ABSTRACT: A tube squeezer having two U-shaped handles and a geared roller as part of each handle. A tube is positionable between the rollers and an actuator attached to one roller causes a positive gripping of the tube and movement of the rollers and the tube.
TUBE SQUEEZER APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to tube squeezers and more particularly to tube squeezers having rollers; the squeezers are capable of being operated while being handheld.

2. Description of Problems in the Prior Art

This walled metal tubes have long been popular as a container for such items as toothpaste, ointments, prescriptions, cosmetics, oil paints, watercolors, caulking material, sealants, epoxies and lubricants. Additionally, the tubes are also being manufactured of flexible synthetic resins in addition to thin metal. A major drawback of all such tubes is that they can usually never be entirely emptied of their contents as there will usually exist a residue of the contents near the tube nozzle and small amounts of residue throughout the entire tube adhering to the interior walls of the tube. A major reason for the residue is that a tube is squeezed by a user's hand in order for the contents to be removed. Since most tubes are wider than the thumbs of most individuals, it is extremely difficult to conveniently apply uniform pressure along the width of the tube as the contents are squeezed toward the nozzle. Finally, as the contents of the tube is dissipated, squeezing of the tube to remove the last portion of the contents becomes extremely difficult because of the usual tube construction which usually includes an annular collar of thicker gage material surrounding the nozzle. The collar cannot be easily squeezed because of the thickness of the material and its geometric shape. In addition, some materials which are used over a period of time tend to harden if not concentrated in the tube. Therefore, when the tube contents are but partially used, the remainder becomes useless, or there is an undesirable change of consistency or there is difficulty in removal from the tube.

Some individuals have attempted to retrieve more of a tube's contents by rolling the tube from end opposite the nozzle much like a window shade. A more uniform pressure is applied across the width of the tube, but this method is inconvenient and there is the possibility of a rupture of the tube wall when the wall is flexed too greatly. A rupture usually means complete loss of the tube contents.

Tube squeezing devices have appeared on the market from time to time. However, they have all had drawbacks of one form or another. Many squeezers could not provide enough force for relative motion between the squeezer device and the tube and thus required that the user push or pull the tube through the squeezer. Pushing or pulling the tube is inconvenient and dangerous because of possible rupture. Finally, many of the prior art squeezer devices were simply uneconomical in construction or very unreliable in operation.

SUMMARY OF THE INVENTION

The above problems in the prior art have been greatly alleviated by the present invention which is a tube squeezer comprising in combination first and second hinged handles wherein one of the handles is rotatable relative to the other of the handles about their joint so as to allow the handles to be relatively rotatable between first and second positions, a first roller rotatably connected to the first handle, a second roller rotatably connected to the second handle, the first and second rollers are closely spaced when the handles are in the second position whereby a tube to be squeezed is receivable between the closely positioned rollers, and a roller actuator for rotating the rollers when the handles are in the second position whereby the tube is squeezed and moved relative to the handles.

An object of the present invention is to provide a tube squeezer which is able to develop a sufficient pressure essentially uniformly distributed along the width of a tube to cause the contents of the tube to be pushed through the tube nozzle.

Another object of the present invention is to provide a tube squeezer which is able to develop an engagement with the tube so as to insure relative movement between the tube and the tube squeezer.

Still another object of the present invention is to provide a tube squeezer which is economically and simply constructed and extremely reliable in operation.

A further object of the present invention is to provide a tube squeezer which seals that portion of the tube that has been squeezed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an embodiment of the tube squeezer.

FIG. 2 is a side section view taken along line 2-2 of FIG. 1, showing the tube squeezer in two positions.

FIG. 3 is a front section view taken along line 3-3 of FIG. 2.

FIG. 4 is a partial side section view taken along line 4-4 of FIG. 3.

FIG. 5 is a partial front section view taken along line 5-5 of FIG. 2.

FIG. 6 is a front section view taken along line 6-6 of FIG. 2.

FIG. 7 is a perspective view of the embodiment shown in FIG. 1 and includes the positioning of a partially squeezed tube between the rollers.

FIG. 8 is a partial side section view illustrating in more detail the squeezing of the tube in FIG. 7.

FIG. 9 is a perspective view of portions of the handles of the embodiment as illustrated in FIGS. 1 and 7.

DESCRIPTION OF AN EMBODIMENT

Referring now to the drawings wherein like reference numerals designate like or corresponding parts throughout the several views, there is illustrated in FIG. 1 a tube squeezer 12 having of a first or top handle 14, a second or bottom handle 16, a first or top roller 18, a second or bottom roller 20 and a roller actuator such as roller key 22.

Referring now to FIGS. 3, 4 and 9, there is illustrated the hinged relationship between the handles 14 and 16. The two handles are joined so as to be rotatable about two pivot rods 24, FIG. 3 and 26. As is shown in FIG. 1 and 9, the bottom handle 16 is U-shaped having a base portion 28 and two leg portions 30 and 32. Both leg portions 30 and 32 terminate into two spaced bearing plates, 36 and 38 for leg portions 32, and 37 and 39 for leg portion 30 with the pivot rod 24 connected to and positioned between the plates 36 and 38 and pivot 26 connected to and positioned between the plates 37 and 39. The top handle 14 has two leg portions 46 and 48 and a base portion 49, FIGS. 1 and 9. Both leg portions terminate in a hook, hook 54 on leg portion 48 and hook 55 on leg portion 46. As is clearly shown, the terminating portion of each of the leg portions 30, 32, 46 and 48 is made integral with the leg portion and the spaced-apart support plates and pivot rods of handle 16 are positioned so as to receive the hooks from handle 14 about the pivot rods.

The hinge arrangement described above allows the handles 14 and 16 to be rotated relative to each other either by rotating about the joint arrangement or by having one of the handles held stationary while the other rotates about the joint. It is to be understood that any connection between the handles 14 and 16 which allows relative movement between the handles is suitable. For example, just having the corresponding legs 30 and 46 and the corresponding legs 32 and 48 simply linked together to allow relative rotation and the engagement of the rollers 18 and 20 is sufficient.

Referring now to FIGS. 1, 2 and 7, there is illustrated in FIGS. 1 and 2 a completely closed position for the handles 14 and 16. That is, the handles are in a position juxtaposed one another. An open position is shown in FIG. 2 in phantom line to illustrate a position which may be assumed when there is relative rotation about the joint of the handles. FIG. 7 illustrates the handles in a position very similar to that shown in FIG. 1 except that the handles are slightly spaced one from the other due to the introduction of a tube 58 between the rollers 18 and 20.
The handles may be made of any suitable material and may be designed in any suitable configuration. For example, the handles 14 and 16 are illustrated to be U-shape. The U-shape configuration is preferable when both handles are to be handgriped since the hand will usually be positioned about the base portions 28 and 49 in a grip similar to that used on an outside door handle of some automobiles, thereby allowing the user to apply through leverage, pressure upon the tube 58. However, for example, if one of the handles is to be held stationary against a support (not shown), then that handle need not have a base portion.

A suitable material for the handles is any moldable synthetic resin such as CYCOLAC, the trade name for material from which telephone housing are made. When such a resin is used, it is desirable to construct the handles having a cross section in a U-shape or channel configuration such as shown in FIGS. 2 and 5 with periodic cross members such as rib 60, FIG. 9, used for strengthening. Any suitable metal may also be used to construct the handles.

Referring now to FIG. 1 again, top roller 18 is rotatably connected to top handle 14 while bottom roller 20 is rotatably connected to bottom handle 16. Each of the rollers are generally cylindrically shaped to form elongated toothed gears with the teeth extending parallel to the longitudinal axis of the rollers and along the entire length. As seen clearly in FIG. 8, the rollers are positioned so that the tooth 62 of roller 18 would engage a tooth 64 of roller 20 if not for the positioning of the tube 58 between the rollers. In the FIG. 1 portion of the roller 18 and roller 20 in rotation is the fact that the rollers engage one another in a usual gear relationship. The engagement made between the teeth of the two rollers and the tube to be squeezed allows for positive relative movement between the tube squeezeer and the tube. For those tubes which are made of thin gage metal, a deformation occurs upon the tube passing between the two rollers, and the tube base 52 becomes serrated, as shown in FIG. 7, once it passes between the rollers. Because of the deformation, there is a gripping contact made between the tooth 62 and the tooth 64 with the tube 58 securely pressed between. Thus, upon rotation of one of the rollers there will be relative movement between the rollers and the tube by either the tube moving, the tube squeezed moving or a combination of both the tube squeezeer and the tube moving. Causing a deformation in thin gage metal tubes has the added advantage of effectively sealing the tube so that any tear existing in the deformed portion of the tube will not present any leakage problem. In the event that a plastic tube is squeezed, there may not be a retained deformation as illustrated in FIG. 7. Nevertheless, the same gripping action occurs as was discussed hereinabove and the same positive relative movement between the tube and the squeezeer is caused when the rollers are rotated.

The rollers may be attached in any convenient way and are illustrated in FIGS. 6 and 9 to be connected by use of a pin 70 having a cylindrical shape and having a smooth surface 72 along about half its length and a serrated surface 74 along the other half of its length. The serrated surface 74 is positionable in a hole such as 76 by pressed fitting so that the pin 70 is prevented from rotating. The smooth surface 72 is received by the roller in a central longitudinal opening 73 formed for this purpose. The fit between the smooth surface 72 and the roller 20 is made sufficiently loose so that there can be rotation of the roller about the pin. As shown in FIG. 7, roller 20 has two identical pins holding the roller in rotatable contact with the handle 16. Roller 18, however, only has one of the pins 70 for holding the roller to the handle 14 while the other side of the roller is held in place by a keyed shaft 76, which is comprised of a flattened section 78 press fitted to a central longitudinal opening 79 in the roller 18, a smooth surface 80 and a slotted surface 82 which is connected to a lever 84. The shaft 76 and the lever 84 comprise the roller actuator 22, FIG. 1. It also to be noted that suitable securing means other than pin 70 may be used to rotatably secure the rollers. For example, molding synthetic resin rollers with short shafts (not shown) extending through openings in the handles may be used and a circumferential slot may be made in the shafts and spring retainers placed in the slot to restrain lateral movement of the rollers.

OPERATION

A tube is squeezed and manipulated as usual until about one-third to one-half of the contents are used. The tube is then capped and the end 86, FIG. 7, of the tube is placed between the rollers 18 and 20 which have been separated by rotating the handles 14 and 16 relative each other. In FIG. 2 the handle 14 is shown in phantom line to have been rotated clockwise to separate the rollers. The end 86 of the tube 58 is placed between the rollers and the handle are brought closer together to a second position as shown by the arrows in FIG. 7. The handles will be slightly spaced from one another because the tube 58 is positioned between the rollers 18 and 20 and thus cause the rollers to be separated slightly more than they would be if the tube was absent. At the same time the hinged arrangement of the handles 14 and 16 allow a pressure to be applied by an operator's hand which will be positioned around the base portions 28 and 49 of the handles. The applied force is transmitted to the rollers. This squeezing pressure will be applied along the entire width of the tube 58.

As the handles are being held together, the lever 84 is rotated in a clockwise direction (when the tube squeezer is positioned as illustrated) as shown by an arrow in FIG. 7. Assuming the tube squeezer is held stationary, the rotating lever 84 rotates the roller 18 in a clockwise direction (FIG. 8) which in turn causes roller 20 to rotate in a counterclockwise direction. As rotation of the rollers occurs, the tube is gripped, deformed and moved in a direction from right to left in the depiction of FIG. 9. As the rotation of the rollers and the movement of the tube continues, the contents within the tube are squeezed and moved away from the end 86 toward the capped end 88 to concentrate the contents. The process of concentrating some tube contents such as oil paints tend to keep the contents softer and easier to dispense. The handles are then rotated to separate the rollers and the tube is removed for usual hand operation.

The operation just described may be continued on an intermittent basis until the entire tube has been passed through the rollers. Since the inventive tube squeezer offers a definite mechanical advantage, squeezing of the tube can be continued up to the collar portion 90. The contents adjacent the collar portion 90 and in the capped end 88 can now be pressed out more easily with the thumb or a finger because the tube 58 has been serrated up to the collar portion.

Referring again to FIG. 7, it is noted that the body of the tube 58 has curved upward in order to pass the base portions 28 and 49 and the handles 14 and 16. Since the rollers and the U-shaped handles form a quadrilateral structure, the end 86 of the tube must either pass between the base portion 28 and 49 or must pass through the opening of the four-sided figure created. Since the opening between the handles will be too small to accept the tube with any convenience and since the serrated tube structure is very easily deflected, there is no problem in having the tube curve slightly so as to avoid the handles.

What I claim is:

1. A tube squeezer comprising in combination:
   first and second hinged handles wherein one of said handles is rotatable relative to the other of said handles about their joint so as to allow the handle to be relatively rotatable between a first and a second position;
   a first roller rotatably connected to said first handle;
   a second roller rotatably connected to said second handle;
   said first and second rollers are closely spaced when said handles are in said second position whereby a tube to be squeezed is receivable between said closely positioned rollers;
   a roller actuator for rotating said rollers when said handles are in said second position whereby said tube is squeezed and moved relative to said handles.
   2. Apparatus as claimed in claim 1 wherein said rollers have a toothed gear cross section for gripping said tube receivable between said rollers.
   3. Apparatus as claimed in claim 1 wherein
at least one of said handles in generally U-shaped, said handle having a base and two leg portions;

one of said rollers is positioned between said two legs forming a quadrilateral with said legs and base portions so as to allow the tube to pass through the quadrilateral after being received between the rollers.

4. Apparatus as claimed in claim 3 wherein said rollers have a toothed gear cross section for gripping said tube receivable between said rollers.

5. An apparatus as claimed in claim 4 wherein roller actuator is connected to said first roller for rotating said first roller to cause the tube receivable between the rollers to be tightly engaged between corresponding teeth of said rollers.