

[54] **FLESH PENETRATING APPARATUS**
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[22] Filed: **March 11, 1971**

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[21] Appl. No.: **123,291**

[52] U.S. Cl.128/347, 128/350
 [51] Int. Cl.A61b 17/34, A61m 27/00
 [58] Field of Search.....128/242, 244, 343, 345, 347,
 128/348, 350 R, 350 V, 351

[57] **ABSTRACT**

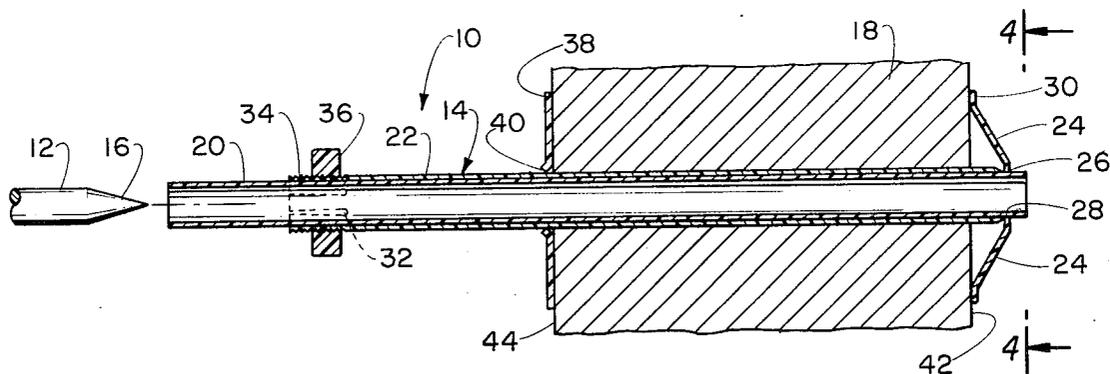
A catheter apparatus for retention within the body of an animal employing a sleeve assembly composed of an inner sleeve telescopically supported within an outer sleeve, a multiple radially expandable finger assembly hingedly integrally connected at one end to the outer sleeve and capable of being maintained in the radially outermost position by the inner sleeve, the fingers being movable substantially in line with the outer sleeve upon disassociation of the inner sleeve.

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8 Claims, 6 Drawing Figures



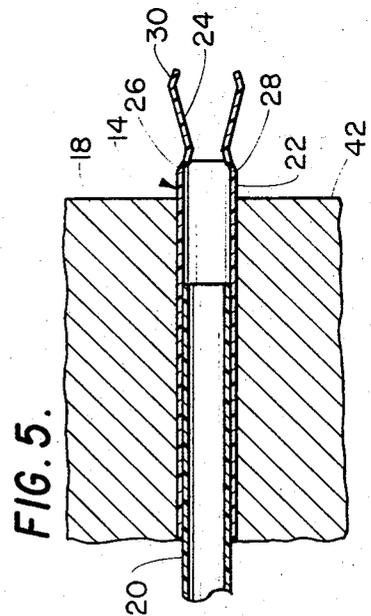
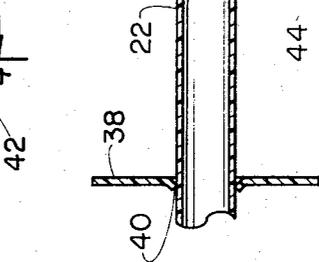
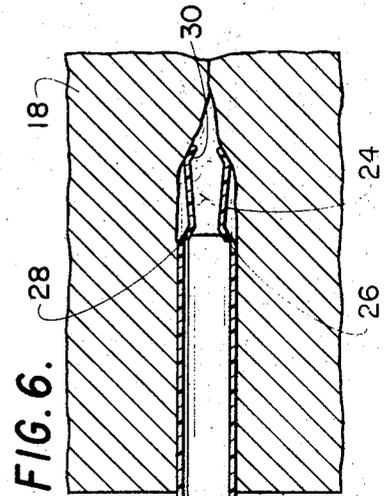
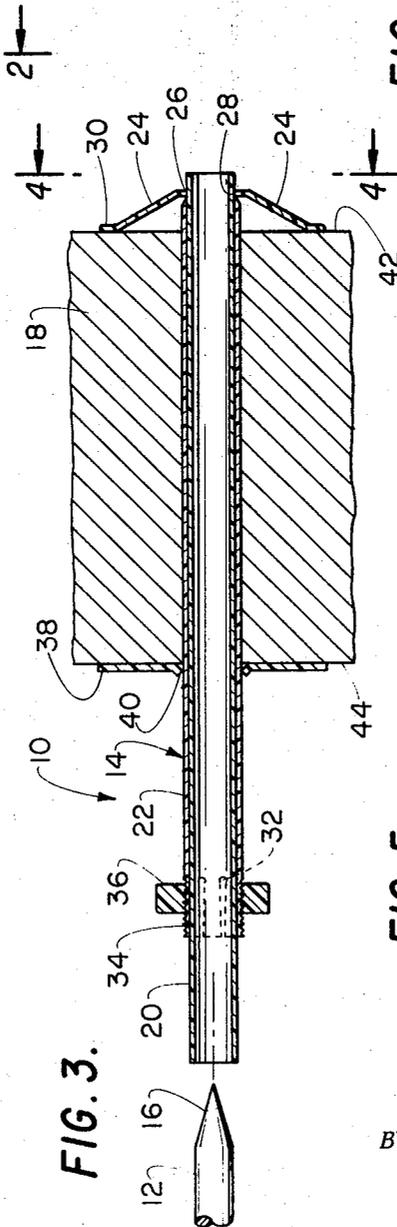
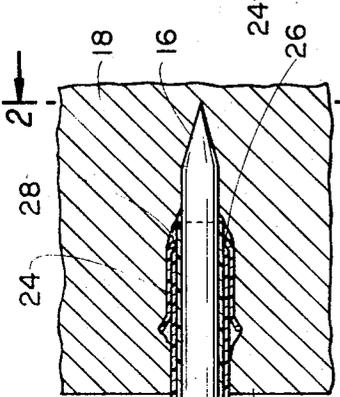
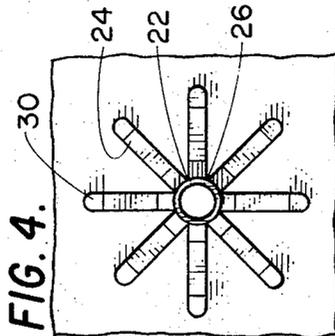
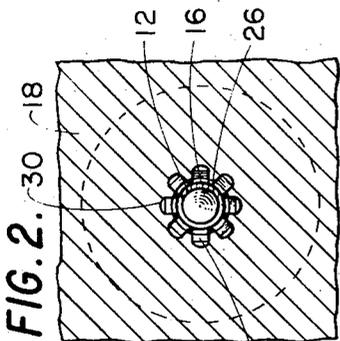


FIG. 1.

FIG. 3.

FIG. 5.

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FLESH PENETRATING APPARATUS

BACKGROUND OF THE INVENTION

The field of this invention relates to medical devices and more particularly to a device which provides access to an interior cavity of an animal body.

In a certain area of medicine trocars are readily employed. A trocar is a sharp pointed instrument which is used to insert a cannula into a body cavity to be employed as a drainage outlet. Basically, a cannula is an elongated rigid tubular element which is to provide communication exteriorly of the body to within a cavity of the body. For example, cannulas are frequently used upon cattle to vent an animal's stomach upon it becoming bloated. Such a disease is quite common in cattle and if a vent is not provided, frequently the animal dies. Additionally, a passage which is provided by a cannula can be employed to facilitate direct insertion of medication into the stomach cavity of an animal. Further, such devices may be applied to an infected wound which requires drainage.

Although such devices are most frequently used upon the lower order of animals, there are certain instances in which a trocar and cannula can be applied to humans. The use of such an instrument in humans would be primarily toward the application of medicines within an internal cavity, such as the stomach, or to effect drainage of an infected wound.

Trocars and cannulas may be made in numerous sizes. To effect drainage of a wound a needle-like size may be adequate. However, to effect insertion of such into the stomach cavity, a pencil size (or larger) cannula may be desired. Heretofore, the trocar related to a pointed instrument which is slidably contained within the cannula. The trocar is caused to penetrate the flesh of the animal and to extend a desired depth within the animal. The trocar carries along with it the cannula. Upon the cannula reaching the desired depth, the trocar is removed leaving an open passage to the particular desired cavity within the animal. In most instances, it is desirable to leave the cannula in position for a period of time of several days. In the lower order of animals, it has not been uncommon for such located cannulas to be dislodged from position either falling exteriorly of the body or being caused to move interiorly of the body as into the stomach cavity. In the past, in an effort to prevent cannulas from moving into the stomach cavity, a portion of the cannula is enlarged and is to extend exteriorly of the body, thereby preventing such dislodgment from occurring. However, no means is provided to prevent dislodgment of the device exteriorly of the body.

In the past, trocars have been made of a stainless steel material of extremely high precision. As a result, such devices have proved most expensive, thereby making it a significant item of purchase for the veterinarian or medical doctor.

It would be desirable to design a trocar and cannula which facilitated entrance of the device interiorly of the body, such device absolutely precluding accidental dislodgment of the device once in position, and such a device being constructed simply and of a low-cost material of construction.

SUMMARY OF THE INVENTION

The apparatus of this invention may provide for the employment of a trocar which is slidably movable within a first sleeve. The trocar can be formed of either a rigid plastic or a rigid metal material with one end thereof being pointed. Basically, the trocar will be of cylindrical configuration. However, polygonal shaped configurations are not to be precluded. A second sleeve is to be located about the first sleeve which is to be of a shorter elongated length than the first sleeve. A combination of the first sleeve and the second sleeve form what is frequently called the cannula. The end of the second sleeve which is to be located within the cavity of the animal includes a plurality of radially extendable fingers. The fingers are hinged pivoted with respect to the first sleeve and are caused to come in contact with the first sleeve upon being extended substantially at a right angle with respect to the sleeve axis. Adjacent the opposite end of the second sleeve and mounted thereupon for a sliding movement is an annular collar. The annular collar is capable of unhindered movement toward the fingers but incurs hindered movement away from the fingers. The end of the second sleeve which is to extend exteriorly of the body is externally threaded and is adapted to cooperate with a nut. This end of the second sleeve is also longitudinally slit a small amount with a plurality of equiangularly spaced apart slits. This end of the second sleeve is also tapered slightly so that upon moving a nut along the second sleeve toward the collar effects contraction of the slits and thereby a binding action to non-removably secure the second sleeve to the first sleeve. Upon the nut being moved directly adjacent the end of the second sleeve, the first sleeve is movable with respect to the second sleeve. Upon sufficient extraction of the first sleeve with respect to the second sleeve, the fingers rotate approximately 90° into substantial longitudinal alignment with the axis of the first sleeve. As a result, no tissue damage occurs during removal of the device due to the fingers being extended. The cannula may be employed without a trocar by inserting the cannula through an existing opening into a cavity. Existing openings may comprise the mouth, nose, ear, or the like. Also, existing openings may also be previous openings formed by a trocar. Further, the cannula may be inserted by a trocar which surrounds the cannula such as a hypodermic needle.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a longitudinal cross-sectional view of the apparatus of this invention showing the trocar and combined cannula during partial insertion through the tissue of an animal;

FIG. 2 is a cross-sectional view of the apparatus of FIG. 1 taken along line 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view similar to FIG. 1 but showing the cannula in the retained position with the trocar being removed therefrom;

FIG. 4 is an end view of the cannula arrangement of this invention taken along line 4—4 of FIG. 3;

FIG. 5 is a fragmentary cross-sectional view showing the fingers mounted upon the second sleeve in the retracted position to facilitate removal of the cannula from the tissue; and

FIG. 6 is a view similar to FIG. 5 showing the cannula during partial removal through the tissue.

DETAILED DESCRIPTION OF THE SHOWN EMBODIMENT

Referring particularly to the drawing, there is shown in FIG. 1 the apparatus 10 of this invention broadly including a trocar 12 and a cannula assembly 14. The trocar 12 is in the general configuration of a cylindrical rod which has the pointed end 16. It is to be understood that the trocar can be made extremely small resembling a needle or can be much larger as in the shape of a pencil or the like. It is also to be understood that the trocar 12 can be in other cross-sectional configurations such as square or rectangular shape. It happens to be that the cylindrical shape depicted would be the easiest to manufacture and also would be the easiest to be inserted through the tissue 18 of the animal with minimum damage.

The trocar 12 is slidably mounted in a snug fitting manner within the first sleeve 20 of the cannula assembly 14. Telescopingly mounted about the first sleeve 20 is a second sleeve 22. Both the first sleeve 20 and the second sleeve 22 are to normally be manufactured from the same material of construction as a rigid plastic or other similar material. Also, the trocar 12 can be either a plastic or metallic material. The second sleeve 22 is of a shorter length than the first sleeve 20. The reason for the difference in length will become readily apparent further on in this specification.

Secured to one end of the second sleeve 22 is a plurality of fingers 24. Each of the fingers 24 is to be formed of a plastic material similar to the material of construction of the second sleeve 22. Each of the fingers 24 is readily disposed with respect to the second sleeve 22. It is to be noted that the number of fingers 24 is to be strictly a matter of choice or design; however, it has been found that eight in number proves to be most satisfactory.

The base of each of the fingers 24 is connected by means of a plastic hinge 26 to the second sleeve 22. Each of the plastic hinges 26 forms an integral connection with the second sleeve 22 and with its respective finger 24. The plastic hinge 26 permits pivotal movement of over 180° from the position shown in FIG. 1 of the drawing to the position shown in FIG. 6 of the drawing. Each of the fingers 24 includes a shoulder 28 adjacent the plastic hinge 26. The function of the shoulder 28 is to be described further on in this specification. Each of the fingers 24 includes a flattened foot-like area 30 adjacent its extremity. The function of the flattened area will also be described further on in this specification.

At the other end of the second sleeve 22 are located a plurality of equiangularly spaced apart longitudinal slits 32. The second sleeve 22 in the area adjacent the slits 32 is exteriorly threaded at 34. A nut 36 is adapted to cooperate with the threads 34 and be movable longitudinally upon the second sleeve 22. The second sleeve 22 in the area of the threads 34 is of a steadily increasing circumference from the end of the second sleeve 22 to the termination of the slits 32. As a result, by tightening nut 36, a concentric contraction of the second sleeve 22 results which effects a binding action upon the first sleeve 20. This binding action is sufficient

to firmly retain the second sleeve 22 together with the first sleeve 20.

Located about the second sleeve 22 nearer the nut 36 than the fingers 24 is an annular collar 38. The collar 38 is crimped at 40 in the aft direction with respect to the fingers 24. The function of the crimping 40 will also be explained further on in this specification. It is to be noted that the collar 38 is slidable about the second sleeve 22 which will also be explained in the following operation of the invention.

The operation of the apparatus 10 of this invention is as follows: It will be presumed that an animal such as a cow has become bloated in the stomach and the gas within the animal's stomach must be vented to the ambient. The veterinarian then locates the first sleeve 20 beyond the fingers 24 which are secured to the second sleeve 22. The operator then tightens nut 36 securing the sleeve 20 and 22 in this arrangement. The fingers 24 are located adjacent the exterior surface of the second sleeve 24. The trocar 12 is then inserted within the first sleeve 20. The operator then places the pointed end 16 adjacent the outer skin of the animal in the particular desired location. The operator then impacts the aft end of the trocar 12 causing the trocar 12 to penetrate the tissue 18. It is upon the penetration of the trocar 12 is to the desired depth, as in this instance to within the stomach cavity, the cannula 14 is likewise to pass through the tissue 18 until the fingers 24 entirely extend within the cavity. The operator then removes the trocar 12 providing a vent opening from the ambient to the stomach cavity by means of the passage within the first sleeve 20. The operator then grasps the exterior portion of the cannula assembly 14 and exerts a force thereupon tending to draw such from the animal. As a result, the free ends of each of the fingers 24 come into contact with the stomach wall 42 and are caused to pivot substantially 90° until the flattened areas 30 are in an abutting relationship with the wall 42. The shoulder 28 of each of the fingers 24 comes into abutting contact with the first sleeve 20 thereby preventing further pivotal movement of the fingers 24 past the 90° position. The operator can feel when this occurs because further outward movement of the assembly 14 is vigorously resisted.

The operator then moves the collar 38 along the second sleeve 22 until the collar comes into an abutting contact relationship with the outer surface 44 of the skin of the animal. The collar 38 is then moved an additionally small amount tending to compress the tissue 18 between the collar 38 and the fingers 24. As a result, a binding action occurs between the fingers 24 and the collar 38 tending to force the crimped portion 40 into greater frictional engagement with the second sleeve 22. As a result of the foregoing, the apparatus 10 of this invention has been installed within the tissue of an animal and is to be firmly retained therein and not capable of being accidentally dislodged. Not only has a vent been provided within the stomach cavity but also a passage is provided for the direct application of medicine or other compounds.

It is to be understood that it is not necessary for the device to be inserted within an open cavity such as a stomach cavity. The apparatus could be inserted within a wound which has become infected. Upon being inserted the desired depth, the pull-back motion upon the

cannula assembly 14 would merely cause the fingers 24 to extend within the adjoining tissue. This extension of the fingers 24 will not be sufficient as to cause significant damage to the tissue. In this instance the drainage for the infected area of the wound would be provided as well as a means to apply a medication directly to the infected area.

To effect easy removal of the apparatus 10 of this invention the procedure is as follows: The operator loosens nut 36 until the first sleeve 20 can be moved relative to the second sleeve 22. Movement of the first sleeve 20 with respect to the second sleeve 22 is accomplished until the forward end of the first sleeve 20 is moved sufficiently to no longer be in cooperation with the shoulder 28 of the fingers 24. As a result, the fingers 24 are free to pivot with respect to the second sleeve 22 to the position in substantial alignment with the longitudinal axis of the second sleeve 22. Thereby as the second sleeve 22 is withdrawn from the tissue 18, the fingers 24 do not hinder the withdrawing movement.

Prior to reuse of the apparatus 10 of this invention, the fingers will be manually pivoted up against the tube 22 as shown in FIG. 1 of the drawing. Also, prior to reuse, the collar 38 is to be manually moved adjacent the threaded area 38. Movement of the collar 38 is not difficult in this direction when there is no force causing the crimped portion 40 to dig into the second sleeve 22. At this time, the apparatus 10 of this invention is ready to be reused.

Another primary advantage of the apparatus of this invention is that the cannula assembly may be employed without the use of the trocar 12. The cannula assembly 14 will be operated in a manner similar to the above described operation. However, the collar 38 may not be employed if the cannula assembly 14 is conducted a substantial distance through a natural cavity as the mouth or through a blood vessel. Actually, it is envisioned that the cannula assembly 14 may be conducted through a blood vessel and lodged in place within the heart. In such instances the inner sleeve 20 may be extended to a substantial length as well as the outer sleeve 22.

Another use contemplated for the apparatus 10 of this invention is that various measurements could be taken by liquid gauges located within the passage of the first sleeve 20. Also, each of the fingers about the flattened areas 30 could have overlapping flaps to protect the tissue in the cavity around the insertion hole. Since the cannula assembly 14 is to be made of a plastic material, it is to have no chemical reaction to tissue. Also, the cannula assembly 14 need not be constructed entirely rigid. The center portion of the cannula assembly may be flexible to facilitate curved movement of the cannula assembly 14 through a body passage (such as a blood vessel). It is only necessary for the ends of the cannula assembly to be rigid to effect operation of the fingers 24 and the nut 36. Basically the uses of the apparatus 10 of this invention are unlimited and up to the ingenuity of the operator.

I claim:

1. A catheter apparatus adapted to be inserted interiorly of an animal body, said apparatus comprising:
a first sleeve and a second sleeve, said second sleeve slidably mounted upon said first sleeve, the com-

bined said sleeves having an inner end and an outer end, said inner end adapted to be inserted into the animal body;

a plurality of separate fingers attached to said inner end of said second sleeve, the base of each of said fingers being pivotally connected to said second sleeve, a shoulder located upon each of said fingers at its said base;

each of said finger elements being movable between a first position and a second position and a third position, the fingers in said first position being in an exterior abutting relationship and in substantial alignment with said second sleeve, said first position being the normal position of said fingers during the insertion movement of said apparatus within the animal body, said second position being such that each of said fingers is substantially perpendicular to the longitudinal axis of said second sleeve said third position being such that said fingers extend beyond said second sleeve and in substantial alignment with said axis, the shoulders being in contact with said first sleeve when the fingers are in said second position, thereby being prevented from movement toward said third position, whereby said fingers may be moved into said third position when said first sleeve is displaced interiorly of said second sleeve so that said shoulders are no longer in abutting contact with said first sleeve, whereby said fingers substantially unhinder withdrawal movement of said apparatus from said animal body.

2. The apparatus as defined in claim 1 including:

the outer extremity of each of said fingers being inclined, the inclination being such that with said fingers in said first position, said outer extremity being inclined outwardly away from said second sleeve, thereby during insertion movement of said apparatus within an animal body said inclined portion of said fingers substantially unhinder insertion movement, and upon said apparatus being completely inserted within the animal body slight movement in reverse to the insertion movement causes said inclined portions of said fingers to contact the animal body and forcibly pivot said fingers to said second position.

3. The apparatus as defined in claim 1 wherein: each of said fingers is equiangularly spaced from each other about said second sleeve.

4. The apparatus as defined in claim 3 wherein: each of said fingers is integrally connected to said second sleeve through a plastic hinge.

5. The apparatus as defined in claim 1 wherein: first means adjustably located upon said second sleeve adjacent said outer end, with said fingers in said second position said first means to contact the exterior surface of the animal body to thereby effect a squeezing of the tissue of the animal between said first means and said finger assembly.

6. The apparatus as defined in claim 5 wherein: said first means comprises a collar slidably mounted upon said second sleeve.

7. The apparatus as defined in claim 1 wherein: said first sleeve is of a greater longitudinal length than said second sleeve.

8. The apparatus as defined in claim 1 wherein:

securing means is connected between said first sleeve and said second sleeve to fixedly retain the position of said sleeves in respect to each other.

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