

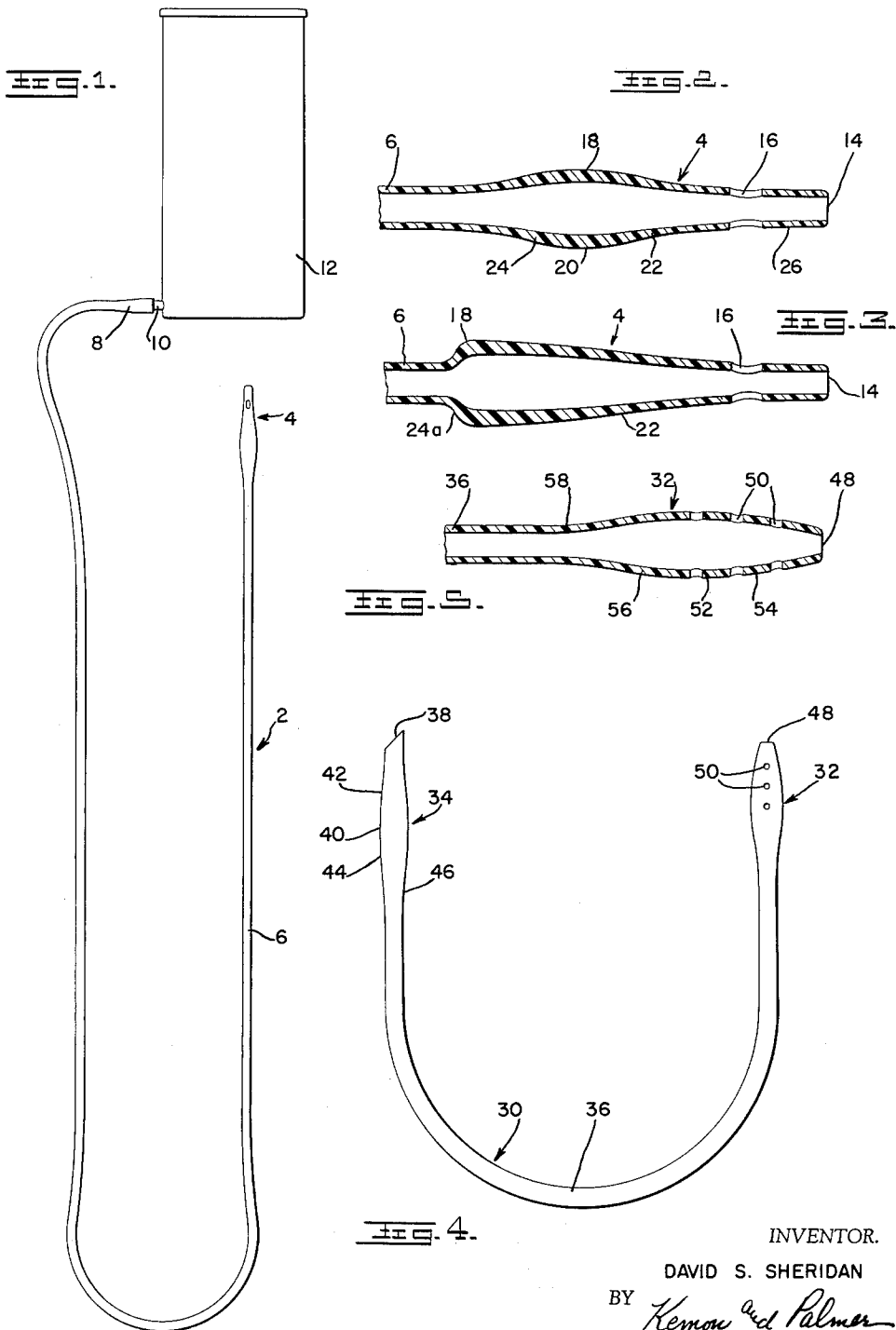
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SEAMLESS EXTRUDED PLASTIC RECTAL TUBES

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SEAMLESS EXTRUDED PLASTIC RECTAL TUBES

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This invention relates to seamless, extruded, plastic rectal tubes. More particularly, it is concerned with seamless rectal tubes formed by extrusion of waterproof, flexible, plastic material which have a bulb designed to help retain the tube within a patient during use, formed integrally into the distal end of the tube solely by double tapering of the tube walls.

Field of Invention

Rectal tubes are formed from a variety of different materials in a variety of lengths and shapes. In many forms of such tubes, a bulb or expanded portion is provided on the distal end of the tube to serve as means for retaining the tube in position within the patient during use of the tube. Such retaining-bulb end tubes come in two standard forms. In one of these, which is particularly employed for roentgenological procedures, the retaining bulb is formed at the very end of the tube so that the tube possesses a blunt bulbular end containing a plurality of side entering ports and an open tip. This form of tube is employed in roentgenological work since it enables the tube to be positioned within the patient in direct contact with the sphincter at the lower end of the large intestine, in order that X-ray opaque fluids introduced into the patient by means of the tube may be most effectively distributed.

In the case of rectal tubes used for general enema purposes, retaining bulbs, when provided thereon, are usually placed back 1/2 to 1 inch from the tip of the tube, so that there is a short nipple end on the tube extending distally of the retaining bulb. Enema tubes of this type have been somewhat standardized for hospital and professional use into two basic forms. The first of these, called rectal-type enema tubes, are usually about 18 to 24 inches long. The second are referred to as Harris flush tubes and are about 5 to 6 feet long.

Rectal tubes have been formed in the past by the extrusion of rubber or plastic materials, but such extruded tubes heretofore have been formed with straight walls at the distal end, i.e., they have not incorporated any retaining bulb or the like. Where a retaining bulb has been incorporated in a rectal tube, either of the X-ray type, the rectal enema type or the Harris flush tube type, as referred to above, the bulb containing portion has been formed by molding of a hard rubber or plastics. This has required that the bulb-containing tube has been relatively short in length because of limitations inherent in such molding operations. In order to provide the additional length desired in the tube, e.g., in the 5 to 6 ft. long Harris flush tubes, the molded short tube has been joined in some fashion to a long connecting tube. For example, the molded tube containing the retaining bulb in the distal end is usually provided with ribs or serrations at the opposite end and a connecting tube is forced over this end to create a fluid-tight connection between the connecting tube and the molded rectal tube. However, seams or other discontinuities in surgical tubes present problems because they can harbor contaminating microorganisms. Actually, hospitals have experienced a substantial amount of cross infections due to repeated use of rectal tubes, as well as other surgical tubes. Consequently, the trend today is to use tubes of this type, wherever practical, only once, after which the tube is disposed of. Since it has been possible heretofore to form rectal tubes of a straight wall variety, i.e., those not provided with a retaining bulb in the distal end, by extrusion methods, it has been pos-

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sible to provide the medical profession and hospitals with a disposable, low-cost rectal tube. However, because of the much greater cost involved in the production of tubes by molding operations in which the tubes are formed by a non-continuous type operation, rectal tubes heretofore formed with a retaining bulb in the distal end have been relatively too costly to be employed on a one-use disposable basis.

Objects

A principal object of this present invention is the provision of new forms of seamless, extruded plastic rectal tubes. Further objects include:

(1) The provision of seamless rectal tubes which include a retaining bulb formed in the distal end thereof, said tubes being formed by extrusion of waterproof flexible plastic material continuously and at high rates or production, so that the tubes can be made so inexpensive they can be employed on a one-use disposable basis.

(2) The provision of seamless, extruded plastic rectal tubes provided at the distal end with an integral retaining bulb and at the proximal end with an integral tubing adapter.

(3) The provision of rectal tubes having bulbular tapered sections therein, and, at the same time, controlled wall thickness throughout the length.

(4) The provision of seamless rectal tubes supplied with integral retaining bulb, the wall thickness of which is controlled to provide a controlled degree of resiliency that enables the tube to be more effectively inserted and withdrawn from the patient than is possible with retaining bulb rectal tubes made by molding procedures.

(5) The provision of rectal tubes of the Harris flush type which are completely seamless, and which have continuous, smooth inside and outside wall surfaces free of joints or seams, notwithstanding the fact that the rectal tube is provided with a retaining bulb in the distal end thereof.

(6) The provision of rectal tubes formed of extruded plastic material which can be formed at such high rates of production as to be of such low cost they may be incorporated in a complete disposable enema unit consisting of a Harris flush type rectal tube plus a disposable plastic bag.

Other objects and further scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description, while indicating preferred embodiments of the invention, is given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

General Description

These objects are accomplished according to the present invention by forming integrally into the distal end of rectal tubes, retaining bulbs by double tapering of the tube wall at the distal end, such retaining bulb being defined by a central section of larger outside diameter than the tip of the distal end and wall portions that taper inwardly from said central section of the retaining bulb, both toward the tip of the distal end and towards the center section of the tube which joins the retaining bulb to the proximal end of the rectal tube. Such tubes are formed by the extrusion of waterproof, flexible, plastic material to provide tubes which are seamless, non-fibrous, and have continuous and smooth external and internal wall surfaces throughout their entire length except for ports or similar small openings generally provided in the distal end of the tubes through which soap solutions, barium compounds or other enema or treating fluids may issue during use of the tube.

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In one of the preferred forms of the new catheters, a second double tapered section is also formed in the tubes at the proximal end. This proximal end, tapered portion forms a tubing adapter which permits quick and very effective fluid-tight connections to be made between the rectal tube and a connecting tube used to join the rectal tube to an enema can or similar enema solution container.

A more complete understanding of the new rectal tubes as provided by this invention can be had by reference to the accompanying drawings, in which:

FIG. 1 is a side elevational view of a rectal tube of the Harris flush type, formed in accordance with this invention, the proximal end of the flush tube being connected to an enema can;

FIG. 2 is an enlarged fragmentary sectional view of the distal end of the rectal tube shown in FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view of a modified form of retaining bulb of the general type shown in FIG. 2;

FIG. 4 is a plan view of another form of rectal tube formed in accordance with this invention;

FIG. 5 is a fragmentary enlarged sectional view of the distal end of the rectal tube shown in FIG. 3.

Detailed Description

Referring in detail to the drawings, FIGS. 1 and 2, the rectal tube 2, which is of the Harris flush type, comprises a distal end portion 4, a middle tubular section 6, and a proximal end portion 8. The tubular section 6 constitutes the major portion of the rectal tube and consists of a long tubular section which is of substantially uniform cross-section throughout its entire length.

The proximal end 8 of the rectal tube is formed in the shape of a funnel which fits over the spout 10 that extends from the base of the enema can 12. The enema can generally will have hand-operative valve means for controlling flow of fluid therefrom, but this is not shown in the drawing for the sake of simplicity.

The distal end 4 of the rectal tube 2 includes an open tip 14, a plurality of side entering ports 16, and the retaining bulb 18. This retaining bulb is defined by a central section 20 of larger outside diameter than the middle tubular section 6 or the tip 14, but a first wall portion 22 which smoothly tapers inwardly from the central section 20, toward the tip 14, and a second wall portion 24 which tapers smoothly inward from the central section 20 toward the tubular center section 6.

It will be observed from FIG. 2 that the thickness of the walls of the rectal tube at the connector end 4 are controlled so that they are thicker in the section 18 than in the sections 22 and 24. This controlled thickness variation permits the resiliency of the bulb to be controlled without changing the flexibility characteristics of the remainder of the rectal tube.

In the form of rectal tubes shown in FIGS. 1 and 2, there is a short nipple 26 formed in the tube between the retaining bulb 18 and the open tip 14, this nipple 26 being defined by wall portions which extend straight back from the tip 14 a short distance before the wall portions 22 begin to taper outwardly toward the center section 20.

In the modified retaining bulb shown in FIG. 3, the section 24a which joins the bulb section 18 to the tubular section 6 has a much sharper angle of taper than the comparable section 24 of the rectal tube of FIG. 2. Otherwise, the different bulbs are the same.

As previously indicated, rectal tubes of the Harris flush type have been extensively used heretofore and generally are about 5 to 6 feet in length. Prior known rectal tubes of this type which have been formed by extrusion of plastic materials have had distal ends which are completely straight, so that the tubes have lacked any inherent retaining feature. Conversely, they have been provided with separately molded distal end sections

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which include a retaining bulb formed by the molding process. However, in this second type of rectal tube, some sort of seam or joint has been required in order to make a fluid-tight connection between the long length of connecting tube and the short molded distal end unit.

FIGS. 4 and 5 help to illustrate two other basic modifications which are found in rectal tubes. First, the rectal tube shown in FIG. 4 is of the short variety, usually about 18 to 24 inches in length, which is invariably used with a connecting tube to permit the enema composition to be conveyed from an enema can or other container to the rectal tube per se. Secondly, FIG. 4 illustrates the blunt nose type of distal end employed on some rectal tubes, particularly those used, as mentioned above, in roentgenological studies.

The rectal tube 30 comprises a distal end portion 32, a proximal end portion 34, and a center tubular section 36.

The proximal end portion 34 includes an open tip 38, a center section 40 of larger outside diameter than the tip 38, a wall portion 42 which tapers smoothly outwardly from the tip 38 to the center section of large diameter, and a wall portion 44 which tapers smoothly inwardly from the center section 40 to the point 46 of apparent beginning of the middle tubular section 36.

The distal end portion 32 of the rectal tube 30 comprises an open end tip 48, a plurality of side entering ports 50, a central section 52 of larger outside diameter than the tip 48 or the middle tubular section 36, smoothly inwardly tapering wall portion 54, and a wall portion 56 which also tapers smoothly inwardly from the central section 52 to the point 58 of apparent ending of the middle tubular section 36.

By comparison of FIGS. 2 and 5, it can be seen that the distal end portion 32 of the rectal tube 30 has no nipple extension comparable to that which is formed in the distal end 4 of rectal tube 2. Consequently, in use of the rectal tube 30, it is possible to position the open tip 48 quite readily in firm and immediate contact with the sphincter at the base of the large intestine of the patient. This is a distinct advantage in performing roentgenological studies, and this general form of distal end for rectal tubes is not new. However, in the past, such bulbular end tubes have been limited to injection, compression or similar molded products and the incorporation of an integral retaining bulb at the distal end of a rectal tube is entirely new in tubes formed by extrusion methods on a continuous basis.

While it is possible to make short tubes of a seamless variety by molding operation, the length of the tubes so formed is generally limited to tubes less than about a foot in length. In contrast, the new medico-surgical tubes of this present invention can be made in any desired length and they still contain as an integral part the retaining bulb feature, plus, if desired, the tapered portion on the proximal end creating the tubing adapter. The extrusion of plastic materials to create these new rectal tubes is accomplished by the continuous extrusion methods disclosed and claimed in my copending application entitled "Production of Tapered Medico-Surgical Tubes Which Have Controlled Wall Thickness by Extrusion," filed June 3, 1958, Serial No. 739,628, now Patent No. 2,940,126.

Conclusion

Rectal tubes as described herein are characterized by the complete absence of any seams, joints or the like which may tend to harbor contaminating micro-organisms. Accordingly, they are easily sterilized and will remain sterile more readily than related prior art rectal tubes which contain ribbed or serrated portions. Furthermore, the extrusion of these new tubes permits them to be made from a much wider variety of plastic compositions than has been possible heretofore, so that greater control of flexibility and wall thickness of the plastic tubes can be obtained. These new rectal tubes can be

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formed, if desired, from rubber or synthetic rubber compositions, but in order to obtain the greatest control and flexibility and also to permit tubes to be completely transparent, it is preferable to use thermoplastic resinous materials in the formation of the new rectal tubes. Examples of usable materials of this type include pliable or flexible forms of nylon, polyester plastics, polyethylene and vinyl polymers, e.g., vinyl chloride polymers or copolymers with other vinyl esters such as vinyl acetate, vinylidene chloride polymers of the like.

The foregoing specification sets forth the precise invention for which patent protection is desired in a manner designed to distinguish it from other inventions and what is old. It includes a specific embodiment of the new rectal tubes and a description of the best mode contemplated for carrying out the invention, the scope of which is defined by the annexed claims.

I claim:

1. A seamless rectal tube made by extrusion of waterproof, flexible plastic material, said tube consisting of a distal end portion, a proximal end portion and a middle tubular portion of substantially uniform cross-section throughout its length, said portions being formed integrally with one another providing a seamless structure, said distal end portion including a retaining bulb and an open-end nipple extending from said retaining bulb, said bulb being formed solely by double tapering of the tube walls and being defined by a central section of larger inside and outside diameters than said middle tubular portion, the wall thickness of said retaining bulb increasing substantially in proportion to the diameter of the bulb whereby the bulb possesses a controlled rigidity, and said proximal end portion including a tubing adapter and an open-end tip extending from said adapter, said adapter being formed solely by double tapering of the tube walls and being defined by a central section of larger inside and outside diameters than said middle tubular portion, said proximal open-end tip being defined by a short straight section of diameter approximately equal to the diameter of said middle tubular portion.

2. A seamless, transparent rectal tube made by extrusion of waterproof, transparent, flexible plastic material, said tube consisting of a distal end portion, a middle tubular portion of substantially uniform cross-section through-

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out its length and a proximal end portion, said distal end portion including at least one side-entering port, a retaining bulb, and an open-end nipple extending from said retaining bulb, said bulb being an integral part of the tube formed solely by double tapering of the tube walls and being defined by a central section of larger inside and outside diameters than said middle tubular portion, the wall thickness of said retaining bulb increasing in thickness substantially in proportion to the diameter of the bulb whereby the bulb possesses a controlled rigidity, a first wall section which tapers smoothly inwardly from said central section toward said nipple and a second wall section which tapers smoothly inwardly from said central section to said middle tubular portion, said side-entering port being located in said nipple, and said proximal end portion including a tubing adapter and an open-end tip extending from said adapter, said adapter being an integral part of the tube formed solely by double tapering of the tube walls and being defined by a center section of larger inside and outside diameters than said middle tubular portion, a wall section which tapers smoothly outwardly from said open-end tip to said center section and a second wall section which tapers smoothly inwardly from said center section to said middle tubular portion, said proximal open-end tip being defined by a short straight section of diameter approximately equal to the diameter of said middle tubular portion.

3. A rectal tube as defined in claim 1 wherein the axial dimension of both the distal end portion and the proximal end portion is greater than the transverse dimension thereof.

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