US 20120022402A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2012/0022402 A1**

(43) **Pub. Date: Jan. 26, 2012**

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(54) **DEVICE AND METHOD FOR INSERTING OR OBTAINING A FLUID WITH GARMENTS, EMBRYOS OR ANY OTHER TYPE OF SOLUTION IN THE OVIDUCT OF A SOW**

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(21) Appl. No.: **13/132,518**

(22) PCT Filed: **Sep. 24, 2009**

(86) PCT No.: **PCT/ES2009/070402**

§ 371 (c)(1),
(2), (4) Date: **Oct. 3, 2011**

(30) **Foreign Application Priority Data**

Sep. 26, 2008 (ES) P200802740

Publication Classification

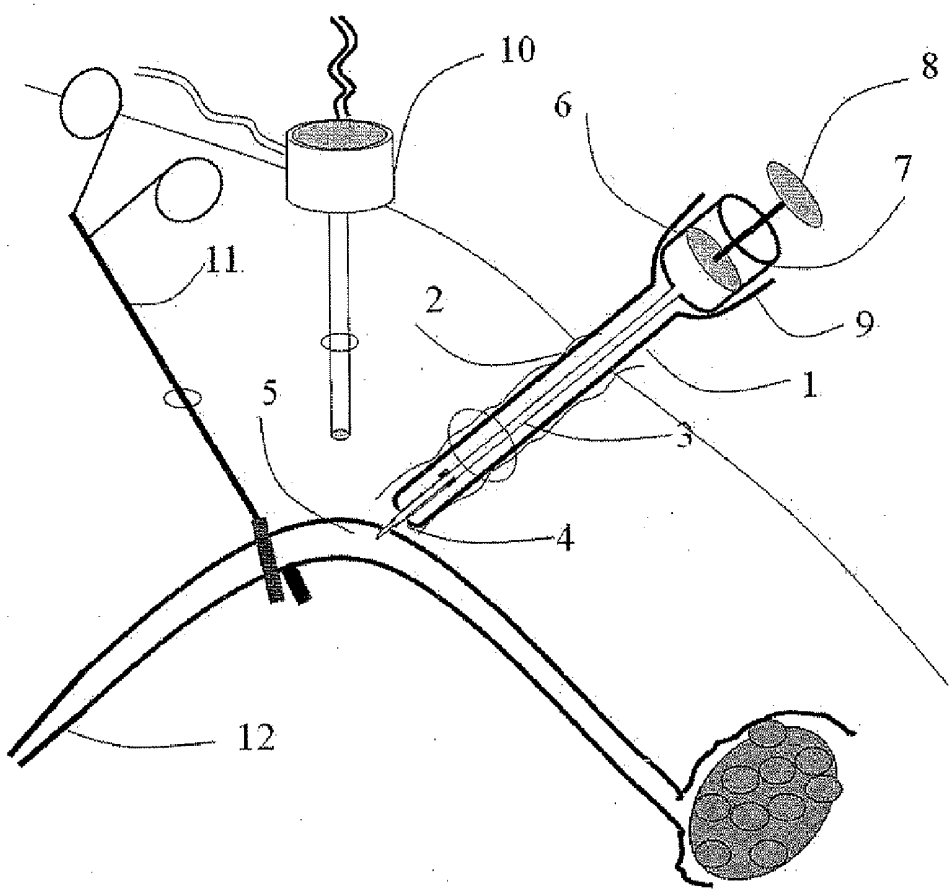
(51) **Int. Cl.**

A61D 19/00	(2006.01)
A61D 19/02	(2006.01)
A61D 19/04	(2006.01)
A61B 5/00	(2006.01)
A61D 7/00	(2006.01)

(52) **U.S. Cl.** **600/576**; 600/33; 604/246; 600/34; 600/35

(57) **ABSTRACT**

The device comprises an injection system, which is made up of a rigid external tubular body (**1**) that enables it to be inserted into the abdominal cavity of a sow. This body is, in turn, covered by a sterile sleeve (**2**) that enables it to be used in different animals. A flexible duct (**3**) runs coaxially and its distal end connects with a bevelled needle (**4**) that permits insertion in the oviduct (**12**) at an angle of 45°. The proximal end of the flexible tube connects with a device (**6**) that includes a sheath (**7**) closed at the other end by a piston (**8**) that slides along the inside of the sheath and that enables the precision insertion of low-volume liquids.



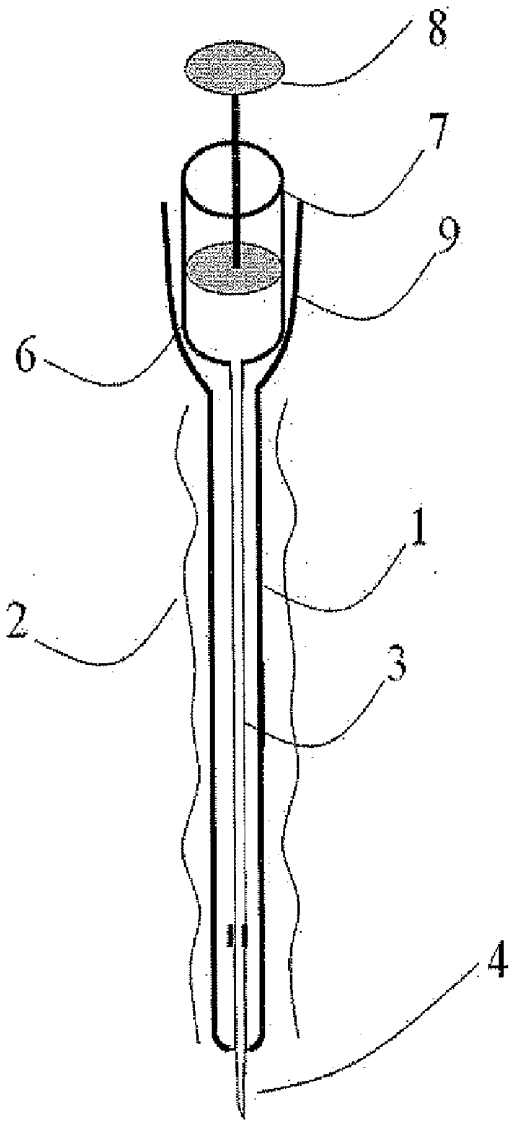


Figura 1

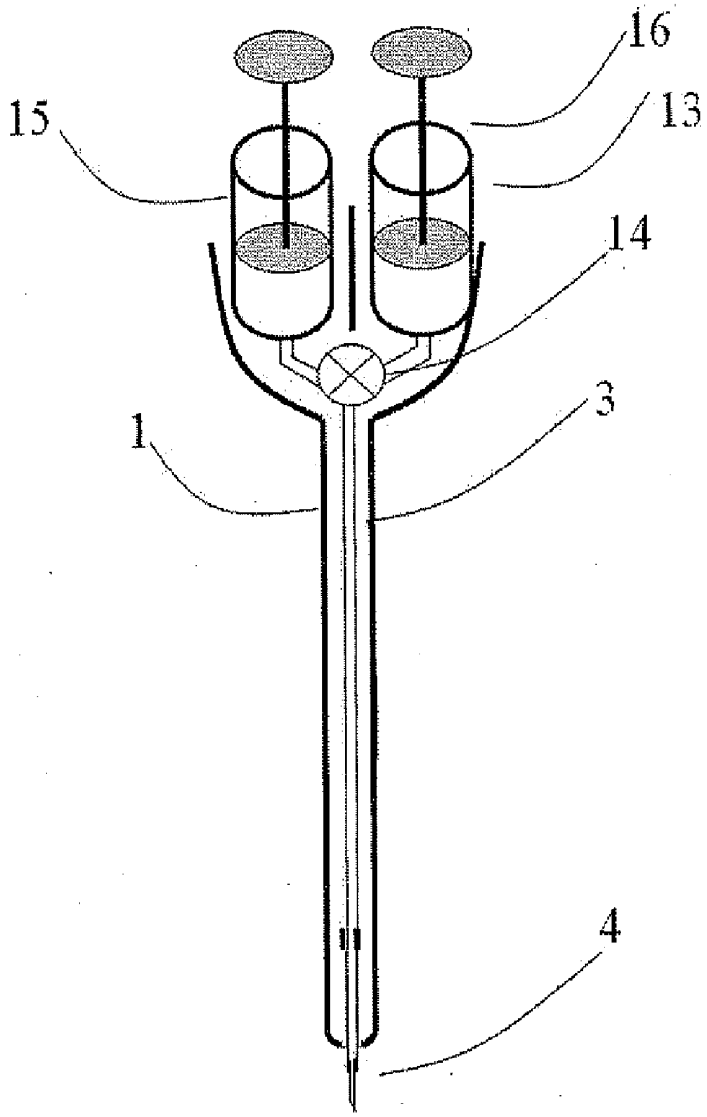


Figura 2

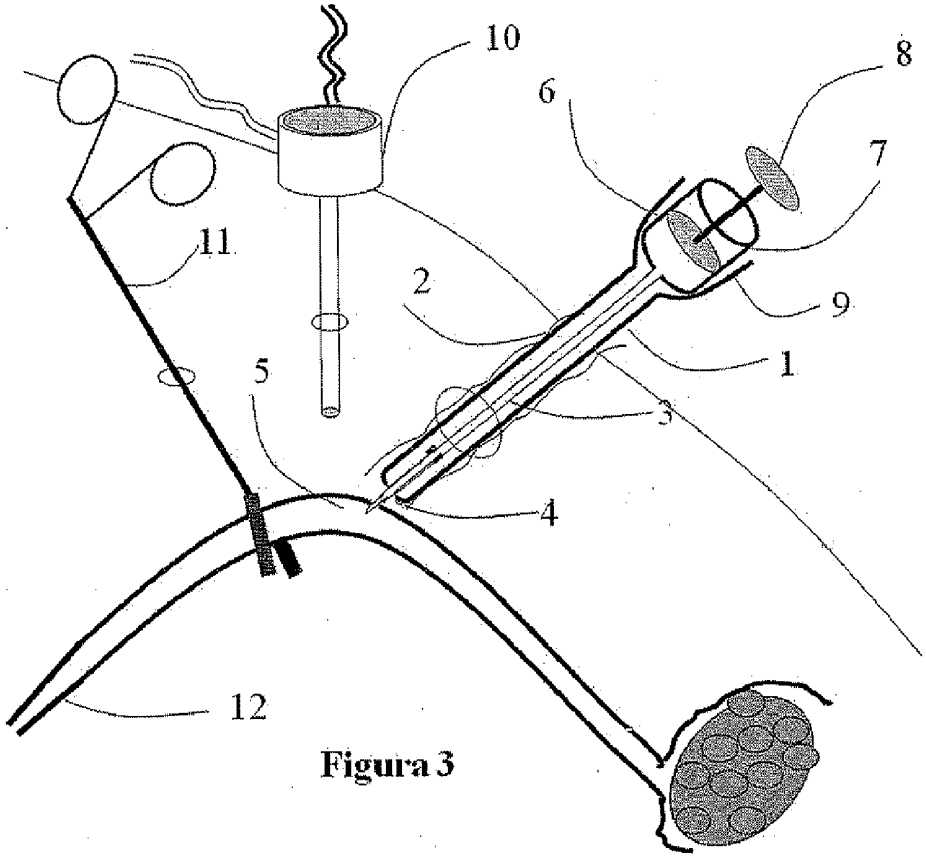


Figura 3

DEVICE AND METHOD FOR INSERTING OR OBTAINING A FLUID WITH GARMENTS, EMBRYOS OR ANY OTHER TYPE OF SOLUTION IN THE OVIDUCT OF A SOW

PURPOSED AND TECHNICAL FIELD OF THE INVENTION

[0001] The invention described here deals with a device for inserting and/or collecting, by laparoscopic means, fluids which may or may not contain cells, in the oviduct of a sow. The invention enables the successful insertion of a low number of spermatozoids, embryos, or therapeutic solutions inside the oviduct in a brief period of time. The invention can also be applied in any other animal species.

ANTECEDENTS OF THE INVENTION

[0002] No method exists in pig farming for the successful insemination with very low number of spermatozoids or the transfer of embryos in the oviduct, except for a surgical approach by laparotomy. Even so, this is an impracticable method in livestock production. The laparoscopic approach to the genital organs is a technique which has been used since the decade of the 1970's in human beings, when there are disturbances in the passage of spermatozoids through the uterus, or in animal species when there are technical problems in the passage of catheters through the cervix. Among domesticated animals, it is the sheep where the greatest development has occurred. In this context, it has been demonstrated that the depositing of spermatozoids diluted to doses as low as 1 million and 10 million, inseminated in the uterus, makes it possible to achieve good fertility results. Besides reproductive efficiency, in terms of the small number of spermatozoids to be inseminated, laparoscopic insemination offers other advantages. Among these is the possibility of performing explorations of the genital organs at the same time as the insemination, making it possible to visualize the functional changes which are occurring, in particular changes in the ovaries, and being able to detect in this way pathologies which could not be handled by nonsurgical systems. It also makes it possible to homogenize the fertility results over the course of the year, which is not always possible when using other insemination procedures.

[0003] In the case of the pig, the nonsurgical procedure of deep intrauterine insemination allows one to successfully deposit spermatozoids in the uterus of a sow down to levels as low as 50 million spermatozoids. There have also been attempts to perform laparoscopic insemination in the uterine horn with at least 20 million spermatozoids, achieving variable fertility results, owing to the characteristics of the uterine wall in this species. Furthermore, this quantity of spermatozoids prevents the insemination of spermatozoids selected by flow cytometry or treated by other technologies where the number of spermatozoids produced per unit of time is extremely low.

[0004] Other similar devices are known from the prior art, such as that described in EP 1177776 B1 of the University of Murcia, although the invention presented here has many differences and advantages over the known prior art. The device described in document EP 1177776 B1 is a nonsurgical device that is introduced via the vagina, cervix, and body of the uterus until it reaches the depths of the uterine horn as the deepest anatomical location. The number of spermatozoids inseminated should be at least **50** million spermatozoids in order to achieve success in the fecundation.

DESCRIPTION OF THE INVENTION

[0005] The invention describes a device for inserting of fluids, which may or may not contain cells, in the oviduct of a sow, making it possible to introduce spermatozoids, embryos, or any type of therapeutic solution, and obtain a fluid with or without cells (gametes—spermatozoids and/or ovocytes—and embryos) from the interior of the oviduct. The device comprises a rigid tubular body that is introduced by a laparoscopic trocar and makes it possible to introduce a flexible tube through its inside, having the following principal characteristics:

[0006] the rigid tubular body and the interior flexible tube are coaxial,

[0007] the interior flexible tube is connected at the proximal end to a beveled needle,

[0008] the flexible tube allows the beveled needle to be inserted in the oviduct, at an angle of 45 degrees,

[0009] the distal end of the flexible tube is connected by one or more sheaths closed by one or more pistons, which slide(s) through the inside of the sheath(s), and enable(s) the precise introduction of fluids with low volume.

[0010] The tubular body of the device for inserting fluids into the oviduct of a sow is in turn covered by a sterile case. In another alternative configuration, this sterile case is disposable.

[0011] In another alternative configuration, the distal end of the flexible tube of the described device is connected to two sheaths, each closed by a piston, which slides inside the sheaths, the two sheaths being connected to the flexible tube by a double cock, alternately enabling the passage of the fluids contained in each sheath.

[0012] Evacuation of the device is done by unlocking the sheath(s), pulling back the beveled needle into the lumen of the rigid tubular body.

[0013] The invention also describes a procedure for inserting fluids, with or without cells, in the oviduct of a sow by using the device of the invention. The procedure makes it possible to introduce spermatozoids, embryos or any type of therapeutic solution in the oviduct of the sow, or to obtain gametes (spermatozoids and/or ovocytes), embryos, or any type of solution from inside the oviduct of a sow. In this procedure, one introduces the device into the oviduct of the sow in the proximal region of the oviduct ampoule, from which the gametes, embryos and/or solutions are discharged gently and without difficulty.

[0014] In this procedure for introducing a fluid with spermatozoids, embryos or therapeutic solutions inside the oviduct of a sow, the beveled injection needle is oriented from the ampoule of the oviduct toward the isthmus of the oviduct.

[0015] This procedure for introducing fluids, with or without cells, in the oviduct of a sow makes it possible to verify the correct visualization of the inoculation by means of the temporary dilation of the walls of the oviduct.

[0016] A procedure is also described for transfer of embryos in a stage from the zygote to the 4-blastomere stage in the oviduct of a sow, using a device with a double-sheath

system, making it possible to introduce separately the fluids contained in each of these sheaths.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] In order to provide a better understanding of this specification, as an integral part of same, we present a series of drawings showing the subject of the invention in illustrative and nonlimiting manner.

[0018] FIG. **1** shows in elevated side view the device of the invention, showing the distinct elements of which it is composed.

[0019] FIG. **2** is an elevated side view of the device of the invention, adapted for the transfer of embryos.

[0020] FIG. **3** shows a schematic representation of the device of the invention in working state inside the abdominal cavity of a sow.

[0021] In the drawings, the following reference numbers are related to the corresponding elements mentioned hereinafter:

[0022] **1**—Rigid tubular body.

[0023] **2**—Sterile case.

[0024] **3**—Flexible tube.

[0025] **4**—Beveled needle.

[0026] **5**—Oviduct ampoule.

[0027] **6**—Sheath/piston device.

[0028] **7**—Sheath.

[0029] **8**—Piston.

[0030] **9**—Posterior end of the flexible tube (**3**).

[0031] **10**—Viewing system.

[0032] **11**—Forceps.

[0033] **12**—Oviduct.

[0034] **13**—Double sheath.

[0035] **14**—Double cock.

[0036] **15**—First sheath.

[0037] **16**—Second sheath.

DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

[0038] To solve the drawbacks pointed out in the prior art, the invention develops a new device and procedure making it possible to introduce a fluid, with or without cells, in the oviduct of a sow in the Trendelenburg position and under general anesthesia, at the side where fertilization occurs.

[0039] For this, the procedure of the invention involves minor surgery performed under general anesthesia with an incision of 2 cm in the umbilical region. Through this, a trocar with direct viewing is introduced to commence producing the pneumoperitoneum. After this, CO2 is introduced to produce the pneumoperitoneum at a pressure of 2 atmospheres via a tube of 2 mm diameter, ending at the trocar. The introduction of the gas is done for a maximum period of 10-15 seconds.

[0040] It invention is composed of a rigid tubular body (**1**), inside which runs a flexible tube (**3**) whose base is connected to a beveled needle (**4**). The other end is connected to a device (**6**) comprising a sheath (**7**) closed by a piston (**8**) that slides inside the sheath (**7**) and allowing a precision introduction of low-volume liquids. This body (**1**) is in turn covered by a sterile case (**2**), allowing it to be used in different animals; said sterile case (**2**) can be disposable. The above-described characteristics of flexibility of the tube and diameter and length of the needle make it possible to deposit the fluids, with or without cells, safely inside the oviduct (**12**). Moreover, the dilation of the oviduct walls during the time of the insemination confirms the proper deposition of the fluid.

[0041] To bring about the introduction of the fluid, or its extraction as the case may be, the animal is subjected to what is known as a minimally invasive surgical procedure. For this, as already mentioned, an incision of around 2 cm length in the skin of the abdominal region is made in the sow in the Trendelenburg position and under general anesthesia. After introducing a viewing system (**10**), such as that illustrated in FIG. **3**, one proceeds to introduce a sufficient quantity of CO2 in the abdominal cavity of the animal, making it possible to visualize the organs. This process of introducing gas is done directly at a pressure of around 2 atmospheres. Once the condition of the inside of the abdominal cavity has been verified, one proceeds to introduce two accessory trocars in the flanks of the animal. The first of these will serve to introduce a nontraumatic forceps (**11**) to assist in the manipulating and holding of the oviduct (**12**). The second serves to introduce the specific instrument of the invention.

[0042] The instrument for insemination, transfer of embryos or introducing of fluids that is necessary to carry out the procedure consists of an injection system, which is comprised of a rigid external tubular body (**1**) which, being adjusted to the existing trocar, allows it to be inserted into the abdominal cavity of the sow. This tubular body (**1**) is in turn covered by a sterile case (**2**), which allows it to be used in different animals. A flexible tube (**3**) runs coaxially, whose proximal end connects to a beveled needle (**4**) that allows it to be inserted at an angle of **45** degrees in the oviduct (**12**), and more specifically in the vicinity of the oviduct ampoule (**5**). The distal end of the flexible tube connects to a device comprising a sheath (**7**), closed at the other end by a piston (**8**), which slides inside the sheath (**7**), and enables the precision introduction of low-volume liquids.

[0043] When the device is used in the mode of insemination with very low number of spermatozoids, one proceeds to fill the sheath/piston device (**6**), which comprises the sheath (**7**) closed by the piston (**8**), which slides inside the sheath (**7**), and enables the precision introduction of low-volume liquids. Once the sheath/piston device (**6**) has been filled, it is connected to the posterior end of the flexible tube (**3**) coaxially to the rigid tubular body (**1**), proceeding with the filling of the latter. The whole is inserted by the trocar, arranged for this purpose until the anterior end of the rigid tubular body (**1**) is situated in the vicinity of the oviduct ampoule (**5**), then moving the coaxial flexible tube (**3**) until the sheath (**7**) located at the posterior end (**9**) of the flexible tube is totally locked in the rigid tubular body (**1**). This arrangement enables an easy insertion of the beveled needle (**4**) in the lumen of the oviduct by using an access angle of 45 degrees.

[0044] The point of access to the oviduct should occur in the oviduct ampoule (**5**), the end of the needle being oriented toward the isthmus of the oviduct (**12**), as shown in FIG. **3**. The characteristics of the device reduce the risk of accidents from perforation of the opposite wall of the oviduct. Once the flexible tube (**3**) is in communication with the oviduct ampoule (**5**) via the needle (**4**), one proceeds to move the piston (**8**) on the sheath (**7**), discharging the predetermined volume of fluid. The proper discharging of the fluid is verified by observing a temporary dilation of the walls of the oviduct (**12**) in general and of the oviduct ampoule (**5**) in particular.

[0045] The evacuation of the system is done by unlocking the sheath (**7**), making it possible to conceal the beveled needle (**4**) inside the rigid tubular body (**1**), avoiding possible

accidents in adjacent areas. The recovery of the sow occurs in the following minutes. The use of this procedure makes it possible to repeat the insemination in the same female in consecutive cycles.

[0046] When the device is used in embryo transfer mode, the system includes two sheaths, a first sheath (**15**) and a second sheath (**16**), each closed by its own piston, and connected to the flexible tube (**3**) by means of a double cock system (**14**), as can be seen in FIG. **2**; in this case, the sterile case (**2**) is not shown. One proceeds to fill the flexible tube (**3**) by the opening that connects the sheath containing only the embryo transfer medium, which is contained, for example, in the first sheath (**15**). As can be seen from FIG. **3**, the device is introduced by the trocar, arranged for this purpose until the anterior end of the rigid tubular body (**1**) is in the vicinity of the oviduct ampoule (**5**), then moving the coaxial flexible tube (**3**) until total locking of the double sheath system and it is situated in the posterior end of the flexible tube (**3**) in the rigid tubular body (**1**).

[0047] One then proceeds to close the sheath containing the embryo transfer medium, for example, the first sheath (**15**), and open the sheath containing the embryos, for example, the second sheath (**16**), which are going to be transferred in a total volume of 100-200 μl. The embryos being transferred should be between the development stage of the zygote to the 4-blastomere stage. The point of access to the oviduct should be in the oviduct ampoule (**5**), the tip of the needle (**4**) being oriented toward the isthmus of the oviduct (**12**). The characteristics of the device reduce the risk of accidents from perforation of the opposite wall of the oviduct.

[0048] Once the flexible tube (**3**) is in communication with the lumen of the oviduct via the needle (**4**), one proceeds to move the piston (**8**) on the sheath that contains the embryos, for example, the second sheath (**16**), discharging the volume of fluid contained therein. The proper discharging of the fluid is verified by observing a temporary dilation of the walls of the oviduct ampoule (**5**). After this, one proceeds to close the sheath containing the embryos, for example, the second sheath (**16**), and open the sheath containing the embryo transfer medium, for example, the first sheath (**15**), in order to discharge an additional volume of 100 μl, allowing the embryos to move from the lumen of the flexible tube (**3**) to the interior of the oviduct (**12**). Evacuation of the system is done by unlocking the double sheath system, making it possible to conceal the beveled needle (**4**) in the lumen of the rigid tubular body (**1**), avoiding possible accidents in adjacent areas. The recovery of the sow occurs in the following minutes. This procedure makes it possible to repeat the transfers in the same female in consecutive cycles.

1-9. (canceled)

10. A device for inserting and/or removing fluids in the oviduct of a sow, comprising:

a. a rigid tubular body introduced by a laparoscopic trocar;

b. a flexible tube located coaxially through the rigid tubular body, wherein the interior flexible tube is connected at a proximal end to a beveled needle, and the flexible tube allows the beveled needle to be inserted in the oviduct, at an angle of less than 75 degrees;

c. one or more sheaths connected to a distal end of the flexible tube; and

d. one or more pistons closing the one or more sheaths, wherein the one or more pistons which slide through the inside of the sheath enable the precise introduction of fluids with low volume.

11. A device for inserting and/or removing fluids in the oviduct of a sow, according to claim **10**, wherein the angle of less than 75 degrees is about 45 degrees.

12. A device for inserting and/or removing fluids in the oviduct of a sow, according to claim **10**, wherein the tubular body is in turn covered by a sterile case.

13. A device for inserting and/or removing fluids in the oviduct of a sow, according to claim **12**, wherein the sterile case is disposable.

14. A device for inserting and/or removing fluids in the oviduct of a sow, according to claim **10** wherein the distal end of the flexible tube is connected to two sheaths, each closed by a piston which slides inside the sheaths, the two sheaths being connected to the flexible tube by a double cock, alternately enabling the passage of the fluids contained in each sheath.

15. A device for inserting and/or removing fluids in the oviduct of a sow, according to claim **10**, wherein the evacuation of the device is done by unlocking the sheath pulling back the beveled needle into the lumen of the rigid tubular body.

16. A device for inserting and/or removing fluids in the oviduct of a sow, according to claim **10**, wherein the fluids to be inserted or removed are selected from the group consisting of: spermatozoids, embryos, oocytes, ovocytes, and therapeutic solutions.

17. A device for inserting and/or removing fluids in the oviduct of a sow, according to claim **10**, wherein the fluids removed from the oviduct include cells.

18. A device for inserting and/or removing fluids in the oviduct of a sow, according to claim **10**, wherein the fluids removed from the oviduct do not include cells.

19. A method of inserting and/or removing fluids in the oviduct of a sow comprising the steps of:

a. introducing a rigid body through the abodominal region of a sow with a laproscopic trocar;

b. introducing a flexible tube through the rigid body, the flexible tube being connected a beveled needle;

c. inserting the beveled needle into the lumen of the oviduct of the sow at an angle of less than 75 degrees;

d. actuating a piston at the distal end of the flexible tube for inserting or removing precise volumes of fluid.

20. The method of inserting and/or removing fluids in the oviduct of a sow according to claim **19** wherein the angle of less than 75 degrees is about 45 degrees.

21. The method of inserting and/or removing fluids in the oviduct of a sow according to claim **19** further comprising the step of: orienting the beveled injection needle from the ampoule of the oviduct toward the isthmus of the oviduct.

22. The method of inserting and/or removing fluids in the oviduct of a sow according to claim **19** further comprising the step of: verifying the correct visualization of the inoculation by temporarily dilating of the walls of the oviduct.

23. The method of inserting and/or removing fluids in the oviduct of a sow according to claim **19** wherein the step of actuating a piston at the distal end of the flexible tube further comprises the steps of:

a. actuating a first piston at the distal end of the flexible tube to introduce a first fluid from a first sheath into the oviduct; and

b. actuating a second piston at the distal end of the flexible tube to introduce a second fluid from a second sheath into the oviduct.

24. The method of inserting and/or removing fluids in the oviduct of a sow according to claim **19** further comprising the steps of:

a. creating a first incision to introduce nontraumatic forceps for holding the oviduct;

b. creating a second incision to introduce a viewing system for visualizing the organs of the sow.

* * * * *

专利名称(译)	用于在母猪的输卵管中插入或获得具有衣服，胚胎或任何其他类型的溶液的流体的装置和方法		
公开(公告)号	US20120022402A1	公开(公告)日	2012-01-26
申请号	US13/132518	申请日	2009-09-24
申请(专利权)人(译)	大学德MURCIA		
当前申请(专利权)人(译)	大学德MURCIA		
[标]发明人	VAZQUEZ ROJAS JUAN MARIA MARTINEZ GARCIA EMILIO VAZQUEZ ROJAS JOSE LUIS ROCA ALEU JORGE		
发明人	VAZQUEZ ROJAS, JUAN MARIA MARTINEZ GARCIA, EMILIO VAZQUEZ ROJAS, JOSE LUIS ROCA ALEU, JORGE		
IPC分类号	A61D19/00 A61D19/02 A61D19/04 A61B5/00 A61D7/00		
CPC分类号	A61D19/04 A61B10/0045 A61B2019/082 A61D19/027 A61B17/3478 A61B10/0291 A61B46/13		
优先权	2008002740 2008-09-26 ES		
其他公开文献	US9277981		
外部链接	Espacenet USPTO		

摘要(译)

该装置包括注射系统，该注射系统由刚性外部管状主体（1）构成，该外部管状主体能够将其插入母猪的腹腔中。该物体又由无菌套管（2）覆盖，使其能够用于不同的动物。柔性管道（3）同轴延伸并且其远端与斜针（4）连接，斜针（4）允许以45°的角度插入输卵管（12）中。柔性管的近端与装置（6）连接，装置（6）包括护套（7），护套（7）在另一端由活塞（8）封闭，活塞（8）沿护套内部滑动并且能够精确地插入小体积液体。