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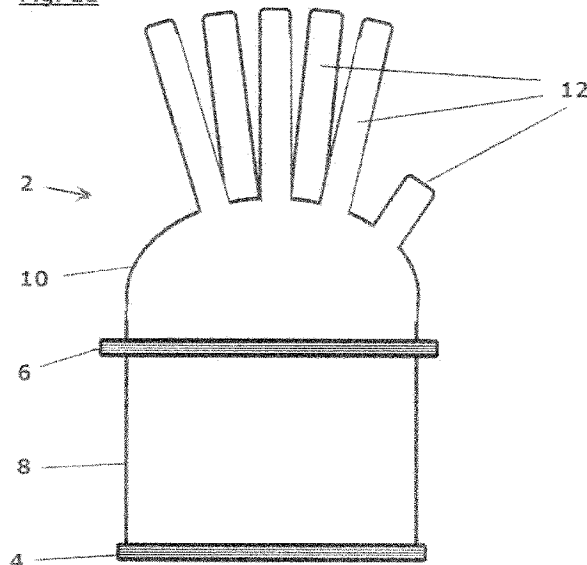
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(54) Title: SURGICAL DEVICE

Fig. 1a



(57) Abstract: A port for minimal access surgery, such as endoscopic or laparoscopic surgery, via an incision in a patient is described together with methods of use of such a port, wherein the port (2) comprises a substantially cylindrical sleeve (8) formed of a flexible membrane material and has a first, open end and a second, closed end (10), a first resilient ring arrangement (4) being provided around said sleeve at said open end, and a second resilient ring arrangement (6) around said sleeve (8) and located on it between said first resilient ring arrangement (4) and said closed end (10), wherein the second resilient ring arrangement is adapted, in use, to be rolled around itself and the sleeve to roll up any flexible membrane material extending between said first and second resilient ring arrangements, so as to draw both the first and second resilient ring arrangements into close engagement against respective sides of the incision, thus functioning as both a wound retractor/port and a seal for the contamination-resistant introduction of surgical instruments.



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Surgical device

FIELD OF THE INVENTION

The present invention relates to surgical methods and devices, and in particular to devices and methods for use in minimal access surgery, such as laparoscopy and natural orifice endoscopy.

BACKGROUND ART

Minimal access surgery refers to the concept of performing surgical operations via reduced or confined access approaches for the purpose of improving patient outcome and convalescence after surgical intervention. Laparoscopic, or "keyhole", surgery is a well-known technique whereby elongate surgical instruments are inserted through one or more narrow incisions (typically 0.5 to 1.5 cm in diameter) in the patient. Various instruments can be introduced into the patient in this way, including scissors, graspers, cutters, energy dissection and sealing devices etc. The surgeon may pick and choose such instruments to suit his purpose. Laparoscopic surgery has several advantages compared to conventional open surgery. The smaller incisions result in reduced abdominal wall injury and hence lessened postoperative pain and wound complications. Patients typically will also have a shorter recovery time and a better cosmetic outcome.

There are instruments which are critical to the success of any laparoscopic surgery, and which therefore tend to be used in every case and at nearly all times. For example, in order to hold a laparoscopic incision open, provide secure and sterile access to the patient and ensure a sealed space with sufficient pneumoperitoneum to enable working, a "port" or "trocar" containing an air valve is placed into each wound. Additionally the surgeon must have some feedback so he can guide his actions appropriately; in short, he must be able to see what he is doing. An optical device, or "laparoscope" provides a suitable imaging mechanism, with currently known

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types comprising either a charge coupled device (CCD) for insertion directly into the patient or a telescopic lens system that brings the image out of the patient where it can be recorded with a camera. In addition, a fibre optic cable provides light so the laparoscope can be effective and a pump system
5 insufflates the patient with an inert gas (e.g. carbon dioxide), so the instruments have space in which to move.

It is of course critical to the patient's wellbeing that any surgery is carried out in a safe and sterile manner. This principle is especially important
10 when a laparoscopic operation involves the gastrointestinal tract as many of these procedures are 'clean contaminated' or potentially 'contaminated' (as defined by the US National Research Council group, see for example Berard F and Gandon J. "Postoperative wound infections: the influence of ultraviolet irradiation of the operating room and of various other factors"
15 1964 *Ann. Surg.* 160 (Suppl. 1) 1-192) and it extends to include any supplementary wounds which are required for the purposes of gastrointestinal specimen extraction, anastomosis formation or stoma creation as part of a laparoscopic operation. Therefore, when such incisions are made a wound protector is often placed into the body wall in order to
20 protect the skin and subcutaneous tissues from microbiological contamination. In cases involving malignancy, this device also acts to shield the wound against tumour cell implantation. For patient benefit, these incisions are often made at the site of one or more of the incisions already made for placement of the laparoscopic trocars.

25 The advantages of laparoscopic operations can be maximized by reducing the number of incisions and recent progress in the field of laparoscopic surgery has resulted in many procedures being performed by grouping the trocars (and hence the instruments) within just a confined
30 single incision. This is particularly attractive when one incision larger than a standard trocar puncture site is required anyway for the purposes of

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specimen extraction, anastomosis formation or stoma creation as maximising the utility of this wound may spare the patient any additional trocar wounds. However, while such surgery has benefits for the patient, the procedure is made more difficult for the surgeon due to the constraints inherent in performing surgery via such a confined access.

Several different "single incision" or "single access" laparoscopic ports to enable such working are currently available. For example, the "SILS port" (manufactured by Covidien (RTM)) comprises a narrow neck of solid plastic with a defined number of holes (three) machined into the plastic. The port is inserted into the incision, and has flanges at either end so that the port is held in place on either side of the incision. Valved tubes can then be inserted through the holes, and elongate surgical instruments inserted through the tubes to allow their access to the patient. The general construct of the outer interface is similar in other commercially available ports including those made by Advanced Surgical Concepts, Ethicon Endosurgery, Innovia, Applied Medical and Karl Storz. While some of these devices (by reason of their design and/or material composition) impose strict cylindrical or conical entry and parallel instrumentation, all (including the low profile devices) impose a fulcrum (generally located at the level of the abdominal wall entry site) onto the individual trocars as well as a predetermined, fixed distance (which predisposes to cluttering and clashing of instruments during certain manoeuvres) between the instrument access points. Both of these factors significantly limit the freedom and independence of movement possible by the individual instruments and optic. In addition, all are supplied in kits that are restrictive in terms of available trocar number (limiting the number of instruments that can be used at any one time) and dimension (limiting the types of instruments that can be used at any one time) and tend to be exclusive of complementary tools that may be already available in a surgery department but made by a different manufacturer.

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Therefore, when using currently commercially available devices (such as Covidien's, described above) surgeons have to plan ahead within very narrow confines which instruments they will need for each particular part of the procedure. If a part of the procedure requires five instruments, say, and the port allows only four instruments to access the operating field at any one time, further incisions will be necessary. In addition, the surgeon's ability to improvise is lost (or at least hampered). For instance, he may need to stem excessive bleeding, but be unable to introduce either further instruments or instruments of greater calibre through the existing port. In addition, the relative hard nature of the construction material of currently available single ports limits the range of motion that is possible for the surgeon engaged in simultaneous instrument working - that is, the instruments are held at fixed distances at their fulcrum points in the device atrium which is/are most often located at the level of the abdominal wall. Furthermore, the fixed number of firm or rigid apertures which are moulded a fixed distance apart from each other (a feature common to many currently commercially available single port devices) imposes further constraints on the manoeuvrability and fluency of instrument movement and flow. Because of the firm nature of the material in which the bores or conduits for access are placed, the currently available ports tend also to contain the minimum number of extra conduits as additional non-used access sites further cramp the working space at the port. The only available device that allows maximum freedom of motion within it actually has no physical seal at the port (Airseal by Surgiquest) but is instead very large in its own diameter and physically restrictive.

Furthermore, existing single access ports are relatively expensive, and are designed primarily to perform competitively to conventional multiport laparoscopy (and priced accordingly) rather than to be able to complement other standard techniques. This dissuades medical authorities from authorising single-port laparoscopic techniques, in spite of the potential health benefits to

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patients and greatly restricts the opportunity for surgeons to gain expertise with these devices. The expense and specificity of these devices in practice in particular also prohibits their use as adjuncts to standard multiport laparoscopic procedures (i.e. their use on any potential extraction wound site on a patient in order to regain maximum capability for further laparoscopic working to allow completion of the procedure). For all these reasons, these devices tend to be used only in highly selected patients in selected centres rather than representing an additional capability for laparoscopic surgery more generally. A simpler arrangement (as detailed herein) would be advantageous as representing a unifying, cross-over device.

US 5524644 and EP 2363105 disclose wound retracting ports for protecting an incised wound from exposure to bacterial and other harmful contaminants of a simpler design, in which there is an impermeable pliable sleeve for insertion into the incision and having resilient annular members connected to each end; one of these is formed to engage the inner edge of the wound, with a portion of the sleeve above the wound being rolled onto the other annular member to draw the remaining sleeve portion contiguous with opposite sides of the wound. Such arrangements are simpler and less expensive but, because they both have an outer part the diameter of which is variable (it depends on the number of turns, or rolls, there are on the outer annular member) and is formed of the material of the sheath, they are not ideal for use with insufflation techniques and are susceptible to damage. They are not easily used with insufflation because of the difficulty of connecting any form of air seal (such as known "snap fit" seals) to the outer part which may have an uncertain diameter (depending on the number of turns, or rolls, there are on the outer annular member), and if a fixture is used which is marginally too tight it can pierce the sleeve, so ruining the air seal and leaving a route for contaminants to reach the wound. These systems therefore currently require sophisticated and specific as well as expensive attachments in order to convert

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them from wound protectors to access platforms. These aspects again considerably limit their uptake and utility for this purpose.

Finally, there has recently been an appreciation that many of the concepts and components of single port operating are applicable to intraluminal and potentially even transluminal operation via a natural orifice (perhaps especially transanal and transrectal procedures). For natural orifice working, there have lately been attempts to converge laparoscopic equipment with the more sophisticated Transanal Endoscopic Microsurgery and Operation (TEM and TEO respectively) techniques and instrument sets. Again, the device disclosed here is fit for this purpose in providing an access port that can be placed across or within a variety of already available and in development proctoscopes, anorectoscopes and anal strut/stent systems as well as externally placed rings and mounts. (Note that, in connection with natural orifice working, the terms "wound" and "incision" used herein should be construed broadly, so as to encompass any natural human orifice).

The present invention seeks to address these and other problems.

SUMMARY OF THE INVENTION

In one aspect, the invention provides a port for minimal access surgery via an incision in a patient, comprising a substantially cylindrical sleeve formed of a flexible membrane material and having a first, open end and a second, closed end; a first resilient ring arrangement around said sleeve at said open end, and a second resilient ring arrangement around said sleeve and located on it between said first resilient ring arrangement and said closed end, wherein the second resilient ring arrangement is adapted, in use, to be rolled around itself and the sleeve to roll up any flexible membrane material extending between said first and second resilient ring arrangements, so as to draw both the first and second resilient ring arrangements into close engagement against respective sides of the incision.

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Such an arrangement may in some embodiments be of unitary construction and hence relatively inexpensive (unitary in this context indicates that the port is a one-piece, integrated device that is not made from separate components and cannot be taken apart without causing the destruction of the port). It is easy to use and, as will become clearer below, capable of performing the functions of both a wound retractor/port and a seal in one, avoiding the connection problems of some prior devices (thus, in describing embodiments of the invention herein, the word "port" should be construed broadly, so as to encompass a device which performs the function of a port and a seal). In use, such a device provides all the functions associated with the arrangements of US 5524644 and EP 2363105, but may also provide two layers of sleeve material adjacent the incision, effectively doubling the thickness of the sleeve, therefore providing additional protection against contamination as well as against device damage and parietal wall trauma that may occur during instrumentation insertion, withdrawal and exchange (especially with respect to sharp instrumentation).

In some embodiments the sleeve is elastically resilient and all formed of the same material suitable for surgical use, such as a polyolefin or polyisoprene, natural or synthetic rubber or silicone and, as is known in the art, substantially transparent or translucent. The flexible nature of the device means it may be used to provide a robust, secure and hermetic sealing of an incision through which such a device has been installed while providing, at its upper surface, entry points to allow the insertion of instruments and connection tubing for gas sufflation. The material may alternatively be substantially opaque, for situations when it is desirable to exclude ambient light from the wound area. The ring arrangements may be formed of a resilient material such as an elastomer, which is flexible (optionally different to the material of the sleeve) and either joined to the sleeve arrangement by the application of heat or a suitable adhesive, or they may be seated in annular pockets formed in the sleeve. Alternatively, the ring arrangements may be formed of the same material as the sleeve, and may therefore be moulded or otherwise

incorporated into the sleeve in a simple, single manufacturing step. In some embodiments one or both of the ring arrangements is/are of larger diameter than that of the incision, with the second resilient ring arrangement having a diameter greater than the diameter of the incision. This enables a user readily to recognise which way round the device should be used, and can be assisted by providing that one of the ring arrangements is of a different colour to the other.

In use, the second ring arrangement may be inserted into the incision and located against the inside of the incision, whilst the first ring arrangement may be located outside the incision. In this position, if the length of the cylindrical sleeve is shorter than the distance between the inside and the outside of the patient's body at the location of the incision, the elastic sleeve can be stretched to insert the lowermost ring into the wound incision and then its elasticity draws the two ring arrangements taut against the two sides of the incision. The second ring arrangement is capable of being able to be rolled around itself, to "roll up" sleeve material and draw the two ring arrangements into close contact with opposing sides of the incision.

Additionally or alternatively the ring arrangements are sufficiently flexible to also allow either or both rings to be stretched over the outer component of a standard wound protector or other device placed around (on either internal or external aspect) or through an incision or natural orifice. In doing so, the device may also be used in association with a flat sterile drape based around a single ring for insertion into an incision in order to provide tension on the drape so that this construct acts as a wound retractor as well as a simple wound protector. Furthermore, in a third use, the ring arrangements can also be sufficiently flexible to be deformed enough not only to allow their straight insertion into a wound or natural orifice (or indeed other hollow device placed into either an incision or natural orifice) but also that the second ring arrangement can be passed through the first ring arrangement to leave two nested cylinders of sleeve material, one inside the other, with the second ring arrangement at one end, the first ring arrangement at the other end, and with

the closed end of the sleeve extending through and beyond the first ring arrangement. The outermost sleeve, in cooperation with the two ring arrangements, is then able to function as a port, similar to those of the prior art, but with an internal sleeve which functions to both provide additional protection to the incision and also as an access point for introducing instruments and/or trocars – these can pierce the closed end of the sleeve, the dimension, configuration or resilient material of which may be sufficient to provide an airtight seal against the introduced items, or a suitable tie may be used to improve the air seal.

In use, such ports provide instrument access points that allow great freedom of movement of instruments which extend through the gap defined by the sleeve inside the patient. With the upper ring passed through the lower ring, the inner sleeve is also free to move in the gap between it and the outer sleeve. In some circumstances it may be desirable for the inner sleeve to be held tightly against the inside of the outer sleeve; in this case, attachments may be disposed around the sleeve and between said second resilient ring arrangement and said closed end, and adapted, in use, to releasably attach to said second resilient ring arrangement and to enable tensioning of the flexible membrane material between the second resilient ring arrangement and the attachments. These attachments could be formed around the sleeve in the form of small hooks or the like which are adapted to engage with the sleeve material wound round the first ring arrangement or with the ring arrangement, or there may be a ring of adhesive: a user simply draws the inner sleeve tight and then engages the attachments which then hold the inner sleeve in position against the inside of the outer sleeve.

In a second aspect, the invention provides a method of performing minimal access surgery via an incision in a patient using a port as described, comprising passing the second resilient ring arrangement through the first resilient ring arrangement to create two nested cylinders of flexible membrane material, and inserting the first resilient ring arrangement through the incision into the patient. Such a method is quick and easy to apply, and reliable in use,

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particularly when compared with the two-piece configuration common in prior art devices.

By twisting one of the first and second resilient ring arrangements relative to the other about the cylindrical axis whilst holding the two ring arrangements a fixed distance apart along the cylindrical axis, the internal diameter of the port can be adjusted so as to fit an incision of a certain diameter, and/or to hold the incision at a certain diameter, as is known in the art.

It may be advantageous for the sleeve material extending from the second ring arrangement to the closed end to be formed of a different material as that extending between the ring arrangements, so as to improve the seal, for example. It is additionally advantageous that the second, closed end of the sleeve defines a plurality of instrument access points, each point comprising a tubular extension of the sleeve, so that instruments/trocars may be inserted through the closed end through the closed ends of these tubular extensions (or the ends of these extensions may simply be cut off to allow insertion). The tubular extensions may be "stepped", i.e. have sections of different diameters (usually decreasing in the direction away from the ring arrangements) or more gradually tapered. These tubular extensions may then allow for a greater self-sealing action by the resilient sleeve material, provide additional protection to the wound incision edges, and/or provide a larger area for any additional tie to further seal against the inserted item. The conduits may include discrete rings, internal ribbing and/or valves to ensure maximised efficiency of gas-sealing during instrument usage. Because the closed end will extend outside of the patient (especially in association with the positive pressure induced by sufflation of gas into the patient's body cavity or viscus), the fulcrum point for the instrument is moved away from the level of the parietal wall. This means that any trocar inserted into the device initially remains extrinsic to the patient, and this may minimise the risk of organ or visceral injury. Furthermore, the added lever effect improves the angulation possible for synchronous or isolated instrument movement (an effect also enhanced by the thinness, elasticity and flexibility of the material).

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will now be described, by way of example and with reference to the accompanying figures in which:

5 Figures 1a and 1b are schematic views, in elevation and plan view respectively, of an embodiment of the present invention, shown prior to use;

 Figures 2a and 2b are schematic elevation views of the embodiment of Figures 1a and 1b at different stages of use, and

 Figure 3 shows a modification to the devices of Figures 1 and 2.

10 DETAILED DESCRIPTION OF THE EMBODIMENTS

 Figures 1a and 1b show a surgical access port 2 in its "opened out" form, prior to being prepared for use on a patient. It comprises a first ring arrangement 4 and a second ring arrangement 6 joined by a cylindrical tube of flexible material 8; this tube 8 continues beyond the second ring arrangement 6
15 to form a cap 10 at one end. As shown, the cap 10 has a number of extensions 12 as conduits for instrument or trocar insertion (the number and disposition of these conduits may be varied as necessary, and any discrepancies between the views in Figures 1a and 1b ignored). The cap end of the tube is closed, as manufactured, whilst the other end of the tube, defined by the first ring
20 arrangement 4 is open. Both ring arrangements are resiliently flexible so that they can be easily deformed by manual pressure, and will then "snap" or spring back into their original, substantially circular shape.

 Figures 2a and 2b illustrate both the preparation of the device 2 of Figure 1a for use on a patient, and how the device is adapted in use to fit tightly.
25 Firstly, the second ring 6 is pushed through the first ring 4, turning the tube 8 inside out but creating a double cylinder of sleeve material (nested one inside the other) and leaving the extensions 12 protruding from the mouth of the first

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ring 4 (apart from one, shorter extension (such as may be used for gas sufflation) which, as shown in Figure 2b, is within the sleeve 8 and slightly distorting its shape). In this configuration, the second ring 6 is deformed again so it can be introduced into a wound incision (the patient's body wall, in which the wound is incised, is depicted at 14), and when fully inserted its resilience opens the ring 6 out to its original shape, to lie inside the wound and against the inside of the patient's body (the outside of the patient's body is depicted as 16, the interior of the patient's body cavity is depicted as 18); of course, this ring 6 is suitably larger in diameter than the wound so as to seat against it and not pull out in normal use. The user can now grasp the first ring 4 and the extensions 12 and pull the device 2 so that the ring 6 inside the patient's body seats firmly against the body wall, inside the patient, as shown in Figure 2a.

Now the first ring 4 outside the patient can be rolled over and over on itself to roll up the excess tube material, until the first ring 4, wrapped in several turns of the tube material, abuts against the outside of the patient's body, and the cap 10 and extensions 12 project away from the patient's body, as shown in Figure 2b. Now pulling the tube of material still extending between the rings 4, 6 tight, thus holds the device 2 firmly in place in the wound, and provides a contamination-resistant barrier for the edges of the wound incision in similar manner to known wound protecting devices.

Because the cap 12 is formed of a flexible and elastic (yet durable) material, this advantageously allows greater freedom of movement of instruments at a relatively less fixed point of insertion. Furthermore, the projection of the cap 10 and the extensions 12 a distance away from the patient body provides significant ergonomic advantage in terms of allowing greater relative movement at the tips of instruments in synchronous use. It also offers an improved safety profile as any trocars placed within such a device would be in fact be placed extra-corporeally (or outside the patient body cavity) and so minimise any potential injury due to trocar misplacement. Although the drawings show the cap 10 as generally hemispherical, there is no

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reason why the cap 10 cannot be changed in shape and/or dimension so as to increase the distance away from the patient body to a substantial distance, at least equal to or greater than the wound diameter, so the cap 10 could be elongate, or even bag-shaped to improve freedom of movement. The first ring arrangement 4 may consist of two rings (not shown); this is to facilitate the rolling up step, and this could equally be achieved using a single ring provided with lugs, or with an oblate or pointed cross section, for example (not shown) and the ring(s) may be hollow and/or provided with shaped inserts to assist in rolling (or prevent unwanted unrolling) as are known in the art.

As is also known in the art, rotating one ring about its axis relative to the other ring will twist the tube 8 extending in between, and cause its diameter and length to change; using this relative rotation, or twisting, while the device 2 is in situ on a patient will serve to further secure the device 2 in position on the body of the patient (by reducing the length), and to retract (open) the wound (by exerting an expanding radial force on the incision) or to allow the wound to close, as desired.

Once the device 2 has been inserted and tightened on a patient as described above, the cap 10 of tube material and the extensions 12 are left protruding out through the first ring 4, and these seal the open wound from the atmosphere. When surgery is to start, the surgical instruments and/or trocars can be pushed through the material of the cap 10 to access the wound (this can of course be done prior to placement of the device in the patient so that the entire construct is inserted at one time into the patient or the device can be placed first and thereafter trocar and instruments positioned or some combination of the two can be performed). The material of the cap 10 is simply punctured or cut to allow insertion of the instruments. The instruments may be inserted through the ends of the extensions 10; if the end of an extension is cut off, the instrument may be passed down the extension, and provided the diameter of the extension is appropriate, the resilient flexibility of the material of the tube 8 and the extensions 10 will act so as to grip the outside of the

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introduced instrument (not shown) and make a seal against it, thus maintaining the contamination-resistant properties of the seal. If needed, ties can be used to further secure the extensions to the sides of the instrument or trocar which has been introduced, although it is advantageous to rely on the resilience of the extensions themselves to perform this function without needing additional parts. When instruments are in use inside the body, a particular advantage of the device 2 is that the instruments are shielded from the edges of the wound by two layers of sleeve material. Not only does this provide additional protection to the wound, also any rubbing takes place between the layers of sleeve material, and there is less risk of the instrument abrading a single sleeve, as in known devices, and possibly damaging the wound edges.

The ring arrangements 4, 6 are disposed in pockets formed in the material of the sleeve 8; alternatively the rings may be attached to the sleeve 8 by heat sealing or a suitable adhesive or one or both rings may be manufactured within the material of the device by rolling, plication or some other method. The rings may have configurations of colour and/or shape/texture for easy use and orientation of the device, and many other variations will be apparent to the skilled person. For example, some type of releasable attachment 20 (see Figure 2b) may be provided on the cap 10 to be releasably attachable to the rolled up material on the first ring 4, or *vice versa*, to hold the material of the cap 10 against the material of the sleeve 8 inside the edges of the wound; these attachments 20 could be adhesive, hooks, or any other suitable attaching device formed on or provided on the cap 10, and/or ring 4.

The sleeve material may be lightweight and translucent, which allows ambient light to help illuminate the activity taking place inside the patient (and to see the colour of the ring arrangements contained within pockets in the sleeve material), but the material may be opaque if desired (to limit light leakage, for example). Also as shown, the material of the sleeve 8 is the same as that of the cap 10 (since they are formed as a unitary item), however the two may be of different materials, and/or of different thicknesses for different applications.

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Alternatively, the device 2 may be formed of an opaque and of a stiffer and much more robust material, such as a surgical rubber, and is then a unitary device formed of the same material throughout. In such an embodiment, the rings 4, 6 are formed of the same material as the sleeve 8, and can be created
5 by moulding the entire device 2 in one step. In use, the device 2 operates in exactly the same way as described above, but once the second ring 6 has been passed through the first ring 4, the second ring 6 placed inside the patient and the first ring 4 rolled down, the resilience of the material acts to hold the first ring 4 in place and prevent unrolling. The diameter of the second ring 6 is larger
10 than that of the first ring 4 in order to hold its position inside the incision. In this embodiment, the use of a stiffer material reduces the ability of the device to act as a wound retractor by relative twisting (so the device 2 would have to be of similar diameter to the incision), but is beneficial because it provides very robust physical protection to the wound edges and, subject to suitable sterilisation,
15 could be re-used. To accommodate incisions of different diameter, the device 2 could be manufactured in a range of diameters.

Figure 3 shows a modification to the device 2" of Figures 1 and 2 in which the extensions 12" are formed as cylinders as before, but now they are stepped in diameter (two steps are shown in Figure 3, but there could be more than two,
20 as many as are reasonable and practical). This arrangement is advantageous because it allows different diameter tools to be used (if the very end of the cap shown is cut off, a relatively small diameter instrument or trocar can be introduced, whereas if the extension is cut at the first step then a larger diameter trocar or instrument can be introduced) and allows separate ties to be
25 used to improve sealing, if desired. Where a trocar or an instrument is used with one or more steps remaining, the material of the remaining steps rolls over itself and around the instrument, allowing the instrument greater freedom of movement perpendicular to the plane of the rings, and provides further protection to the wound edges. The extensions 10 can also be tapered or
30 otherwise ringed or internally ribbed (not shown), or any combination of these, to provide added security of gas sealing along the trocar or instrument length.

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Additionally, while the description here predominantly refers to the concept of laparoscopic (i.e. transabdominal working), it should be realised that the same device can perform similar specific functions and capability either alone or in concert with wound protector or retractor systems to facilitate other celioscopic (including conventional multiport operations) or thoracoscopic approaches or indeed for transanal and even transrectal laparo/endoscopic operations, or for any minimally invasive surgery technique.

The Figures illustrate an embodiment in which the length of the cylindrical sleeve 8 is greater than the distance between the inside 18 of the patient's body and the outside 16 at the location of the incision (the "body thickness"). As has also been mentioned, the sleeve may be elastic and shorter than the body thickness, in which case the device has to be stretched to seat the ring arrangements against the opposite edges of the wound – but then the same elasticity of the sleeve may act advantageously to hold the device 2 tightly thereagainst – the rolling of the sleeve could then additionally tauten the ring arrangements against the patient's body.

In another variation, the access device can be used simply by stretching the lower ring directly onto the external aspect of any standard wound protector or protector-retractor already placed into a surgical incision. Alternatively, it can be directly applied to the external aspect of a ring, mount, strut or stent placed either in or around either an incision or natural orifice. In such use, the lower ring catches around the exterior of the secondary device and the upper ring takes up position just above so that the interior of the other device (and hence incision or orifice) is securely sealed and made useful for laparoscopic or endoscopic working. Additionally, some additional material such as a sterile drape can be captured between the lower ring of the port device and another externally or internally placed mount or ring so that additional wound protection or retraction may be incorporated into the surgical device construct.

It should also be noted that the device disclosed here is fit for the purposes described above and also for providing an access port that can be

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placed across or within a variety of already available and in development proctoscopes, anorectoscopes and anal strut/stent systems as well as externally placed rings and mounts. It also has potential applications for thoracoscopic procedures and other minimal invasive operations.

- 5 It will of course be understood that many other variations may be made to the above-described embodiment without departing from the scope of the present invention.

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CLAIMS

1. A port for minimal access surgery via an incision in a patient, comprising:

5 a substantially cylindrical sleeve formed of a flexible membrane material and having a first, open end and a second, closed end;

a first resilient ring arrangement around said sleeve at said open end, and

10 a second resilient ring arrangement around said sleeve and located on it between said first resilient ring arrangement and said closed end,

15 wherein the second resilient ring arrangement is adapted, in use, to be rolled around itself and the sleeve to roll up flexible membrane material extending between said first and second resilient ring arrangements, so as to draw both the first and second resilient ring arrangements into close engagement against respective sides of the incision.

2. A port as claimed in Claim 1 wherein the second, closed end of the sleeve defines a plurality of instrument access points, each point comprising a tubular extension of the sleeve.

3. A port as claimed in Claim 2 wherein the or each tubular extension is stepped in diameter.

4. A port as claimed in Claim 1, 2 or 3 wherein the second resilient ring arrangement is adapted, in use, to be located at the interior of the incision, inside the patient.

5. A port as claimed in any preceding claim wherein the first resilient ring arrangement has a diameter greater than the diameter of the incision and is adapted, in use, to be located at the exterior of the incision, outside the patient.

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6. A port as claimed in any preceding claim wherein the length of the cylindrical sleeve is less than the distance between the inside and the outside of the patient body at the location of the incision.
- 5 7. A port as claimed in any preceding claim further comprising attachments disposed around the sleeve and between said second resilient ring arrangement and said closed end, and adapted, in use, to releasably attach to said second resilient ring arrangement and to enable tensioning of the flexible membrane material between the second resilient ring arrangement and the attachments.
- 10 8. A port as claimed in any preceding claim wherein the second resilient ring arrangement has a diameter greater than the diameter of the incision.
9. A port as claimed in any preceding Claim wherein the port is unitary in construction.
- 15 10. A port as claimed in any preceding Claim wherein the cap is shaped and/or dimensioned so as, in use, to project from the patient body a substantial distance.
11. A method of performing minimal access surgery via an incision in a patient using a port comprising:
 - 20 a substantially cylindrical sleeve formed of a flexible membrane material and having a first, open end and a second, closed end;
 - a first resilient ring arrangement around said sleeve at said open end, and
 - 25 a second resilient ring arrangement around said sleeve and located on it between said first resilient ring arrangement and said closed end, wherein the second resilient ring arrangement is adapted, in use, to be rolled around itself and the sleeve to roll up flexible membrane material extending between said first and second

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resilient ring arrangements, so as to draw both the first and second resilient ring arrangements into close engagement against respective sides of the incision the method comprising:

5 passing the second resilient ring arrangement through the first resilient ring arrangement to create two nested cylinders of flexible membrane material, and

inserting the first resilient ring arrangement through the incision into the patient.

- 10 12. A method according to claim 11 wherein the length of the cylindrical sleeve is less than the distance between the inside and the outside of the patient body at the location of the incision, the method comprising allowing the ring arrangements to snap into tight engagement against respective sides of the incision.
- 15 13. A method as claimed in Claim 11 or 12 further comprising rolling the second resilient ring arrangement around itself and the adjacent sleeve to roll up flexible membrane material extending between said first and second resilient ring arrangements, so as to draw both the first and second resilient ring arrangements into close engagement against respective sides of the incision.
- 20 14. A method as claimed in any of Claims 11, 12 or 13 further comprising twisting one of the first and second resilient ring arrangements relative to the other about the cylindrical axis.
- 25 15. A method as claimed in any of Claims 11 to 14 wherein the second, closed end of the sleeve defines a plurality of instrument access points, each point comprising a tubular extension of the sleeve, the method further comprising inserting a surgical instrument and/or trocar through one of said instrument access points.

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16. A method as claimed in Claim 15 further comprising sealing the tubular extension against the introduced instrument/trocar against the passage of air therebetween.
- 5 17. A method as claimed in Claim 15 or Claim 16 further comprising inserting gas sufflation tubing through one of said instrument access points and insufflating a body cavity inside said incision.
18. A method as claimed in Claim 17 wherein, after insufflation, the port comprises an intra-device space which is external to the body cavity.
- 10 19. A method as claimed in any of claims 11 to 18 wherein one or more attachments are disposed around the sleeve and between said second resilient ring arrangement and said closed end and are adapted to releasably attach to said second resilient ring arrangement, the method further comprising pulling the attachment(s) and attaching it/them to the second resilient ring arrangement so as to tension the flexible membrane material between the second resilient ring arrangement and the attachments.
- 15 20. A method as claimed in any of claims 11 to 19 wherein the minimal access surgery is one of endoscopic, laparoscopic, celioscopic, transanal or transrectal surgery.

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Fig. 1a

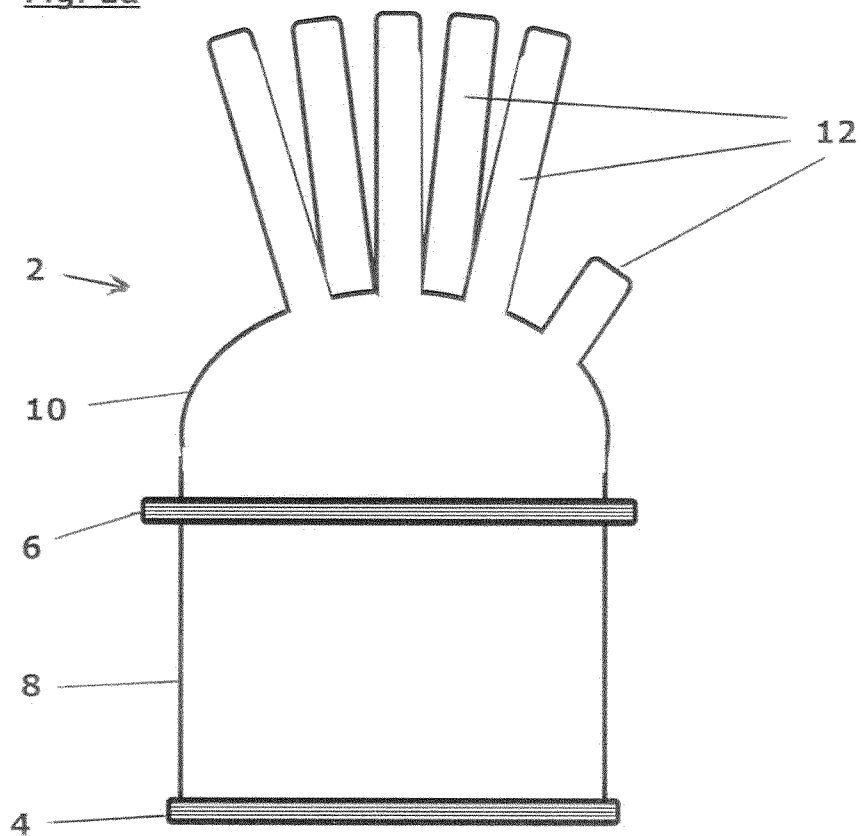


Fig. 1b

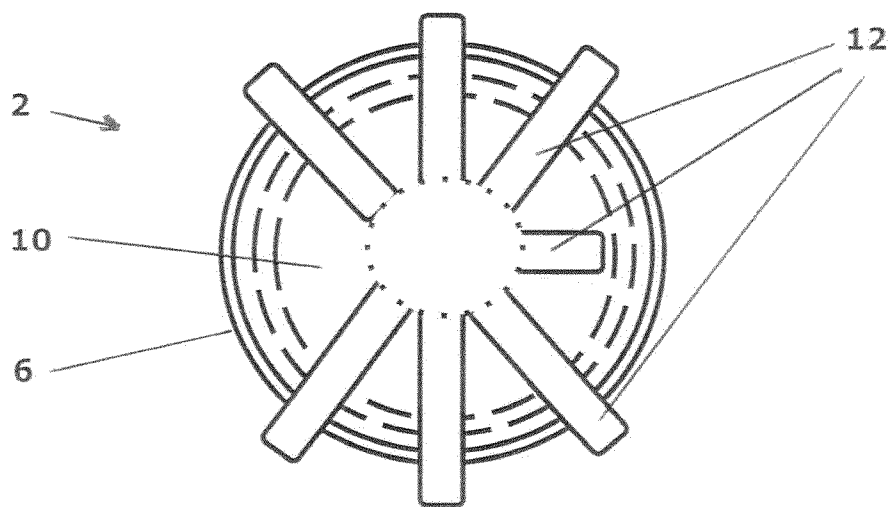


Fig. 2a

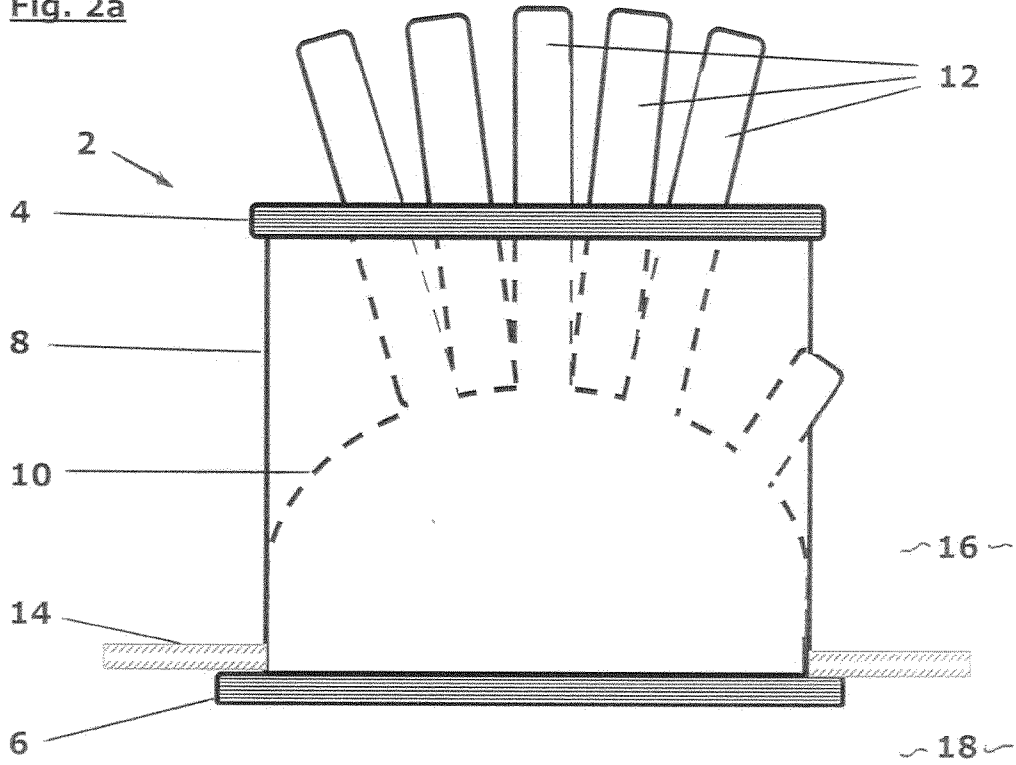
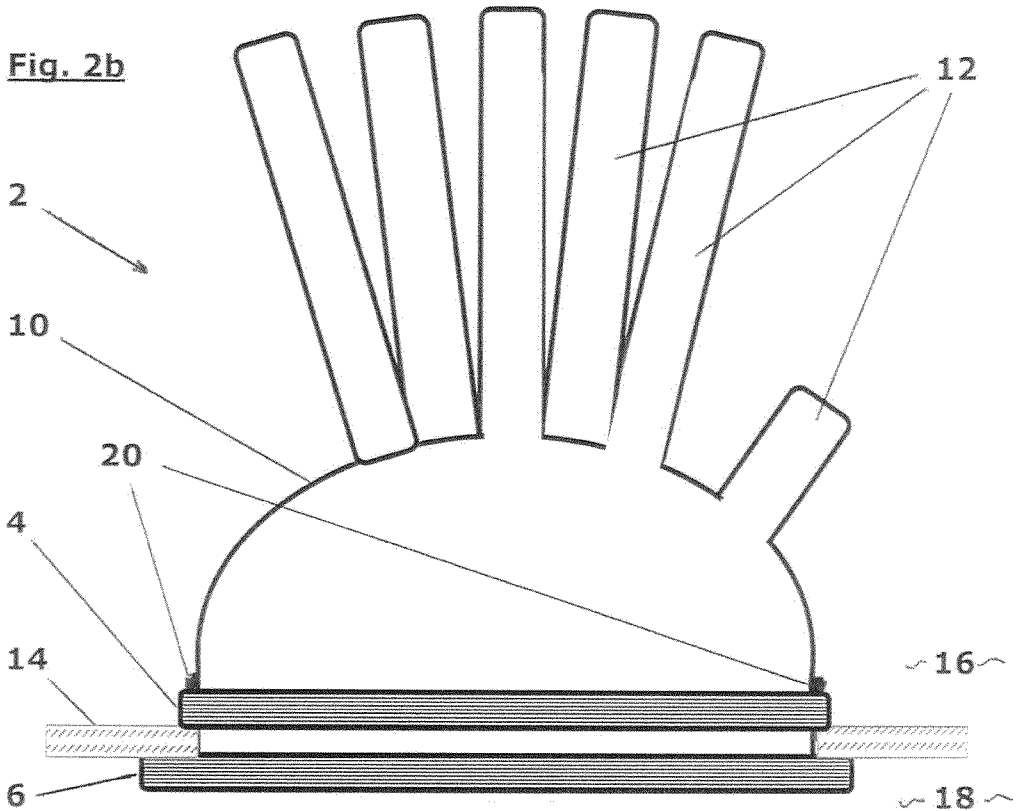
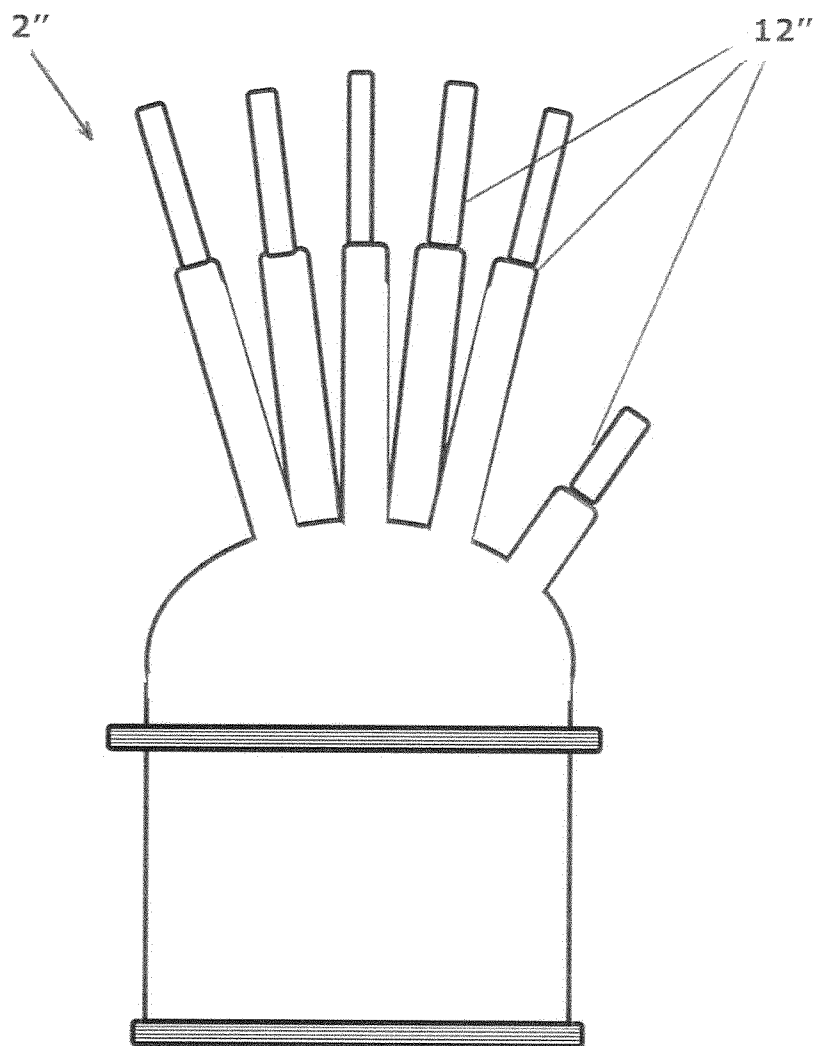


Fig. 2b



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Fig. 3



专利名称(译)	手术设备		
公开(公告)号	EP2884919A2	公开(公告)日	2015-06-24
申请号	EP2013752606	申请日	2013-08-13
[标]申请(专利权)人(译)	欧洲外科与创新研究所		
申请(专利权)人(译)	欧洲外科研究与创新研究所有限公司		
当前申请(专利权)人(译)	欧洲外科研究与创新研究所有限公司		
[标]发明人	CAHILL RONAN		
发明人	CAHILL, RONAN		
IPC分类号	A61B17/34 A61B17/02		
CPC分类号	A61B17/3423 A61B2017/3466 A61M39/0247 A61M2039/0264 A61M2039/0279 A61M39/02		
优先权	2012014515 2012-08-14 GB		
外部链接	Espacenet		

摘要(译)

描述了通过患者的切口进行诸如内窥镜或腹腔镜手术的最小通路手术的端口以及使用这种端口的方法，其中端口（2）包括基本上圆柱形的套筒（8），该套筒由柔性并且具有第一开口端和第二封闭端（10），在所述开口端围绕所述套筒设置的第一弹性环装置（4）以及围绕所述套筒的第二弹性环装置（6）8）并且位于所述第一弹性环装置（4）和所述封闭端（10）之间，其中所述第二弹性环装置在使用中适于围绕其自身卷绕，并且所述套筒卷绕任何柔性膜材料在所述第一和第二弹性环装置之间延伸，以便拉动第一和第二弹性环装置紧靠在切口的相应侧上，因此用作伤口牵开器/开口和第e耐污染手术器械的介绍。