

[54] CATHETER ADVANCES WITH CLUTCH

[75] Inventors: Edwin A. May, Ridgewood, N.J.;
Geoffrey W. Wilks, Warwick, R.I.

[73] Assignee: International Paper Company, New
York, N.Y.

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128/221, DIG. 16; 254/150 R, 175.3, 175.5,
175.7; 43/8; 226/127, 181, 187-191;
192/82.1, 82.3, 82.4

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Primary Examiner—Richard A. Gaudet

Assistant Examiner—J. C. McGowan

Attorney, Agent, or Firm—Lawrence W. Flynn, Esq.

[57] ABSTRACT

A device for inserting a catheter into a mammalian body, comprising a housing member for storing a flexible catheter, a hollow needle connected to the catheter and supported on the housing member, at least one driven roller within said housing member for engaging and moving the catheter through the needle, and a detent normally preventing rotation of the driven roller in a direction reverse of advancement of the catheter.

11 Claims, 4 Drawing Figures

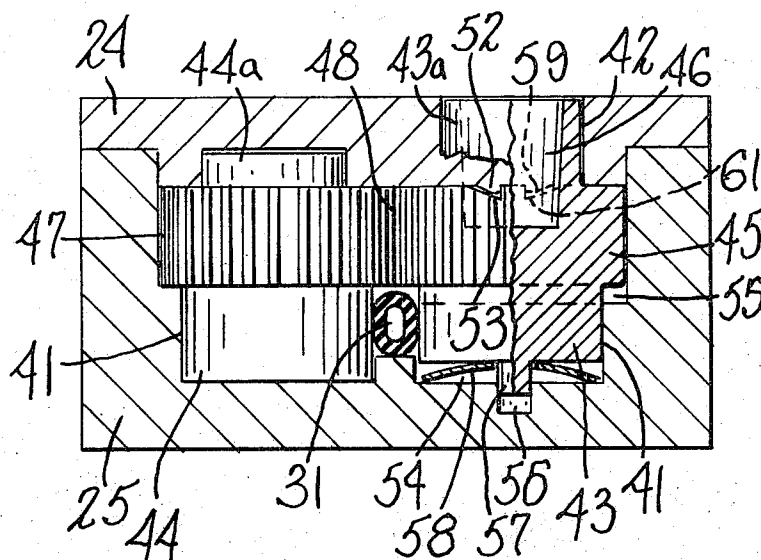


Fig. 1

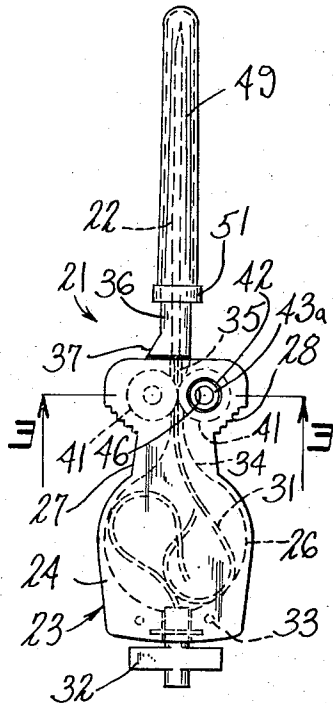


Fig. 2

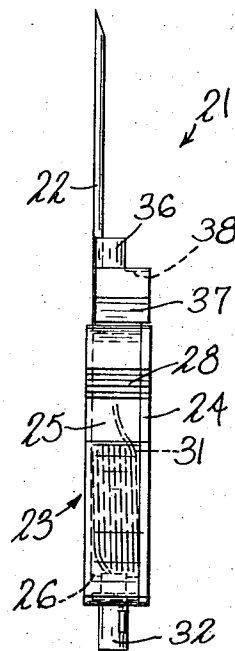


Fig. 3

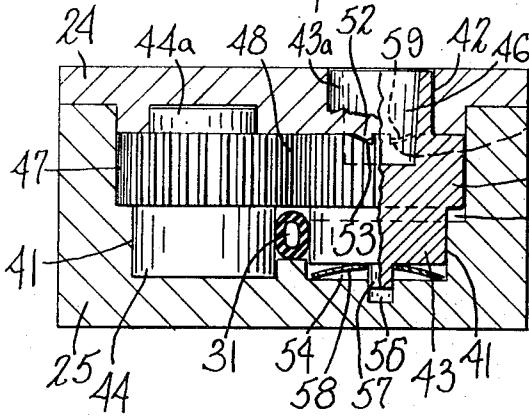
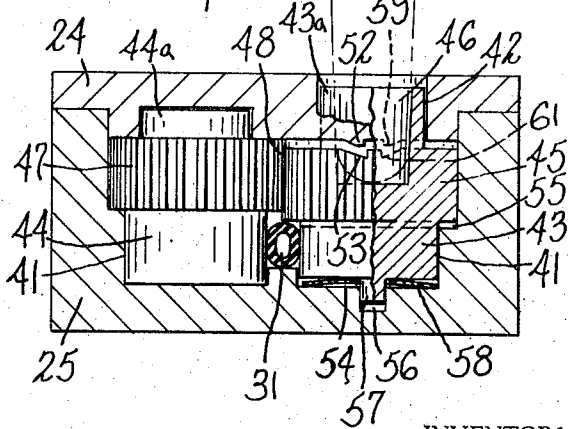


Fig. 4



INVENTORS

Edwin A. May
Geoffrey W. Wilks

BY *Dedico and Montgomery*
ATTORNEYS

CATHETER ADVANCES WITH CLUTCH

BACKGROUND OF THE INVENTION

This invention relates to a device for inserting a catheter into a mammalian body and more particularly to a device for moving a catheter through passageways, canals, or blood vessels of a mammalian body.

In co-pending applications Ser. No. 15,039 filed Feb. 27, 1970 and Ser. No. 212,972, now U.S. Pat. No. 3,774,605, issued Nov. 27, 1973, filed simultaneously herewith, devices for inserting a catheter are disclosed which comprise a housing member, a hollow needle supported in the housing member and drive means for engaging the catheter and moving the catheter through the needle, wherein the housing member defines a passage for moving a flexible catheter to the needle. The catheter is any flexible tube designed for insertion into a mammalian body for various medical purposes. The devices of the co-pending applications, as well as the device of the present invention, maintain the catheter in a sterile condition prior to and while it is being inserted, and provide ease of insertion and control of movement of the soft and flexible catheters conventionally employed therewith, without bending or binding of the catheter and without the use of stylets or wires.

While providing new and improved structure and substantial advantages over known catheter devices, several problems still persist. For example, it would be desirable normally to prevent movement of the catheter back into its housing once it has been advanced out of the housing, in order to provide for positive advancement and to avoid pinching and loss of sterile condition of the catheter by such reverse movement. Moreover, prevention of reverse movement of the catheter will also insure that the catheter has been inserted to the extent desired, perhaps as indicated by calibration marks on the catheter itself.

However, in some circumstances it may nevertheless be desirable to permit reverse movement and return of the catheter into the housing. For example, it may be desirable not to advance all of the catheter into the patient, the housing to be retained for storage of the coiled portion of the catheter and to maintain the sterile condition of such portion. In this instance, it would be desirable to provide for return of the entire catheter to the housing after its use, for disposal of catheter and housing, rather than to require manual removal of the catheter from the patient and separate disposal of the housing and catheter.

OBJECTS AND SUMMARY

Accordingly, an object of the invention is to provide a new and improved catheter device while nevertheless generally retaining the benefits of the devices of the co-pending applications.

Another object is to provide a new and improved device for inserting a catheter wherein the catheter is normally prevented from returning to its housing once it has been advanced therefrom.

Another object is to provide a new and improved device for inserting a catheter wherein the catheter, after advancement to any extent from its housing, may be returned to its housing.

These and other objects, features and advantages of the invention will be apparent from the specification which follows.

In summary outline, the invention is a device for inserting a catheter comprising a housing member, a hollow needle supported on the housing member, drive means comprising at least one driven roller for engaging and moving the catheter through the needle, and detent means normally preventing rotation of the driven roller in a direction reverse of advancement of the catheter.

The invention accordingly comprises the features of construction, combination of elements and arrangements of parts which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

DETAILED DESCRIPTION

For a more complete understanding of the nature and objects of the invention, reference is made to the following description, taken with the accompanying drawing, in which:

FIG. 1 is a front elevational view of a device of the invention;

FIG. 2 is a side elevational view of a device of the invention;

FIG. 3 is an enlarged, partly schematic, section along the line 3—3 of FIG. 1 showing one position of displaceable elements; and

FIG. 4 is an enlarged, partly schematic, sectional view similar to FIG. 3 showing a second position of displaceable elements.

With reference to FIGS. 1 and 2, a device 21 of the invention includes a hollow needle 22 which is to be inserted in a blood vessel or other channel or member of a patient, for the purpose of providing access to a portion of the body. After insertion of the needle, the catheter is moved through the vessel to the required extent and the needle is then removed from the device and the catheter used in removing body fluids or for the administration of fluids, in accordance with known medical procedures. Similarly, the device may be inserted into a body canal, passageway or cavity in order to move a catheter therethrough.

With reference to FIGS. 1-4, a device 21 comprises a hollow needle 22, and a casing or housing member 23 having a removable top member or cover 24 and a bottom or base member 25. The cover and base member define therebetween a chamber 26. The housing member is contracted at one portion thereof to form a neck 27 having indented edges 28, together providing the housing member with a shape for convenient holding and gripping of the device. A catheter 31 is storable within the chamber 26 and has at its proximal end a member, such as a winged tip 32, adapted for epidermal fixing or taping of the proximal end of the catheter to a patient. The winged tip 32 is normally held within the body of the housing member 23 but is removable therefrom upon detachment of the cover 24. The cover 24 preferably is press-fitted to base member 25 but optionally may be fitted thereto with pins 33.

The storage chamber 26 leads to a first channel 34 and then to a second channel 35, the catheter passing through these channels into a generally semi-tubular extension 36. The semi-tubular extension 36 preferably is unitary with a slotted, generally flattened extension 37 of base member 25 but may comprise a separate ele-

ment. The hollow needle 22 (of known construction) has a clamping member 38 comprising two wing-like members mounted on the slotted extension 37. Other details of the needle 22 are described in the above-cited co-pending application filed simultaneously herewith and form no part of the present invention.

In the upper portion of housing member 23 is a pair of annular chambers 41, one chamber of which has an opening 42 through cover 24. Within the chamber having the opening 42 is a driven roller 43 and in the second annular chamber 41 is a second roller 44. At least an upper portion 45 of roller 43, which upper portion here comprises a spur gear, is hollowed or slotted as at 46. Optionally, each of rollers 43 and 44 may be provided, as shown, with upper portions 45 and 47 comprising meshing spur gears meshing at 48 so that the driven roller 43 may in turn drive roller 44. Alternatively, no gearing is provided and roller 44 is an idler roller, the upper portions 45 and 47 then being in sliding contact.

The upper portions or spur gears 45 and 47 each have corresponding shaft portions 43a and 44a, set into cutouts in the cover 24. The shaft portions conveniently are formed with their corresponding spur gears and rollers 43 and 44 to provide unitary assemblies.

The opening 42 provides access to slotted driven roller 43 for insertion of an actuating device such as a shaft connected to a knob, as in copending application Ser. No. 15,039. Preferably, however, as illustrated in FIG. 1, the needle 22 is provided with a shield 49, an end of which is structured to pass through opening 42 and to form a press-fit in the slot 46 of shaft 43a and gear 45. When so inserted, the shield 49 is used to rotate roller 43.

Roller 43 frictionally engages catheter 31 and advances the catheter from storage chamber 26 through lower channel 34, through upper channel 35 into hollow needle 22, and then into the body of a patient. The collar 51 on shield 49 facilitates removal of the shield from the needle and gripping of the shield for actuating the roller 43. It will also be noted that the lower (collared) end of shield 49 is adapted to fit snugly over the semitubular extension 36 when providing its protective function.

As shown in FIG. 4 the shield 49 when inserted through opening 42 also serves as a lever to facilitate removal of cover 24 from member 25. When so employed, the cover 24 and base member 25 are separated and each may be discarded, thus completely removing the catheter from the housing member. The winged tip 32 may be taped or otherwise fastened to the epidermal surface of the patient for convenience of medical treatment, such as administration of a blood plasma or the like, during or after removal of housing member 23. Alternatively, the winged tip 32 may be replaced with a conical attachment, as in the device of application Ser. No. 15,039, for similar medical treatment. For most medical treatments, however, it is preferred to remove the catheter and winged tip from the needle 22, the housing member 23 and the actuator shield 49.

Preferably, at least the cover 24 is transparent so that the feeding of the catheter 31 into the body may be observed and the extent of the feed determined. While the housing member 23 is shown as substantially rectangular in cross section, other shapes, such as spherical, conical or the like, may be employed.

With reference to FIGS. 3 and 4, one embodiment of one way clutch means for normally preventing rotation of driven roller 43 in a direction reverse of advancement of catheter 31 is shown.

It will be noted that cover 24 is provided with a generally wedgeshaped, downwardly projecting cam surface, such as a rising cam 52. Upper roller portion 45 has a cam follower detent cut 53 which mates with the cam surface of rising cam 52. The vertical displacement of upper portion 45 and roller 43, which obviously results from contact of rising cam 52 and detent cut 53 upon actuation of the roller 43, is compensated for by the space 54 below roller 43, the space 55 below roller 43, and the space 56 below the shaft member or pin 57 of roller 43. These spaces are provided as extra area in the cutout for roller 43 in base member 25. A spring 58 such as a wave washer biases the roller 43 in an upward direction.

In FIG. 3, the rising cam 52 and mating detent cut 53 are shown oriented with respect to the direction of rotation of roller 43 required for advancement of the catheter 31 so as not to impede the advancement but to prevent reverse rotation of the roller by insertion and turning of the tip of shield 49. In this manner, positive advancement is assured and any tendency of the roller 43 to pinch or otherwise to constrict the catheter 31 is prevented. However, if rewind of the catheter into the housing is desired, the roller 43 may be forced downwardly by the tip of shield 49 to compress spring 58 as shown in FIG. 4, thereby providing clearance between cam surface 52 and detent cut 53, such that the roller 43 then may be rotated in the reverse direction.

If desired, several pairs of rising cams and detent cuts may be provided such as the second rising cam 59 and detent cut 61, shown in dotted line in FIGS. 3 and 4, displaced 180° from cam 52 and detent cut 53. The pairs of cams and detent cuts may be spaced so as to indicate by suitable indicia on the housing, or solely by the number of clicks as the catheter is advanced, the length of catheter passed out of the housing. Moreover, although FIGS. 3 and 4 show only the roller portion 45 provided with a cam surface 52 and a detent cut 53, other roller portion 47 may be modified in a like manner. It will also be apparent that the location of rising cam 52 and detent cut 53 may be reversed, such that rising cam 52 is on the upper portion 53 and the detent cut is in the cover 24, with suitable orientation of direction of the cam 52 and detent cut in accordance with the direction of rotation required for advancement of roller 43.

While the one way clutch means described above is a preferred embodiment, other structure equivalent to that described will be apparent, such as a prong, spring-loaded button, or other resilient member cooperating with a depression in an adjoining face, or a ratchet and pawl arrangement.

In operation, the hollow needle 22 of the device (which contains in a sterile state a catheter 31) is inserted into the blood vessel or other canal of the mammal, and the catheter is advanced through the needle and into the vessel or canal to the required extent, by turning the roller 43 as by insertion of the tip of shield 49 through the opening 42 of cover 24 into the slot 46. Advancement of the catheter will be evident from the sound or "feel" of clicks from the movement of cam surface 52 past detent cut 53. Normally, the catheter

will be advanced to its entire length and the needle 22 and housing 23 removed. For this purpose the needle 22 is scored lengthwise (not shown) so that it can be split into two halves and discarded. The cover 24 may then be removed from the bottom member 25, and the winged tip 32 and terminal end of the catheter removed. These features of the needle and housing are described in the co-pending applications and form no part of the present invention.

If, during advancement of the catheter, it is desired to return all or a portion of the catheter to its housing 23, the roller 43 is biased against spring 58, as shown in FIG. 4, as by forcing the tip of shield 49 beyond its normal position in slot 46, so as to provide clearance between cam 52 and detent cut 53, and the roller 43 is rotated in a reverse direction. In these manners provision is made both for positive advancement and rewind of the catheter, as described.

Various materials may be used for the construction of the needle, housing member and catheter, as set forth in the co-pending applications, forming no significant aspect of the present invention, and the operation of the invention is in other respects substantially the same.

It may thus be seen that the objects of the invention set forth, as well as those made apparent from the preceding description, are efficiently attained. Since changes in the disclosed embodiments of the invention as well as other embodiments thereof which do not depart from the spirit and scope of the invention may occur to others skilled in the art, the appended claims are intended to cover all embodiments and modification to the disclosed embodiments of the invention which do not depart from the spirit and scope thereof.

What is claimed is:

1. In a catheter device which comprises a housing having a chamber containing therein an antiseptic catheter, a hollow needle connected to the housing and communicating with the chamber, and rotating drive means frictionally engaging the catheter for moving the catheter through the needle,

the improvement comprising:

clutch means cooperating with the drive means comprising a stationary member and a rotatable and axially movable member carried by the drive means, said members being normally engaged and when engaged, preventing movement of the catheter through the needle in a direction toward the chamber.

2. The device of claim 1 further including means for moving the member mounted for axial and rotational movement in its axial direction to separate it from engagement with the other member whereby said clutch means disengages and permits movement of the catheter through the needle in a direction toward the chamber.

3. In a catheter device which comprises a housing having a chamber containing therein an antiseptic catheter, a hollow needle connected to the housing and communicating with the chamber, and rotating drive means frictionally engaging the catheter for moving the catheter through the needle,

the improvement comprising:

clutch means cooperating with the drive means, said clutch means comprising a first movable member mounted for axial and rotatable movement on said

drive means, and a second stationary member, said first and second members being normally engaged and, when engaged, preventing movement of the catheter through the needle in a direction toward the chamber.

4. The device of claim 3 further including means for manually moving said movable member in an axial direction away from said stationary member to disengage the clutch means thereby permitting movement of the catheter through the needle in a direction toward the chamber.

5. In a catheter device which comprises a housing having a chamber containing therein an antiseptic catheter, a hollow needle connected to the housing and communicating with the chamber, and rotating drive means mounted on the housing and frictionally engaging the catheter for moving the catheter through the needle,

the improvement comprising:

means for mounting the rotating drive means for axial and rotatable movement,

first clutch means carried by the housing and second clutch means carried by the axially movable drive means which, when in cooperative engagement, limit rotation of the drive means to that direction which causes the catheter to move through the needle in a direction away from the chamber, and

resilient means urging the axially movable drive means against the first clutch means in a direction generally parallel to its axis to cause the first and second clutch means to cooperatively engage each other.

6. The device of claim 5 further including means for applying to the drive means a force to axially move the drive means away from the first clutch means thereby disengaging the first and second clutch means to permit rotation of the drive means in that direction which causes the catheter to move through the needle in a direction toward the chamber.

7. In a catheter device which comprises a housing having a chamber containing therein an antiseptic catheter, a hollow needle connected to the housing and communicating with the chamber, and drive means for moving the catheter through the needle, the drive means comprising at least one roller mounted in a cutout in the housing, and means for manually driving the roller to cause the roller to frictionally engage the catheter and move it through the needle,

the improvement comprising:

means for mounting the driven roller on the housing for axial and rotatable movement,

a first clutch means carried by a surface of the cutout and a second clutch means carried by the axially mounted roller which means, when engaged, cooperate to permit the roller to move only in a direction which causes the catheter to advance through the needle in a direction away from the chamber,

means for urging the axially movable roller, in a direction generally parallel to its axis, against the cutout surface to cause engagement between the first and second clutch means, and

means for manually exerting against the axially movable roller, from the exterior of the housing, a force sufficient to axially displace the roller and thus disengage the first and second clutch means when desired to thereby permit movement of the catheter

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through the needle in a direction toward the chamber.

8. The device of claim 7 wherein the axially moveable roller is the driven roller.

9. The device of claim 8 wherein each roller includes a gear, the roller being adapted to rotate with the gear, and wherein the gears are disposed in meshing engagement.

10. In a catheter device which comprises a housing having a chamber containing therein an antiseptic catheter, a hollow needle connected to the housing and communicating with the chamber, and drive means for frictionally engaging the catheter and moving it through the needle, the drive means comprising at least one driven roller mounted in a cutout in the housing,

the improvement comprising:

means for mounting the driven roller on the housing for axial and rotatable movement,

a rising cam carried by a surface of the cutout and a cam follower carried by the driven roller which,

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when engaged, cooperate to limit rotation of the driven roller to a direction which causes the catheter to advance through the needle in a direction away from the chamber,

spring means urging the driven roller against the rising cam in a direction generally parallel to its axis to cause the rising cam and cam follower to engage, and

an opening in the housing providing access from the housing exterior to the driven roller by which a force may be applied to the driven roller to move it axially against the spring biasing to cause disengagement of the rising cam and cam follower as long as the force is maintained to thereby permit movement of the catheter through the needle in a direction toward the chamber.

11. The device of claim 10 further including an actuating arm passing through the opening with an end of the arm connected to the driven roller to provide axial and rotatable movement of the driven roll as desired.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,838,688 Dated October 1, 1974

Inventor(s) Edwin A. May et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Title of invention should read -- CATHETER ADVANCER WITH
CLUTCH --.

Signed and Sealed this

seventh Day of *October* 1975

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks