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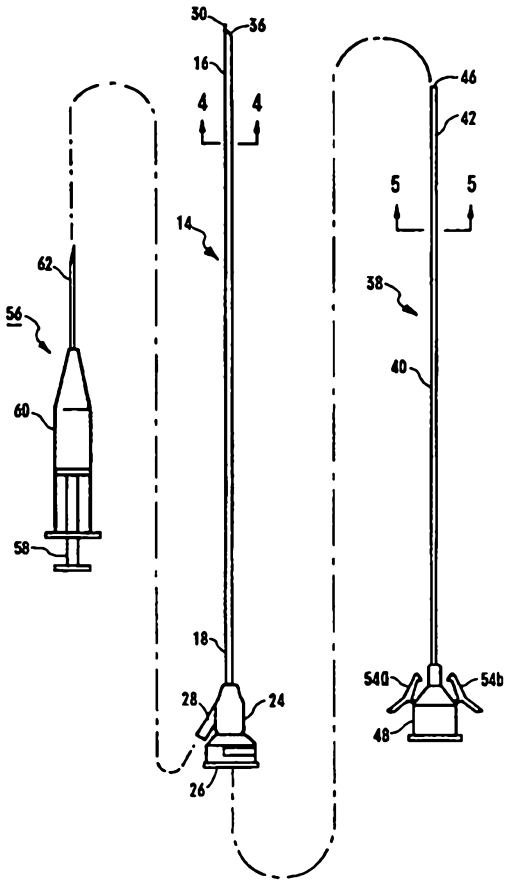
(54) Title: ARTIFICIAL INSEMINATION SYSTEM

(57) Abstract

An artificial insemination system and its use requires a sheath (14) which has a first lumen (20) for receiving and holding an endoscope (38), and a second lumen (22) through which semen can be injected into the uterus of the animal to be inseminated. Additionally, the sheath includes a blunt guide probe (30) which extends distally from the distal end of the sheath and a window (36) covering the distal end. When using the system, the endoscope (38) is initially inserted into the first lumen of the sheath (14). The combination of the sheath and endoscope are then inserted into the vagina of the animal, and, using the endoscope, the guide probe is directed through cervix os into the cervix until the distal end of the second lumen is positioned in the uterus. An injector filled with semen is used to inject semen into the uterus through the second lumen.



ARTIFICIAL INSEMINATION SYSTEM

FIELD OF INVENTION

The present invention pertains generally to devices and methods useful for the artificial insemination of mammals. More particularly, the present invention pertains to devices which may be used for non-surgical placement of spermatozoa into the uterus of a subject animal. The present invention is particularly, but not exclusively useful for the non-surgical artificial insemination of ewes.

BACKGROUND OF THE INVENTION

In recent years, effective application of artificial insemination has become established as a proven method for improving the production of domestic livestock. Generally, such techniques provide livestock managers with an enhanced ability to selectively breed a single male to a large number of females. Selective breeding, of course, allows the production of livestock with improved genetic traits. Artificial insemination techniques also decrease the chance of diseases and physical injury formerly associated with the natural breeding process. As a result of these and other advantages, the use of artificial insemination has become a widespread technique in the management of many forms of domestic livestock.

Not surprisingly, then, a large number of varying techniques have been developed for the artificial insemination of livestock. The simplest and most common of these techniques is known as vaginal artificial insemination, or VAI. VAI has the advantage of being relatively inexpensive. VAI also requires little operator expertise or training. Unfortunately, VAI techniques are generally effective only when used in combination with relatively large amounts of freshly collected semen. In particular, VAI techniques have proven to be relatively

ineffective when applied to sheep, especially when frozen semen is utilized.

Transcervical artificial insemination, or TAI, has been developed as an alternative to VAI techniques. When compared to VAI, TAI offers an alternative procedure for using frozen or fresh semen. TAI techniques also generally require fewer spermatozoa than VAI methods. Unfortunately, TAI techniques are more expensive and require more training than traditional VAI methods and present extremely variable results. Additionally, TAI techniques also present a risk of trauma to the subject animal.

Laparoscopic artificial insemination, or LAI, is another technique developed as an alternative to more traditional insemination techniques. In comparison to VAI, or TAI, LAI, offers the highest rate of pregnancy. LAI also requires the smallest number of spermatozoa per procedure. LAI is, however, an invasive and traumatic surgical procedure requiring a highly trained and licensed veterinarian. LAI also has the highest trauma risk potential.

In general, each of the preceding techniques has been applied to a number of differing types of livestock. For example, VAI, TAI and LAI methods been utilized for sheep as well as goat applications. It should be appreciated, however, that each of the preceding techniques may be more, or less, effective when utilized for a particular species. Practice has also shown that applications involving sheep are particularly problematic. In particular, female sheep, or ewes, have a cervical anatomy which includes four to six cervical rings. The rings function as partial seals for the cervical canal making traversal of the canal during an artificial insemination procedure problematic and often, ineffective. The presence of the cervical rings also increases the risk of traumatic injury during the artificial insemination procedure.

A second difficulty associated with the artificial insemination of sheep is caused by chemical incompatibility between the cervical secretions of a ewe and cryoprotectants used to preserve spermatozoa. In more detail, it is generally the case that spermatozoa are combined with a cryoprotectant and frozen prior to implantation during an artificial insemination procedure. Freezing, of course, allows the spermatozoa to be stored for long periods of time without loss in potency. Freezing can only be accomplished, however, if a cryoprotectant is added to preserve the spermatozoa during the freezing process. Unfortunately, the cryoprotectants generally available are chemically incompatible with the chemical environment present in the cervix of a sheep. The resulting chemical reaction destroys the majority of the implanted spermatozoa defeating the object of the inseminatio procedure.

In light of the above, the present invention advantageously provides a system and method for artificial insemination which minimizes the risk of trauma to the subject undergoing insemination. Advantageously the present invention also provides a system and method for artificial insemination which minimizes the level of skill and training required for successful operation. Further, the present invention advantageously provides a system and method for artificial insemination which maximizes the rate of successful insemination. Still further, the present invention advantageously provides a system and method for artificial insemination which minimizes the amount of spermatozoa required for successful insemination. Advantageously the present invention also provides a non-surgical system and method for artificial insemination which is adaptable to the insemination of female sheep. Advantageously the present invention still further provides a system and method for artificial insemination which is relatively simple to use, easy to manufacture, and cost effective.

SUMMARY OF THE INVENTION

According to one aspect of the invention there is provided an artificial insemination system which comprises:

a sheath having a distal end and a proximal end, said sheath being formed with a first lumen and a second lumen;

an elongated guide probe formed with a projection extending from said distal end of said sheath;

an angled window positioned at said distal end of said sheath to cover said first lumen;

an endoscope insertable into said first lumen for viewing said guide probe projection through said window in a distal direction from said distal end of said sheath to guide and steer said sheath through anatomical passageways by manipulation of said sheath; and

an injector engageable in fluid communication with said second lumen at said proximal end of said sheath for injecting fluid through said second lumen of said sheath and out said distal end thereof.

According to another aspect of the invention there provided a method for artificially inseminating an animal which comprises the steps of:

providing a device, said device comprising a sheath having a distal end and a proximal end and formed with a first lumen and a second lumen, an elongated guide probe formed with a projection extending from said distal end of said sheath with an angled window positioned at said distal end of said sheath to cover said first lumen, an endoscope having a lens insertable into said first lumen for viewing said guide probe projection through said window in a distal direction from said distal end of said sheath, and an injector engageable in fluid

communication with said second lumen at said proximal end of said sheath for injecting semen through said second lumen of said sheath and out said distal end thereof;

inserting said endoscope into said first lumen;

viewing said guide probe projection through said endoscope to guide and steer said distal end of said sheath through the cervix and into the uterus of an animal by manipulation of said sheath;

engaging said injector with said proximal end of said sheath; and

injecting semen from said injector through said second lumen of said sheath to inseminate the animal.

According to yet another aspect of the invention there provided an apparatus for artificial insemination of an animal comprising:

an elongated sheath having distal and proximal ends and including first and second lumens;

the distal end of the sheath including a viewing window sealingly covering the distal end of the first lumen;

an endoscope having distal and proximal ends, and an illuminating optic bundle and a viewing optic bundle extending between the distal and proximal ends, a lens associated with the distal end of the viewing optic bundle;

the distal end of the endoscope removable insertable into the first lumen of the sheath to a position proximal the viewing window of the sheath;

a connector between the sheath and the endoscope which fixes the distal end of the endoscope with respect to the viewing window of the sheath but allows rotational movement of the sheath about the endoscope;

so that the sheath can be rotated during insertion of the device relative to the endoscope and the position of the distal end of the endoscope and the viewing window remains fixed for standardized depth of vision and to deter optical distortion whether or not the sheath is rotated about the endoscope.

According to a further aspect of the invention there provided a method of artificial insemination comprising:

removably placing the distal end of an endoscope in a fixed position relative the distal end of a lumen which is sealingly covered by a viewing window so that the distal end of the endoscope is fixed longitudinally relative to the viewing window and has a field of view through the viewing window;

inserting the combined lumen and endoscope through the cervix and into the uterus of an animal while maintaining the fixed position between the viewing window and the distal end of the endoscope, but rotating, as needed, the lumen relative to the endoscope; and

injecting semen in the field of view of the endoscope when the distal end of the lumen is at or near the uterus;

the fixed position between the viewing window and the distal end of the endoscope providing a standardized depth of vision, the ability to rotate the lumen relative to the endoscope enhancing the ability to manipulate the lumen through anatomical structures.

According to still another aspect of the invention there provided an apparatus for traversing cervical anatomy of an animal which comprises:

(a) a sheath having a distal end and a proximal end elongated along a longitudinal axis, the sheath having perimeter dimensions sized small enough relative

to said cervical anatomy of said animal such that it can be steered substantially non-traumatically through the cervical anatomy of said animal;

(b) a guide probe formed with a projection extending from said distal end of said sheath, the guide probe including rounded outer surfaces some of which extend asymmetrically outside the perimeter dimensions of the sheath at or near the distal end of the sheath, the outer surfaces extending laterally and distally from the distal end of the sheath and having perimeter dimensions sized small enough relative to said cervical anatomy of said animal such that it can be steered substantially non-traumatically through the cervical anatomy of said animal.

According to another aspect of the invention there provided a method for traversing cervical anatomy of an animal which comprises the steps of:

providing a device comprising an elongated, relatively small in cross section sheath having a distal end and a proximal end, a guide probe formed with a projection extending from said distal end of said sheath, the guide probe including rounded outer surfaces some of which extend asymmetrically outside the perimeter dimensions of the cross-section of the body of the sheath at or near the distal end of the sheath, the sheath and guide probe having perimeter dimensions sized small enough relative to said cervical anatomy of said animal such that they can be steered substantially non-traumatically through the cervical anatomy;

guiding and steering said distal end of said sheath through the cervix and into the uterus of an animal by manipulation of said sheath and guide probe.

A system for artificially inseminating an animal essentially includes a sheath, an endoscope and a semen injector. More specifically, the endoscope is insertable into the sheath and useable there for visually positioning the sheath into the uterus of the animal. Further, the semen injector is connectable with the sheath for injecting semen through the sheath and into the uterus. As intended for the present invention, the sheath may be discarded after use.

The sheath for the system of the present invention is elongated and has both a first lumen and a second lumen which run substantially the entire length of the sheath. Additionally, a guide probe extends from the distal end of the sheath and a window is positioned to cover the distal end of the first lumen. The sheath also has a proximal connector which is engageable with the endoscope and with the injector.

In addition to its optical components, the endoscope for the system of the present invention includes a housing which is engageable with the proximal end of the sheath. With specific regard to its optical components, the endoscope includes a fiber optic bundle and an illumination guide. A lens is mounted on the distal end of the fiber optic bundle, and a viewing system which is mounted on the housing is optically connected to the proximal end of the fiber optic bundle. A light source, also mounted on the housing, is connected to the proximal end of the illumination guide. As intended for the present invention, the fiber optic bundle and the illumination guide are substantially the same length and are dimensioned to position the lens immediately proximal to the window when the endoscope has been inserted into the first lumen of the sheath.

In the operation of the artificial insemination system of the present invention, the endoscope is initially inserted into the first lumen of the sheath. The proximal connector on the sheath is then engaged with the housing of the endoscope. With this engagement, as indicated above, the lens of the endoscope is positioned immediately proximal to the window. Next, the sheath is guided through the vagina and cervix of the animal and into the uterus. This guidance is done by continuously viewing the guide probe with the endoscope to guide and steer the sheath through the anatomical passageways. Further, due to the relative stiffness of the endoscope and sheath, it is possible to guide the sheath by manual manipulation of the endoscope.

Once the distal end of the sheath has been properly positioned in the uterus of the animal, the injector is connected into fluid communication with the proximal end of the second lumen. Semen from the injector is then injected through the second lumen and into the uterus. Following injection of the semen into the uterus, the system is withdrawn from the animal and, if desired, the sheath can be discarded before a subsequent use of the endoscope.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features of this invention, as well as the invention itself, both as to its structure and its operation will be best understood from the accompanying drawings, taken in conjunction with the accompanying description, in which similar reference characters refer to similar parts, and in which:

Figure 1 is a perspective view of the sheath and endoscope of the present invention, in combination as the sheath is being inserted through the cervix of a ewe;

Figure 2 is a plan view of the injector, sheath and endoscope components of the system of the present invention with connecting lines to show their respective cooperation;

Figure 3 is a plan view of the distal end of the sheath of the present invention;

Figure 4 is a cross-sectional view of the sheath of the present invention as seen along the line 4-4 in Fig. 2; and

Figure 5 is a cross-sectional view of the endoscope of the present invention as seen along the line 5-5 in Fig. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is a system and method for artificial insemination of animals. The system of the present invention is shown in Figure 1 and generally designated 10. More specifically, in Figure 1, the system 10 of the present invention is shown in its intended environment partially inserted into the cervix 12 of an animal, such as a ewe (not shown).

The structural details of the device 10 of the present invention may be better appreciated by reference initially to Figure 2. In Figure 2, it may be seen that the device 10 includes a long, narrow sheath 14 having a distal end 16 and a proximal end 18. Referring temporarily to Figure 4, it may be seen that the sheath 14 is formed to include a first lumen 20 and a second lumen 22. Although not shown, it may be appreciated that the first lumen 20 and second lumen 22 extend throughout the length of the sheath 14.

Returning to Figure 2, it may be seen that a proximal connector 24 is attached to the proximal end 18 of the sheath 14. The connector is formed to include a first port 26 and a second port 28. The first port 26 is attached in fluid communication with the second lumen 22. Similarly, the second port 28 is attached in fluid communication with the

first lumen 20. The second port 28 is fabricated as a quick-connect type connector.

The distal end 16 of the sheath 14 include several structural elements better appreciated by reference to Figure 3. In Figure 3, it may be seen that a guide probe 30 is connected to the distal end 16 of the sheath 14. In more detail, the guide probe 30 is formed as an extension of the first lumen 20. A projection 32 is formed at the distal end of the guide probe 30. Additionally, an exit port 34 is formed in the first lumen 20, just proximal to the projection 32. Functionally, it may be appreciated that fluid injected in to first lumen 20 at the second port 28 will pass the length of the sheath 14 and emerge at the exit port 34. Figure 3 also shows that the distal end 16 of the sheath 14 includes a window 36. The window 36 is optically transparent and prevents passage of fluid into the distal end of second lumen 22.

Referring again to Figure 2, it may be seen that the present invention also includes an endoscope generally designated 38. The endoscope 38 of the present invention is fabricated as an elongated rod 40 having a distal end 42 and a proximal end 44. An objective lens 46 is attached to the distal end 42 of the rod 40. Additionally, a housing 48 is attached to the proximal end 44 of the rod 40. The housing 48 is connectable to a light source and a viewing system, such as a video display (light source and viewing system not shown). Referring briefly to Figure 5, is may be seen that the rod 40 of the endoscope 38 surrounds a fiber optic bundle 50 and an illumination guide 52. For the purposes of the present invention, the fiber optic bundle 50 and the illumination guide 52 extend through the length of the rod 40. Additionally, both the fiber optic bundle 50 and the illumination guide 52 are connected between the objective lens 46 and the housing 48. Functionally, the illumination guide 52 functions as a means whereby light from a light source connected to the housing 48 may be

projected through the rod 38 and emitted from the distal end 42 of the rod 40 illuminating a field of view at the distal end 42 of the rod 40. Simultaneously, the fiber-optic bundle 50 functions as a means whereby an image of the illuminated field of view may be conveyed back through the rod 40 to a viewing system connected to the housing 48.

The rod 40 of the endoscope 38 is insertable through the first port 26 of the sheath 14. When inserted in this fashion, the rod 40 passes into the second lumen 22 until the objective lens 46 is positioned at the window 38 located at the distal end 16 of the sheath 14. As the endoscope 38 reaches the point of full insertion into the sheath 14, two quick-release connectors 54a and 54b engage the housing 48.

Continuing with Figure 2, it may be seen that the present invention includes an injector generally designated 56. Generally, the injector 56 may be of any type which is connectable to the second port 28 of the sheath 14 and which may be used to pass fluid into the second port 28 to be emitted at the exit port 34. For these purposes, the injector 56 shown in Figure 2 includes a syringe type body 58 and a plunger 60. An insemination straw, or needle 62 is connected to the distal end of the body 58.

OPERATION

Operation of the present invention begins with insertion of the endoscope 38 into the sheath 14. Once the endoscope 38 has been fully inserted into the sheath 14, the quick-release connectors 54a and 54b engage the connector 24 of the sheath 14 allowing the sheath 14 and endoscope 38 to be manipulated as a single unit. A light source and viewing system, such as a video display system, is then connected to the housing 48 of the endoscope 38. As shown in Figure 1, the distal end 16 of the sheath 14,

containing the endoscope 38 is then inserted through the cervical os 64 and into the cervix 12. As the sheath 14 is advanced through the cervix 12, an image is conveyed by the endoscope 38 to the viewing system. As may be appreciated by reference to Figure 1, this allows the guide probe 30, and thus the sheath 14, to be selectively steered past anatomical structures, such as the many fornia 66, that lie between the cervical os 64 and the body of the uterus 68. Once the distal end 16 of the sheath 14 has reached the body of the uterus 68, the injector 56, which will generally be prefilled with a solution containing spermatozoa, may be connected to the second port 28 of the sheath 14. The plunger 58 of the injector 56 is then advanced to cause the fluid in the injector to flow through the first lumen 20 and out of the exit port 34.

Once the spermatozoa have been introduced into the uterus 68, the entire device 10 may be withdrawn from the cervical os 64. The quick-release connectors 54a and 54b may then be manipulated to release the endoscope 38 from the sheath 14. The endoscope 38 is then removed from the sheath 14, allowing the endoscope 38 to be inserted into a second sheath of the same type as sheath 14 for insemination of another animal.

While the particular system and method for artificial insemination as herein shown and disclosed in detail is fully capable of obtaining the objects and providing the advantages herein before stated, it is to be understood that it is merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as described in the appended claims.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

The reference to any prior art in this specification is not, and should not be taken as, an acknowledgment or any form of suggestion that that prior art forms part of the common general knowledge in Australia.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An artificial insemination system which comprises:

a sheath having a distal end and a proximal end, said sheath being formed with a first lumen and a second lumen;

an elongated guide probe formed with a projection extending from said distal end of said sheath;

an angled window positioned at said distal end of said sheath to cover said first lumen;

an endoscope insertable into said first lumen for viewing said guide probe projection through said window in a distal direction from said distal end of said sheath to guide and steer said sheath through anatomical passageways by manipulation of said sheath; and

an injector engageable in fluid communication with said second lumen at said proximal end of said sheath for injecting fluid through said second lumen of said sheath and out said distal end thereof.

2. A system as recited in claim 1 wherein said guide probe and said window are formed as an integral unit, with said integral unit being attached to said distal end of said sheath.

3. A system as recited in claim 1 wherein said endoscope comprises:

a housing engageable with said proximal end of said sheath;

a viewing system mounted on said housing;

a lens;

a fiber optic bundle optically interconnecting said lens with said eyepiece for viewing distally from said sheath;

a light source mounted on said housing;

an illumination guide interconnecting said lens with said light source for illuminating beyond said distal end of said sheath.

4. A system as recited in claim 3 wherein said viewing system is an eyepiece.

5. A system as recited in claim 3 wherein said viewing system is a camera.

6. A system as recited in claim 3 further comprising means for stiffening said system to facilitate guiding and placement of said system into a body cavity of an animal.

7. A system as recited in claim 3 wherein said fiber optic bundle has a proximal end and a distal end with said viewing system connected to said proximal end of said fiber optic bundle and said lens mounted on said distal end of said fiber optic bundle.

8. A system as recited in claim 3 wherein said endoscope is dimensioned for insertion into said first lumen of said sheath to position said lens immediately proximal to said window.

9. A method for artificially inseminating an animal which comprises the steps of:

providing a device, said device comprising a sheath having a distal end and a proximal end and formed with a first lumen and a second lumen, an elongated guide probe formed with a projection extending from said distal end of said sheath with an angled window positioned at said distal end of said sheath to cover said first lumen, an endoscope having a lens insertable into said first lumen for viewing said guide probe projection through said window in a distal direction from said distal end of said sheath, and an injector engageable in fluid communication with said second lumen at said proximal end of said sheath for injecting semen through said second lumen of said sheath and out said distal end thereof;

inserting said endoscope into said first lumen;

viewing said guide probe projection through said endoscope to guide and steer said distal end of said sheath through the cervix and into the uterus of an animal by manipulation of said sheath;

engaging said injector with said proximal end of said sheath; and

injecting semen from said injector through said second lumen of said sheath to inseminate the animal.

10. A method as recited in claim 9 wherein said inserting step is accomplished by positioning said lens immediately proximal to said window.

11. A method as recited in claim 9 further comprising the step of discretionarily discarding said sheath after the animal has been inseminated.

12. An apparatus for artificial insemination of an animal comprising:

an elongated sheath having distal and proximal ends and including first and second lumens;

the distal end of the sheath including a viewing window sealingly covering the distal end of the first lumen;

an endoscope having distal and proximal ends, and an illuminating optic bundle and a viewing optic bundle extending between the distal and proximal ends, a lens associated with the distal end of the viewing optic bundle;

the distal end of the endoscope removable insertable into the first lumen of the sheath to a position proximal the viewing window of the sheath;

a connector between the sheath and the endoscope which fixes the distal end of the endoscope with respect to the viewing window of the sheath but allows rotational movement of the sheath about the endoscope;

so that the sheath can be rotated during insertion of the device relative to the endoscope and the position of the distal end of the endoscope and the viewing window remains fixed for standardized depth of vision and to deter optical distortion whether or not the sheath is rotated about the endoscope.

13. The apparatus of claim 12 further comprising the viewing window is at a non-perpendicular angle relative to the longitudinal axis of the endoscope to reduce reflection and glare.

14. The apparatus of claim 12 wherein the endoscope has a field of view and further comprising a guide probe extending from the distal end of the sheath, the guide probe being at least partially in the field of view of the endoscope.

15. The apparatus of claim 14 wherein the guide probe extends outwardly of the distal end of the sheath and outside the perimeter dimensions of the sheath to form a partial longitudinal and partial radial extension of the distal end of the sheath which can be manipulated to assist navigation of the device through small openings and which can assist in expanding small openings.

16. The apparatus of claim 12 wherein the viewing window is angled with respect to the distal end of the sheath and the distal end of the endoscope.

17. The apparatus of claim 12 wherein the connector comprises a first housing connected to and having an opening into the first lumen of the sheath, a second housing connected to the endoscope and mating with the first housing in an assembled position, a stop member in the first housing prohibiting further longitudinal movement of the endoscope into the sheath when the first and second housings are mated in the assembled position, and a releasable lock between the first and second housings to prohibiting longitudinal movement but allowing rotation between the sheath and the endoscope.

18. The apparatus of claim 14 wherein the guide probe comprises a projection with rounded surfaces attached to a conduit in fluid communication with said second lumen, and including an exit port in one of the projection and conduit.

19. The apparatus of claim 18 wherein the guide probe has a leading edge and the exit port is positioned away from the leading end of the projection and

transverse to the longitudinal axis of the device so that the exit port resists clogging or contact with any material or surfaces when the device is being inserted.

20. A method of artificial insemination comprising:

removably placing the distal end of an endoscope in a fixed position relative the distal end of a lumen which is sealingly covered by a viewing window so that the distal end of the endoscope is fixed longitudinally relative to the viewing window and has a field of view through the viewing window;

inserting the combined lumen and endoscope through the cervix and into the uterus of an animal while maintaining the fixed position between the viewing window and the distal end of the endoscope, but rotating, as needed, the lumen relative to the endoscope; and

injecting semen in the field of view of the endoscope when the distal end of the lumen is at or near the uterus;

the fixed position between the viewing window and the distal end of the endoscope providing a standardized depth of vision, the ability to rotate the lumen relative to the endoscope enhancing the ability to manipulate the lumen through anatomical structures.

21. The method of claim 20 further comprising angling the viewing window relative to the plane of the distal end of the endoscope to reduce reflection and glare, and to provide an a wider field of view from the endoscope in the direction of the angling of the viewing window.

22. The method of claim 20 further comprising extending a guide probe from the distal end of the lumen, the guide probe being at least partially in the field of view of the endoscope.

23. The method of claim 22 wherein the guide probe extends outwardly of the distal end of the lumen and outside the perimeter dimensions of the lumen to form a partial longitudinal and partial radial extension of the distal end of the lumen which can be manipulated to assist navigation of through relatively small openings and which can assist in expanding relatively small openings.

24. The method of claim 20 wherein the viewing window is angled in a non-parallel orientation with respect to the distal end of the lumen and the distal end of the endoscope.

25. An artificial insemination system according to claim 1 and substantially as hereinbefore described with reference to the accompanying drawings.

26. A method according to claim 9, and substantially as hereinbefore described with reference to the accompanying drawings.

27. An apparatus according to claim 12, and substantially as hereinbefore described with reference to the accompanying drawings.

28. A method according to claim 20, and substantially as hereinbefore described with reference to the accompanying drawings.

DATED this 1st Day of October, 2001

Elite Genetics, Inc.
by its Patent Attorneys
DAVIES COLLISON CAVE

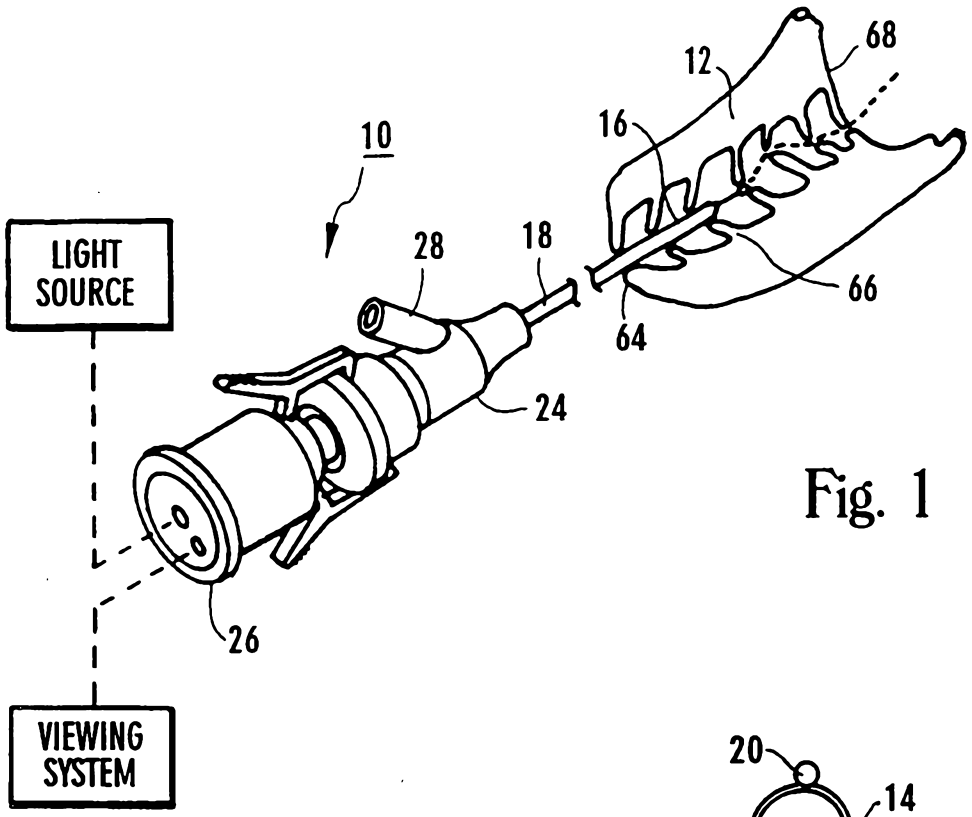


Fig. 1

Fig. 4

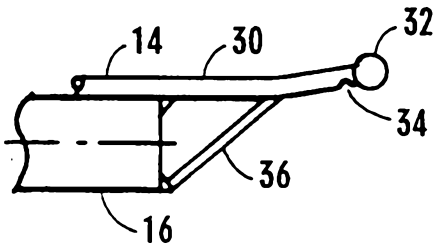


Fig. 3

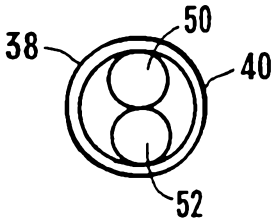


Fig. 5

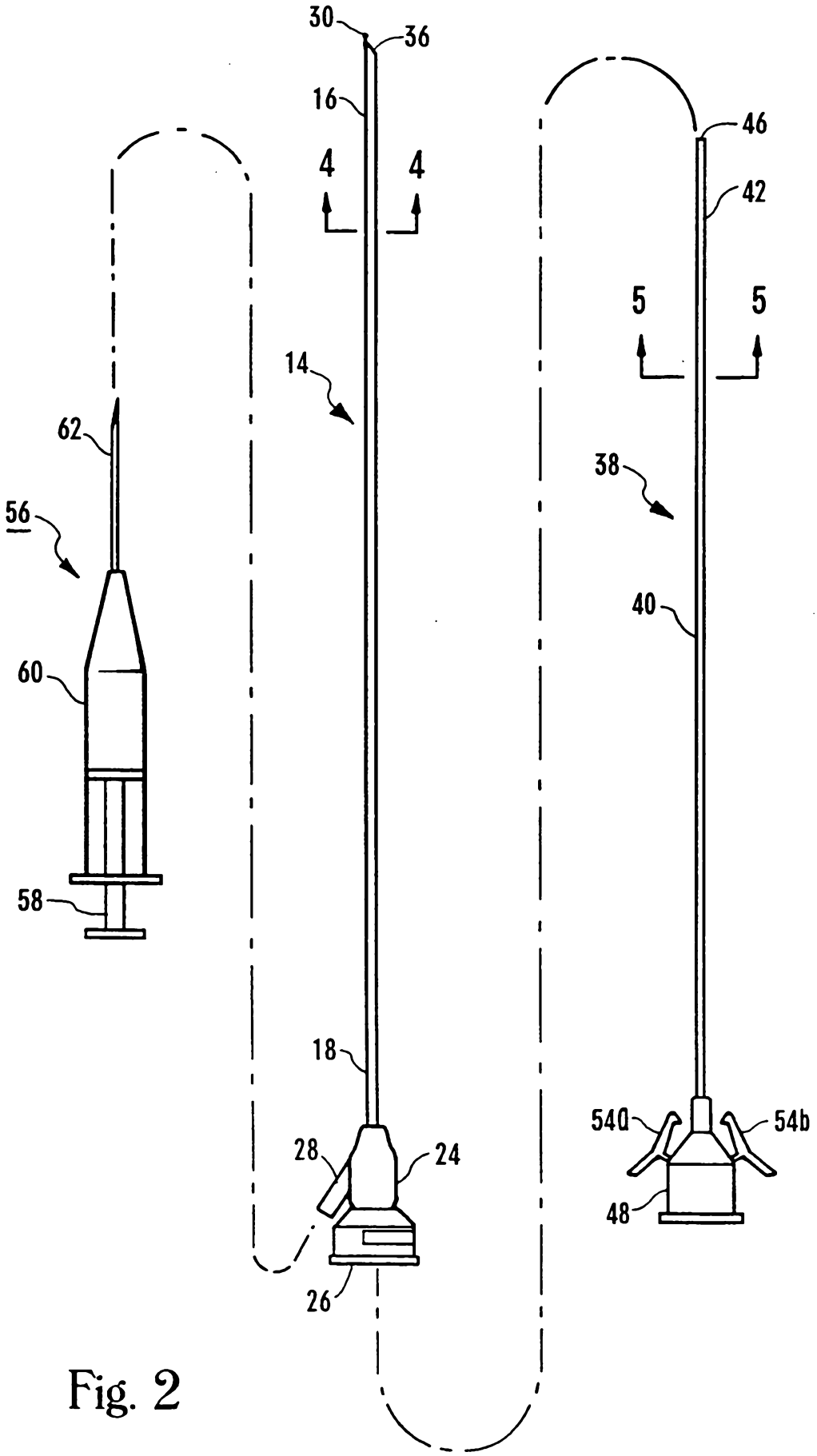


Fig. 2