(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
29 April 2010 (29.04.2010)

PCT

(10) International Publication Number
WO 2010/045702 A1

(51) International Patent Classification:
A61B 17/34 (2006.01) *A61M 39/06* (2006.01)

(21) International Application Number:
PCT/BR2009/000355

(22) International Filing Date:
20 October 2009 (20.10.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PI0805749-4 20 October 2008 (20.10.2008) BR

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

[Continued on next page]

(54) **Title**: IMPROVED TROCAR SEALING

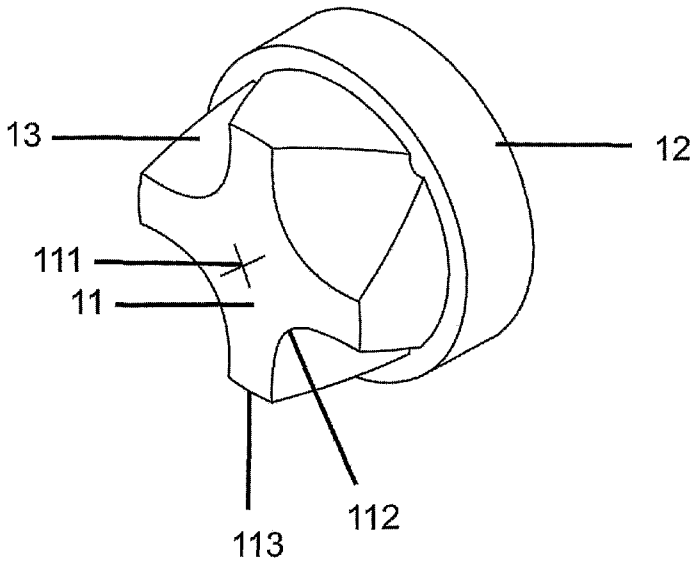

Fig. 3B

(57) **Abstract**: Improved trocar sealing comprising a cylindrical body that includes a circular opening (10) at one end; a base (11) at the opposite end to said circular opening (10), base (11) showing on the surface the provision of cuts (111), equipped with a surrounding area of enlargement in diameter (12) disposed on the surface of the cylindrical body adjacent to the circular opening (10), an area with a diameter as the diameter of the circular opening (10) and endowed ray-shaped hollow (13) in internal and external surface, said area disposed between the area of enlargement in diameter (12) and endowed with the basic end (11), and semi-circular indentations (112) arranged on the base (11), said indentations (112) aligned with the concave-ray (13) and interspersed with extensions (113) aligned with the perimeter of the circular opening (10) disposed at the opposite end of the cylindrical body.

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

IMPROVED TROCAR SEALING

The present invention is in respect of an improvement of a trocar seal. More specifically it consists of a disposable seal for the trocar produced in biocompatible silicone which has a set up which minimizes the gas flow in the escape direction and allows the introduction and removal of instruments in a smooth way.

INVENTION BACKGROUND

Video laparoscopy surgery is carried out with the help of instruments and suitable apparatus to get abdominal cavity visualization without the necessity of large incisions and as a result less surgical trauma. Therefore this type of intervention needs the abdominal cavity to be transformed from potential to real with gas insufflation.

In the case of intra-abdominal procedures, the use of the instrument is indispensible. In this way it is necessary that the forceps get access to the peritoneal cavity, without gas escaping from the operative field.

The trocars are the instruments which allow these procedures to be carried out, being equipped with seals to avoid gas escape. The sealing mechanism is positioned inside the trocar housing chamber, sealing against the external surface of the inserted instruments, impeding or minimizing the exit of fluids and insufflation gases of the body cavity through the trocar cannula.

The prior art concept describes double sealing assemblies with a proximal seal to seal around the instrument and a duckbill seal provided below the proximal seal to seal the trocar housing when the instrument is not there.

Other trocars use a single seal mechanism, generally a silicone device with an opening diameter orifice less than the diameter of the instrument to be used with the trocar.

However, these trocar seals have the inconvenience of being difficult to assemble in the trocar because of the countless constituent components of the sealing device. Also the devices have a fragile resistant sealing point which can be broken due to instrument attrition.

Therefore, there is a need to provide a trocar sealing device which maintains the pneumoperitoneum during the whole procedure, including introducing and removing instruments providing a minimum attrition with the instruments, such an improvement in a trocar sealing device is described and claimed in this present application.

SUMMARY

Generally, the present invention is related to an improvement in the sealing of a trocar which consists of a cylindrical body which includes a circular opening in one of its ends; a base at the opposite end of this circular opening, the base has on the surface an arrangement of cuts; a surrounding enlarged diameter area arranged on the cylindrical body surface contiguous to the circular opening; an area with a diameter equal to the measured diameter of the circular opening and it has concave radial contours on the internal and external surfaces, this area is between the enlarged diameter area and the base end, and semi-circular depressions on the base, these depressions are aligned with the concave radial contours and inserted between extensions aligned with the circular opening perimeter on the opposite end of the cylindrical body.

An invention characteristic is the improvement in trocar sealing which enables the fast and easy connecting of the trocar due to the minimum component number.

An invention characteristic is the improvement in trocar sealing which provides the sealing during the whole procedure minimizing escaping gas flow.

An invention characteristic is the improvement in trocar sealing with a biocompatible silicone material which eliminates the deformation caused by instruments passing, maintaining the material resilience and allowing the introduction of instruments with diverse diameters.

An invention characteristic is the improvement in trocar sealing which allows the instrument to slide through the sealing device with the minimum attrition possible, eliminating ruptures.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1A shows details of the sealing element positioning in the trocar chamber.

Figure 2 shows details of the sealing element.

Figure 3 shows a perspective view of the sealing element, figure 3A is the front face and figure 3B is the rear face.

DETAILED DESCRIPTION OF THE INVENTION

The trocar sealing improvement, the objective of this invention, consists of a silicone sealing element to be positioned in the internal part of the trocar, with the objective of restricting gas escape during the surgical procedure through an innovative geometry which minimizes the escaping gas flow.

The sealing element consists of a cylindrical body which includes a circular opening (10) in one of its ends and the opposite end of this circular opening (10) having a base (11).

The base (11) has an arrangement of cuts on the surface (111) which allows instruments to pass through the cuts (111) which due to the material resilience guarantee the seal when there is no instrument placed in the trocar, as shown in figure 3B.

The cylindrical body surface is contiguous with the circular opening (10) it has a surrounding enlarged diameter area (12).

Between the enlarged diameter area (12) and the base end (11) is arranged an area with a diameter equal to the circular opening diameter measurement (10), in this area are concave radial contours (13) on the internal and external surface, these concave radial contours (13) are intercalated and at equal distance.

The concave radial contours (13) create semi-circular depressions (112) on the base surface (11) aligned with the concave radial contours (13), these depressions are inserted between extensions (113) aligned with the circular opening perimeter (10) on the opposite end of the cylindrical body.

The silicone cylindrical body has flexibility and the concave radial contours (13) maintain the structure, maintaining the original shape.

As shown in figure 1, the sealing element (100) is positioned and fixed in the trocar chamber (200) by inserting the ring structure around the mouth with the trocar base, having a dimensional interference between the sealing element and the trocar base which provides the adjustment and the perfect fit having in mind the sealing element body to be produced in silicone which allows malleability.

CLAIMS:

1. **TROCAR SEALING IMPROVEMENT**, characterized by consisting of a cylindrical body which includes:
   a) a circular opening (10) in one of its ends;
   b) a base (11) at the opposite end of this circular opening (10), the base (11) having cuts on the surface (111);
   c) a surrounding enlarged diameter area (12) on the cylindrical body surface contiguous with the circular opening (10);
   d) an area with a diameter equal to the circular opening diameter measurement (10) and having concave radial contours (13) on the internal and external surface, this area is between the enlarged diameter area (12) and the base end (11);
   e) semi-circular depressions (112) on the base (11), these depressions (112) are aligned with the concave radial contours (13) and intercalated with extensions (113) aligned with the circular opening perimeter (10) at the opposite end of the cylindrical body.
2. **TROCAR SEALING IMPROVEMENT,** in accordance with the claim 1, characterized by the fact that the concave radial contours (13) are intercalated and of equal distances.

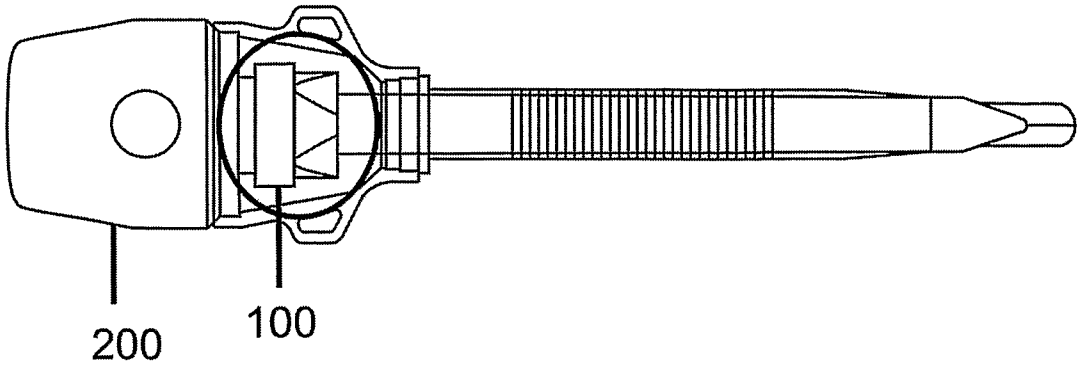

Fig. 1

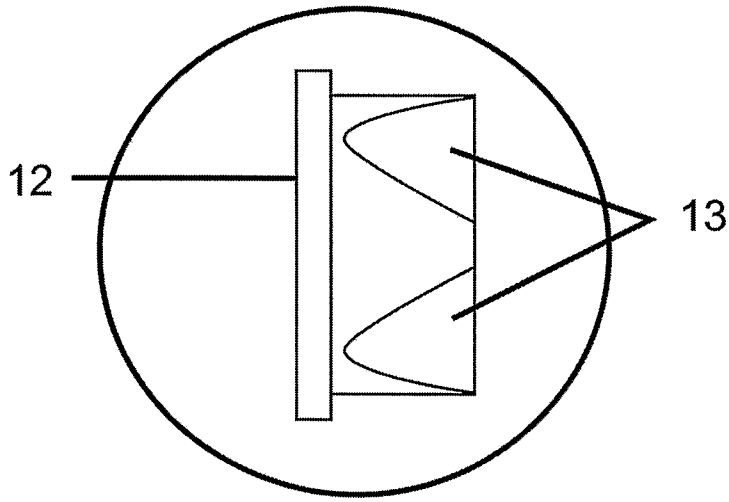

Fig. 2

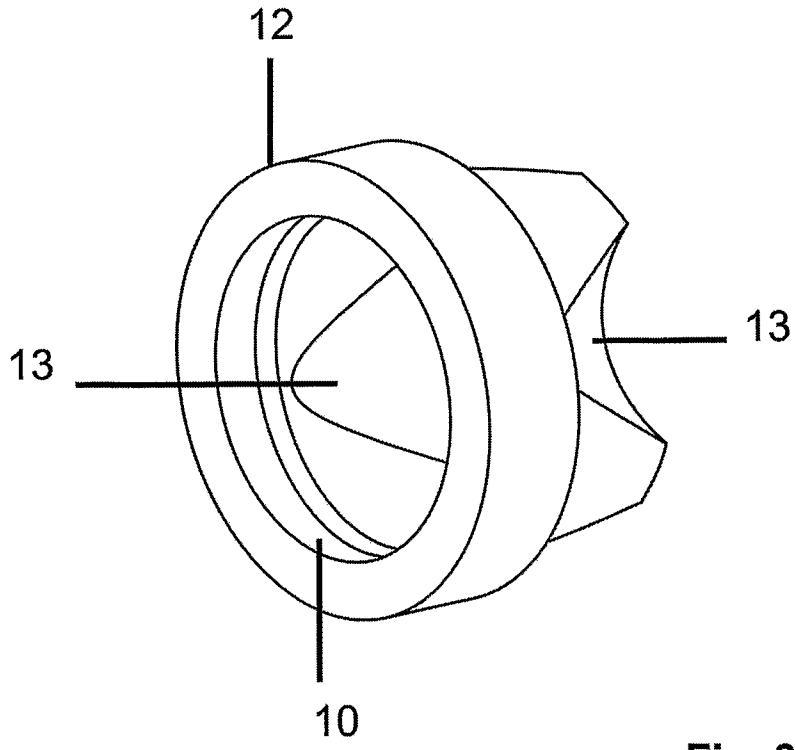

Fig. 3A

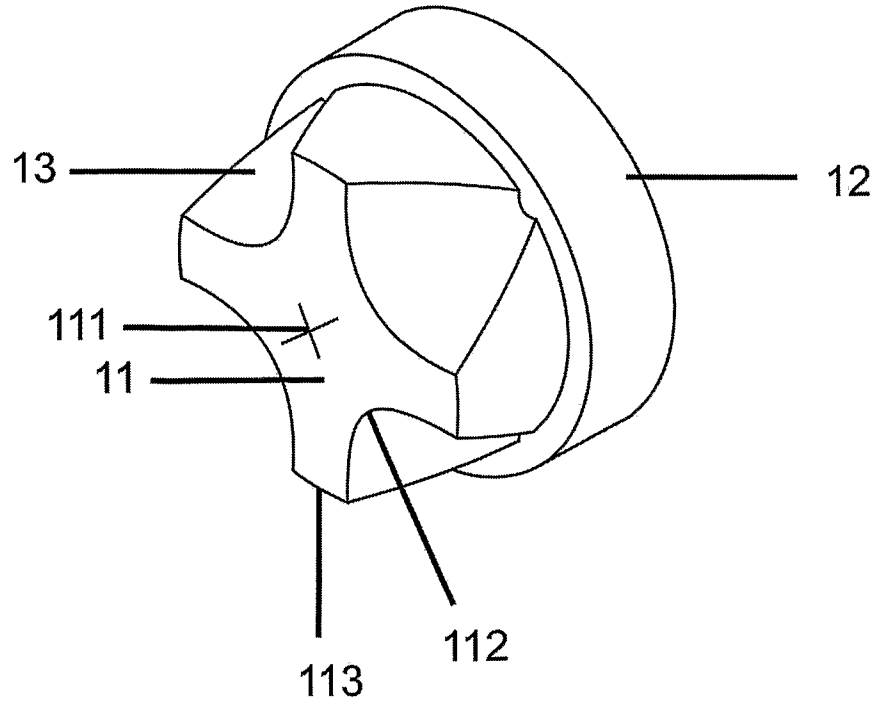

Fig. 3B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/BR 2009/000355

A. CLASSIFICATION OF SUBJECT MATTER
IPC[8]: ***A61B 17/34*** (2006.01); ***A61M 39/06*** (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC[8]: A61B, A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPODOC, WPI, X-FULL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5662615 A (BLAKE, III) 2 September 1997 (02.09.1997) *Entire document* --	1-2
A	US 5401248 A (BENCINI) 28 March 1995 (28.03.1995) *Entire document* --	1-2
A	EP 0630660 A1 (UNITED STATES SURGICAL CORP) 28 December 1994 (28.12.1994) *Entire document* --	1-2

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
05 February 2010 (05.02.2010)	19 February 2010 (19.02.2010)

Name and mailing address of the ISA/ AT	Authorized officer
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2008/0051739 A1 (MCFARLANE) 28 February 2008 (28.02.2008) *Entire document* ----	1-2

International application No.
PCT/BR 2009/000355

Continuation of first sheet

Continuation No. IV:

Text of the abstract

(Continuation of item 5 of the first sheet)

Improved trocar sealing comprising a cylindrical body that includes a circular opening (10) at one end; a base (11) at the opposite end to said circular opening (10), base (11) showing on the surface the provision of cuts (111), equipped with a surrounding area of enlargement in diameter (12) disposed on the surface of the cylindrical body adjacent to the circular opening (10), an area with a diameter as the diameter of the circular opening (10) and endowed ray-shaped hollow (13) in internal and external surface, said area disposed between the area of enlargement in diameter (12) and endowed with the basic end (11), and semi-circular indentations (112) arranged on the base (11), said indentations (112) aligned with the concave-ray (13) and interspersed with extensions (113) aligned with the perimeter of the circular opening (10) disposed at the opposite end of the cylindrical body.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/BR 2009/000355

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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