of the device is typically formed from a plastic material having a flat, no gloss interior which is in contact with the tube. As previously mentioned, the tube retainer contact surface typically ranges in height from about 0.10 inch to about 0.11 inch. The diameter of a retainer hole is slightly less in diameter than a standard cannula tube. This interference fit provides an approximately 8 oz. pushing/pulling resistance when adjusting the cannula length between the clamp and the ears, while the interior contact surface permits ease of movement of the tube within the retainer when the tube above and below is generally parallel to a centerline of the tube retainer. The gas tube is inserted through an open area in the sidewall of the tube retainer. The open area of the tube retainer is typically tapered, and is located toward the back side of the tube retainer structure, adjacent the portion of the device which makes up the clamp. This reduces the possibility that the tube will be bumped out of the tube retainer. An open area in the tube retainer sidewall is typically in the form of a slot which has a tapered entry. The gas tube is compressed and inserted into the tapered entry of the slot. The retained tube shape is very near its original shape, being slightly oval shaped when it is present in the tube retainer. It is advantageous to have the gas tube locked in position within the retainer portion of the device when the tube encounters an obstruction. When the gas tube becomes wedged under, within, or otherwise obstructed by an object, the clamp tugs on the clothing, which tends to pull the retainer in a horizontal position relative to the tubing direction, thereby locking the tubing in place in the retainer.

There is a method of using the secure cannula clamping device which improves performance of the device. Proper location of the device upon the body of the wearer is essential for maximum comfort during use. A correct location of the clamp requires that the clamp is positioned on either the left or right side of the body at about elbow height. The clothing is then pinched with the thumb and forefinger with one hand and the open clamp is positioned and clamped onto the pinched cloth surface. As mentioned above, the clamp has a lever which locks the clamp in place. Placing the clamp on the left or right side keeps the air tube from getting between the legs of the cannula wearer. Placing the clamp at a middle position of the front of the body is not normally recommended for ambulatory gas users; however, for those who are bedridden, placing the clamp at the middle position may be useful at times.

With the gas supply, e.g. oxygen, tubing clamp in place, the cannula may be adjusted to body height. While standing, the wearer clamps the clamping device in hand and adjusts the clamping device position so that the clamping device jaw centerline is approximately parallel to the floor. The wearer then squeezes the gas supply tubing and forces it into the retainer through the tapered slot. The length of tubing between the clamp and the ears may then be adjusted. This is achieved by holding the clamp in one hand and either pulling the tubing up for more slack or down for less slack. The goal is to achieve a near weightless feel. The type of clothing (close or loose fit) to which the clamp is attached must be considered in determining the best length for the tubing to the ears. This relatively short segment of cannula gas supply tubing has some rigidity, and when in place between the clamp and the ear, added slack lifts the upper portion of the tubing, and the weight becomes less around the ears.

While no maintenance is required for the clamp, which may be used in the shower or bathtub, cannula manufacturers recommend that the cannula be replaced every one or two weeks since the nose inserts begin to harden and the tubes around the ears become stiff. Further, an old cannula makes it difficult to achieve proper slack.

The above described exemplary embodiments are not intended to limit the scope of the present invention, as one skilled in the art can, in view of the present disclosure, expand such embodiments to correspond with the subject matter of the invention claimed below.

We claim:

1. A secure cannula clamping device which is used to reduce or prevent transfer of forces to a head area of a cannula wearer when tubing which leads to a cannula gas supply becomes encumbered or ensnared by a body or object, causing the tubing leading to the cannula to be pulled or jerked, said device comprising:

   a cannula tubing retainer which is attached to a clamping device, wherein said cannula tubing retainer is positioned relative to said clamping device so that a centerline along an upper surface of said cannula tubing retainer is approximately parallel to a centerline through said clamping device clamping jaws, wherein said clamping device is actuated by a lever with an over center cam action that forces jaws of the clamping device together, and wherein said lever locks said jaws in place when said lever is in a closed position.

2. A secure cannula clamping device in accordance with claim 1, wherein said cannula tubing retainer is a molded part of a housing structure which includes a flat bed into which said clamping device is placed.

3. A secure cannula clamping device in accordance with claim 1, or claim 2, wherein said tubing connects an oxygen supply to said cannula.
4. A secure cannula clamping device in accordance with claim 3, wherein said oxygen supply is an oxygen tank or an oxygen concentrator.

5. A secure cannula clamping device in accordance with claim 2, wherein said cannula tubing retainer and housing structure are formed from a plastic molded material.

6. A secure cannula clamping device in accordance with claim 2 or claim 5, wherein said plastic is polycarbonate.

7. A secure cannula clamping device in accordance with claim 1 or claim 2, when an adhering insert is placed within said flat bed to provide attachment of said clamping device to said flat bed.

8. A secure cannula clamping device in accordance with claim 7, wherein said adhering insert is a tape with an adhesive on each side.

9. A secure cannula clamping device in accordance with claim 8, wherein said adhesive is waterproof.

10. A secure cannula clamping device in accordance with claim 1 or claim 2, wherein said clamping device jaws include members which interlock together when said clamp is closed.

11. A secure cannula clamping device in accordance with claim 10, wherein said members which interlock are male and said female members are formed from rubber, plastic, or a combination thereof.

12. A secure cannula clamping device in accordance with claim 10, wherein said interlock is formed using protrusions and recesses.

13. A method of securing tubing which leads to a cannula, where said tubing is in communication with a gas supply container, to prevent the transfer of forces to the head of a wearer of said cannula, said method comprising:

   connecting said tubing to a clamping device which is attached to an article attached to a body portion of said cannula wearer at a position between a shoulder and a hip of said cannula wearer, wherein said tubing is connected to said clamping device by a cannula tubing retainer which is attached to said clamping device at a location such that a centerline along an upper surface of said tubing retainer is approximately parallel with a centerline passing through a clamping mechanism of said clamping device; and attaching said clamping device to said article in a manner such that there is slack in tubing which is present above said centerline along an upper surface of said tubing retainer.

14. A method in accordance with claim 13, wherein a gas supplied to said cannula is oxygen at a concentration such that when said gas supply is mixed with a person's breathing intake, the user receives about 24% up to about 40% oxygen based on volume.

15. A method in accordance with claim 13, wherein said slack in said tubing present above said centerline along an upper surface of said tubing retainer is obtained by, said wearer of said cannula grasping said clamping device and positioning the centerline of said clamping device approximately parallel, if not parallel, to a floor surface upon which said cannula wearer is standing, and adjusting the length of tubing above said upper surface of said tubing retainer.

16. A method in accordance with claim 13, wherein said article to which said clamp is attached is an article of clothing worn by the wearer of said cannula.