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Medical Device Package With Flip Cap Having A Snap Fit

Abstract

A package for a medical device such as an intermittent catheter has a case which is closed at one end and open at the other end. A cap is connected to the case by a hinge to permit selectable movement of the cap between an open position, wherein access is provided to the open end of the case, and a closed position, wherein the cap prevents access to the open end of the case. A seal is connected to one of the cap and case. The seal is engageable with the other of the cap and case when the cap is closed to form a barrier that maintains a sterile environment inside the package. The seal can be repeatedly made and broken whenever the user closes or opens the cap, respectively. The case includes a pair of slots at the open end. A pair of latches are formed in the cap. The latches fit into the slots to prevent lateral forces from distorting the cap when the cap is closed.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] The present application is a continuation of U.S. Nonprovisional application Ser. No. 18/497,493, filed Oct. 30, 2023, which is a continuation of U.S. Nonprovisional application Ser. No. 17/379,652, filed Jul. 19, 2021, which is a divisional of U.S. Nonprovisional application Ser. No. 16/094,937, filed Oct. 19, 2018, which is a National Stage of PCT International Application No. PCT/US2017/028979, filed Apr. 21, 2017 which claims the benefit of and priority to: U.S. Provisional Patent Application No. 62/326,322, filed Apr. 22, 2016; U.S. Provisional Patent Application No. 62/431,856, filed Dec. 9, 2016; U.S. Provisional Patent Application No. 62/448,748, filed Jan. 20, 2017; and U.S. Provisional Patent Application No. 62/461,635, filed Feb. 21, 2017, the disclosures of all of which are hereby incorporated herein by reference.

FIELD OF THE DISCLOSURE
[0002] This disclosure relates generally to packaging for medical devices such as urinary catheters. More particularly, this disclosure relates to compact catheters, such as urinary catheters, and the packaging, storing and hydrating/lubricating of such catheters.
BACKGROUND
[0003] Intermittent catheterization is a good option for many users who suffer from a neurogenic bladder, that is, an atonic or unstable bladder associated with a neurological condition, such as diabetes, stroke, or spinal cord injury. Very often a neurogenic bladder is caused by conditions which may also result in diminished dexterity of the user.
[0004] Commonly, in intermittent catheterization single use, individually packaged, sterile catheters are used. Catheters often include a surface treatment that reduces friction to allow for easier and less traumatic insertion into and through the user's urethra.
[0005] Regardless of whether a surface treatment is used or what type of surface treatment is used, some type of package for the catheter is required. In the past various kinds of packages have been used, including molded containers of assorted sizes and shapes, bags and pouches made of plastic or metal foil, and similar kinds of devices While these prior art packages generally accomplish the objective of protecting the catheter during transport, storage and preparation for use, they suffer from disadvantages that range from fundamental—the packages may break open prematurely; to economic—the package designs are wasteful of material and labor; to the annoying—the packages

confuse users as to how to open them or are difficult for a user of low dexterity to easily access the catheter, or the packages tend to spill the hydrating medium upon opening.

[0006] Accordingly, what is needed is a catheter package that is economical to manufacture and fill, reliable throughout its useful life, and simple and intuitive to use. It is also desirable to have a compact package which is can be discreetly carried by the user in a purse or pouch; discrete to dispose of in a waste bin; and intuitive and easy to open, particularly by a user with low dexterity. Additional desirable features of the package include easy removal of the catheter from the case; easy reclosing of the case after use; hygienic use; and it should be discreet and clean to carry after use.

[0007] Because users often carry intermittent catheters with them in containers such as purses, handbags, shoulder bags, backpacks and the like, the sealed catheter package should be capable of withstanding compression and other forces to which such containers are typically subjected. More particularly, the catheter package should remain sealed even when subjected to such forces so as to, among other things, maintain the sterility of the catheter within the package.

[0008] Furthermore, users will often prefer to return a used catheter to their purse or bag for subsequent disposal. Accordingly, the catheter package should be capable of receiving a used catheter back in the package and then being reclosed in a sealed and secured manner. Thus, a catheter package with a reliably reclosable cap would also be desired. Convenience may be further enhanced if the reclosable cap is attached to the remainder of the package so the cap does not become misplaced during use of the catheter.

[0009] As described above, many users of intermittent catheters have limited manual dexterity that can make it difficult for them to open a package and extract a catheter from the package. Thus, while reliable and secure capping and re-capping are a desired aspect of a compact catheter, also desired is the ability to easily open the package, access and extract the catheter. Accordingly, it would be desirable to provide a catheter and catheter package wherein extraction of the catheter is made easier by presenting at least a portion of the catheter (that is not inserted into the urethra of the user, such as the funnel) beyond an open end of the package when the cap is removed. Thus, the end of the funnel is presented for easy extraction and/or for easy and hygienic attachment of a urine collection bag, if desired.

[0010] Of course, having at least a portion of catheter or the funnel extending beyond the open end of the package may make the above-described sterile sealing, capping and recapping operations more difficult to achieve. For example, providing a cap hinge that is unobtrusive but affords an arc of motion for the cap that allows the cap to clear the funnel during opening and closing movements and attain the aforementioned sealing (capping) and re-sealing (e.g., “dynamic sealing”) presents one challenge. Still another challenge is providing a cap that can be configured to achieve reliable sealing over an extending portion of the catheter (e.g., funnel) while withstanding the forces and loads to which it may be subjected while being carried in a handbag, purse or other receptacle which can compromise the seal. Side loads, i.e., radial or tangential loads on the cap can be a particular problem, especially on the portion of the cap opposite the hinge location. The catheter packages described herein address these concerns.

SUMMARY

[0011] In one aspect, the present disclosure is directed to a catheter package, including a case having a hollow tube which is closed at one end and open at the other end, and a cap. The package may include a hinge having one end connected to the cap and a second end connected to said other end of the hollow tube. The hinge permits selectable movement of the cap between an open position, wherein access is provided to the open end of the hollow tube, and a closed position, wherein the cap prevents access to the open end of the hollow tube. A seal is connected to at least one of the cap and case. The seal is engageable with the other of the cap and case when the cap is in the closed position to form a barrier between the cap and case that maintains a sterile environment inside the case and cap.

[0012] In another aspect, the present disclosure is directed to a catheter package including a case having a hollow tube which is closed at one end and open at the other end and a cap. The package may include a hinge having one end connected to the cap and a second end connected to the other end of the hollow tube. The hinge permits selectable movement of the cap between an open position, wherein access is provided to the open end of the hollow tube, and a closed position, wherein the cap prevents access to the open end of the hollow tube. A seal connected to at least one of the cap and case is provided. The seal is engageable with the other of the cap and case when the cap is in the closed position to form a seal between the cap and case that can be repeatedly made and broken whenever the user closes or opens the cap, respectively.
[0013] In one more particular aspect, the present disclosure includes a hard plastic packaging that holds a short, hydrophilic coated catheter. The catheter may have a length of, by way of example only, about 91 mm of exposed length. A funnel is attached to the catheter. The funnel may be, for example, about 40 mm long. The hard packaging enables the properties of vapor hydration through a hydration liner that separates a water chamber from the hydrophilic coated catheter.
[0014] In another more particular aspect, the present disclosure is directed to a hard plastic packaging that holds a short, hydrophilic coated catheter. The catheter tubing may have a length of, by way of example only, about 91 mm of exposed length. A funnel is attached to the catheter tubing. The funnel may be, for example, about 40 mm long. The hard packaging enables the properties of vapor hydration through a hydration liner that separates a water chamber from the hydrophilic coated catheter.
[0015] In a further aspect, the present disclosure is directed to a package that has a hollow plastic case for receiving the catheter. The case has a generally tubular wall closed at one end by a bottom wall. The opposite end of the case is open and has a cap attached to it by a hinge. The cap is selectably movable between open and closed positions in which the cap uncovers or covers the open end of the case, respectively. The cap has a pair of latches on the bottom edge thereof. A pair of slots are formed on the top of the case and define a detent between them. When the cap is placed in the closed position the latches fit into the slots and engage the detent to retain the cap in the closed position by releasably resisting vertical lifting forces on the cap. Engagement of the detent by the latches also prevents lateral forces on the closed cap from dislodging the cap or impairing its seal.
[0016] A case insert has a lower, collet portion engaging the internal surface of the case's tubular wall just below the open end thereof. An upper, projection portion of the case insert extends axially upwardly from the collet and protrudes beyond the open end of the case's tubular wall. An O-ring is seated in a groove on the outer surface of the projection. The O-ring is engageable with the interior surface of the cap when the cap is in the closed position. The cap is configured to fit around and clear the upstanding funnel and the projection of the case insert during opening and closing motions of the cap. The case insert may be made of a relatively rigid material to support the O-ring in sealing engagement with the cap even after repeated closing and opening sequences of the cap. The case insert also helps resist distortion of the location of the closed cap on the case due to side loading of the cap, i.e., tangential or circumferential forces on the cap that may be encountered during storage and transport of the package.
[0017] The lower end of the collet portion of the case insert may have a radially inwardly extending foot that engages a flange on the lower end of the funnel to limit the extent to which the catheter can be inserted into the case. The foot is located such that the upper portion of the funnel extends above the open end of the case when the catheter is stored in the package. Alternately, the inwardly extending foot could be located on the case. In this configuration the funnel interacts with the case, not the case insert.
[0018] In a further aspect, the present disclosure is directed to a case insert that has a shortened collet portion with ribs formed around its internal surface. The bottom edge of the collet is supported in the tubular wall of the case by a ledge.

[0019] In a still further aspect, the present disclosure is directed to a package that has a hollow plastic tube for receiving the catheter. The tube has a generally cylindrical wall closed at one end by a bottom wall. The opposite end of the cylindrical wall has a cylindrical ferrule which is open at its end and defines a rim. At least partially surrounding the ferrule is a collar. At least a portion of the collar is separated from the ferrule, leaving a gap between the ferrule and the collar. Thus, the entirety of the rim is devoid of any features that would interfere with a tight fit between the ferrule and a cap. The cap is attached by a hinge to the collar. The cap is selectably movable between open and closed positions in which the cap uncovers or covers the open end of the ferrule, respectively. The cap may have a skirt which engages with a mating portion of the collar to cover the ferrule completely. A tongue on the ferrule is engageable with a groove on the interior of the cap to retain the cap in the closed position when the cap is pivoted onto the top of the ferrule.
[0020] In another aspect, the present disclosure is directed to a package that has a hollow plastic tube for receiving the catheter. The tube has a wall of generally rectangular cross section and is closed at one end by a bottom wall. The opposite end of the tube's wall flares outwardly to an enlarged shoulder, the top land of which defines a sealing surface. A cap is attached to the tube by a hinge which allows the cap to move selectably between open and closed positions on the tube. The bottom of the cap has a sealing surface that engages that of the shoulder when the cap is closed to seal the interior of the package. The cap has mounted thereon a novel operating lever. The lever has a fulcrum attached to the cap and both an opening mechanism and a locking mechanism. The operating lever allows easy opening and closing of the packaging containing the catheter as well as easy access to the catheter. The package is opened by actuating a finger-sized flexible operating lever which is part of the cap. When the opening mechanism of the operating lever is depressed, it disengages the locking mechanism by pulling it away from the case body due to the intrinsic stiffness and elasticity of the plastic and the geometry of the pivot point. Actuation of the locking mechanism will also break a tamper evident feature placed between the locking mechanism on the cap and the case. The cap and the case may be molded as two separate components or one component.
[0021] Once the cap and the opening mechanism are actuated, the sterile seal between the cap and the case is breached. This seal may be overmolded or inserted into the case. It will possibly be made out of a thermoplastic or a thermoset or a combination of both.
[0022] In another aspect, the present disclosure is directed to a package that has a three-part container for receiving the catheter and a cap for closing the container. The three parts of the container include a hydration liner, a case, and a sleeve. Each of these three parts is basically an elongated, hollow tube, closed at one end and open at the other end, with the open end being selectably openable and closable by the cap. The hydration liner fits within the case which in turn fits within the sleeve. The hydration liner has window openings that permit hydration of a catheter stored in the liner. The cap may be either a flip cap that is removably attached to the case by a hinge, or it may be a twist-off cap that is removably attached to the case by threads. With either type of cap the sleeve and cap meet one another at a joint where the outer contours of the cap and sleeve match one another. In other words, the outer perimeters of the outer surfaces of the sleeve and cap match one another. Thus, the mechanical components such as threads, flanges, lips, grooves, seals and the like are hidden under one or both of the sleeve and cap. The matching outer contours of the sleeve and cap provide a smooth joint between the sleeve and cap and provide an aesthetically pleasing exterior appearance for the package.
[0023] In an alternate aspect, the present disclosure is directed to a package that has a two-part container that utilizes the case to provide the function of the hydration liner. The two parts of the container include a case and a sleeve. Once again each of the two parts is an elongated, hollow tube, closed at one end and open at the other end, with the open end being selectably openable and closable by the cap. The case fits within the sleeve. The case may have window openings that permit hydration of a catheter stored in the case. The cap may be either a flip cap or a twist-off cap.

The sleeve and cap meet one another at a joint where the outer contours of the outer surfaces of the sleeve and cap match one another to provide an aesthetically pleasing exterior appearance for the package.
[0024] The package(s) of the present disclosure permit a user to retrieve the catheter from the case and re-capture it if they so wish. Once the cap is locked back into its closed position the package retains its original sealing qualities (meaning it will not leak), with a feature, such as a label that breaks upon opening, indicating that the product has been used. Another potential indication of use could be stress marks created in the hinge when the user first opens the product.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0025] FIG. **1** is a perspective view of a first embodiment of the package of the present disclosure, with the cap in the closed position.
[0026] FIG. **2** is an exploded perspective view of the package of FIG. **1** from a different angle, with the cap shown in the open position on the case and the liner, case insert, O-ring, catheter tube and funnel removed from the case.
[0027] FIG. **3** is a rear elevation view of the package looking at the hinge joining the cap to the case.
[0028] FIG. **4** is a left side elevation view of the package of FIG. **1**.
[0029] FIG. **5** is a front elevation view of the package of FIG. **1**.
[0030] FIG. **6** is a front elevation view of the liner.
[0031] FIG. **7** is a side elevation view of the liner.
[0032] FIG. **8** is a top plan view of the liner.
[0033] FIG. **9** is a bottom plan view of the liner.
[0034] FIG. **10** is a perspective on an enlarged scale of a first embodiment of the case insert.
[0035] FIG. **11** is a front elevation view of the case insert of FIG. **10**.
[0036] FIG. **12** is a left side elevation view of the case insert of FIG. **10**
[0037] FIG. **13** is a rear elevation view of the case insert of FIG. **10**.
[0038] FIG. **14** is a top plan view of the case insert of FIG. **10**.
[0039] FIG. **15** is a bottom plan view of the case insert of FIG. **10**.
[0040] FIG. **16** is an enlarged perspective view of the upper portion of the package assembly with the cap in the open position, showing the catheter funnel protruding above the case insert.
[0041] FIG. **17** is an enlarged section through the upper portion of the package, taken along the line **17-17** of FIG. **1**.
[0042] FIG. **18** is an enlarged section, similar to FIG. **17** but showing an alternate embodiment of the case insert.
[0043] FIG. **19** is an enlarged section, similar to FIG. **17** but with a portion of the funnel broken away to show a further alternate embodiment of the case insert.
[0044] FIG. **20** is a perspective view similar to FIG. **16** but showing an alternate embodiment of the detent wherein the detent is attached to the case insert instead of to the case.
[0045] FIG. **21** is an enlarged section through the package, taken along line **17-17** of FIG. **1** and showing an alternate embodiment of the case insert.
[0046] FIG. **22** is a perspective view of the case insert of FIG. **21**.
[0047] FIG. **23** is a perspective view of the upper portion of the package assembly with the cap in the open position, showing an alternate embodiment of the case insert.
[0048] FIG. **24** is a section taken generally along line **24-24** of FIG. **23**.
[0049] FIG. **25** is a perspective view of the upper portion of the package assembly with the cap in the open position, showing a further alternate embodiment of the case insert.

[0050] FIG. **26** is a section taken generally along line **26-26** of FIG. **25**.
[0051] FIG. **27** is a section taken generally along line **27-27** of FIG. **25**.
[0052] FIG. **28** is a vertical section similar to FIG. **17** but with the cap shown in the open position and with an alternate embodiment of the case insert.
[0053] FIG. **29** is a vertical section taken along line **29-29** of FIG. **1** but with the cap shown in the open position and with the case insert of FIG. **28**.
[0054] FIG. **30** is a side elevation view of the case insert of FIGS. **28** and **28**.
[0055] FIG. **31** is a front elevation view of the case insert of FIGS. **28** and **29**.
[0056] FIG. **32** is a perspective view of an first alternate embodiment of the disclosure, showing the upper portion of the package tube, with the cap in an open position.
[0057] FIG. **33** is a longitudinal section taken along line **33-33** of FIG. **32**.
[0058] FIG. **34** is a perspective view of the package of FIG. **32** from a different angle, with the open cap and ferrule aligned.
[0059] FIG. **35** is a side elevation view of the upper portion of the package of FIG. **32**.
[0060] FIG. **36** is a vertical section taken along line **36-36** of FIG. **34**.
[0061] FIG. **37** is a perspective of an entire package according to a second alternate embodiment of the present disclosure, showing the cap in a closed position.
[0062] FIG. **38** is a perspective of the package of FIG. **37** but with the cap shown in a partially open position to expose a catheter within the package.
[0063] FIG. **39** is a section, on an enlarged scale, taken generally along line **39-39** of FIG. **37**, with the cap shown in a closed position and the operating lever in a locked condition.
[0064] FIG. **40** is a section similar to FIG. **39** but with the operating lever moved to a release position.
[0065] FIG. **41** is a perspective view similar to FIG. **38** but on an enlarged scale showing just the upper end portion of the package.
[0066] FIG. **42** is a perspective view of a hydration liner that can be used in either of the packages of the present disclosure.
[0067] FIG. **43** is a top plan view of the hydration liner of FIG. **42**.
[0068] FIG. **44** is a side elevation view of the hydration liner of FIG. **42**.
[0069] FIG. **45** is a longitudinal section through the hydration liner of FIG. **42**.
[0070] FIG. **46** is a perspective view of another embodiment of a hydration liner that can be used with the packages and assemblies of the present disclosure.
[0071] FIG. **47** is a side elevation view of the hydration liner of FIG. **46**.
[0072] FIG. **48** is a longitudinal section through an assembly of the embodiment of the package shown in FIGS. **32-36** of the present disclosure, including a hydration liner and catheter therein.
[0073] FIG. **49** is an enlarged section of the package assembly, including the portion indicated by the circle labeled FIG. **49** in FIG. **48**.
[0074] FIG. **50** is a perspective view showing a user connecting a urine collection bag to the catheter assembly.
[0075] FIG. **51** is a perspective view illustrating that the package assembly may be positioned in different orientations during connection to the urine collection bag.
[0076] FIG. **52** is a perspective view showing the urine collection bag attached to the funnel of the catheter.
[0077] FIG. **53** is a perspective view of the catheter being removed from the package assembly.
[0078] FIG. **54** is a perspective view of another embodiment of a package assembly of the present disclosure.
[0079] FIG. **55** is a perspective view of a further alternate embodiment of the disclosure, showing a catheter package with a flip cap in a partially open position to expose a catheter funnel in the package.
[0080] FIG. **56** is a longitudinal section taken along line **56-56** of FIG. **55** but with the cap moved

to a closed position.
[0081] FIG. **57** is a section taken along line **57**-**57** of FIG. **56**.
[0082] FIG. **58** is a section similar to FIG. **56**, showing an alternate arrangement for a hinge connecting a case and a flip cap.
[0083] FIG. **59** is a longitudinal section through a package of a further alternate embodiment of the disclosure wherein the container is a two-part structure and no catheter is shown in the package.
[0084] FIG. **60** is a view similar to FIG. **21** showing a further alternate embodiment of a liner.
[0085] FIG. **61** is a left side elevation view of yet another alternate embodiment of the disclosure wherein the flip cap is separate from the case.
[0086] FIG. **62** is a longitudinal section through an assembly of the embodiment of the package shown in FIG. **61**.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0087] The present disclosure is directed to packages for medical devices such as intermittent urinary catheters. Such a package is shown generally at **10** in FIG. **1**. FIG. **2** shows the major components of the package including: a case **12**, a cap **14**, a hydration liner **16**, a case insert **18**, and an O-ring **20**. FIG. **2** also illustrates the product contained within the package **10**, namely, a urinary catheter which includes catheter tubing **22** and a funnel **24** attached to one end of the tubing **22**.
[0088] Details of the case **12** will now be described. The case is preferably molded from a suitable plastic material, such as polypropylene, although other materials could be used. The case includes a hollow tubular wall **26** which defines an axis A as seen in FIG. **19**. The tubular wall **26** terminates at an end wall **28** that closes the bottom of the tubular wall. The interior surface of the tubular wall may be generally cylindrical. The exterior surface of the tubular wall **26** may have either a cylindrical or rectangular cross-sectional shape or the cross-section could be otherwise. As shown in FIG. **1**, most of the exterior surface of the tubular wall **26** has a generally rectangular cross-section with large-radiused corners **30** joining four sides **32**, although as shown even the sides **32** are not perfectly flat as they have a slight curvature on their outer surfaces. Above this rectangular portion the tubular wall **26** flares outwardly somewhat at a neck portion **34** to increase the diameter of the tube. The top of the neck **34** joins a cylindrical collar **36**. The collar terminates at an open end of the tubular wall **26**.
[0089] Further details of the structure of the collar **36** are best seen in FIG. **16**. The open end of the collar is cylindrical in shape and thus has circular internal and external edges. Thus, the external shape in this embodiment is circular and the external dimension would be an outside diameter. However, other external shapes could be used and the external dimension of a non-circular collar would not technically be a diameter. The thickness of the wall **26** creates a radial surface or top land **40** on the open end of the collar **36**. The top land **40** is the radial surface at the greatest axial extent of the collar **36**. In the orientation of the drawings, it is the highest or topmost radial surface. The collar **36** includes several features of varying axial extent. These include a shoulder **38**, sloping portions **38**A, **38**B of the shoulder that define a pair of slots **44** and **46** and a detent **48** between the slots. The shoulder **38** extends arcuately about 180° and is centered near the mid-point of a hinge **42**. The top land **40** at the shoulder **38** extends circumferentially in two directions from the mid-point of the hinge **42** and merges with gradually downwardly sloping portions **38**A, **38**B that join slots **44** and **46**. The slots **44** and **46** terminate at a detent **48**. The detent has a pair of undercuts **50** on its lateral edges that define ears **52**A and **52**B. The surfaces of the undercuts **50** and ears **52**A, **52**B, while not solely axial, include an axial component. The top land **40** at the detent **48** has the same height or axial location as the top land at the shoulder **38**.
[0090] The hinge **42** as shown is a living hinge, but other hinge arrangements could be used. The hinge connects to the collar **36** and the cap **14** to permit selectable movement of the cap between open and closed positions.
[0091] Internal features of the case **12** are shown in FIG. **17** and include upper and lower radial beads **54** and **56**. Between the beads the internal surface of the neck defines a sealing surface **58**.

Below the lower bead **56** there is an inwardly extending spacer **60** of limited arcuate extent on the interior of the neck **34** at the front only.

[0092] Details of the cap **14** will now be described. They are best seen in FIG. **16**. The cap is hinged to the case **12** by hinge **42** and is selectably movable by a user between a closed position and an open position. FIG. **16** shows the cap in the open position. The cap **14** includes a generally cup-shaped shell **62** having a top wall **64** joined to a generally cylindrical side wall **66**. The top wall **64** and side wall **66** may merge on one side of the cap to form a lip **68** that makes it easy for a user to engage the cap with a finger or thumb. Alternately, the lip **68** can be used to assist in opening the cap by placing the lip **68** in engagement with the edge of a table or similar surface and pulling the case downwardly. The hinge **42** is attached to the side wall **66**. The side wall terminates at a bottom land **70**. The bottom land is the radial surface that mates with the top land **40** of the collar **36**. It is the portion of the open end of the side wall **66** having the least axial separation from the top wall **64**. Like the top land **40**, the bottom land **70** is cylindrical. Two latches **72**, **74** extend from the bottom land **70** axially away from the top wall **64** of the cap. When the cap is in the closed position the latches extend or project downwardly from the bottom land **70** of the cap. Each latch has a sloping edge **72**A, **74**A that extends from a sill portion **71** of the bottom land **70** to a crest surface **72**B, **74**B of the latch. The facing edges of the latches **72**, **74** have undercuts **72**C, **74**C that form tabs **72**D, **74**D and define a gap **76** in the cap between the latches. Similarly to the undercuts **50** and ears **52**A, **52**B, the undercuts **72**C, **74**C and tabs **72**D, **74**D include an axial component.

[0093] When the cap is closed the bottom land **70** of the cap **14** mates with the top land **40** of the collar **36**. That is, the sill **71** engages the shoulder **38**, and the gap surface **76** engages the top land **40** on the detent **48**. Also, the sloping edges **72**A, **74**A engage the sloping portions **38**A, **38**B, and the crests **72**B, **74**B engage the slots **44** and **46**. Finally, as the cap closes the tabs **72**D, **74**D of the cap snap past the ears **52**A, **52**B of the detent **48** to allow the detent to end up disposed in the gap **76**. That is, ears **52**A, **52**B of the detent end up disposed in the undercuts **72**C, **74**C of the latches **72**, **74**. Similarly, the tabs **72**D, **74**D end up disposed in the undercuts **50**A, **50**B of the detent **48**. During closing or opening movement of the cap the tabs **72**D, **74**D and ears **52**A, **52**B interfere with one another but flex slightly to allow these parts to slide past one another in either an opening or closing direction. Thus, when the cap is closed the cap and collar present a smooth, but interlocking external surface on the top of the package. Furthermore, when the cap is closed the axial components of the latches **72**, **74** and detent **48** end up adjacent one another which will prevent any lateral forces on the cap from dislodging the cap or degrading the seal between the cap and O-ring, as will be explained below. By lateral forces it is meant forces in a plane roughly parallel to that defined by the mating top and bottom lands **40** and **70** of the case and closed cap. This would include forces tangential to the cap or forces acting on the cap in a circumferential direction. That is, the rear portion of the cap is held fixed against lateral loads by the hinge **42**. The front portion of the cap is held fixed against lateral loads by engagement of the detent **48** with the latches **72** and **74**.

[0094] Turning now to FIGS. **6-9**, a hydration liner is shown generally at **16**. The hydration liner is sized to fit within the case **12**. The liner **16** rests within the tubular wall of the case with the catheter's tubing **22** (but not the funnel **24**) within the liner **16**. The liner defines a space between the liner's exterior surface and the case's interior surface within which a hydration mechanism, such as liquid water may reside. This permits hydration of the surface treatment on the catheter tubing.

[0095] The liner **16** may be a relatively rigid plastic such as LDPE or HDPE or other relevant materials. The liner has a generally hollow tube **78** which is open at the top and closed at the bottom. At its upper end the tube **78** has a seat of slightly increased outside diameter compared to the remainder of the tube **78**. The seat is sized to engage the internal wall of the package case. The seat includes an upper portion **80** of maximum outside diameter and a lower portion **82** which has a stepped down outside diameter compared to the upper portion. The upper portion may engage a radially extending ledge on the inside surface of the case to hold the liner in place. A keyway or slot

84 is formed in the upper portion **80** of the seat. There are locating pads **86** at the bottom of the tube **78** which are engageable with the internal walls of the case to fix the bottom end of the tube. A pair of flats **88** are formed on opposite side of the exterior of the tube **78**. The keyway **84**, locating pads **86** and flats **88** help orient the liner in place during the assembly process. The walls of the liner tube **78** have formed therein one or more passages or windows **90**. The windows will be covered with a patch (not shown) of liquid impermeable/vapor permeable material such as, but not limited to, calcium carbonate. The patches will allow passage of water vapor (for hydration of the catheter) but will block passage of liquid water droplets. The patch might be heat sealed around the perimeter of the windows **90**.

[0096] Turning to FIGS. **10**-**15**, details of the case insert **18** will now be described. This embodiment of the case insert has four portions or regions, a sleeve **92**, a transition section **94**, a collet **96** and a projection **98**. The lowest of these is the cylindrical sleeve **92**. It has a radially inwardly directed foot or flange **100** at the bottom thereof. The sleeve at its upper end joins the transition section **94**. The transition section flares out prominently toward the front of the insert and less so to the rear. The flaring of the transition section **94** results in the top of the transition section and the collet **96** having an increased outside diameter compared to the sleeve. At the junction of the exterior surfaces of the sleeve **92** and the transition section **94** and at the front thereof is a T-shaped bumper **102**. The bumper is engageable with the spacer **60** in the neck **34** of the case **12** to fix the sleeve **92** and transition section **94** in the case **12** in a radial direction.

[0097] The top of the transition section **94** joins the collet **96**. The collet is cylindrical and fits inside the collar **36** of the case's tubular wall **26**. In this embodiment the collet has a circumferential groove **104** on its exterior surface. The groove receives an O-ring **106** (FIG. **17**). The O-ring **106** engages the sealing surface **58** in the collar **36** to prevent any leakage of a hydrating medium, e.g., liquid water, from the lower portion of the case **12**.

[0098] The top of the collet **96** joins the projection **98**. The projection is that portion of the case insert **18** that protrudes above the top land **40** of the collar **36**. Uke the collet **96**, the projection **98** is cylindrical and it has essentially the same inside and outside diameters as the collet. Near the top edge of the projection **98** there is a circumferential groove **108** on its exterior surface. This groove receives the O-ring **20**. As seen in FIG. **17**, the O-ring **20** engages the internal surface of the cap's side wall **66** to prevent any leakage of liquids from the interior of the case insert **18**. The O-ring **20** provides a dynamic seal in that the cap can be opened and closed numerous times and each time the cap is closed the O-ring **20** will again prevent any escape of moisture from the package.

[0099] One of the advantages of the case insert is that it provides the option of making it from a different material than that of the case. If desired, the case can be made to be very stiff because the case insert material is not limited by the needs of the case and cap material. The latter must be soft enough to produce a good living hinge. But with an entirely separate case insert, it can be made quite robust and therefore it provides a good base for the O-ring **20**. For example, the case insert could be made of a stiff HDPE or a grade of polypropylene that is harder than the polypropylene of the case. Alternately, the case and case insert could be made of the same type of polypropylene. Mounting the O-ring on the case insert also eliminates any need to place a seal or sealing material in the cap. Furthermore, greater dimensional tolerance can be held since the case insert is a single component, as opposed to being part of the case, which itself is already a complex mold.

[0100] There are several alternative methods for assembling the case **12** and case insert **18**. A first method is to mold the case as an overmold on the case insert. This would be a two shot process. The case insert itself is molded in shot one. Then the case is overmolded around the case insert in shot two. A second method is a one shot assembly. This would be a one shot process. The case and case insert are both made in one shot. A third method is a separate component assembly process. In this process the case and case insert are individually molded as separate components and then assembled together. That is, the case insert would be inserted into the case during the assembly process.

[0101] FIG. **17** illustrates the interactions among the parts at the top of the case **12**. The bottom the case insert's collet **96** sits on the lower bead **56** in the neck **34** of the case. The T-shaped bumper **102** engages the spacer **60** in the neck **34**. The lower O-ring **106** engages the sealing surface **58**. The upper O-ring **20** engages the interior of the cap **14**. The catheter tubing **22** is supported in the bottom of the funnel **24**. The bottom of the funnel is supported by the foot **100** of the case insert's sleeve **92**.

[0102] FIG. **18** illustrates an alternate embodiment of the case insert at **18**A. This embodiment deletes the lower O-ring and the groove on the collet **96**A therefor. Instead of the insert-to-case seal being made by an O-ring, it is made by an interference fit between the outer surface of the collet **96**A and the sealing surface **58** of the collar **36**. The interference fit may be enhanced by ultrasonically welding the case insert **18**A to the case **12**.

[0103] FIG. **19** shows another alternate embodiment for a case insert **18**B. In this embodiment both the sleeve and transition section of the previous case inserts have been deleted. Case insert **18**B has just a collet **96**B and a projection **98**B. The projection **98**B and the O-ring **20** therein are similar in structure and function to the previously described embodiment. The collet **96**B is axially shorter than the collets **96** and **96**A. Collet **96**B extends only as far as, and rests on, the upper radial bead **56** in the neck **34**. Also, a series of indentations are cut on the internal surface of the collet **96**B to define a series of axially-extending ribs **110**. The indentations reduce portions of the wall thickness which makes the part easier to mold.

[0104] FIG. **20** illustrates an alternate arrangement for a detent **48**A. This detent is similar to detent **48** in that it has a pair of ears, one of which is seen at **52**A, that are located so as to flexibly engage the tabs **72**D, **74**D of the cap's latches **72**, **74** when the cap **14** moves between its open and closed positions. But instead of the detent **48**A being formed on the case and extending axially, the detent **48**A is attached to the external surface of the case insert **18**A and extends radially outwardly therefrom. There is open space underneath the detent **48**A and thus the detent is separated from the top land **40** of the case **12**. The outer circumference of the detent **48**A still has the same outside diameter as the top of the collar **36** and the bottom of the cap side wall **66**. Accordingly, when the cap **14** is closed the mating detent and cap surfaces present a smooth, continuous outer surface. When the cap is closed the latches **72**, **74** snap around the detent **48**A with the tabs **72**D, **74**D ending up tucked under the ears **52**A, **52**B so that the ears resist unintentional opening forces and retain the cap closed. However, the ears and tabs will flex upon application of an intentional opening force to allow the cap to move from the closed position to the open position. Also, while the detent **48**A is shown as a single piece, it could be formed as two separate pieces with an intermediate hiatus, so long as the positions of the ears **52**A, **52**B remain the same. Making the detent **48**A as two pieces may make each individual piece more flexible for purposes of snapping past the moving tabs of the cap.

[0105] FIGS. **21** and **22** show another alternate embodiment for a case insert **18**C. The case insert **18**C lends itself to the possibility of manufacturing it and the case **12**C in a one-shot molding process. However, case insert **18**C can also be manufactured in a two-shot molding process. Or it could be made entirely separately from the case and then the separate case and case insert **18**C are assembled together. Thus, the design of case insert **18**C affords complete flexibility in the choice of its manufacturing process. Case insert **18**C is generally similar to the case insert **18**A of FIG. **18** in that it has a sleeve **92**C, a transition section **94**C, a collet **96**C and a projection **98**C, with a groove **108** on the external surface of the projection for receiving a single O-ring **20**. Case insert **18**C differs from case insert **18**A in that the external surface of the transition section **94**C and the collet **96**C closely adhere to the internal surface of the case's tubular wall **26**C, particularly at the neck **34**C and collar **36**C. Thus, case insert **18**C does not have a piece like the bumper **102** and the case **12**C does not have a piece like the spacer **60** on the interior of the neck.

[0106] FIGS. **23** and **24** illustrate a first variation of the case insert **18**C. In the embodiment of FIGS. **23** and **24** a case insert **18**C-**1** differs from case insert **18**C only in that the O-ring groove

108C-**1** is formed from two separate components. The O-ring groove is defined by upper and lower flanges **112**C-**1** and **114**C-**1**, respectively. The upper and lower flanges join a root **116**C-**1** of the groove. In this embodiment the root **116**C-**1** and the lower flange **114**C-**1** are integrally formed during a molding operation. But the upper flange **112**C-**1** is made as a separate part and attached to the root portion **116**C-**1** at a later step in the assembly process. It may be attached by ultrasonic welding, for example, although other methods could be used.

[0107] FIGS. **25-27** illustrate a second variation of the case insert **18**C. In the embodiment of FIGS. **25-27** a case insert **18**C-**2** once again differs from case insert **18**C only in that the O-ring groove **108**C-**2** is formed from two separate components. The O-ring groove **108**C-**2** is defined by upper and lower flanges **112**C-**2** and **114**C-**2**, respectively. The upper and lower flanges join a root **116**C-**2** of the groove. In this embodiment the lower flange **114**C-**2** is integrally formed with the collet **96**C-**2** of the case insert **18**C-**2** during a molding operation. But root **116**C-**2** is not molded with the lower flange **114**C-**2**. Instead, the root **116**C-**2** is integrally formed with the upper flange **112**C-**2**, with the combination root and upper flange being separate part from the lower flange. This combined root and upper flange is then attached to the lower flange **114**C-**2** at a later step in the assembly process. Once again, the combined upper flange **112**C-**2** and root **116**C-**2** may be attached to the lower flange **114**C-**2** by ultrasonic welding, or other suitable method.

[0108] In both of the case inserts **18**C-**1** and **18**C-**2** shown in FIGS. **23-27**, the end result is a case insert whose shape is the same as case insert **18**C. By forming the O-ring grooves **108**C-**1** or **108**C-**2** with two separate components there is no mold parting line on the root surfaces **116**C-**1** and **116**C-**2**.

[0109] FIGS. **28-31** show another alternate embodiment for a case insert **18**D. This embodiment is similar to the case insert **18**B of FIG. **19** in that it has a collet **96**D and a projection **98**D, with a groove **108**D on the external surface of the projection **98**D for receiving a single O-ring **20**. As with case insert **18**B, the case insert **18**D lacks a sleeve. However, case insert **18**D does have a truncated transition section **94**D. The truncated transition section **94**D includes an annular hoop **118** that has an elongated apron **120** on the front side thereof. The apron **120** extends circumferentially about one quarter of the way around the hoop **118** and it merges gradually with the remainder of the hoop. The bottom edges of the hoop **118** and apron **120** form an opening of sufficient diameter to allow the catheter funnel **24** to move easily in and out of the package.

[0110] When installed in a case **12** the apron **120** is generally opposite and spaced from the neck **34** of the tubular wall **26** of the case **12**. The bottom edges of the hoop **118**, including the apron **120** are angled inwardly from the internal surfaces of the case's collar **36** and neck **34**. Thus, the hoop **118** is spaced from the case and defines a trap space **122** (FIGS. **28** and **29**) between the hoop and the internal surface of the case. The trap space **122** is enlarged in the area of the apron **120**. The trap space **122** will trap any loose water in a direct hydration scenario and stop unwanted spillage. That is, in a package using direct hydration there is liquid water in the case for hydrating the catheter. When the catheter is removed, the hydration water could potentially leak out the open case. A hydration liner is one way to prevent this. The case insert **18**D provides another way to prevent spillage of hydration water without using a liner. Here the hoop **118** forms the trap space **122** which will collect any hydration water prone to leaking out an opened container and thereby prevent spillage. It will be noted that the amount of hydration water in the case is not sufficient to flood the trap space **122** and spill out through the opening in the center of the case insert **18**D.

[0111] One of the advantages of using one of the case inserts **18** or **18**A to **18**D to mount the O-ring **20** where it engages the interior surface of the cap **14** is this arrangement enables the outer contours of the cap **14** and collar **36** to match one another. That is, the exterior shape and outer dimensions of the cap **14** and collar **36** are the same. In the illustrated embodiments the exterior shape of the top land **40** and the bottom land **70** is circular and each land **40** and **70** has the same external diameter. Thus, as the cap closes on the collar the bottom land **70** of the cap's side wall **66** meets the top land **40** of the collar **36** in facing relation. Neither the cap nor the collar overlaps the other

and one does not fit inside the other. Instead the case insert's projection **98** fits inside the cap and the cap fits right on top of the collar. This arrangement provides a smooth, continuous contour to the exterior of the package while still sealing against leakage.

[0112] Other advantages of the case insert include the fact that the case insert acts as a plug that stops the hydrating fluid from spilling when the case is opened or when the catheter is removed. The case insert combined with the funnel keep the hydrating fluid from spilling into the interior of the cap. Thus, the case insert maintains the hydrating fluid where it belongs, namely, next to the coating on the catheter. The case insert could also be elongated downwardly to include a gel lubrication area. There is also the potential to add a wiping mechanism to the bottom of the case insert so as to remove any excess gel on the catheter.

[0113] Further benefits of the case insert include the case insert acting as a seal aid. Due to its material stiffness and design, it gives extra robustness when subject to large external forces compared to the traditional flip cap design in which there is no projection extending above the open end of the case. This affords greater ease of use in terms of the opening and closing force required while ensuring a sterile flip open and close seal is achievable. Also, the case insert and O-ring allow for multiple opening and closing sequences in which a vapor and liquid seal is achieved upon each closing.

[0114] An additional benefit of the case insert is the case insert can be used as a funnel gripper. The case insert keeps the funnel in a position that ensures it will not interact with the cap when the cap is being opened or closed. The case insert allows the protrusion of the funnel above the case when the cap is opened, thereby presenting the funnel prominently to the user for gripping. The case insert also gives the latch mechanism more rigidity. Finally, the case insert assists the latch mechanism in resisting lateral forces. Due to its relative stiffness, the case insert aids in maintaining a seal with the closed cap even when the cap is subjected to lateral forces.

[0115] It can be seen that the catheter package of FIGS. **1-22** addresses the issues noted above. The shell **62** of the cap **14** surrounds an upstanding funnel **24** when the cap is closed. The neck **34** of the case's tubular wall **26** provides an enlarged diameter for the collar **36** which in turn offsets the vertical axes of the tubular wall **26** and the collar **36**. This permits the catheter funnel **24** to be located closer to the hinge **42** than to the detent **48**, thereby providing clearance for the cap beyond the funnel during opening and closing movements. At the same time, the case insert **18** provides a mounting location for the O-ring that allows the O-ring to break and make a seal with the interior of the cap multiple times. Finally, the vertical components of the latches **72**, **74** interengage with those of the detent **48** to resist lateral loads on the cap.

[0116] A further alternate package for medical devices such as intermittent urinary catheters is shown generally at **210** in FIGS. **32-36**. The upper portion of such a package is shown here. The major components of the package **210** are a case **212** and a cap **214**. The cap is hinged to the case and is selectably movable by a user between a closed position and an open position. FIGS. **32-36** show the cap in the open position.

[0117] Details of the case **212** will now be described. The case includes a hollow tube **216** which terminates at an end wall (not shown) that closes the bottom of the tube. The tube may have either a cylindrical or rectangular cross-sectional shape or the cross-section could be otherwise. The tube defines a central axis A (FIG. **36**). As can be seen in FIGS. **33** and **36** the upper end of the tube **216** has an internal rib **218** that protrudes inwardly from the inside surface of the tube **216**. Rib **218** supports the catheter funnel that will be described below in connection with FIGS. **48-49**. Just above the rib **218** there is an internal ledge **220**. The ledge is not uniform around the internal diameter of the tube **216** as the ledge has a somewhat greater radial extent on one side of the tube, the right side as seen in FIG. **36**. This provides a structure from which the tube flares outwardly somewhat to increase the diameter of the tube at a neck portion **222**. The neck portion **222** joins a cylindrical ferrule **224**. The ferrule defines a central axis B (FIG. **36**) and terminates at an open end which defines a rim **226**. It will be noted that axis A of the tube **216** is laterally offset from the axis

B of the ferrule **224**. That is, axis A is closer to the cap hinge than axis B is. This is advantageous because it places an installed catheter, and in particular the catheter's upstanding funnel, closer to the hinge and farther away from the lug (described below) of the cap. This placement of the catheter makes it less likely that the funnel will interfere with the lug and skirt of the cap as it closes around the top of the funnel. In some respects the ferrule can be considered part of the upper end of the tube **216**. On the exterior of the rim **226** there is a small bead **228** (FIG. **36**) extending radially outwardly from the ferrule wall. The exterior of the ferrule **224** also carries a tongue **230** extending radially outwardly from the ferrule wall on the side of the ferrule opposite from the cap **214**.

[0118] A collar **232** surrounds the exterior of the ferrule **224**. However, the collar is not concentric with the ferrule and the collar is not exactly cylindrical either. Rather, the collar has a band portion **234** that adjoins the exterior surface of the ferrule. The band portion includes a shoulder **236**. The shoulder has an enlarged top land. The shoulder **236** is somewhat below and axially spaced from the tongue **230**. The shoulder and tongue have approximately the same circumferential extent. Thus, the shoulder **236** and tongue **230** define a pocket **238** between them. A pad **240** is formed below the shoulder **236** and extends below the band **234** onto the neck **222** of the tube **216**.

[0119] As the band **234** encircles the ferrule **224** moving circumferentially away from the shoulder **236** the band gradually separates from the exterior surface of the ferrule to form a separate stand-off wall **242**. The stand-off wall, while generally curving around the ferrule **224**, is non-cylindrical, thereby enabling the stand-off wall to define a space or gap **244** (FIGS. **33** and **36**) between itself and the exterior surface of the ferrule **224**. The stand-off wall **242** includes two scalloped portions **246**A, **246**B, each of which merges with one of a pair of ears **248**A, **248**B, respectively. Between the ears the stand-off wall **242** has a curved panel **250**. The panel has a reduced height compared to the ears **248**A, **248**B. With the foregoing description of the collar **232**, it can be seen that the ferrule **224** is generally that portion of the tube **216** above the neck **222** and surrounded by the collar **232**.

[0120] The top edge of the panel **250** joins one end of a hinge **252**, the other end of which connects to the cap **214**. The hinge **252** as shown in a living hinge, but other hinge arrangements could be used.

[0121] Details of the cap **214** will now be described. The cap **214** includes a generally cup-shaped external shell **254** having a top wall **256** joined to a generally cylindrical side wall **258**. The top wall and side wall may merge on one side of the cap to form a lip **259** that makes it easy for a user to engage the cap with a finger or thumb. The hinge **252** is attached to the side wall **258**. A depending skirt **260** extends from the bottom edge of the side wall. The skirt includes curved edges **262**A, **262**B which mate with the scalloped portions **246**A, **246**B, respectively, of the collar when the cap is closed. This presents a smooth, but interlocking external surface on the top of the package when the cap is closed.

[0122] The interior of the skirt also has a lug **264** spaced inwardly from a flange **266** which is on the edge of the skirt. Together the lug **264** and flange **266** define a groove **267** between them. This groove receives the tongue **230** on the ferrule **224** when the cap **214** is closed on the ferrule. The flange **266** and/or the tongue **230** flex to permit the tongue and flange to move past one another during closing or opening. Upon closing the flange **266** ends up in the pocket **238** next to the shoulder **236**. This snap fit closure retains the cap **214** closed until such time as a user wishes to open the cap by pushing the cap upwardly adjacent the pad **240**.

[0123] The interior of the cap is lined or partially lined with a liner **268** made of relatively soft material compared to that of the cap and case. The soft liner promotes a tight seal between the cap **214** and the ferrule **224**. It will be noted the liner may include a sprue portion **270** through the top wall **256** of the cap that assists in fixing the liner in place. The open end of the liner is cylindrical so that it can fit snugly around the external surface of the ferrule **224** adjacent to the rim **226** and immediately therebelow. The bead **228** on the rim impinges on the internal surface of the liner **268** to further assist in making a tight seal when the cap is closed. This seal is capable of retaining any

hydration mechanism in the case. It will be noted that since the stand-off wall **242**, and particularly its curved panel **250**, allows all of the hinge connections to be remote from the ferrule **224**, neither the hinge **252** nor anything else will interfere with the liner **268** contacting the ferrule's outer surface adjacent the rim **226** when the cap is closed. The skirt **260** of the cap in the closed position engages the top edge of the collar **232**, with the liner **268** fitting around the external diameter of the ferrule.

[0124] It will also be noted that when the cap is closed a portion of the cap liner **268** will reside in the gap **244** between the ferrule **224** and the stand-off wall **242**. This construction of a female cap surrounding a male ferrule when the cap is closed affords a moisture tight seal between the cap and ferrule. At the same time the cap and ferrule construction leaves the opening at the rim **226** of the ferrule **224** unobstructed so that the funnel of an installed catheter can extend beyond the top of the case. This extension of the funnel of an installed catheter beyond the case is desirable from the standpoint of making it easy for a user to grab the funnel and extract the catheter from the case. It also makes it easier to return a used catheter to the package because the end of the funnel is always going to be exposed for a user's fingers to grab and hold. It can be seen that the female cap defines an enclosure which when closed surrounds the extending funnel portion and also permits sealing against the outside surface of the ferrule **224**.

[0125] A further alternate embodiment of a package according to the present disclosure is shown generally at **272** in FIGS. **37-41**. This package **272** in similar to that of FIGS. **32-36** in that it has a case **274** and a cap **276** hinged to the case. The cap is movable by a user between a closed position, shown in FIGS. **37** and **39**, and an open position. The cap is shown partially open in FIGS. **38** and **41**, where the funnel portion **277** of a catheter can be seen. The case **274** includes a tube **278** having a closed end **280**. The tube as shown in this embodiment has a four-sided construction of generally rectangular cross section, although the cross section could be cylindrical or otherwise. The top of the tube **278** has a neck **282** portion that merges with a shoulder **284**. The neck and shoulder create an enlargement near the top of the tube. The top land of the shoulder may have a sterile seal made of TPE or silicone for engagement with the bottom rim of the cap. The shoulder has a notch **286** formed on one side thereof. On the side of the tube opposite the notch **286** there is a hinge **288** attached to the shoulder **284**.

[0126] The cap **276** includes its own hinge element **290** (FIGS. **39** and **40**) that may be pinned to the hinge **288** on the shoulder **284**. The hinge element **290** is attached to a side wall **292** of the cap **276**. The top of the cap is closed by a top wall **294**. Mounted on the cap opposite the hinge element **290** there is a finger-sized, flexible operating lever **296** attached to the side wall. The lever has a fulcrum **298** (FIGS. **39** and **40**) attached to the cap. The lever includes both an opening mechanism **300** above the fulcrum **298** and a locking mechanism **302** below the fulcrum. The locking mechanism includes a hook **304** that is engageable with the notch **286** as seen in FIG. **39**. The cap is opened by depressing the opening mechanism **300**. When the opening mechanism of the operating lever is depressed, the lever **296** pivots about the fulcrum **298** and thereby disengages the hook **304** from the notch **286** by pulling the hook away from the notch due to the intrinsic stiffness and elasticity of the plastic. This is best seen in FIG. **40**. The cap can then be tilted back about the hinges **288**, **290**, as seen in FIG. **41**. Actuation of the locking mechanism **302** will also break a tamper evident feature, such as a piece of an adhesive label (not shown), placed between the locking mechanism **302** on the cap and the case **274**.

[0127] Turning now to FIGS. **42-45**, a hydration liner is shown generally at **306**. The hydration liner is sized to fit within either case **212** of FIGS. **32-36** or case **274** of FIGS. **37-41**. The liner **306** rests in the tube of the case with the catheter's tube portion (but not the funnel portion) within the liner. The liner defines a space between the liner's exterior surface and the case's interior surface within which a hydration mechanism, such as liquid water may reside. This permits hydration of the surface treatment on the catheter tubing.

[0128] The liner **306** may be a relatively rigid plastic such as LDPE or HDPE or other relevant

materials. The liner has a generally hollow tube **308**. At its upper end there is a seat portion **310** of slightly increased outside diameter compared to the remainder of the tube **308**. The seat portion **310** is sized to engage the internal wall of the package case, as will be further explained below. A pair of interference ribs **312** may be formed on the external surface of the seat **310**. At the top edge there is a seal **314**. In addition to the ribs **312**, the external surface of the seat **310** has at its top edge a crab claw seal **314**. While the ribs **312** provide stability of the liner **306** while engaged with the internal wall of the package case, the crab claw seal **314** provides a moisture-tight seal against the interior wall of the package case. The walls of the liner tube **308** have formed therein one or more passages or windows **316**. The windows will be covered with a patch (not shown) of liquid impermeable/vapor permeable material such as, but not limited to, calcium carbonate. The patches will allow passage of water vapor (for hydration of the catheter) but will block passage of liquid water droplets. The patch might be heat sealed around the perimeter of the window.

[0129] FIGS. **46** and **47** illustrate another embodiment of a hydration liner that is shown generally at **306***a*. Similar to hydration liner **306**, hydration liner **306***a* is sized to fit within either of the cases shown in FIGS. **32-36** and FIGS. **37-41** or any other suitable case. The liner **306***a* rests in the tube of the case with the catheter's tube portion positioned within the liner. The upper seat portion **310***a* may have a substantially smooth surface that is sized to engage the internal wall of the package case, such as by a friction fit. The upper seat portion may be held in place by fiction fit, heat sealing, adhesive and/or any other suitable manner of attachment. In one embodiment, the substantially smooth surface of the seat portion **310***a* may, optionally, include a detent or recess that engages, for example, a protruding lip that may be formed on the interior surface of the tube, such as the lip **326** shown in FIG. **49**. The friction fit, heat sealing and/or adhesive between the internal wall of the package and the seat portion **310***a* may provide a moisture-tight seal or the seat portion **310***a* may include a seal such as the crab claw seal **314** described above. Similar to liner tube **306**, the walls of the liner tube **308***a* may have formed therein one or more passages or windows **316***a* that may be covered with a liquid impermeable/vapor permeable material.

[0130] The liner tubes disclosed herein may have one or more mechanisms or features that assist in aligning the liner tube during the manufacturing process. For example, when the one or more windows **316**, **316***a* are covered with a liquid impermeable/vapor permeable material, the alignment features and mechanisms may be used to orientate or align the liner tube during a process for attaching the liquid impermeable/vapor permeable material to the liner tube. In one embodiment, the alignment features assist in aligning and holding the liner tuber during a heat sealing process for attaching a liquid impermeable/vapor permeable calcium carbonate material to the liner tube. Such aligning mechanisms and features may also be used to transfer and orient the liner tube along a production line. Furthermore, the case may also include alignment features, which may correspond to the alignment features of the liner tube, that assist in aligning the liner tube and case relative to one another during assembly of the package so that the liner tube is in a desired orientation relative to the case. In one example, the alignment features may include one or more protrusions **313***a* located at the closed end **311***a* of the liner tube **308***a*. Additionally, the alignment features of the liner tube **308***a* may include flat surfaces located on the sides of liner tube **308***a* that, optionally, may be tapered. In the illustrated embodiment, liner tube **308***a* includes a flat, tapered surface **315***a*. In other examples, the liner tube **308***a* may include a plurality of flat surfaces. For instance, the liner tube **308***a* may include flat, tapered surfaces **315***a* on opposed sides of the tube. Furthermore, the seat **310***a* of the liner tube **308***a* may include alignment features that include notches or cutouts **317***a*. It will be understood that the liner tubes may include one or more of above described alignment features.

[0131] FIGS. **48** and **49** illustrate the package **210** of FIGS. **32-36** in an assembly including a hydration liner **306** and a catheter **318** installed in the case **212**. The catheter has a funnel **320** and tubing **322** press fit into the bottom of the funnel at a central bore in the funnel. The funnel has a flange **324** (FIG. **49**) extending generally radially outwardly on its external surface near the bottom

of the funnel. This flange **324** interacts with the internal rib **218** on the internal surface of the case **212** to assist in retaining the catheter **318** in the tube **216**. When the catheter is installed in the tube **216** the bottom of the funnel **320** rests on the top land of the hydration liner's seal portion **310**. Retention of the seal portion **310** in the tube **216** is aided by the interference ribs **312** surrounding an inwardly protruding lip **326** which is formed on the interior surface of the tube **216**.

[0132] As shown in FIGS. **48** and **49** and explained above, upon opening of the package **210**, the distal end **321** of the funnel **320** projects above the rim **226** and extends or projects out of the opening of the package so that the funnel **320** may be accessed and grasped by the user to remove the catheter **318** from the package. As also discussed above, the catheter **318** is retained within the package by, for example, an interaction between the internal rib **218** of case **212** and flange **324** of the funnel **320**, until the user applies sufficient force to remove the catheter from the package. For example, axial movement of the catheter to move the flange **324** past the rib **218**. One of the benefits of this retention feature is that the engagement between the catheter **318** and the case **212** resists inadvertent removal of the catheter **318** so that the catheter **318** remains within the opened package **210** until the user actively removes the catheter **318** for use. In other words, the retention feature prevents the catheter **318** from inadvertently falling out of the package **210**. For conventional package assemblies wherein the catheter may inadvertently fall out of the package, the catheter is at risk of coming into contact with surfaces that may contaminate the catheter which can result in increasing the risk of infection. Thus, retaining the catheter **318** within the opened package **210** until it is ready for use can assist in reducing the risk of undesired contamination. This is particularly useful for individuals with limited dexterity and for those who have the habit of commencing the catheterization procedure by opening the package and then proceeding with the other steps of the catheterization procedure.

[0133] Referring to FIGS. **50**-**53**, there are some catheterization procedures that require the use of a urine collection bag **330** and/or the user prefers to use a urine collection bag **330**. In catheterization procedures that use a urine collection bag **330**, each of the features of the catheter extending beyond the rim **226** of the opening of the package **210** and the catheter retention feature may provide benefits to the user.

[0134] Turning first to the retaining feature, which retains the catheter **318** within the package **210** until the user applies sufficient force to the catheter **318** to remove it from the package **210**. Referring to FIG. **50**, for illustrative purposes, there is shown a typical urine collection bag **330** that includes a urine collection reservoir **332**, such as a plastic bag, a tube **334** for the passage of urine into the collection reservoir **332** and a connector **336** that connects the tube **334** to the funnel **320** of the catheter. In the illustrated embodiment, the connector **336** may include a tapered end portion **338** which is sized to be fitted within the opening of the funnel **320** and be retained within the funnel **320** by a friction fit. Referring to FIGS. **50** and **52**, to connect the urine collection bag **330** to the funnel **320**, the connector **336** is inserted into the funnel **320** and force is applied to securely fit the connector within the funnel.

[0135] In conventional packages already known in the field, the user first removes the catheter from the package and then attaches the urine collection bag to the funnel by grasping the funnel. While connecting the collection bag to the funnel, the user tries to avoid contact with the catheter tube, so as to avoid contamination thereof. This may be difficult for users with limited dexterity and may lead to an increased risk of contamination.

[0136] Turning back to FIGS. **50**-**53**, because the catheter **318** is securely retained within the package **210** and the user does not have to be concerned with the catheter **318** inadvertently falling out of the package, the user may grasp the outside of the package **210** (as opposed to only grasping the funnel) to connect the urine collection bag **330** without having to first remove the catheter from the package. The ability to be able to grip the outside of the package **210** provides a larger gripping surface for the user for the user to manipulate the catheter **318** and also reduces the risk of contamination because the catheter **318** remains protected within the package **210** during

connection of the connector **336** and the funnel **320**. Furthermore, as shown in FIG. **51**, after opening of the catheter package **210**, the package **210** may be held in virtually any orientation without the concern of the catheter **318** falling out of the package **210**. This can be beneficial to users with limited dexterity, especially those that would need to hold the package **210** upside down or with the opening in a downward orientation in order to connect the urine collection bag **330** to the catheter funnel **320**.

[0137] Regarding the distal end of the funnel **320** extending above the rim **223** and out of the opening of the package **210**, this feature allows the user to see the insertion of the connector **336** into the funnel **320** and visually inspect the connection. Additionally, after the connection has been made, the user may grasp the distal portion of the funnel **320** extending from the opening of the package **210** to remove the catheter **318** from the package **210**, as shown in FIG. **53**. It will be understood that this ability to connect a collection bag to a funnel while the catheter is still in the package applies to each of the various embodiments of packages shown in this disclosure.

[0138] FIG. **54** illustrates another embodiment of the present disclosure wherein the top **340** of the package **342** has any of the features discussed above, but the bottom **344** of the package **342**, which forms or defines the hollow tube that houses the catheter tube, is made from a flexible material. For example, the bottom **344** of the package **342** may be made from one or more flexible polymeric and/or metal foil sheets. The sheet may be a laminate that includes both polymeric and metal layers. In the illustrated embodiment, the bottom **344** of the package **342** may be formed from a front sheet **346** and a back sheet **348** wherein the sheets **346** and **348** are sealed together along the side edges **350** and bottom edge **352**. The top edges **354** of the sheets **346** and **348** may be attached to the top **340** of the package **342**, by for example, adhesive or welding.

[0139] It will be noted that the case **212** and the cap **214** are formed as a single component. This affords the advantage that assembly of multiple parts of the package is not required. Installation of a catheter is all that is needed to complete the product package assembly.

[0140] This product is helpful as it addresses issues that many intermittent catheter users are experiencing, especially around the areas of hygiene after use, ease of removal of the catheter and the opening of the product. In these criteria the package of the present disclosure is superior to currently available products, especially in discreet female intermittent catheters. For example, a typical intermittent catheter user is a multiple sclerosis sufferer. Multiple sclerosis sufferers have varying levels of dexterity and grip strength which can also vary from day to day in some patients. Having an easy to open package is reassuring that they will always able to void their bladder confidently.

[0141] The hygienic re-capture of the catheter into its packaging is also an advantageous feature of the packaging that other catheters do not fully address; with the flip cap concept of the present disclosure the catheter can be safely captured after use without fears of spills. Our catheter funnel, unlike many prior art funnels, is also able to be used with drainage or collection bags made by a variety of manufacturers. The collection bag could be attached by a user to an upstanding funnel while the catheter is still in the case. The collection bag may have a fitting that goes inside the funnel. The collection bag could then be detached from the funnel after the used catheter is replaced in the case.

[0142] Among the advantages of the present disclosure are: intuitiveness to open; ease of opening; ease of removal of the catheter from the case; ease of closing of the case after use; discretion and clean to carry after use; and hygienic use.

[0143] An additional embodiment of a package for a urinary catheter is shown generally at **410** in FIGS. **55-57**. The catheter itself is shown generally at **412** and is best seen in FIG. **56**. The catheter has a ribbed funnel **414** and tubing **416** press fit into the bottom of the funnel **414** at a central bore in the funnel. The funnel has a flange **418** extending generally radially outwardly on its external surface near the bottom of the funnel. This flange **418** interacts with the internal surface of the case to assist in retaining the catheter **412** in the package **410**. When the catheter is installed in the

package the bottom of the funnel **414** rests on the top land of the hydration liner's seat portion **432**.
[0144] The package **410** includes a container **420** and a cap **422**. The cap **422** in this embodiment is a flip cap that is connected to the container by a hinge and is selectably movable by a user between a closed position, shown in FIG. **56**, and an open position. FIG. **55** shows the cap **422** in a partially open position. When the cap **422** is fully open a user has access to the open end of the container **420** for removal or replacement of the catheter **412**.
[0145] The container **420** in this embodiment is a three-part structure including a hydration liner **424**, a case **426**, and a sleeve **428**. Each of these three parts is basically an elongated, hollow tube, closed at the bottom end and open at the top end, with the open top end being selectably openable and closable by the cap **422**. The hydration liner **424** fits within the case **426** which in turn fits within the sleeve **428**, as best seen in FIGS. **56** and **57**.
[0146] Details of the hydration liner **424** will now be described. The hydration liner **424** may be a relatively rigid plastic such as LDPE or HDPE or other suitable material. The liner has a generally hollow tube **430** which is closed at the bottom. The liner tube **430** may have a slightly conical shape. The conical shape makes an internal surface of the liner tube wall below the section line visible at **430**A in FIG. **57**. The walls of the hydration liner's tube **430** also have formed therein one or more passages or windows **431** (FIG. **57**). The windows will be covered with a patch (not shown) of liquid-impermeable but vapor-permeable material such as, but not limited to, calcium carbonate. The patches will allow passage of water vapor for hydration of the catheter but will block passage of liquid water droplets. The patches may be heat sealed around the perimeter of the window. Thus, the liner **424** defines a space **433** between the liner's exterior surface and the case's interior surface within which a hydration mechanism, such as liquid water may reside. This permits hydration of the surface treatment on the catheter tubing **416**.
[0147] At its upper end the exterior of the liner's tube **430** has a seat portion **432** of slightly increased outside diameter compared to the remainder of the tube **430**. The seat portion **432** is open at its top such that it can receive the catheter tubing **416**. The seat portion **432** has radially-extending interference ribs **434** formed on the external surface thereof. In addition to the ribs **434**, the external surface of the seat portion **432** has at its top edge a seal **436**. The ribs **434** and seal **436** are sized to engage the internal wall of the case **426**. While the ribs **434** engage the internal wall of the case **426** to provide stability, the seal **436** provides a moisture-tight seal against the interior wall of the case **426**. This maintains the hydration mechanism, e.g., liquid water, in the space **433** between the liner's exterior surface and the case's interior surface. It will be understood that in an alternate configuration the radially-extending ribs **434** could be formed on the internal wall of the case instead of on the seat portion **432** of the hydration liner **424**. Forming the ribs on the case may make it easier to protect the ribs after manufacture of the hydration liner and prior to assembly of the package.
[0148] Turning now to the details of the case **426**, it includes a hollow tube **438** the bottom of which terminates at an end wall **440** that closes the bottom of the tube **438**. The hollow tube **438** may have either a cylindrical or rectangular cross-sectional shape or the cross-section could be otherwise. The upper end of the case **426** flares outwardly somewhat to increase the diameter of the tube at a neck portion **442**. The neck portion **442** joins a cylindrical ferrule **444** at the top of the hollow tube **438**. The ferrule **444** terminates at an open end which defines a rim **446**. On the exterior of the ferrule **444** there is a flange **448** extending radially outwardly from the ferrule wall. This flange **448** interacts with the sleeve **428** as will be explained below. The exterior of the ferrule **444** also carries a tongue **450** extending radially outwardly from the ferrule wall on the side of the ferrule opposite from a hinge for the cap **422**.
[0149] The sleeve **428** has a shape reminiscent of that of the case **426** except that the sleeve is somewhat larger than the case such that the case can be received inside the sleeve. As such the sleeve **428** has a hollow tube **452** having a lower, closed end wall **454**. Toward the top of the tube **452** the sleeve **428** flares outwardly on the right side as seen in FIG. **56** to form a neck portion **456**

that encompasses the neck **442** of the case **426**. On the right side of FIG. **56** the neck portion **456** terminates just above the flange **448** as at junction **458**. Thus, the flange **448** is recessed slightly from the end of the sleeve at **458**. However, extending circumferentially around the sleeve from the junction **458**, the upper end of the sleeve extends axially beyond the flange **448** to an increasing degree. This forms a collar **460** on the open end of the sleeve **428** that, in a side elevation view, slopes diagonally upwardly from a low point at junction **458** to a high point at the diametrically opposite side of the collar at **462**. In other words, the top land **464** of the sleeve **428** extends diagonally to the vertical axis of the sleeve. The top land **464** has an outer contour or outer perimeter as would be best seen in a top plan view of the container with the cap removed.

[0150] Details of the cap **422** will now be described. The cap **422** as shown is generally a two-part structure that includes a generally cup-shaped external shell **466** and a liner **476** attached to the interior of the shell **466**. The shell has a top wall **468** joined to a side wall **470**. The side wall terminates at a generally downwardly facing bottom land **472**. A hinge (not shown) is attached to the side wall **470** and to the case **426**. The interior of the shell's side wall **470** also has a groove **474** formed therein. This groove **474** receives the tongue **450** on the ferrule **444** when the cap **422** is closed on the ferrule. The tongue **450** flexes to permit the tongue to move into and out of engagement with the groove **474** during closing or opening. Upon closing the tongue **450** ends up in the groove **474**. This snap fit closure retains the cap **422** closed until such time as a user wishes to open the cap by pushing the cap upwardly.

[0151] The interior of the cap is lined or partially lined with the liner **476** which is made of relatively soft material compared to that of the shell **466** and case **426**. The soft liner **476** promotes a tight seal between the cap **422** and the ferrule **444**. This seal is dynamic in the sense that it can be repeatedly made and broken whenever the user closes or opens the cap **422**, respectively. It will be noted the liner **476** may include sprue portions **478** through the side wall **470** of the cap **422**. The sprue portions **478** assist in fixing the liner **476** in place and provide a good gripping surface on the exterior of the cap. The open end of the liner is cylindrical so that it can fit snugly around the external surface of the ferrule **444** adjacent to the rim **446** and immediately therebelow. This seal is capable of retaining any hydration mechanism in the case. The bottom land **472** of the side wall **470** of the cap **422** when in the closed position engages the top land **464** of the sleeve's collar **460**. The bottom land has an outer contour that is the same as the outer contour of the top land **464** of the sleeve's collar **460**. That is, the outer perimeter of a bottom plan view of the bottom land **472** substantially matches the outer perimeter of a top plan view of the top land **464** of the sleeve **428**. This provides a smooth mating of the exterior surfaces of the sleeve **428** and cap **422**, thereby creating a pleasing aesthetic appearance to the exterior of the closed package.

[0152] FIG. **58** illustrates an alternate embodiment for hinging the cap to the case. In this embodiment the case **426**A includes a stand-off wall **480** that is separate from the exterior surface of the ferrule **444**A. The stand-off wall **480**, while generally curving around the ferrule **444**A, is non-cylindrical, thereby enabling the stand-off wall to define a space or gap between itself and the exterior surface of the ferrule **444**A. The top edge of the stand-off wall **480** joins one end of a hinge **482**, the other end of which connects to the cap **422**A. The hinge **482** as shown in a living hinge, but other hinge arrangements could be used. It will be understood that a sleeve (not shown but similar to sleeve **428**) would surround the case **426**A and mate with the underside of the cap **422**A.

[0153] A further alternate embodiment of the package of the present disclosure is illustrated generally at **522** in FIG. **59**. This is a flip cap version of a package similar to that of the FIGS. **55-58** embodiment in that it has a container **524** and a flip type cap **526**. However, the container **524** of FIG. **59** is a two-part structure instead of the three-part structure previously shown. The container **524** has a case **528** and a sleeve **530** surrounding the case, but there is no hydration liner as in the previous embodiments. Instead, the case **528** has windows **532** each covered with a patch (not shown) of liquid-impermeable but vapor-permeable material such as, but not limited to, calcium carbonate. The patches will allow passage of water vapor for hydration of a catheter inside the case

but will block passage of liquid water droplets. Thus, the case **528** functions like the hydration liner **424** of the prior embodiments. The case **528** defines a space **534** between the case's exterior surface and the sleeve's interior surface within which a hydration mechanism, such as liquid water may reside. This permits hydration of the surface treatment on the catheter tubing **416**. While a flip type cap **526** is shown in this embodiment with a two-part container, it will be understood that a twist cap could also be used.

[0154] An alternate version of a liner is shown at **16**A in FIG. **60**. The liner **16**A is similar to liner **16** except that the length of the hollow tube is truncated when compared to the hollow tube **78** of FIG. **21**. This truncated version of the liner may be used where direct hydration of the catheter tubing with liquid water is utilized. The upper portion of the seat of the liner **16**A will seal against the interior surface of the neck **34**C. The catheter tubing will seal against the bottom of the funnel. After removal of the catheter if the case is laid on its side the liner **16**A will prevent leakage of hydration water out the open top of the case. This is because the inside diameter of liner **16**A is small enough to prevent drainage of the small amount of water used for hydration. That is, with the package on its side, there is not enough hydration water to flood the lowermost wall of a horizontal disposed tube to a depth that would leak out through the center of the liner **16**A. Thus, the liner **16**A serves as a plug to retain hydration water even when the catheter is not in the package.

[0155] FIGS. **61** and **62** illustrate yet another embodiment of the present disclosure. This package **124** has a cap and hinge that are essentially similar to those of FIGS. **1-31**. Also, package **124** includes a latch mechanism for the cap that includes the interengageable detent, slots and latches as in FIGS. **1-31**. But package **124** differs from the previous embodiments in that it has a two-part case **126** comprising a stem section **128** and a flip cap section **130**. The upper portion **132** of the stem section **128** extends through and fits tightly within an opening in the flip cap section **130**. The vertical axis of the opening in the flip cap section is shown at axis C. The lower portion **134** of the stem section **128** is exposed as it extends below the flip cap section **130**. The stem section and flip cap section are fixed to one another by a suitable technique such as welding, adhesive or a snap fit.

[0156] The lower portion **134** of the stem section is seen in FIG. **61**. Similar to the case **12**, the lower portion **134** has a hollow, tubular wall terminating at an end wall **136**. The hollow, tubular wall of the lower portion **134** may have a generally rectangular cross section as in tubular wall **26**. However, in the vicinity of the bottom of the flip cap section **130** the tubular wall of the lower portion **134** gradually merges to a circular cross section such that the upper portion **132** of the stem section **128** has a circular cross section that fits snugly inside the opening through the flip cap section **130**, as seen in FIG. **62**. Thus, the vertical axis of the lower portion **134** and most of the upper portion **132** coincides with axis C. The circular cross section of the upper portion **132** ceases at the top end of the stem section at a bowed out portion **138** that extends toward the front of the case **126**. The underside of the bowed out portion **138** engages a ledge formed on the interior of the flip cap section to limit relative axial movement between the flip cap section and the stem section. The external axial surface of the bowed out portion **138** defines a root **140** of an O-ring groove. The bowed out portion terminates at a radial, upper flange **142** of an O-ring groove. The internal surface of the stem section may have one or more notches as at **144** for locating a hydration liner **16** or a funnel **24**.

[0157] Looking now at the flip cap section **130**, it is noticeably similar to the upper portion of the case **12** in that it includes a body portion have a neck **146** that merges with a generally cylindrical collar **148**. The collar and neck define an internal opening therethrough that receives the stem section as described above. The collar **148** terminates at a shoulder **150** and a detent **152**. Between them the shoulder and detent define a pair of slots, one of which is seen at **154** in FIG. **61**, each of which receives a latch, one of which is seen at **156**, on the bottom of a cap **158**. The cap is connected to the collar **148** by a hinge **160**. With the exception that these flip cap components are not integral with the tubular wall of the stem section **128**, the foregoing components are essentially the same as the corresponding components of FIGS. **1-31** and they operate in the same manner as

described above.
[0158] The flip cap section **130** also includes a cylindrical, axial projection **162**, which, as seen in FIG. **62**, is indented slightly from the outside diameter of the collar **148**. The amount of the indentation is sufficient to receive the wall thickness of the cap **158**. The projection **162** defines a vertical axis D. It will be noted that axis D is laterally offset from axis C. This affords the same advantage in terms of clearance between the cap and funnel as described above in connection with axes A and B of FIG. **36**. The top land of the projection **162** defines a lower flange of an O-ring groove. Thus, an O-ring groove is defined by the upper flange **142**, the root **140** and the lower flange of projection **162**. The O-ring groove receives an O-ring (not shown here but the same as O-ring **20**) that seals against the internal surface of the cap **158** when the cap is closed and thus prevents any leakage from the package **124**. It can be seen that since the upper and lower flanges **142**, **162** of the O-ring groove are formed on different parts, there will be no mold parting line on the root **140** of the O-ring groove.
[0159] It should be understood that various changes and modifications to the presently preferred embodiments described herein will be apparent to those skilled in the art. Such changes and modification can be made without departing from the spirit and scope of the invention disclosed herein. For example, while the outside or exterior contours of the collar and cap are circular, it could be otherwise so long as each piece has the same contour at the location where they meet one another when the cap is closed. Also, while the case insert is shown mounted in the case, it will be understood that the location of the insert could be switched to place it in the cap. The projection of the insert would then extend axially beyond the bottom land of the cap. The projection would again carry an O-ring to seal against the interior surface of the collar. Thus, the use of the term “case insert” herein does not require that the insert be located in the case. In a similar vein, while the embodiments shown have the latches on the cap and the slots for receiving the latches on the case, the positions of these parts could be reversed such that the latches are on the case and the receiving slots is on the cap. Also, while two latches are shown, a different number could be present.

Claims

1. A medical device package, comprising: a case having a hollow tubular wall which defines an interior and an axis and is closed at one end, the other end of the tubular wall extending to a collar which terminates at a top land to define an open end of the collar, the top land having an external shape and dimension; a cap having a side wall which defines an interior of the cap and terminates at a bottom land, the bottom land having an external shape and dimension which matches that of the top land; a hinge having one end connected to the cap and a second end connected to said collar, the hinge permitting selectable movement of the cap between an open position, wherein access is provided to the open end of the collar, and a closed position, wherein the cap prevents access to the open end of the collar; and a case insert mounted in the interior of the case and having a projection extending axially beyond the top land thereof, the projection having an external dimension less than an internal dimension of the cap such that that the projection will fit inside the cap when the cap is closed.
2. The medical device package of claim 1, wherein the projection extends axially beyond the open end of the collar of the case.
3. The medical device package of claim 1, further comprising a seal member.
4. The medical device package of claim 3, wherein the seal member is an o-ring.
5. The medical device package of claim 3, wherein the seal member is mounted so as to be engageable with an internal surface of the cap.
6. The medical device package of claim 1 wherein the case insert is made of a stronger material than the case.
7. The medical device package of claim 1 wherein the case insert further comprises a collet

mounted in the case, with the projection attached to the collet.
8. The medical device package of claim 3 an external surface of the case insert.
9. The medical device package of claim 8, wherein the seal member is a first O-ring and the seal between the case insert and the internal surface of the tubular wall is formed by a second O-ring mounted on an external surface of the case insert.
10. The medical device package of claim 8 wherein the seal between the case insert and the internal surface of the tubular wall is formed by an interference fit between the case insert and the internal surface of the tubular wall.
11. The medical device package of claim 1, wherein the case and the case insert are two separately manufactured components.
12. The medical device package of claim 1, where in the case insert includes at least two portions, a first portion having a different diameter than the second.
13. The medical device package of claim 12, wherein the first portion includes the projection and the diameter is larger than a second portion of the case insert.
14. The medical device package of claim 1, wherein the medical device is a urinary catheter that includes a funnel.
15. The medical device package of claim 14, wherein the case insert grips the funnel of the urinary catheter so that the funnel is in a position that ensures it will not interact with the cap when the cap is being opened or closed.
16. The medical device package of claim 14, wherein the case insert grips the funnel of the urinary catheter and allows protrusion of the funnel above the case when the cap is opened.
17. The medical device package of claim 1, wherein the case insert aids in maintaining a seal with the closed cap even when the cap is subjected to lateral forces.