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E. F. SCHMERL
GASTROINTESTINAL TUBE
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FIG. 1

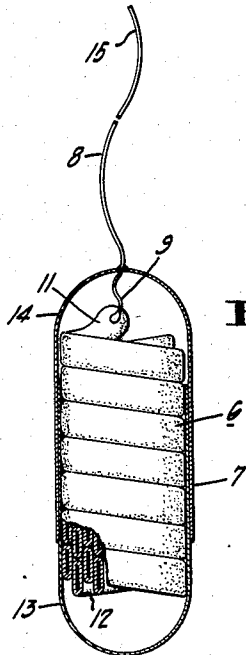


FIG. 3

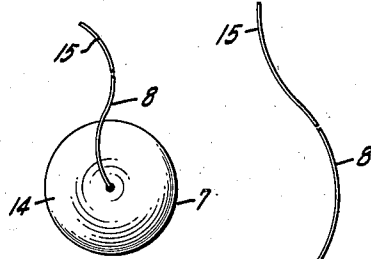


FIG. 2

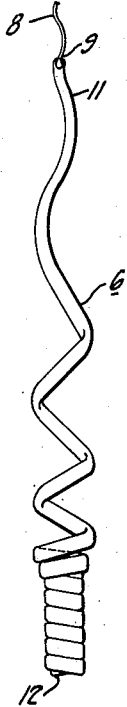
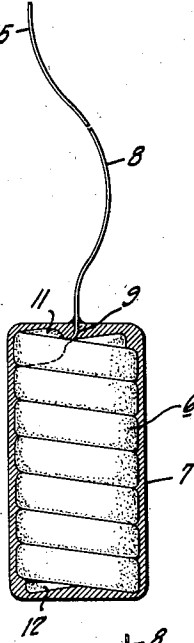


FIG. 4

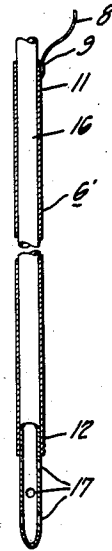


FIG. 5

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GASTROINTESTINAL TUBE

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5 Claims. (Cl. 128—276)

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The invention relates to various types of stom-
achal, duodenal or intestinal tubes which are
adapted for insertion into the gastro-intestinal
tract of a patient for feeding fluids into the tract
or in removing fluids or other matter therefrom.

Gastro-intestinal tubes of the character de-
scribed are of several well-known types such as
the Levin, Rehfus, Wangenstein, and Miller-Ab-
bott tubes, and are generally designed for inser-
tion, by pushing action, through the oral or nasal
passages of the body into the oesophagus and
thence into the stomach, duodenum, etc. As will
be appreciated, the insertion of such a tube is
sometimes difficult, requires considerable skill on
the part of the doctor or nurse, and such inser-
tion is not only most discomforting to the patient
but is best accomplished with his active cooper-
ation. Sometimes, through lack of skill or error
on the part of the doctor or nurse, the inserted
end of the tube will enter the larynx or air pas-
sage instead of the oesophagus, and where in-
serted through the nasal passage will sometimes
curl back through the mouth instead of passing
into the oesophagus. To assist in the insertion
of the tube, the patient, if conscious, is called
upon to swallow the inserted tube end, which
causes the epiglottis to swing over and seal off
the air passage and thereby guide the inserted
tube end into the oesophagus, and to thereafter
continue to swallow until the inserted tube end
has reached and passed through the cardia or
stomach entrance. Where the patient is uncon-
scious at the time of the insertion of the tube
and his cooperation in swallowing cannot be
elicited, the insertion of the tube may be more
difficult, sometimes practically impossible. An-
other disadvantage of the tubes described above
and their method of insertion is the fact that the
exit opening or openings in the inserted end of
the tube may become clogged during the course
of the insertion with mucus or other matter in
the stomach, thereby blocking the tube and re-
quiring its removal for cleaning before it may be
again inserted. Also, tubes heretofore available
have been inherently comparatively expensive
and designed for repeated use, thus involving the
problems of washing, cleansing, sterilizing and
storing in a sterile condition each time the tube
is used involving a series of time consuming op-
erations by trained personnel. Frequently it is
desirable that the patient in home treatment in-
sert such a tube himself at regular intervals over
a period of perhaps several weeks for the pur-
pose of carrying out what is sometimes referred
to as a "continuous drip" treatment, as for in-

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stance advocated in cases of duodenal ulcer.
Manifestly, the self-administration of tubes of
the character above is most difficult and dis-
tressing to the patient and cannot be accom-
plished at all by some patients.

An object of the present invention is to pro-
vide a new and improved form of gastro-intesti-
nal tube which may be quickly and easily inserted
within the stomach or other part of the gastro-
intestinal tract of the patient without requiring
any special skill and without any appreciable dis-
comfort to the patient, and which may be simply
and readily inserted by the patient himself with-
out assistance.

Another object of the present invention is to
provide a gastro-intestinal tube and insertion
method of the character described which will de-
liver the inserted end of the tube into the stom-
ach or other part desired of the gastro-intestinal
tract while positively insuring that the exit open-
ing or openings of the tube will remain free, open
and unobstructed during insertion.

A further object of the invention is to provide
a gastro-intestinal tube of the character de-
scribed which will be simple and inexpensive in
its manufacture, readily sterilized at time of
manufacture and maintained in sterile condition
until used, and which is designed for single use
and disposal after such use.

Still another object of the invention is to pro-
vide a method of insertion of a gastro-intestinal
tube of the character described which permits of
the use of a soft, flexible, pliable, thin walled
tube, as contrasted to the stiffer, thick walled
tubes heretofore required, thus adding materially
to the comparative comfort of the patient while
the tube is inserted.

The invention possesses other objects and fea-
tures of advantage, some of which, with the fore-
going, will be set forth in the following descrip-
tion of the preferred form of the invention which
is illustrated in the drawings accompanying and
forming part of the specification. It is to be
understood, however, that variations in the show-
ing made by the said drawings and description
may be adopted within the scope of the invention
as set forth in the claims.

Referring to said drawings:

Figure 1 is a cross-sectional view on an en-
larged scale of a gastro-intestinal tube con-
structed in accordance with the present in-
vention.

Figure 2 is an end elevation of the tube illus-
trated in Figure 1, on a similarly enlarged scale.

Figure 3 is a cross-sectional view similar to

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Figure 1 but showing a modified form of construction.

Figure 4 is a side elevation of the tube in position for unwinding within the stomach of the patient.

Figure 5 is a cross-sectional view of the tube showing its use as a sheath for guiding a conventional type tube into the gastro-intestinal tract.

In accordance with the present invention and as a principal feature thereof, I provide a soft, flexible gastro-intestinal tube 6 which is compacted into a small volumetric form as illustrated in Figures 1, 2 and 3, capable of being swallowed and encapsulated in a material 7 dissolvable in the gastro-intestinal tract, whereby the tube may be released for unfolding in the stomach after swallowing, as illustrated in Figure 4, for drawing up one end 11 of the tube into the oral cavity of the patient by means of a draw thread 8 having one end 9 thereof connected to the tube end 11 and having a length sufficient to leave its opposite end 12 within or outside of the oral cavity upon swallowing of the encapsulated tube. The tube 6 is preferably formed of a thin wall of flexible plastic material such as nylon, vinylite, cellophane, or the like, and should have a length, depending upon its use, of from approximately 12 to 30 inches. The minimum indicated length of 12 inches will extend from the front of the oral cavity into the oesophagus. A tube of approximately 18 inches is required to extend into the stomach and approximately 30 inches is required for extension into the duodenum, the latter measurements being also taken from the front of the oral cavity. The tube may be compacted in any suitable manner, as by folding or rolling into a helical, coiled or other compacted construction having an overall size capable of being swallowed. A compacted form of approximately $\frac{1}{4}$ " diameter by $\frac{3}{4}$ " in length is suitable for this purpose.

In order to maintain the compacted tube in a soft, flexible condition for ready unfolding or unwinding when released within the gastro-intestinal tract, the tube may, at the time of compacting, be appropriately coated or otherwise lubricated with a suitable lubricant for this purpose. Finely powdered hydrogenated vegetable oil, sold under the trade name of "Stearotex," finely powdered stearic acid, purified talc, or a mixture of starch and talc, boric acid, liquid petrolatum, or glycerin may be used. Preferably, the lubricant should be of a material either soluble in the gastro-intestinal juices or readily carried off by such juices.

The compacted tube may be held in compacted form by either enclosing the tube in a gelatin capsule as illustrated in Figure 1 or by coating the compacted form with a gelatinous material for maintaining its shape, as illustrated in Figure 3. A hard type of capsule is shown in Figure 1 in which the tube 6 is inserted within the body or base 13 of the capsule and sealed therein by the capsule cap 14, the latter being perforated for passing therethrough of the thread 8. This type of capsule is widely used in the practice of pharmacy and is made largely from gelatin and sugar, the pharmacopoeia permitting gelatin for this purpose to contain 0.15 per cent sulphur dioxide to prevent decomposition during manufacture. Glycerin may also be used for imparting flexibility. The gelatinous material used as a coat in the form of the invention illustrated in Figure 3 may be essentially the same as that used in the capsule illustrated in Figure 1. The essential characteristic required of the capsule or gelati-

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nous coating material in the two forms of the invention is that such material be dissolvable in the gastro-intestinal tract so as to release the tube for unfolding after the unit has been swallowed. Where it is desired to pass the unit through the acid juices in the stomach and into the intestinal tract for dissolving in the alkaline intestinal fluids, the capsule or envelope may be provided with an enteric coating such as salol, as is well understood in the art.

The drawthread 8 may be of any suitable material such as cotton, silk, rayon or appropriate plastic or the like and of a length sufficient to extend from outside of the oral cavity to caudal part of the gastro-intestinal tract to which the compacted tube is to be inserted. A thread length of from 30 to 40 inches will be sufficient for most purposes. Preferably the diameter of the thread should be small to facilitate swallowing and easy withdrawing, without being so fine as to irritate the mucous membranes over which it is drawn under the light tension which is required to draw up the tube end. The word "thread" as used herein is intended to define any elongated element of the character described including a cord or string.

It will now be clear that the compacted encapsulated tube of the present invention may be easily and conveniently swallowed by the patient for deposit into the stomach or other part of the gastro-intestinal tract, while the outer end 15 of the thread is maintained outside of the body. Within a reasonably short period of time, the gelatinous envelope of the tube will be dissolved or liquefied by the gastro-intestinal juices to thereby release the compacted tube for unfolding or uncoiling. The thread 8 may then be drawn outwardly from the oral cavity so as to draw up the tube end 11 out of the stomach and through the oesophagus into the oral cavity. In this latter operation, the normal constricting action of the cardia of the stomach about the portion of the tube passing therethrough will assist in insuring the proper unwinding of the tube within the stomach and prevent the coiled tube from being withdrawn from the stomach as a coiled unit. This latter operation of drawing out of the tube is a very simple one and is accomplished without any material discomfort to the patient. Also, since this withdrawing action requires no cooperation of the patient such as his swallowing, the tube end may be easily withdrawn from the stomach and into and from the mouth as above described when the patient is unconscious. This fact makes the tube of the present invention ideally used in instances where such tubes are required for post-operative treatment. In such cases the patient may swallow the encapsulated tube prior to the operation and thereafter, and while the patient is still unconscious, the doctor or nurse may pull up the tube end for such use of the tube as may be required.

Since a small, compacted form of the tube is desired for ready swallowing by the patient, a soft, pliable, thin-walled tube is indicated. Such a tube is best used for feeding of fluids into the gastro-intestinal tract. Where it is desired to remove body fluids or substances from the gastro-intestinal tract, a conventional thick-walled tube suitable for suction may be desired. In such cases, the tube of the present invention may be used as a sheath, as indicated in Figure 5 of the drawing, through which the conventional thick-walled tube 16 may be inserted and guided into the gastro-intestinal tract. In such use, the sheath 6', illustrated in Figure 5, is compacted,

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encapsulated, swallowed, and withdrawn as hereinabove described, so as to provide a positive guide for the heavy-walled tube 16 into the oesophagus and the gastro-intestinal tract of the patient.

The tube and encapsulating envelope of the present invention may be conveniently sterilized at the time of manufacture and assembly, and due to its hermetically-sealed condition the tube will remain sterile until used. Also, as will be understood, since the tube is inserted as a compacted unit into the gastro-intestinal tract as above described, while enclosed in its envelope, the opening or openings provided in the inserted end of the tube will at all times be and remain free, open and unobstructed, and the problem of the clogging of such openings by mucus or other material in the tract during insertion is completely obviated. Where used as a feeding tube and not as a sheath, the lower end 12 of the tube may be formed closed and the exit opening or openings formed in the side of the tube adjacent such end as is common in the art and illustrated at the lower end 17 of the conventional tube 16 shown in Figure 5. It will also be clear that method of insertion of the present tube by swallowing the compacted tube as a whole and the drawing up of one end of the tube as described, enables the use of a very soft, flexible, pliable, thin-walled tube as contrasted to the tubes heretofore used, and which, by reason of their method of insertion by being pushed into the gastro-intestinal tract, had to be much stiffer and thicker walled. Accordingly, the present tube may be much smaller and thereby occupy less room in the tract, and because of this and its softness and flexibility, be much more comfortable to the patient when inserted.

I claim:

1. A gastro-intestinal tube comprising, a length of flexible tubing compacted into a small volumetric form capable of being swallowed, means enclosing said compacted tubing to retain said form and dissolvable in the gastro-intestinal tract, and a thread connected to one end of said tubing and extending therefrom for retaining of one end of said thread for manual engagement upon swallowing of said compacted tubing and means.

2. In a device of the character described, a flexible tube having a length extendable from the oral cavity to the oesophagus of the user, an envelope enclosing said tube in compacted form cap-

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able of being swallowed and dissolvable in the gastro-intestinal tract, and a thread connected to one end of said tube and extending from said envelope and having a length sufficient to permit retaining of one end of said thread for manual engagement upon swallowing of said envelope and tube.

3. In a device of the character described, a capsule of a size capable of being swallowed, a flexible tube having a length extendable from the oral cavity to the stomach of a user and compacted into said capsule, and a thread connected to one end of said tube and extending from said capsule by a distance sufficient to permit manual engagement of one end of said thread upon swallowing of said capsule, said capsule being soluble in the stomach to release said tube therein and permit the withdrawing of said tube end to the oral cavity by means of said thread.

4. In a device of the character described, a flexible tube compacted into a small volumetric form capable of being swallowed and being coated with a material retaining said tube in compacted form and being dissolvable in the gastro-intestinal tract, and a thread connected to one end of said tube and having a length sufficient to extend from the stomach to the oral cavity of the user whereby upon dissolving of said material and release of said tube from compacted form said tube end may be drawn from the stomach into the oral cavity by means of said thread.

5. In a device of the character described, a flexible tube having a length sufficient to extend from the gastro-intestinal tract to the oral cavity of a user and compacted into a volumetric form capable of being swallowed, lubricating means assisting the unfolding of said tube from compacted form, means enclosing said compacted tube to retain said form and being dissolvable in the gastro-intestinal tract so as to release said tube for unfolding therein, and a thread connected to one end of said tube and extending therefrom by a distance sufficient to retain one end of the thread in the oral cavity upon swallowing of said compacted tube whereby upon release of said tube in said tract said tube end may be drawn into the oral cavity by said thread.

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No references cited.