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(54) **LAPAROSCOPIC ACCESS PORT AND PORT SLEEVE ARRANGEMENT**

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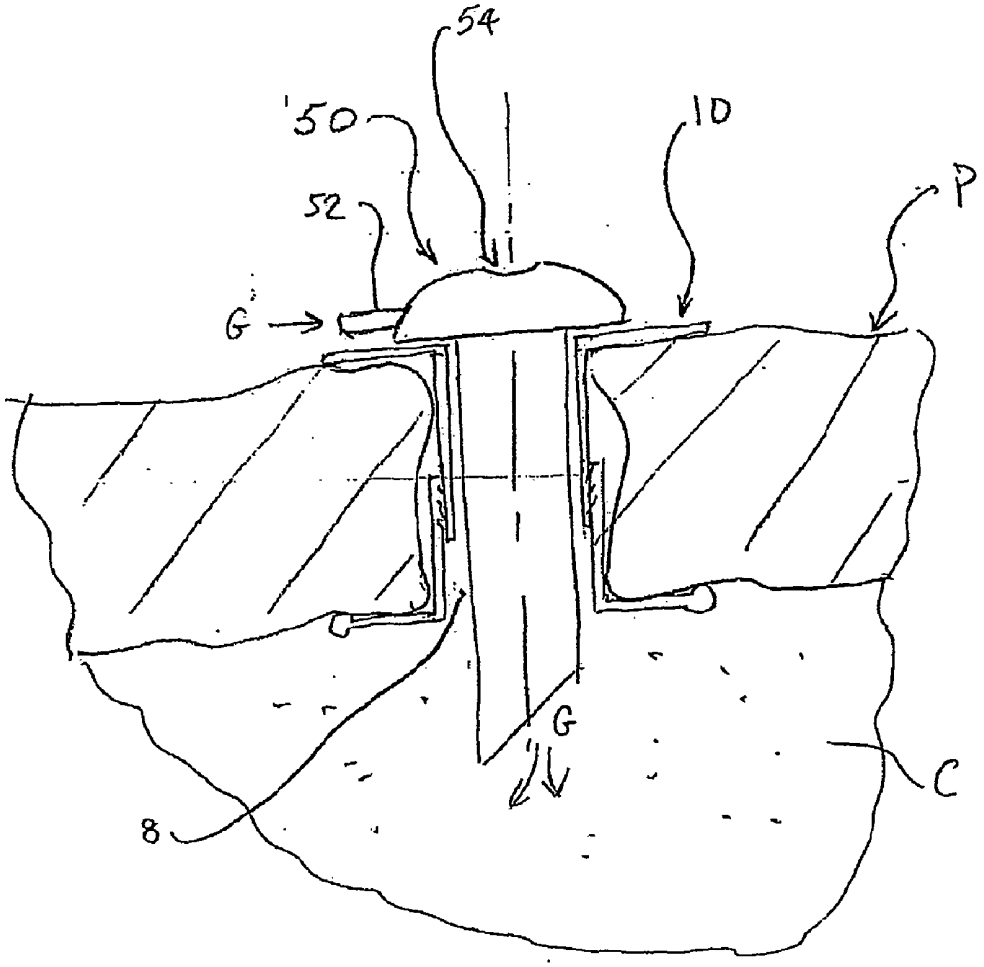
(57) **ABSTRACT**

Disclosed are embodiments of a laparoscopic access port having a head (portion **450**) for use generally externally of a patient and for providing a seal around a laparoscopic tool (not shown)when said tool is inserted into the head via a (bore **408**); and a sleeve portion (**410**) connected to the head and for accommodating the tool, the sleeve (**410**) extending along an axis and being adapted for inserting generally into the body of a patient in the direction of the axis;said access port being adjustable in overall length X in the direction of the axis, the sleeve portion comprising a shank (**411**) attached or attachable to the head (**450**) and a flanged piece (**413**) moveable relative to the shank by means of a mechanism for causing the overall length X of the port to adjust, the mechanism being operable externally of the patient at or adjacent the head, for example by means of rotation of an element of a lower head part (**440**), or by sliding motion of the shank (**411**) and flanged piece (**413**).



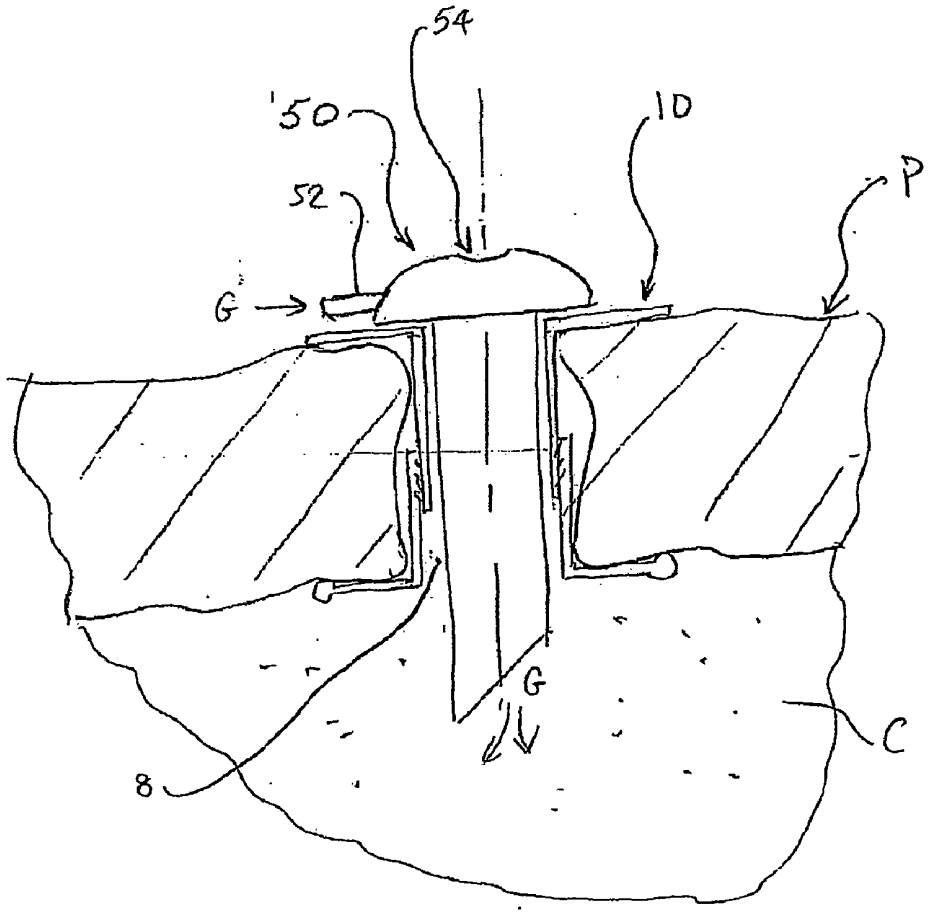


FIG 1

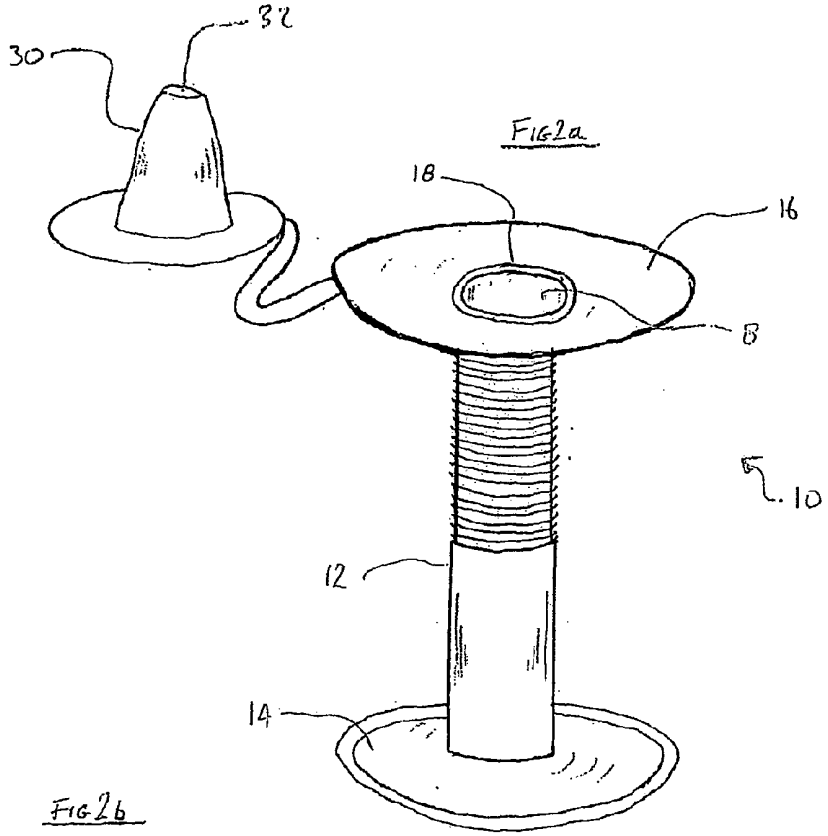


Fig 2a

Fig 2b

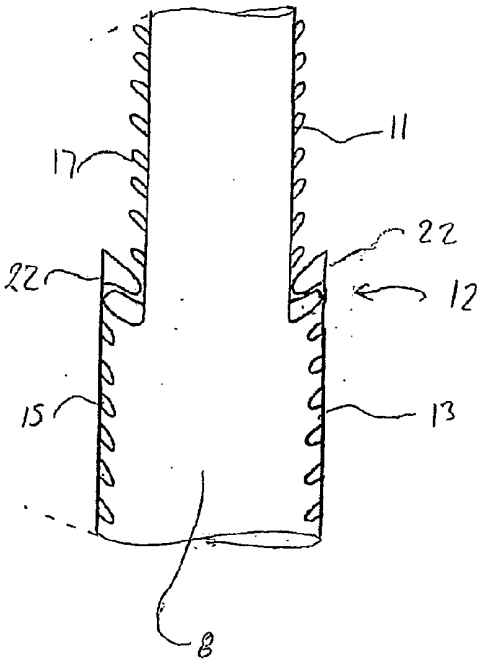
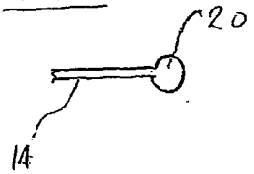


Fig 2c



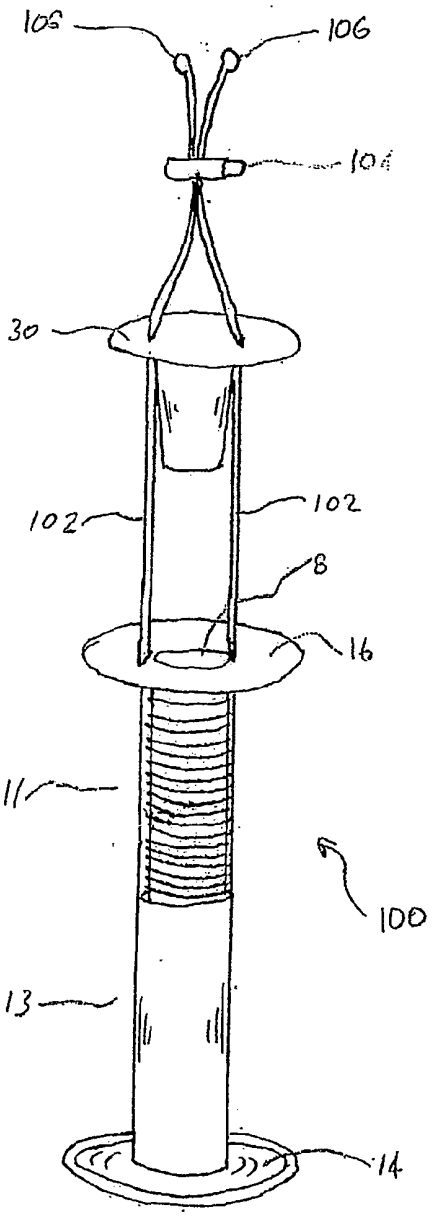


Fig 3a

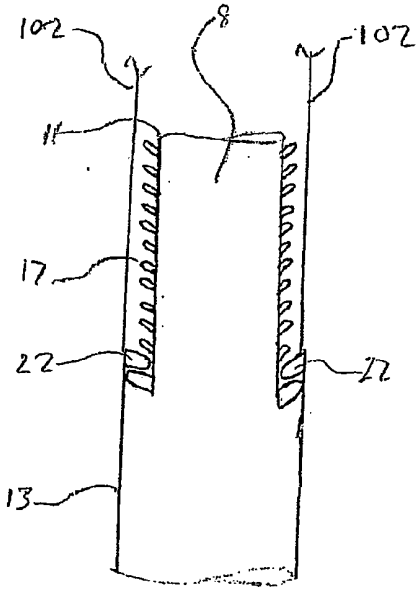
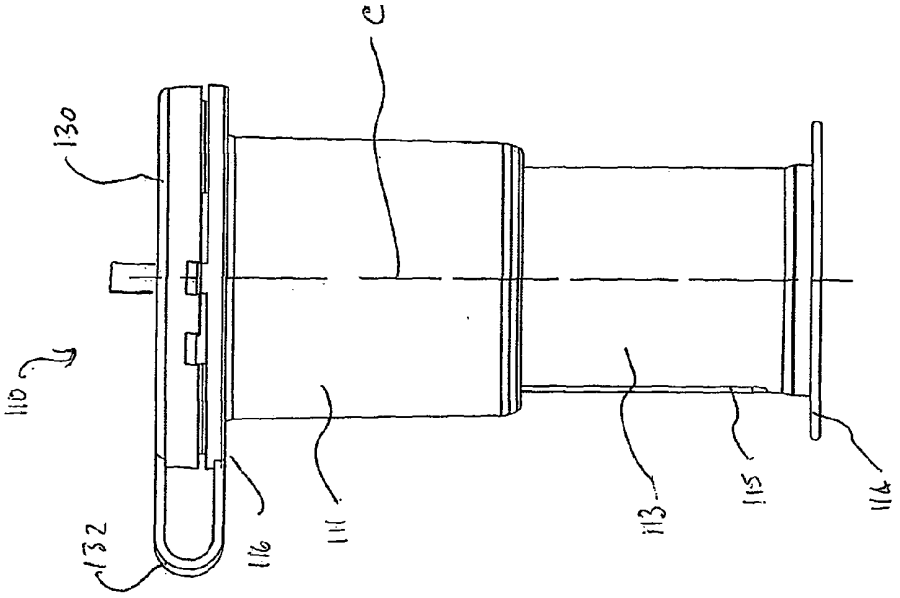


Fig 3b


C
130
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115
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Fig 4b

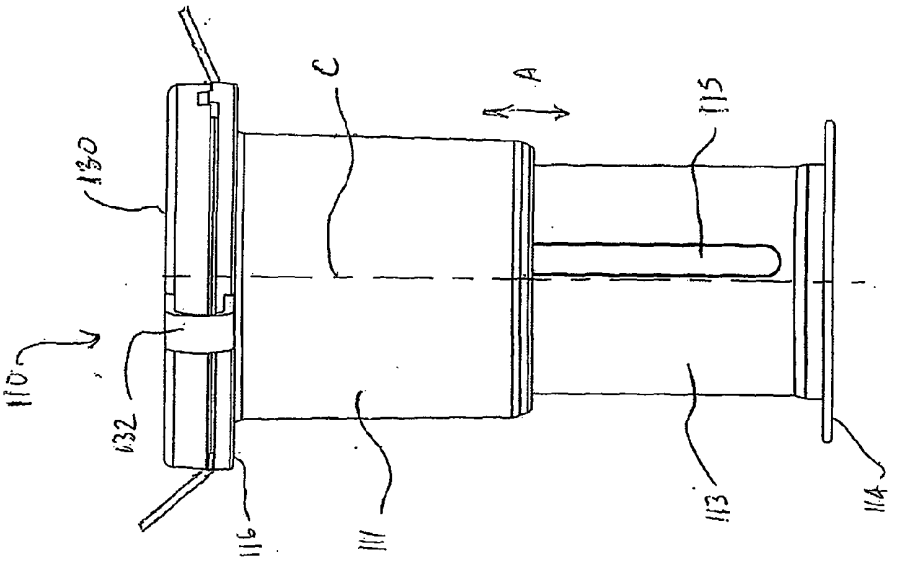
C
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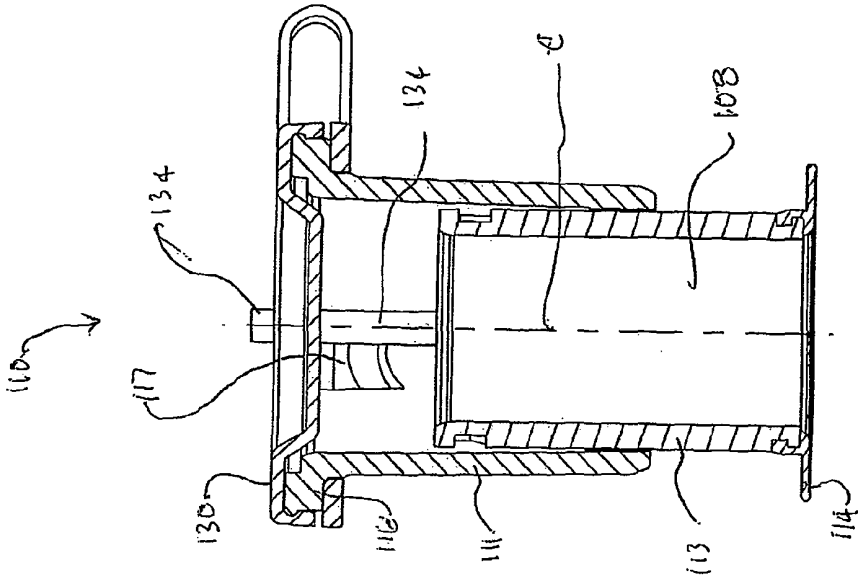
Fig 4a


110
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108
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FIG 5b

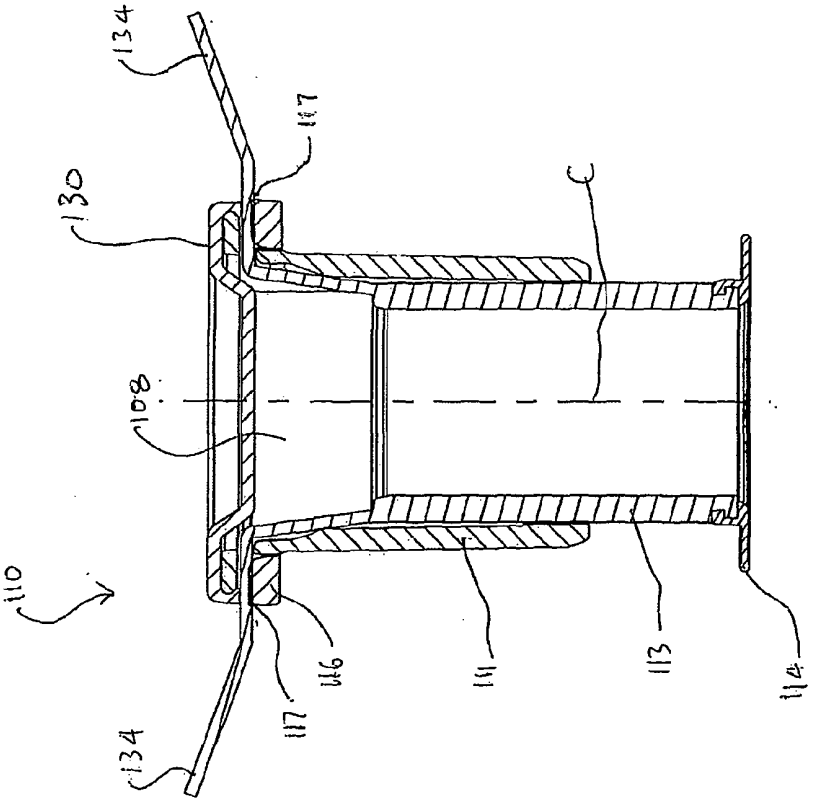
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FIG 5a

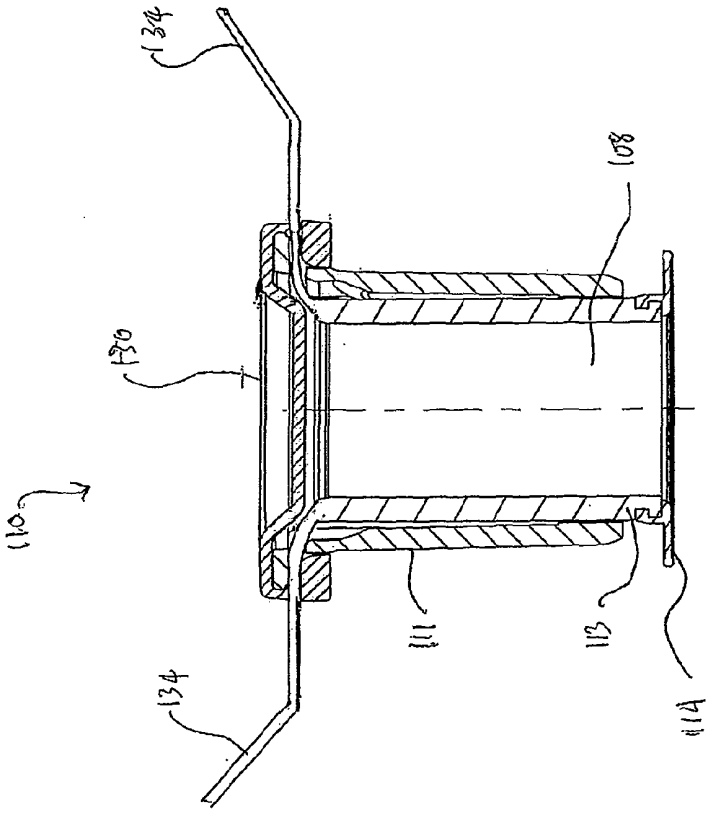


FIG. 6

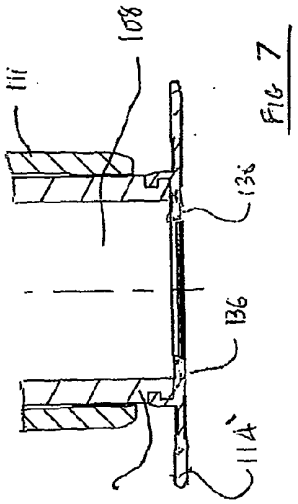


FIG 7

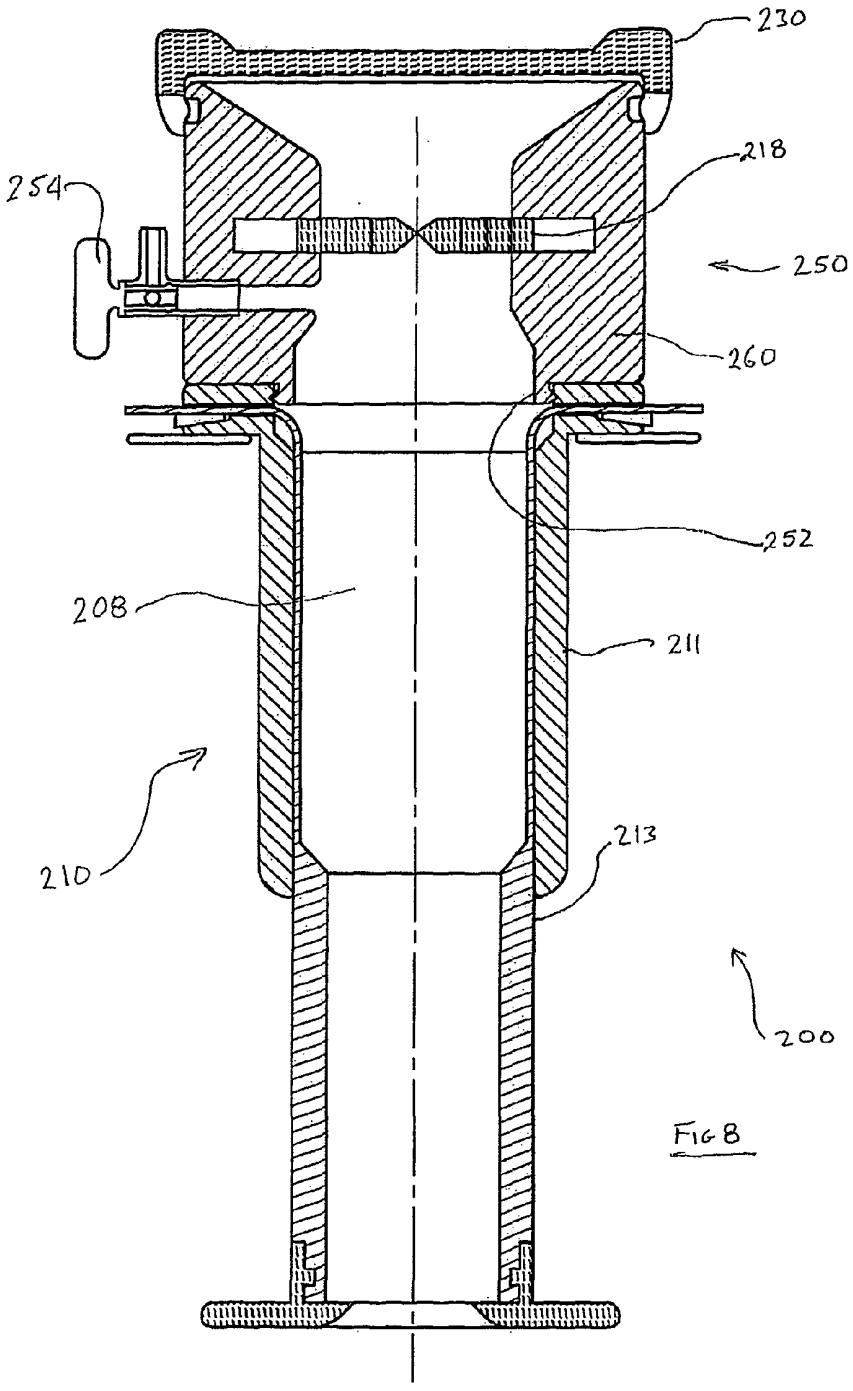


FIG 8

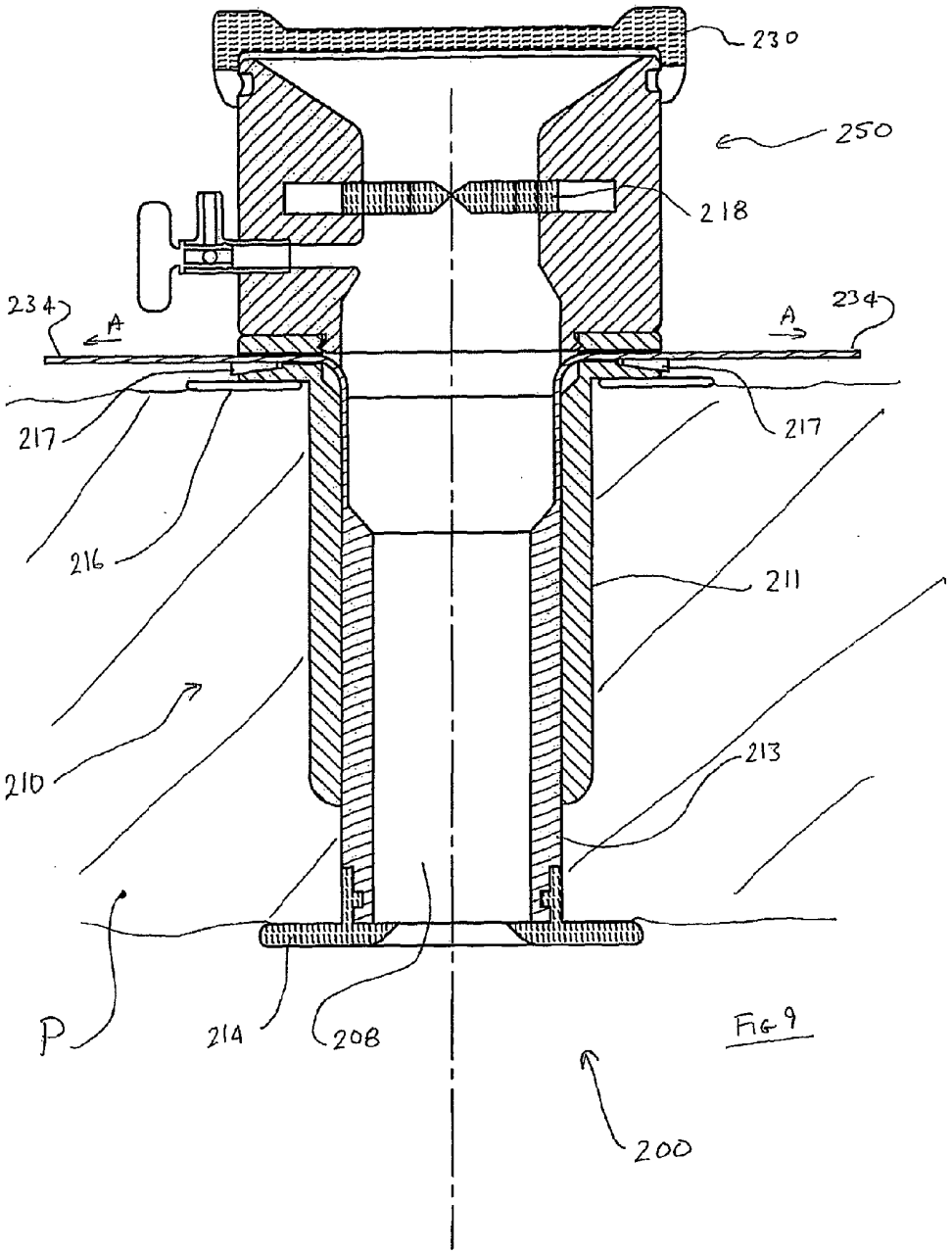


Fig 9

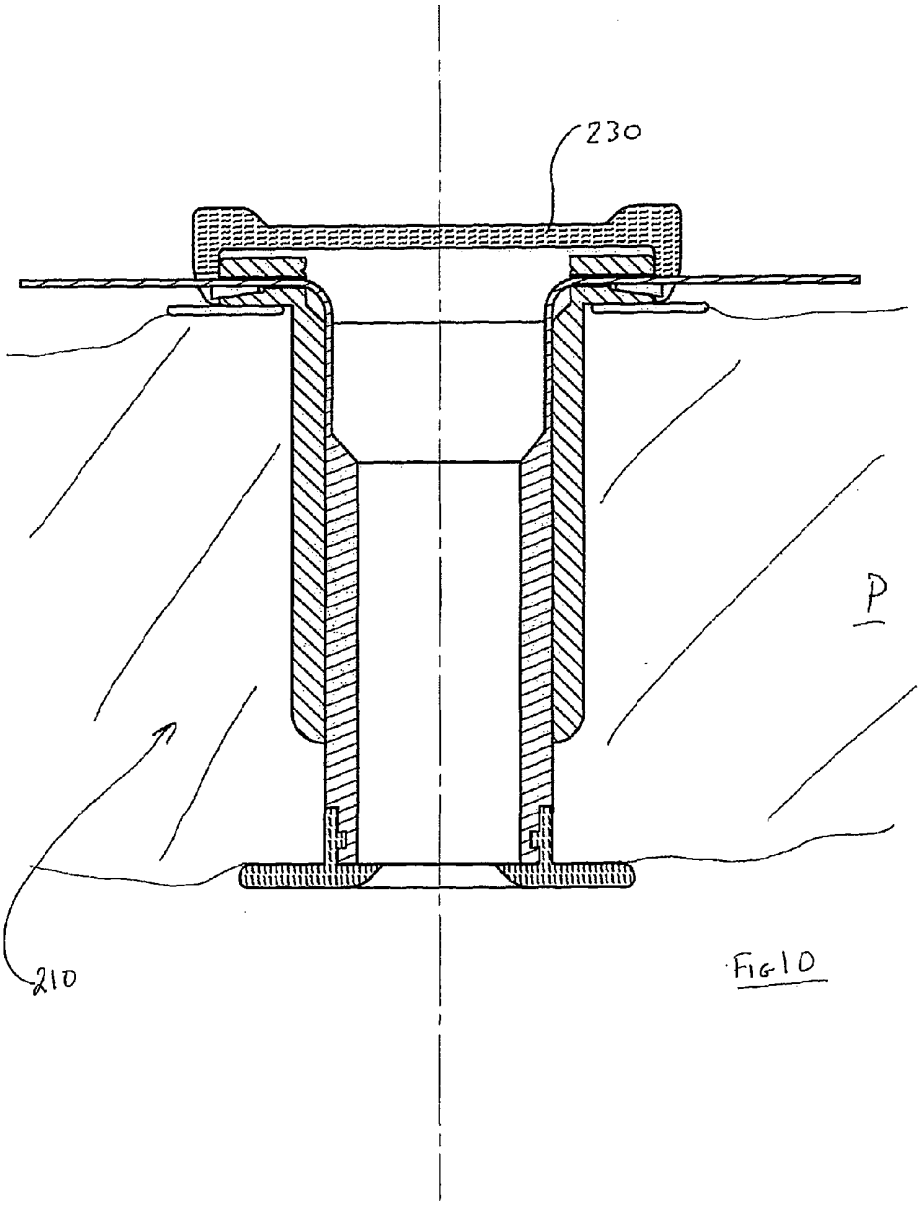


Fig 10

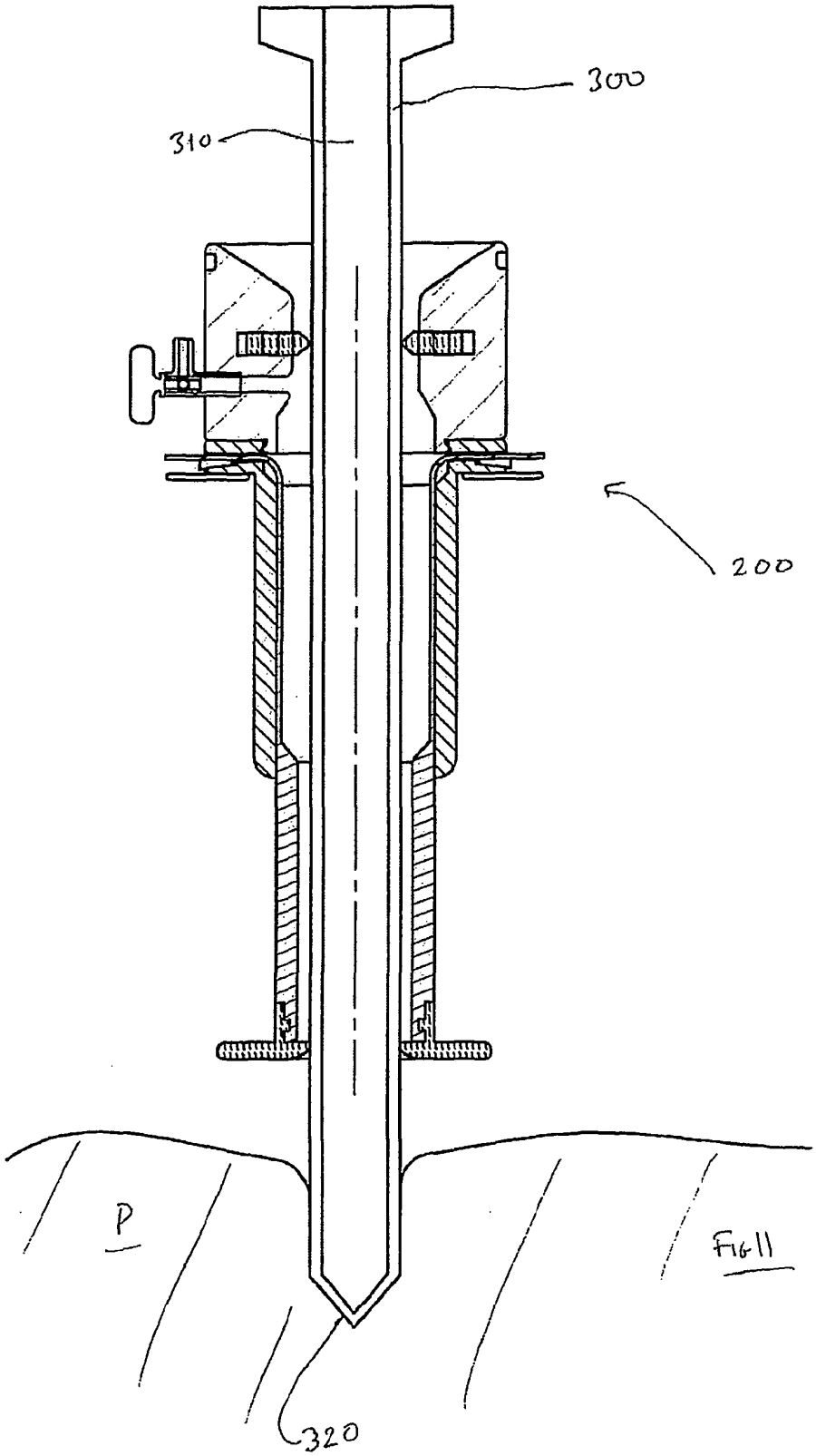


Fig 11

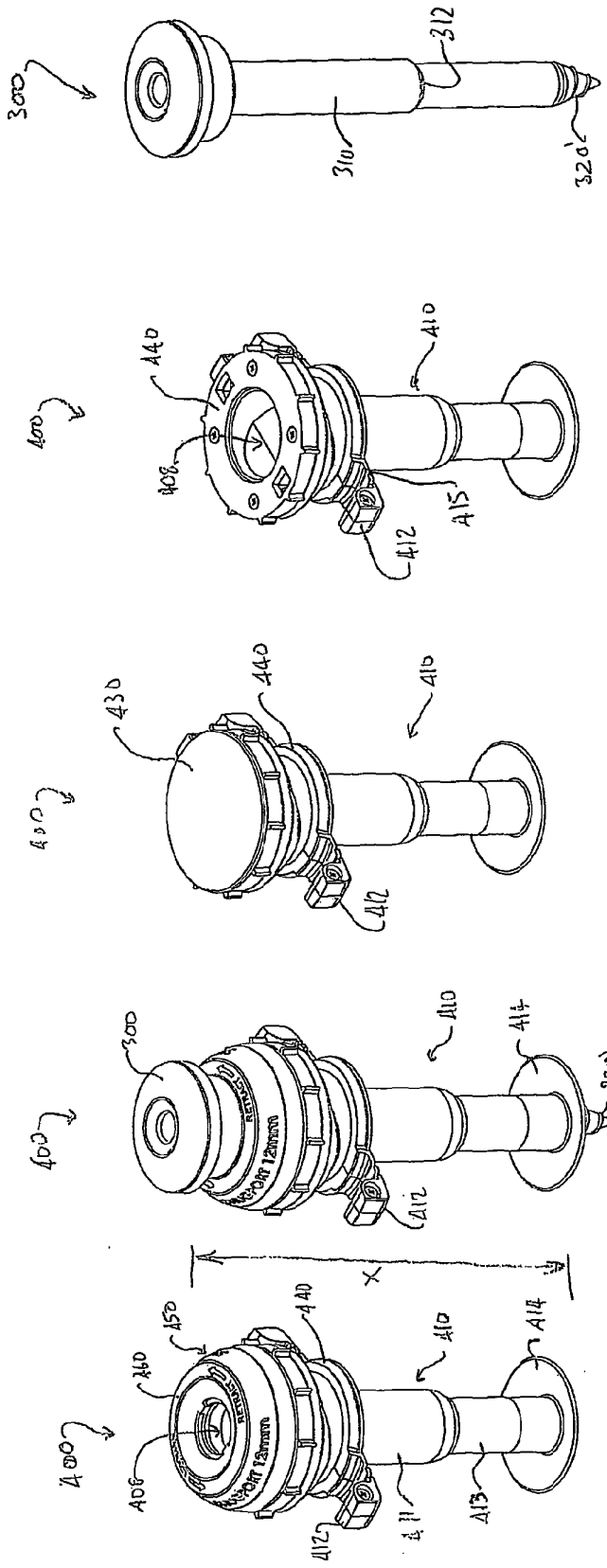


Fig 12a

Fig 12b

Fig 12c

Fig 12d

Fig 12e

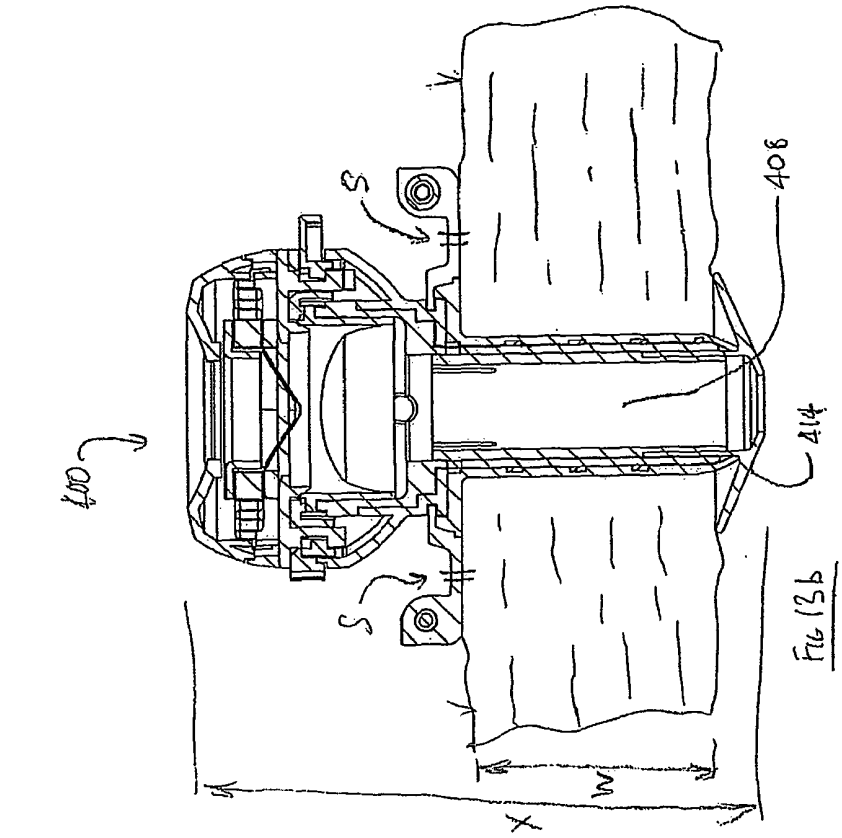


Fig 13b

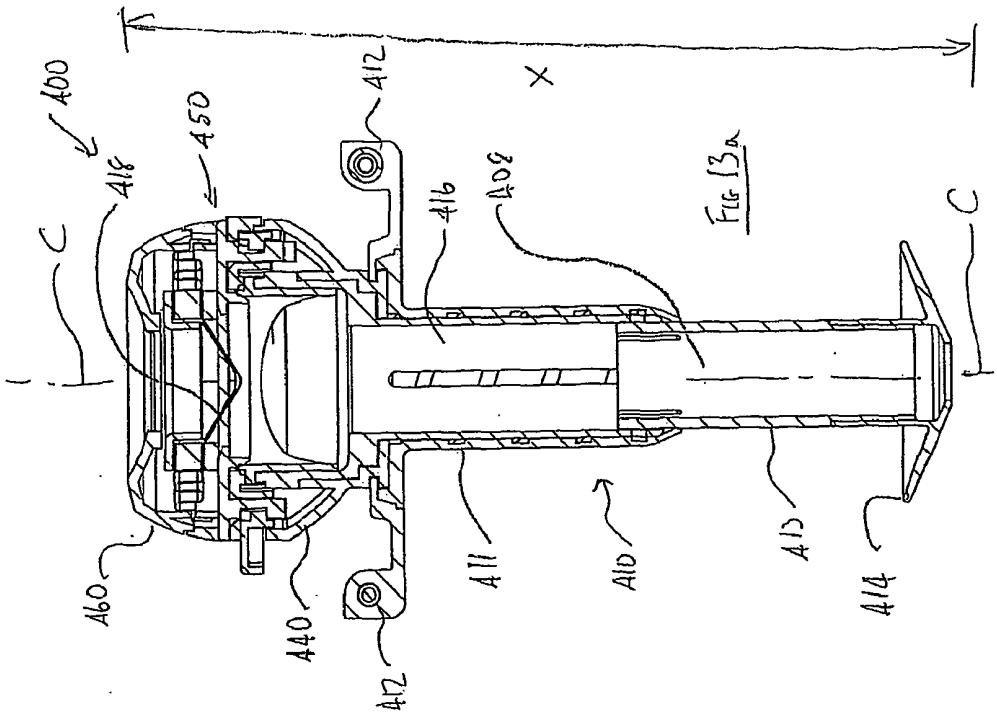
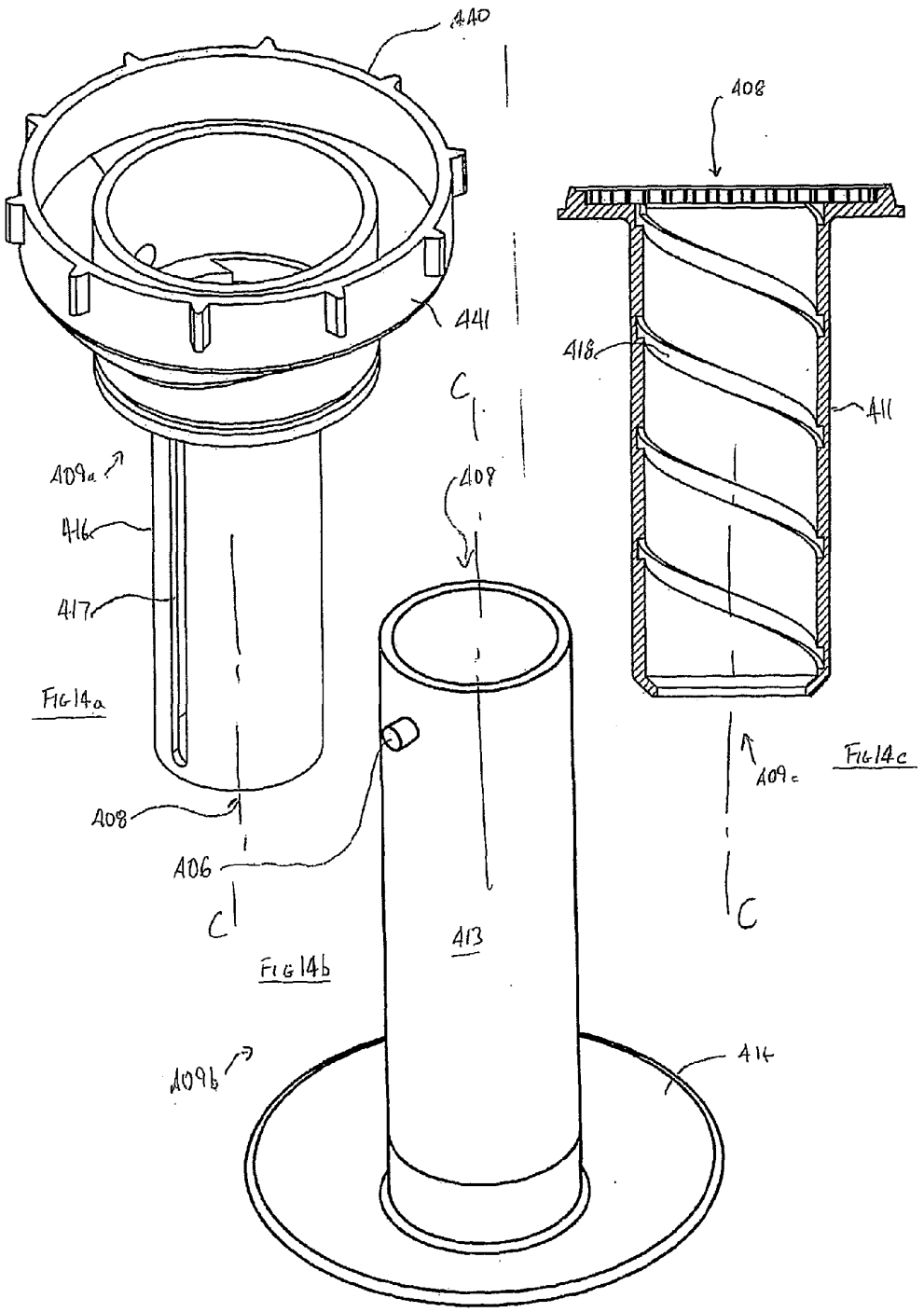


Fig 13a


440
441
C
409a
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409b
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Fig 14b
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409c
C
Fig 14c

Fig 14a

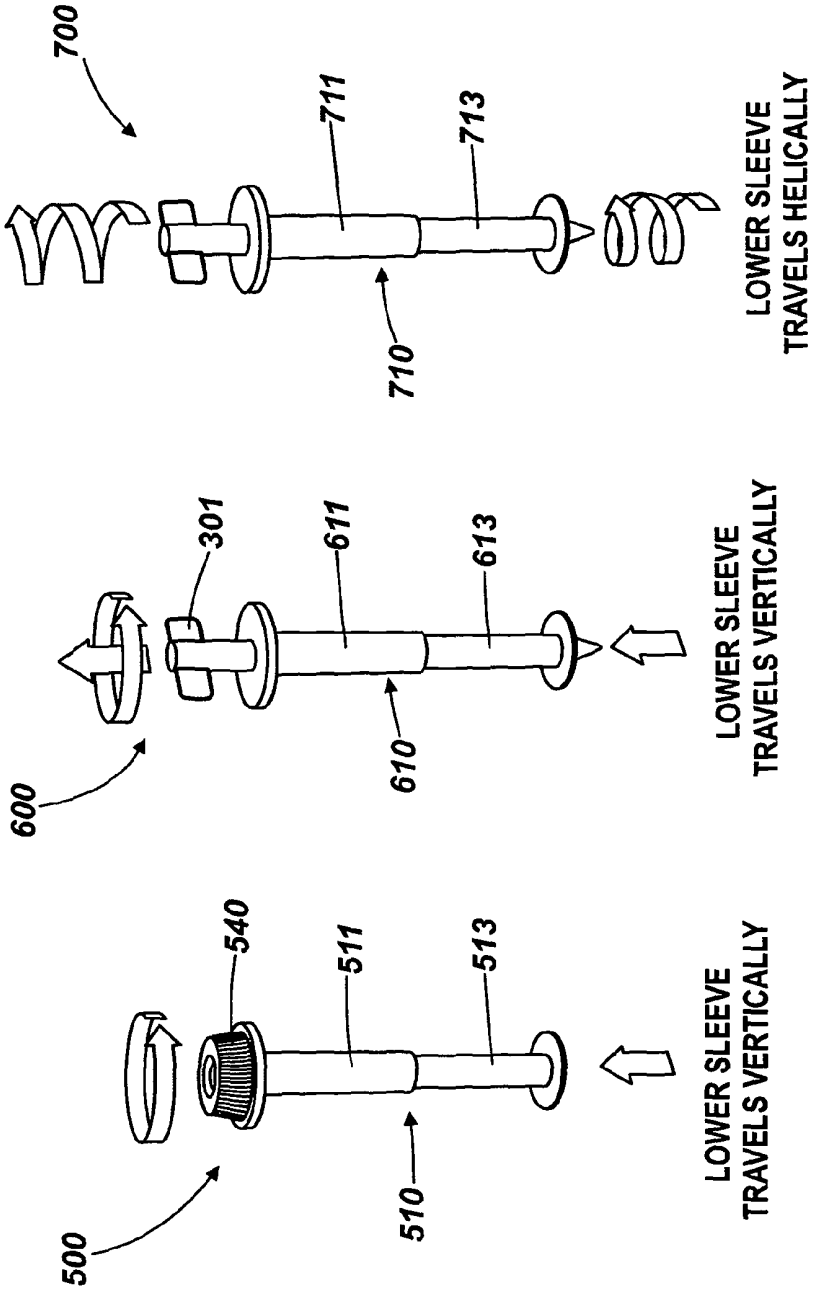

Fig. 15c

Fig. 15b

Fig. 15a

LAPAROSCOPIC ACCESS PORT AND PORT SLEEVE ARRANGEMENT

[0001] The invention relates to an access port and port sleeve arrangement for use in laparoscopic surgical procedures and the like. Laparoscopic surgery, often termed 'key-hole' surgery conventionally involves making, typically two or more, small incisions in a patient and inserting an access port into each of those incisions. One or more of the known access ports may allow the introduction of an insufflation gas so that a surgeon has room to undertake a procedure, for example by inflating the abdominal cavity of a patient. The access port further includes an opening through which is inserted a surgical tool during the procedure. Such apertures are generally self-sealing so when a tool is not present in the aperture, little insufflation gas pressure is lost through the port.

[0002] The known access ports have a stem which is inserted into a patient, for carrying a head of the access port typically having a self sealing aperture and insufflation gas valves etc. The stems need to be long enough to reach through bodily tissues of large or obese patients and so these stems are usually and needlessly too long for many patients. In addition, the stems are usually pointed so that they can be inserted easily into an incision. As a result of their length and pointed end of the stem, there is a possibility that internal trauma may occur if the stem is forced against internal tissues.

[0003] The inventor has realised that there is a need for an access port which avoids or mitigates internal trauma.

[0004] Commercially available access ports are, by necessity cumbersome and bulky. The ports usually have a means for insufflating the patient, as well as a self-sealing aperture. The ports are designed for use during surgery, and then removal when surgery is finished. Some surgical procedures require two or more sessions spaced hours or days apart. When an access port is reintroduced into a patient for further surgical procedures, for example, to check on the initial surgery, that reintroduction can cause additional trauma at the re-entry area.

[0005] The inventor has realised also that there is a need for a port which can be left in the patient for further surgical sessions, but the present devices mentioned above are not suitable for that purpose. A particular shortcoming of present designs is that they protrude into the body in use and protrude above the line of the body significantly, making them potentially very uncomfortable for the patient if the patient were to lie on the port or knock the head of the port on an obstruction. The necessary rigidity of the port also makes them dangerous if they were left in place.

[0006] The inventor has further realised that a device that can facilitate removal and reinsertion of an access port, and which could be left in place until all surgical sessions were complete, would be of great benefit to a patient and surgical staff.

[0007] Embodiments of the invention address the problems mentioned above. The access port of the present invention, in embodiments, employs a length adjustable stem, for example a telescopic stem principle, so that the conventional stem of the port is replaced by a length adjustable sleeve arrangement and this sleeve arrangement allows the internal length of the port (conventionally the stem portion) to be adjusted to the dimension of the patient's bodily tissues, for example the abdominal wall, so there is less chance of accidental internal trauma. The sleeve can be at least partially removeable from the head of the port so that the sleeve can be left in the patient if required, for example either to be reconnected later or to allow access to the surgical site for other instruments inserted through the sleeve. A removable cap can be used to seal the body cavity from the external environment. In addition, the same length adjustable principle can be applied to a stand-alone sleeve which is positioned generally inside the body without the head of an access port, which sleeve has little material protruding above the patient's body line and so can remain in the patient after an initial surgical procedure session, providing a ready reinsertion point, for example, for known access ports.

[0008] The present invention provides a laparoscopic access port having a head portion for use generally externally of a patient, and a sleeve portion extending along an axis and for inserting generally into the body of a patient in the direction of the axis, said port being adjustable in overall length in the direction of the axis, the sleeve portion comprising a shank attached or attachable to the head and a flanged piece moveable relative to the shank by means of a mechanism for causing the overall length of the port to adjust, the mechanism being operable externally of the patient at or adjacent the head.

[0009] The head, or part of the head, and sleeve may be separable.

[0010] The invention provides also a sleeve insertable at least partially into a patient, the sleeve being suitable for either complementary connection to the head of an access port or for removably supporting the head of a laparoscopic access port in use.

[0011] In an embodiment, said sleeve (in its stand-alone form or the sleeve attached or attachable to the head of an access port) includes a first seal member for preventing or inhibiting the escape of insufflation gases, in use, and a second seal member for preventing or inhibiting the escape of said gases, acting between the sleeve and the patient in the form of a flange or flanged piece.

[0012] In an embodiment, said sleeve is generally tubular, including a first tubular piece forming the shank and a second tubular piece forming the flanged piece, one of said tubular piece being relatively moveable within the other to adjust the overall length of the port.

[0013] Preferably the first or second tubular piece has a thread and the other of the first or second tubular pieces has a complementary thread or thread- following formation such that the movement of the second tubular piece causes said overall length adjustment.

[0014] Preferably the rotation of the second tubular piece is caused by a manually rotatable third tubular piece forming part of the mechanism and extending from the head such that the third tubular piece can be rotated externally of the patient in use.

[0015] Preferably said third tubular piece extends at least partially within the second tubular piece, which in turn is at least partially within the first tubular piece.

[0016] Preferably the third tubular piece includes at least one axially extending slot for accepting a detent formed on or in the second tubular piece for allowing the detent of second tubular piece to move axially in the slot under the influence of the thread.

[0017] Preferably, the flanged piece includes a distal end at which is formed a flange, optionally being formed from flexible material.

[0018] Preferably the sleeve further includes a one-way movement mechanism operable so that the shank and flanged piece can move only toward each other, in turn so that the flange of the flanged piece and the head can only move toward each other.

[0019] More preferably the one-way mechanism includes complementary formations on the shank and flanged piece which allow them only to come closer together.

[0020] In an embodiment the shank and flanged tubular piece of the sleeve include cooperating means to prevent or restrain their relative movement, for example during insertion of the sleeve.

[0021] Preferably said means to prevent or restrain relative movement includes a bayonet type mechanism.

[0022] Preferably the bayonet type mechanism includes one or more studs on one of the shank or flanged piece slideable in a complementary channel or channels in the other of the shank or flanged piece, the channel or channels including an area which allows the relative sliding of the shank and flanged piece and an area that does not.

[0023] Preferably the area of the channel or channels which allows said sliding together has sides which extend generally parallel to the axis and the area that does not has sides which extend obliquely to the axis.

[0024] In an embodiment, the flanged piece has at least one flexible draw tab for holding the flange in place while the shank is moved toward or over the flanged piece.

[0025] Preferably the draw tab comprises two draw tabs, which are tensioned in use to pull the shank or flanged piece together.

[0026] Preferably each draw tab is held in place in use to thereby hold the inner and outer flanges in place relative to each other.

[0027] The port may further include a plug or cap to substantially seal the port after the head of the access port is removed or partially removed.

[0028] In an embodiment, the access port further includes an introduction tool which includes a shoulder, in use engageable with the second tubular piece.

[0029] Preferably the access port includes at least one ear at or adjacent the head for allowing securing of the head by means of suture.

[0030] The invention extends to a combination of a sleeve for insertion into a patient optionally with features mentioned above, supporting a laparoscopic access port head and arranged such that the access port head is removable from the sleeve. The sleeve, if a stand-alone sleeve, can allow multiple reinsertions of the head onto the sleeve, or if the sleeve is attachable to the head of a port then the sleeve allows reconnection of the head at a later time while the sleeve stays in the patient.

[0031] The invention further extends to a method of using medical equipment, comprising or including the following steps in any suitable order:

[0032] a) inserting a sleeve into a patient for holding or supporting a laparoscopic access port head,

[0033] b) inserting a laparoscopic access port head into the sleeve or attaching a laparoscopic access port head to the sleeve;

[0034] c) optionally inserting and removing a surgical tool into the access port;

[0035] d) removing the laparoscopic access port or port head from the patient but not the sleeve;

[0036] e) optionally, reintroducing the laparoscopic access port into the port or re-attaching a laparoscopic access port head to the sleeve; and

[0037] f) removing at least a portion of the sleeve.

[0038] Preferably, the step of inserting the sleeve is followed by securing the sleeve in place, by means the bringing together of inner and outer flanges of the sleeve.

[0039] Preferably the sleeve may be sealed with out without the inserted or attached head, by means of the sealing cap fitted to an exterior portion of the sleeve, or fitted to the head.

[0040] Although, there are many ways of putting the invention into effect, by way of example only, embodiments of the invention are described below, with reference to the drawings, wherein:

[0041] FIG. **1** shows the a first embodiment of invention in use;

[0042] FIG. **2***a* shows a pictorial view the first embodiment of the invention;

[0043] FIGS. **2***b* and **2***c* show partial enlarged views of the first embodiment shown in FIG. **2***a;*

[0044] FIG. **3***a* shows a pictorial view of a second embodiment of the invention;

[0045] FIG. **3***b* shows a partial enlarged view of the second embodiment;

[0046] FIGS. **4***a* and **4***b* show side views of a third embodiment of a sleeve according to the invention;

[0047] FIGS. **5***a, b* and **6** show sectional views of the third embodiment;

[0048] FIG. **7** shows a partial view of a modification to the embodiment shown in FIGS. **5***a,b* and **6**;

[0049] FIGS. **8** to **10** show a fourth embodiment of the invention;

[0050] FIG. **11** shows an adaptation of the fourth embodiment;

[0051] FIGS. **12** to **14** show a further embodiment of the invention; and

[0052] FIGS. **15***a* to **15***c* show yet further embodiments of the invention.

[0053] Referring to FIG. **1**, there is shown generally an arrangement of a sleeve **10** for a laparoscopic access port **50** in use. Initially an incision is made in the patient P and the sleeve **10** is inserted into the incision. The insertion of the sleeve **10** is assisted by the flexible nature of the flanges of the sleeve as described below. Once the sleeve **10** is in position a laparoscopic access port **50** is inserted into the sleeve **10** through a channel **8**. The access port **50** is of a generally known construction and so is not described here in detail, although FIG. **1** illustrates a tube **52**, which is used for insufflation of a body cavity C using a pressurised gas G supplied by the pipe **52**. The access port **50** includes a generally central aperture **54**, which is self-sealing and allows the insertion of surgical tools and the like through the aperture **54** and into the body cavity C.

[0054] The access port sleeve **10** is shown in more detail in FIGS. **2***a*, **2***b* and **2***c*. FIG. **2***a* shows the sleeve **10** before it is inserted into the patient P. The sleeve comprises a generally tubular portion **12**, an inner flange **14** and an outer flange **16**. The sleeve is manufactured from a rigid or semi-rigid plastic such as polythene, and the inner and outer flanges **14** and **16** are manufactured from a flexible elastomer such as silicon rubber.

[0055] The inner flange **14** in use sits against the inner wall of a body cavity C (as shown in FIG. **1**) and the outer flange **16** lies against the epidermis of a patient P. The sleeve

includes a first seal member **18** adjacent the outer flange **16**. The purpose of the first seal member **18** is to provide a seal between the sleeve itself and the laparoscopic access port **50** when the access port **50** is inserted within the channel **8** of sleeve **12**. In this embodiment the seal member **18** is provided by an inner lip of the outer flange **16**. Additionally, the inner flange **14** acts as a further, second, seal member to provide a seal between the sleeve **10** and the inner wall of the body cavity C. The seal members **14** and **18** act to prevent or inhibit the escape of insufflation gases G from within the body C.

[0056] Referring additionally to FIG. **2***b* the tubular portion **12** is shown in more detail. The portion **12** is formed from two tubular pieces **11** and **13** each of which have a series of protrusions which form complementary ratchet formations **15** and **17** which act as a one-way movement mechanism so that the pieces **11** and **13** can be pushed together but not pulled apart. In use, this allows the flanges **14** and **16** to be brought together, but they cannot move apart. Stop members **22** at the ends of the ratchet mechanism **15** and **17** prevent the inner and outer tubular pieces **11** and **13** separating and so this prevents the inner tubular piece **13** from inadvertently falling into the body cavity C.

[0057] Referring additionally to FIG. **2***c*, a section of a circumferential portion of the inner flange **14** is illustrated. The flange has a thickened annular periphery, in this case a ring **20** of circular cross-section. The purpose of the thickened periphery is to help maintain the shape of the flange **14** within the cavity C, and help it spring into shape when it has been collapsed and inserted into the initial incision in the patient P.

[0058] A captive plug **30** is illustrated in FIG. **2***a* which can be inserted into the aperture **8** and sealed against the first seal member **18**. The plug **30** includes a membrane **32** which can be punctured so that a drain or the like can be passed through the aperture **8** into the cavity C.

[0059] In general the internal diameter of the aperture **8** will be in the order of 7.5 mm to 14 mm to allow the insertion of a laparoscopic access port which in turn is capable of receiving laparoscopic surgical tools of a diameter of 5 mm to 11 mm. Whilst the sizes mentioned above are typical of presently used apparatus, it will be appreciated that other sizes may be employed for example smaller sizes may be used for paediatric surgery.

[0060] In use the sleeve **10** is pushed through an incision in the patient P by collapsing the inner flange **14** and forcing the sleeve **12** into the incision. As the inner flange **14** enters the cavity C the flange will resiliently return to its planar shape as illustrated in FIG. **2***a*. In this position the ratchet mechanism **15** and **17** can be used to draw the inner flange **14** and outer flange **16** together. When the two flanges are drawn together the outer flange **16** will sit neatly on the outside of the patient P generally flush with the patient's skin. The laparoscopic access port **50** can then be repeatedly inserted and removed from the patient into and out of the channel **8**, without the unnecessary trauma to the patient P.

[0061] When the access port **50** is removed the plug **30** can be inserted into the channel **8** so as to avoid infection entering the cavity C via the channel **8**.

[0062] A second embodiment of the invention is shown in FIGS. **3***a* and **3***b*. Where features of the first and second embodiments are similar or identical then these features have like reference numerals. This sleeve **100** is used in a similar manner to the sleeve **10** described above. There are two flanges **14** and **16** on either side of tubular pieces **11** and **13**. Lower tubular piece **13** includes two straps **102** extending upwardly, through flange **16**, and through plug **30**. The straps are held together by a sprung clasp **104**. In use, when the sleeve is inserted into a body cavity or the like, the clasp can be he held with one hand, whilst the upper flange **16** is pushed away from the clasp. Since the straps hold the lower tubular piece **14** in place, then the flanges will be forced together as the flange **16** is pushed.

[0063] FIG. **3***b* shows a one-way ratchet mechanism which is similar to the to ratchet mechanism shown in FIG. **2***b*. In FIG. **3***b* only one set of ratchet formations **17** is present, which act with end stops **22** to provide one-way movement, for moving the flanges **14** and **16** together. Since there are no features of the ratchet mechanism within the channel **8** then the channel provides easier passage for access ports and the like, and makes the parts easier to produce.

[0064] In use the flanges can be brought together as described above. When it is desired to seal the channel **8**, the plug **30** is pushed into the channel **8** and the clasp **104** is moved down relative to the straps **102** to prevent the plug from coming out.

[0065] In a refinement, the lower tubular piece **13** is slightly longer than the upper tubular piece **11**. This means that the upper tubular piece cannot be inadvertently forced to protrude into a body cavity beyond the flange **14**, so reducing the likelihood of damaging internal organs and the like.

[0066] A third embodiment of the invention is shown in FIGS. **4** to **7**. The general arrangement of parts in the third embodiment is similar to the previously described embodiments. This embodiment is used in the same way as, and has similar dimensions to the previously described embodiments

[0067] Referring to FIGS. **4***a* and **4***b* a sleeve **110** is pushed into an incision in a patient and left there until it is no longer required, allowing repeated insertions of laparoscopic access ports and the like. The sleeve **110** includes an moulded plastics inner tubular piece **113** and a moulded plastics outer tubular piece **111** which are relatively adjustable by means of a telescoping movement in the direction of arrows A along axis C, as the outer tubular piece **111** slides over the inner tubular piece **113**. Insertion of the sleeve **110** into a body cavity is carried out by holding the outer tubular piece **111** and forcing the inner piece **113** into the cavity. Since the action of inserting of the sleeve into a body cavity is likely to require some insertion force, then this could result in the collapsing of the tubular pieces together. However the collapsing is prevented by a mechanism including a bayonet type fitting which includes a channel **115** and is described in more detail below.

[0068] The sleeve **110** includes an inner flange **114** and an outer flange **116**, which perform sealing functions as described above. The outer tubular piece **111** has a cap **130**, which is used for sealing the sleeve when not used for laparoscopic access. The cap **130** has a tether **132**.

[0069] FIGS. **5***a* and **5***b* show sections of the tube when they are partially collapsed. Such a partial collapsed state may provide the correct dimension between the inner and outer flanges, for example if the patient is overweight.

[0070] Access channel **108** for accepting a laparoscopic access port can be readily seen formed within inner diameters of the two tubular pieces **111** and **113**. Two flexible draw tabs **134** can be seen. These are integrally moulded with the inner tubular piece **113** and extend through openings **117** in the outer flange **116**. The tabs **134** can be gripped and pulled through the openings **117** from the outside to hold the inner piece **113**, while the outer tubular piece **111** is pushed toward the inner piece **113**. This action brings the two tubular pieces

together. The openings **117** include a gripping mechanism for one-way movement of the tabs **134** therethrough so that the two tubular pieces are held together by tension of the tabs and cannot come apart once they have been forced together.

[0071] FIG. **6** illustrates the third embodiment wherein the two tubular pieces **111** and **113** have been collapsed fully because the draw tabs **134** have been pulled to their fullest extent. This arrangement would be suitable for patients having a thinner cavity wall.

[0072] A modification is shown in FIG. **7**, wherein the flange **114'** is radially extended compared to the flange **114** shown in FIGS. **4***a* to **5***c*. This extended flange is approximately 1.5 times the diameter of the bore **108**. Also, the flange **114'** has an inner lip **136** which seals against a port **50** or the like when the port is inserted into the bore **108**. This lip is preferably in the position shown, but could be positioned anywhere in the bore **108**.

[0073] Inner flange **114** is resiliently fitted to the inner end of the moulded tube and the draw tabs **134** are integrally formed on the outer end of this tube. The tube wall includes the channel **115** which has a majority of its length extending parallel to the axis C. At the outer end of the tube **119** the channel extends obliquely to the axis. A similar mirror-image channel (not shown) is provided on the opposite side of the tube.

[0074] The outer tubular piece **111** and cap **130** in more detail. The outer tube **111** includes a pair of studs **118**, slideable in the channels **115** mentioned above. The studs and channels form a bayonet fitting which restricts the coming together of the two tubular pieces **111** and **113** when the studs are located in the outer oblique end **119** of the channel **115**. When the outer tubular piece **111** is then rotated about axis C relative to the inner tubular piece **113**, the studs can be moved into a position in the channel, which allows the tubular pieces to come together. It will be noted that the openings **117** are wider than the tabs **134** to allow said relative rotation of the tubular pieces.

[0075] The embodiments described above refer to a sleeve which can accommodate a conventional access port. However, in an alternative design a sleeve having a similar arrangement to the sleeves described above may form part of a surgical access port.

[0076] Such a combined port and sleeve **200** is illustrated in the sectional views of the fourth embodiment shown FIGS. **8**, **9** & **10**. In this embodiment sleeve **210** is of similar construction to the sleeves **10**, **100**, and **110** mentioned above, and although not explicitly illustrated, it is envisaged that the sleeve **210** may have incorporated, the same or similar attributes as the sleeves **10**, **100** and **110**. Parts which are similar to the parts of sleeves **10**, **100** and **110** have like numbering.

[0077] Referring in particular to FIG. **8**, sleeve **210** is removably attached to the head of an access port **250** by means of a shoulder **252** on formed integrally with a body portion **260** of the port head **250**, which is a snap fit into an aperture **208** of the sleeve **210**. Access port head **250** includes a cap **230**, a spiral seal **218** and a gas supply tap **254**.

[0078] In use, as illustrated in FIG. **9**, the sleeve **210** is inserted into the incision in a patient P and pushed through the body tissues. The sleeve **210** is telescopic, because the outer piece **211** of the sleeve **210** and the inner piece **213** of the sleeve may slide relative to each other. However, when inserted into the patient, it is envisaged that the inner and outer pieces will be restrained against their relative movement, for example by the use of a bayonet fitting of the type described above and illustrated in FIG. **4***a*.

[0079] Following insertion, the inner and outer pieces are relatively rotated to remove the influence of the bayonet restraint. Draw tabs **217** are pulled in the direction of arrow A and as a result, the inner piece **213** is drawn toward an outer piece **211** of the sleeve **210**. A one way movement mechanism **217** stops the tabs from sliding backwards. As described previously, flanges **214** and **216** on the inner and outer parts, come closer together to minimise the leakage of insufflation gases. The flanges are formed from elastomeric material.

[0080] At this stage, cap **230** can be removed and an instrument (not shown) can be pushed through the seal **218** into the aperture **208** and on, into the patient P.

[0081] After surgery, the instrument is removed and the port arrangement **200** can be removed. In this embodiment, the head **250** can be removed from the sleeve **210**, whilst the sleeve remains in the patient. Thus the sleeve can remain in the patient for further access to the surgical site in subsequent surgical operations, or for observations, or drainage, or suchlike, in a similar manner to the sleeves described above.

[0082] FIG. **10** shows the sleeve **210** with the access port **250** removed, for allowing the sleeve to remain in the patient if desired. In this case the cap **230** has been fitted over the sleeve to prevent the ingress of contamination. It should be noted that, in this embodiment, it is not essential that the head **250** be removable from the sleeve **210**, however when the head is removable, then the patient need not endure discomfort if the sleeve is left in place.

[0083] In FIG. **11**, the access port arrangement **200** includes a pointed introduction tool **300** for aiding the introduction of the sleeve **210** into the patient P. The tool **300**, has a hollow interior including a bore **310** which in use can be used to insert a camera to aid the guiding the tool **300** during insertion by means of inserting the camera to the pointed end **320** of the tool **300**.

[0084] Referring to FIGS. **12***a* to **12***e* a further laparoscopic access port **400** is illustrated in different configurations. In FIG. **12***a*, the port is shown having two main parts—an access head **450** which remains external to a patient, and provides access for laparoscopic surgical instruments through an access bore **408**, and a sleeve **410** which is insertable into an incision in a patient and thus is generally internally disposed in use.

[0085] The generally tubular sleeve **410** has two main parts—a shank **411** generally rotatably attached to the head **450**, and a moveable flanged piece **413**, which is moveable relative to shank **411** to adjust the overall length X (including the head) of the port **400**. A mechanism is described below for causing said movement.

[0086] The head **450** is divided into two parts—a lower part **440** which is rotatably attached to the shank **411** and a removable part **460**, which can be detached, as shown in FIG. **12***d*, for the reasons mentioned above relating to patient safety and comfort. As shown in FIG. **12***c*, a cap **430** can be fitted over the lower port part **440**.

[0087] As illustrated in FIGS. **12***b* and **12***e*, the port **400** can be inserted into a patient using the introduction tool **300** described above, again fitted temporarily within bore **408**. The introduction tool shown in FIGS. **12***b* and **12***e* includes an auger **320'** which aids insertion of the port **400**. The introduction tool includes a shoulder **312** which sits on the externally facing end of the flanged piece **413** to inhibit that flange piece

from collapsing into the shank during insertion, as well as minimising the stress exerted on the length adjustment mechanism described above.

[0088] Once inserted a flange **414** helps to hold the port in place as described above and provides a radially inwardly facing seal around bore **408** to aid prevention of the escape of insufflation gases when a laparoscopic tool is being used in the bore **408**. Sutures stitched into the skin of a patient, can be attached to ears **412** to aid the securing of the port **400** in place on/in the patient's body. The ears include tapering slots **415** for capturing and securing the sutures in place.

[0089] FIG. **13***a* is a longitudinal section through FIG. **12***a* and FIG. **13***b* is a section similar to the section shown in FIG. **13***a* but with the flange **414** in a retracted position and shown in use. Referring to these two Figures, the head **450** includes a seal member **418** which is displaced when a laparoscopic instrument (not shown) is inserted into the head **450** generally along an axis C, but otherwise inhibits the passage of gases. In use the flanged piece **413** is telescoped into the shank **411** so the overall length X is reduced to fit the abdominal wall thickness W of the patient and sutures S are used to hold the port in place and the flange **414** seals the port against the patient's cavity wall.

[0090] Referring to FIGS. **14***a,b* and *c,* an exploded view of the mechanism **409***a,* **409***b* and **409***c* (collectively **409**) for moving the flanged piece **413** is shown. The mechanism includes an internal thread **418** formed in the inside of the shank **411** and diametrically opposed detents **406** formed on the outside of the flanged piece, only one of which is visible. The detents **406** can ride in the thread **418** such that relative rotation of the shank **411** and flanged piece **413** causes the flanged piece to move axially along axis C. Said relative rotation is caused by an intermediate tubular piece **416** attached to the lower port part **440**. This intermediate part in use lies radially between the shank **411** and the flanged piece **413** and the detent **406** extends captively through slots **417** in the intermediate piece (only one of which is visible), and into the thread **418**. Rotation of a collar **441** on the port part **440** causes said rotation of the flanged piece **413** driven by the detent **406** and thus said axial movement of the flanged piece **413** following the helix of the thread **418**. It is envisaged that more then one detent may be formed on flanged piece **413**, and a complementary number of slots **417** can be provided also.

[0091] Various alternatives to the above embodiments are described below with reference to FIGS. **15***a, b* and *c* which each show modifications of the previously described embodiment. Referring to FIG. **15***a* a three-tube access port arrangement **500** is illustrated, in which a sleeve **510** has three tubes one inside the other, similar to the tubular arrangement mentioned above. However, in this case a thread is formed on the intermediate tube, which is rotatable externally of the patient by rotation of collar **540**, as described above. The flanged piece **513** can follow the thread and is prevented from rotating with the intermediate piece by detents extending from a shank portion **511**, which extend into slots in the flanged piece **513**. Thus the flanged piece moves purely axially rather than the helical path of the flanged piece **413**. Thus a mechanism is shown which again allows adjustment of the overall length of the access port externally of the patient.

[0092] Referring to FIG. **15***b* a further access port arrangement **600** is illustrated, including a sleeve **610**, and wherein, an introducer tool **301**, is temporarily held in position in a flanged piece **613**. The introducer acts as a handle to pull or push the flanged piece **613** relative to a shank portion **611**, in the manner of a syringe plunger. Thus again a mechanism is shown which allows adjustment of the overall length of the access port externally of the patient using two tubular pieces **611** and **613**.

[0093] Referring to FIG. **15***c* a further access port arrangement **700** is illustrated, wherein introducer **301** is used to rotate the complementarily threaded shank **711** and flanged piece **713**, of sleeve **710**, to provide a further mechanism which allows helical adjustment of the overall length of the access port externally of the patient, again using two tubular pieces **711** and **713**.

[0094] It will be readily apparent to the skilled addressee that further modifications, alterations and additions to the embodiments described above are possible. For example, suitable alternatives to the materials used could be employed. Thus, the flexible silicon elastomer described could be replaced by other suitable biocompatible material i.e. material which is safe for use within a patient's body cavity. The sleeves **10**, **100**, **110**, **210**, **410**, **510**, **610** and **710** could be manufactured from other plastics materials, or metals or ceramic materials. It is possible that the sleeves could be made completely or partially from biodegradable material so that disposal is made less expensive, or from material which can be cleaned and reused. Plastics materials described could include a bactericide to reduce the likelihood of infection. The inner and outer flanges are illustrated as being generally planar and parallel, although it is envisaged that for some applications the shape of the flanges could be altered. For example, the outer flange could be shaped to fit a particular curved body part and thus avoid protruding too far above the skin of a patient. A circular channel **8**, **108**, **208**, **408** and flanges **14**, **114**, **214**, **414** and **16**, **116**, **216** are preferred but it will be appreciated that other shapes, for example hexagonal, could be used. The terms tube and tubular are intended to embrace such non-circular shapes.

1. A laparoscopic access port having: a head portion for use generally externally of a patient and for providing a seal around a laparoscopic tool when said tool is inserted into the head; and a sleeve portion connected to the head and for accommodating the tool, the sleeve extending along an axis and being adapted for inserting generally into the body of a patient in the direction of the axis; said access port being adjustable in overall length in the direction of the axis, the sleeve portion comprising a shank attached or attachable to the head and a flanged piece moveable relative to the shank by means of a mechanism for causing the overall length of the port to adjust, the mechanism being operable externally of the patient at or adjacent the head.

2. A laparoscopic access port as claimed in claim **1**, wherein the head, or part of the head, and sleeve are separable.

3. A laparoscopic access port as claimed in claim **1**, wherein said sleeve is generally tubular, including a first tubular piece forming the shank and a second tubular piece forming the flanged piece, one of said tubular pieces being relatively moveable within the other to adjust the overall length of the port.

4. A laparoscopic access port as claimed in claim **3**, wherein either the first or second tubular piece has a thread and the other of the first or second tubular pieces has a complementary thread or thread-following formation such that the movement of the second tubular piece causes said overall length adjustment.

5. A laparoscopic access port as claimed in claim **4**, wherein the rotation of the second tubular piece is caused by a manually rotatable third tubular piece forming part of the mechanism and extending from the head such that the third tubular piece can be rotated externally of the patient in use, by rotation of the head or part of the head.

6. A laparoscopic access port as claimed in claim **4**, wherein the first and second tubular piece do not rotate relative to each other in use.

7. A laparoscopic access port as claimed in claim **5**, wherein said third tubular piece extends at least partially within the second tubular piece, which in turn is at least partially within the first tubular piece.

8. A laparoscopic access port as claimed in claim **7**, wherein the third tubular piece includes at least one axially extending slot for accepting a detent formed on or in the second tubular piece for allowing the detent of second tubular piece to move axially in the slot under the influence of the thread in the first tubular piece.

9. A laparoscopic access port as claimed in claim **1**, where the flanged piece includes a distal end at which is formed a flange, optionally being formed from flexible material.

10. A laparoscopic access port as claimed in claim **1**, wherein the mechanism includes an indexing mechanism providing audible and/or tactile indication of movement of the second tubular piece.

11. A laparoscopic access port as claimed claim **1**, wherein the mechanism includes at least one flexible draw tab attached to the flanged piece for holding the flange in place while the shank is moved relative to flanged piece.

12. A laparoscopic access port as claimed claim **1**, wherein the mechanism includes an introduction tool insertable into the flanged piece or second tubular piece, and extending such that the introducing tool can be manipulated externally of the patient to move the flanged piece relative to the head.

13. A laparoscopic access port as claimed in claim **1**, wherein the mechanism includes an introduction tool insertable into the flanged piece, said tool including a shoulder for engagement with the flanged piece for supporting said flanged piece during insertion of the port into a patient and maintaining the port in an extended position.

14. A laparoscopic access port as claimed in claim **1**, wherein the port may further include a plug or cap to substantially seal the port after the head of the access port is removed or partially removed.

15. A laparoscopic access port as claimed in claim **1**, wherein the head includes a pierce-able septum.

16. A laparoscopic access port as claimed in claim **1**, further including at least one ear at or adjacent the head for allowing securing of the head by means of suture, said ears including V shaped open slots for capturing said suture.

17. A sleeve arrangement for accepting laparoscopic equipment, comprising: a sleeve portion extending along an axis and being adapted for inserting generally into the body of a patient in the direction of the axis;

said sleeve portion being adjustable in overall length in the direction of the axis, the sleeve portion comprising a shank attached or attachable to an external portion of the sleeve arrangement and a flanged piece moveable relative to the shank by means of a mechanism for causing the overall length of the sleeve to adjust, the mechanism being operable externally of the patient at or adjacent the external portion.

* * * * *

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摘要(译)

公开了腹腔镜进入端口的实施例，其具有通常在患者体外使用的头部（部分450），并且当所述工具经由（孔408）插入头部时，用于在腹腔镜工具（未示出）周围提供密封;连接到头部并用于容纳工具的套管部分（410），套管（410）沿轴线延伸并适于沿轴线方向大致插入患者体内;所述进入端口是可调节的在轴线方向上的总长度X中，套筒部分包括附接或可附接到头部（450）的柄部（411）和可通过用于引起整体的机构相对于柄部移动的凸缘件（413）待调节的端口的长度X，该机构可在患者头部或头部附近可操作，例如通过下头部（440）的元件的旋转，或通过柄（411）的滑动运动和法兰件（413）。