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(54) **STERILE ULTRASOUND PROBE COVER AND METHOD OF RELEASING COUPLING AGENT FROM A SEALED COMPARTMENT**

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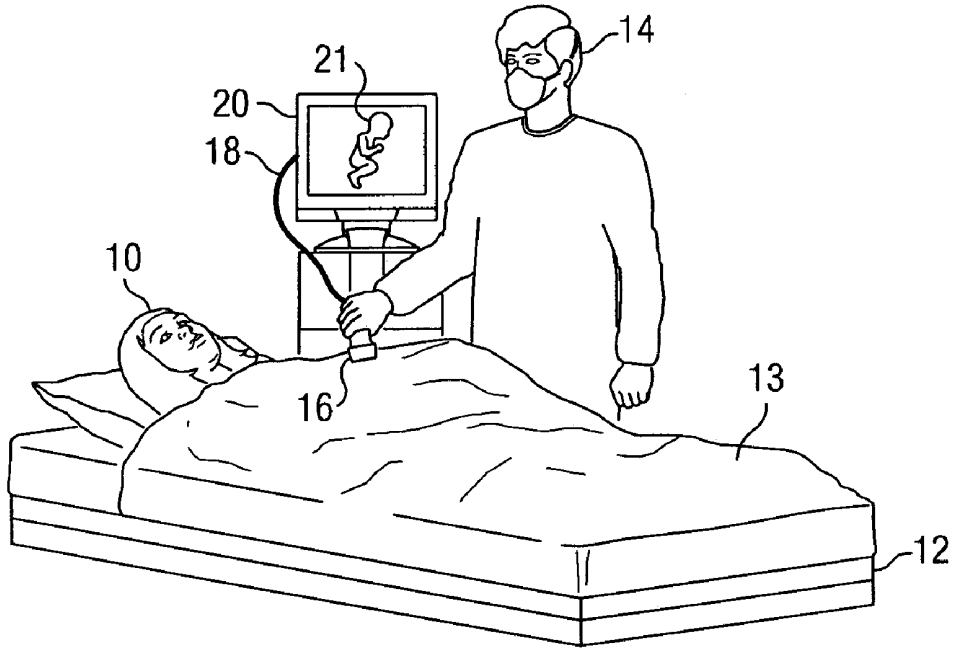
(57) **ABSTRACT**

A sterile cover tube for ultrasound probe and electrical cable has a telescoping tube having a closed end and open end. The telescoping tube is extendable to cover the ultrasound probe and electrical cable. A sealed pouch containing coupling agent is disposed adjacent to the closed end of the telescoping tube. The sealed pouch has a breakable seam or membrane. The sealed pouch can be placed over the probe head prior to placing the cover tube over the probe and electrical cable. The sealed pouch is ruptured by pressure to release the coupling agent over the ultrasound probe after the telescoping tube has been extended over the ultrasound probe and electrical cable. The coupling agent covers the probe head with a thickness of 0.2-6.0 millimeters after the sealed pouch is ruptured to provide an airless medium for an accurate image of the body region of interest.



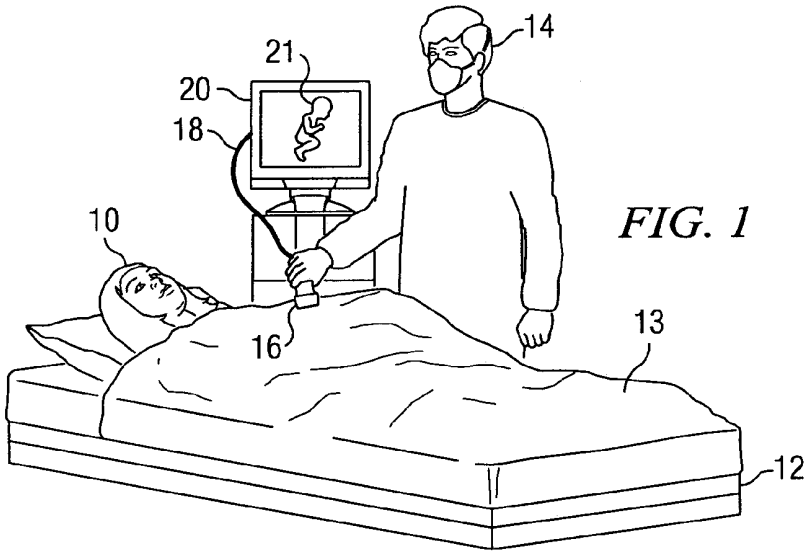


FIG. 1

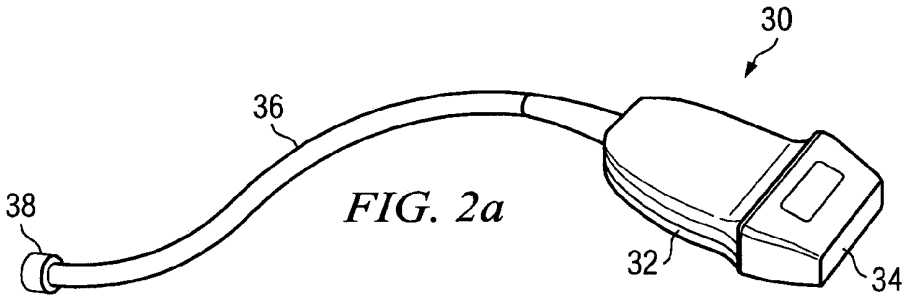


FIG. 2a

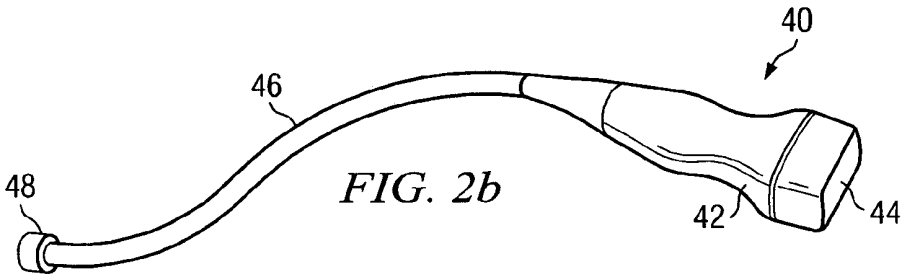


FIG. 2b

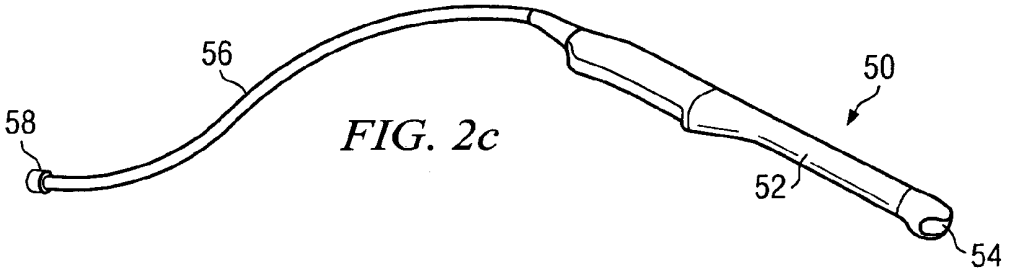


FIG. 2c

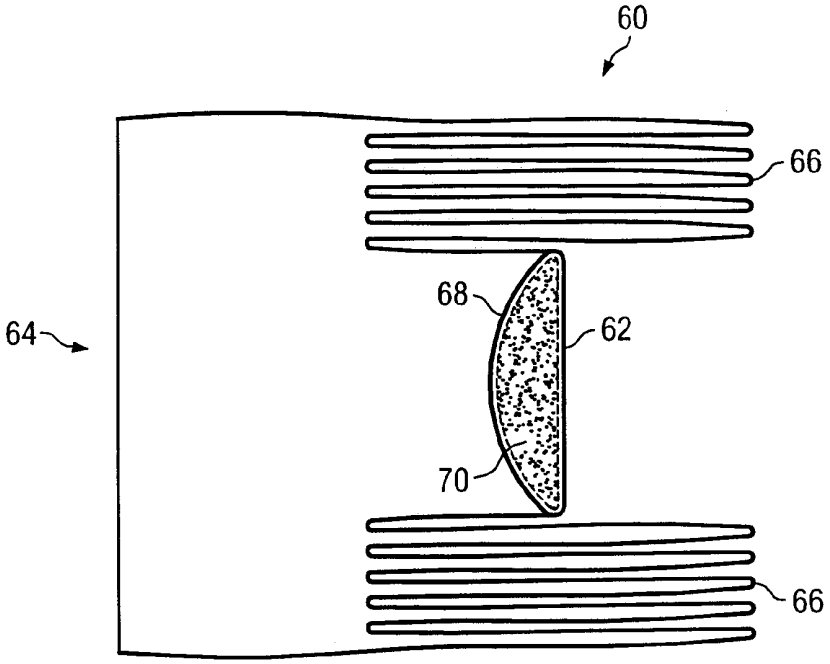


FIG. 3a

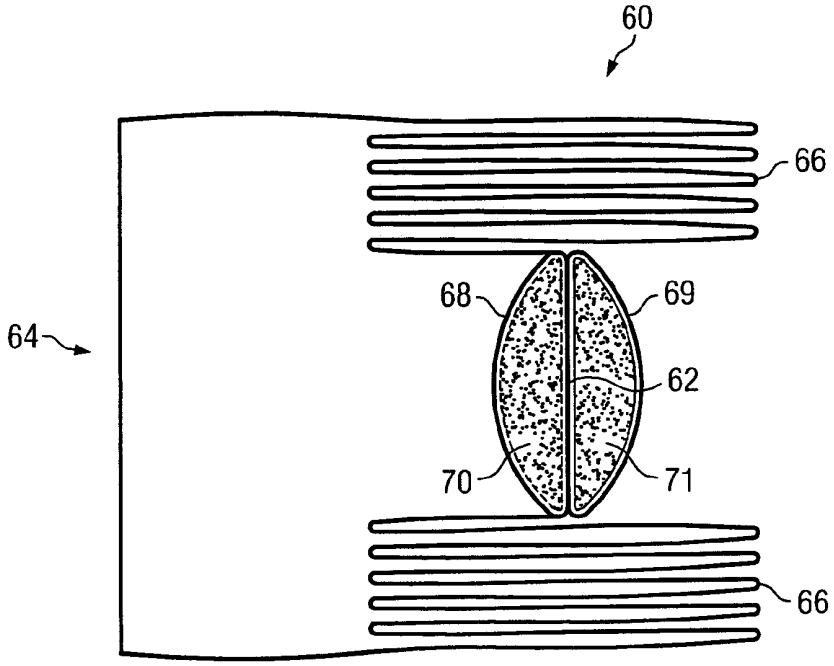


FIG. 3b

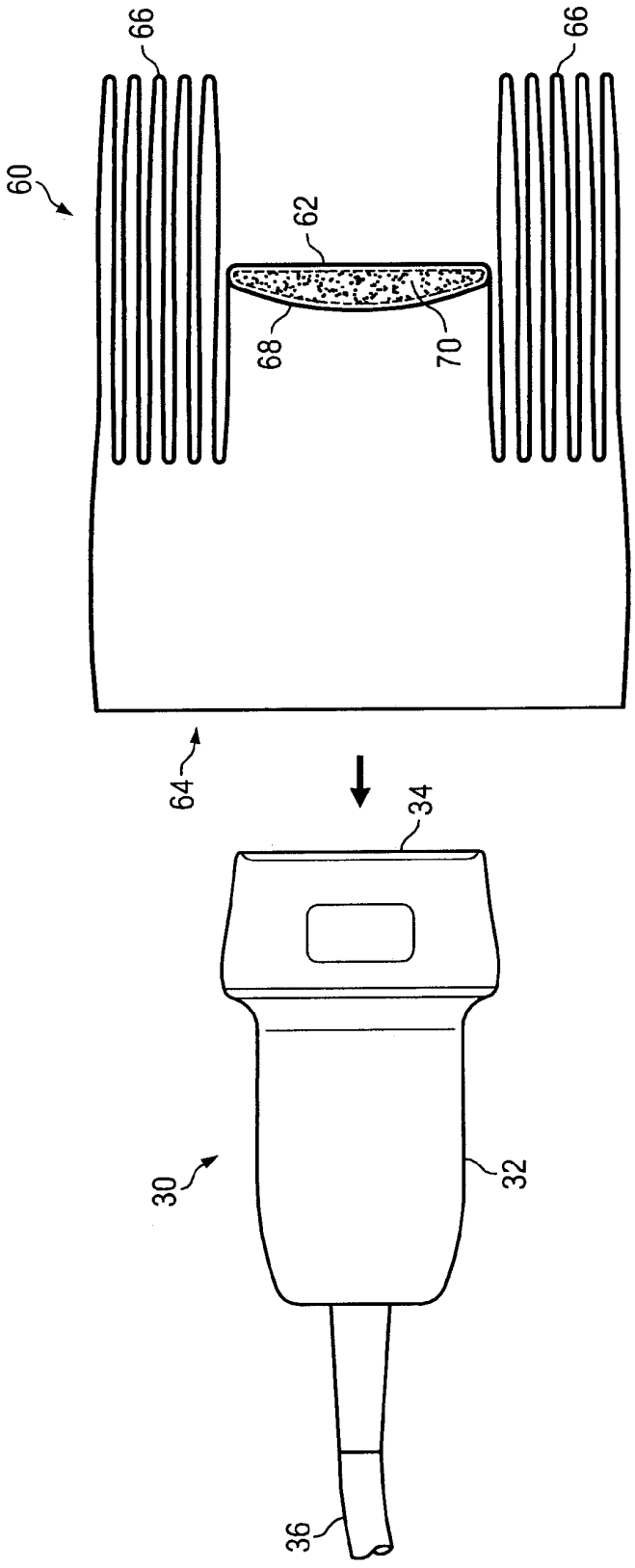


FIG. 4a

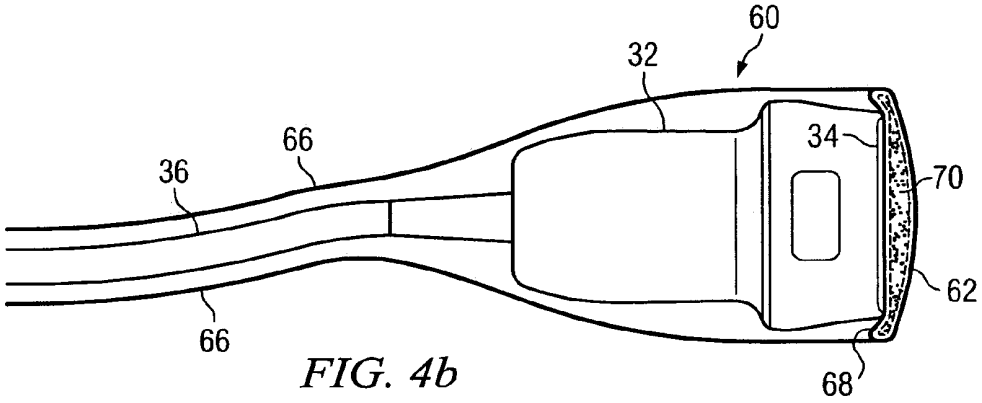


FIG. 4b

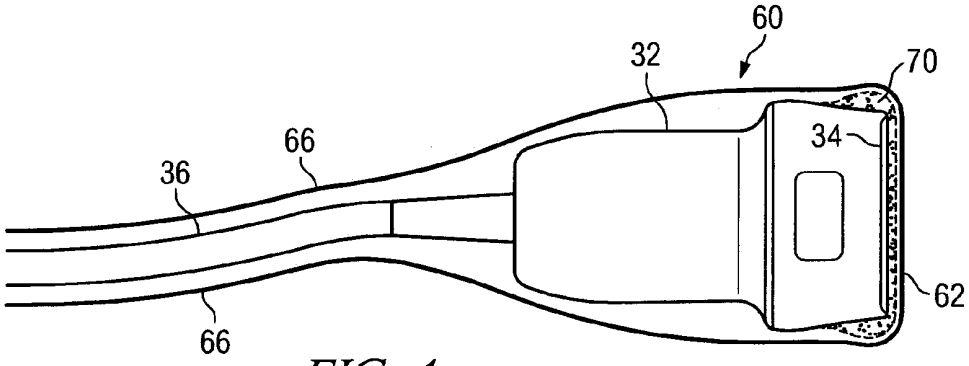


FIG. 4c

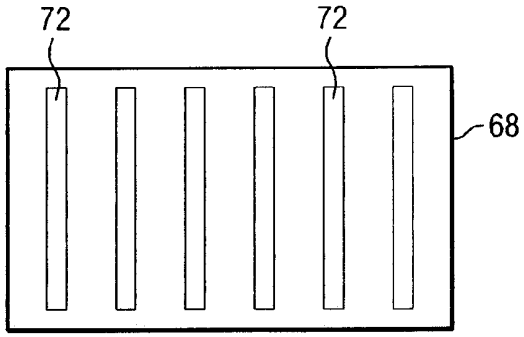


FIG. 5

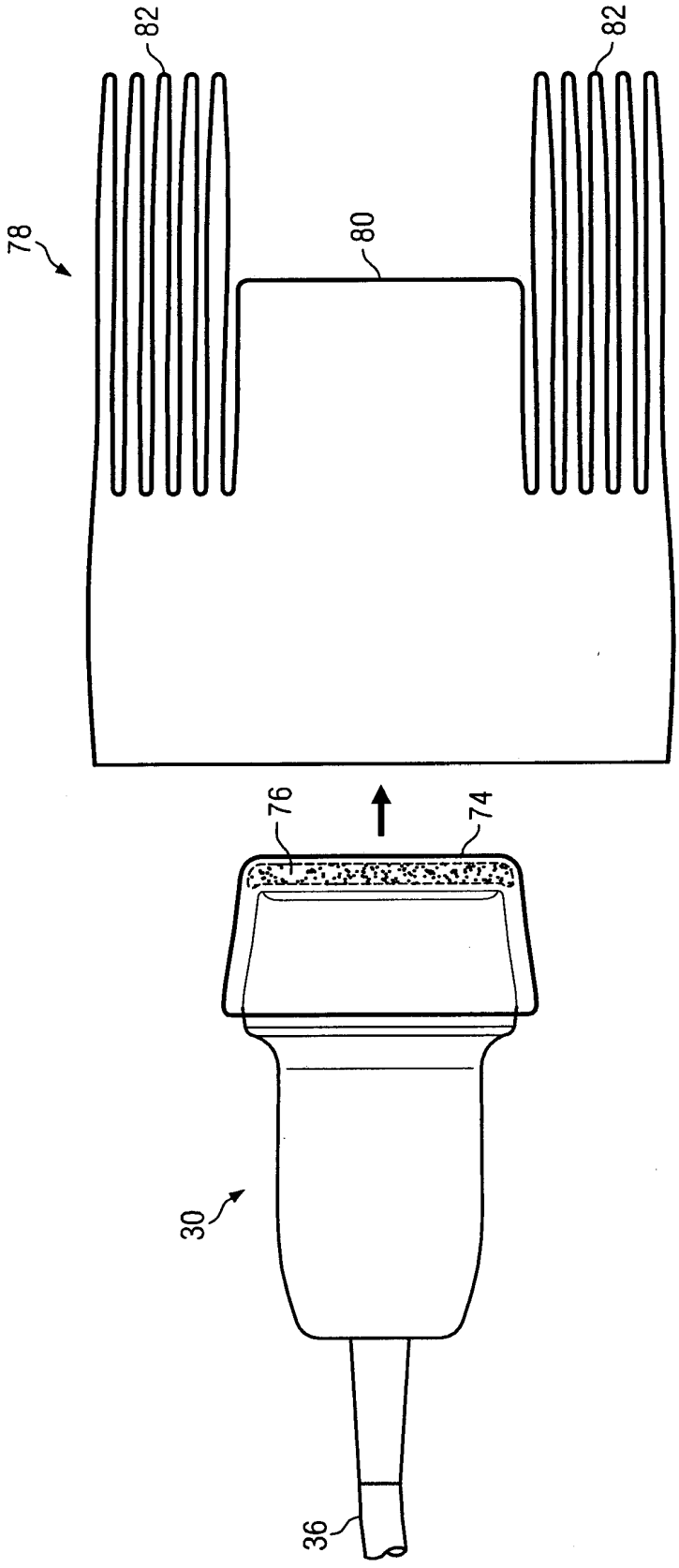


FIG. 6

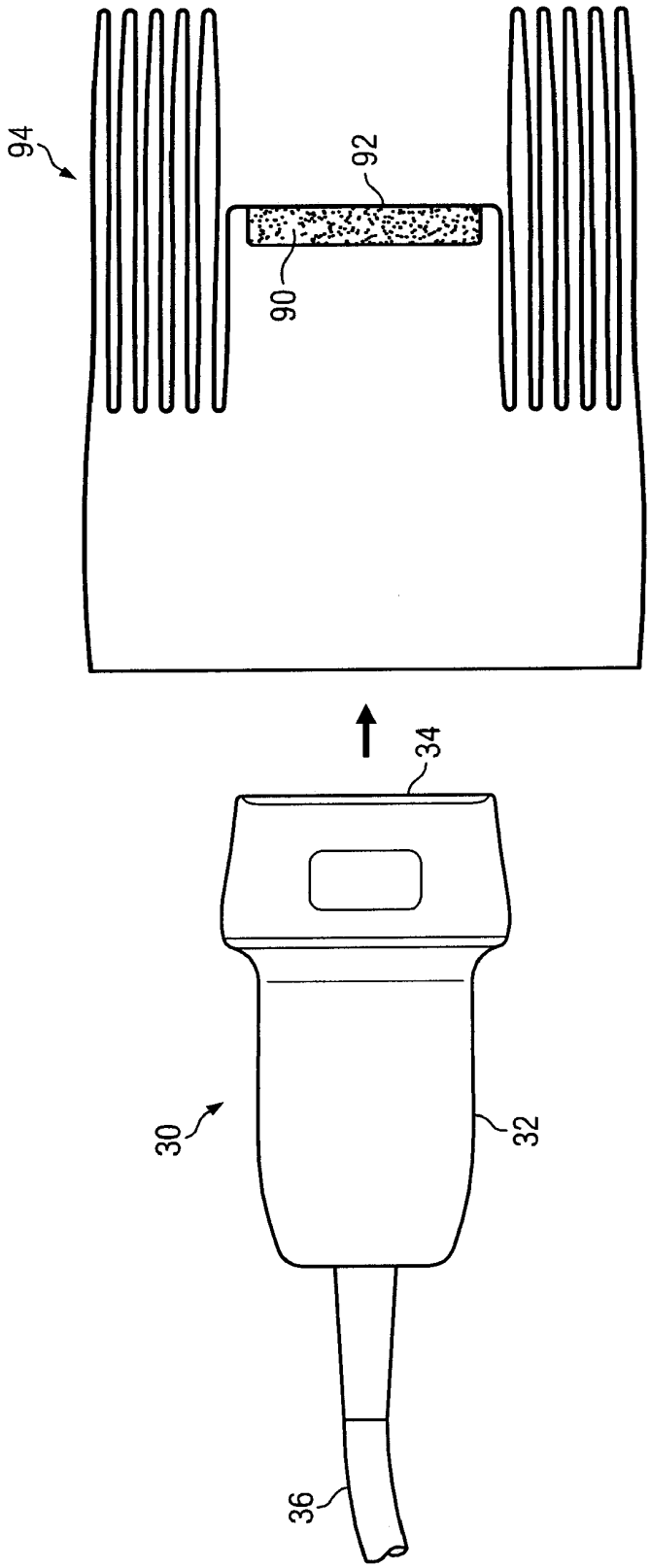


FIG. 7

STERILE ULTRASOUND PROBE COVER AND METHOD OF RELEASING COUPLING AGENT FROM A SEALED COMPARTMENT

FIELD OF THE INVENTION

[0001] The present invention relates in general to medical devices and, more particularly, to a sterile cover tube and sealed compartment containing a coupling agent for maintaining a sterile environment for the transducer probe head and electrical cable of a medical ultrasound unit. The sterile cover tube and sealed compartment provides optimal orientation of the coupling agent and ultrasound probe head.

BACKGROUND OF THE INVENTION

[0002] An ultrasound instrument uses a cyclic mechanical sound or pressure wave, with a frequency typically greater than 20 kHz, and has extensive applications in medical diagnosis and treatment. A health care provider places the ultrasound instrument over an area of interest on the human body. The instrument generates sound or pressure waves which penetrate the soft tissue of the body. The pressure waves incident to an internal structure of interest in the body are reflected back. The instrument receives the reflected waves and converts the data into electrical signals, which are routed to a computer analysis system. The ultrasound measurements reveal detail of the inner structures, such as size, depth, composition, and orientation in real-time images. Ultrasound allows the health care provider to image muscles, tendons, blood vessels, and internal organs, such as the heart, respiratory system, and digestive system. Ultrasound has applications in cardiology, OB/GYN, radiology, urology, internal medicine, emergency medicine, breast imaging, and anesthesiology. For example, ultrasound can be used during the third trimester to monitor and analyze the condition of the fetus, e.g., gestational age, fetal viability, physical abnormalities, fetal growth, fetal movement and heartbeat, and sex of the fetus, as part of routine and diagnostic prenatal care. Another example, is sterile central venous access in emergency medicine.

[0003] Ultrasound testing is typically done in a sterile manner. U.S. Pat. No. 5,259,383 describes an ultrasound instrument which includes a non-sterile housing containing a transducer probe and electrical cable connected to a computer analysis system. The transducer probe generates the mechanical sound or pressure waves which are emitted into the area of interest in the body. The sound or pressure waves incident to an internal structure of interest are reflected back. The reflected pressure waves are received by the probe and converted to electrical signals. The electrical cable routes the electrical signals to the computer analysis system, which displays a visual image of the body area of interest.

[0004] To maintain a sterile environment, a sterile cover tube is placed over the transducer probe. The cover tube is about 2.5 meters long and completely covers the probe and a portion of the electrical cable that may come in contact with the sterile field, e.g., patient covering. The sterile cover tube may extend along the entire electrical cable up to the connector of the computer analysis system. The cover tube has a closed end and an open end. A coupling agent is provided in gel form in a separate packet, tube, or other container. Prior to placing the cover tube over the probe, the operator removes the coupling agent from the separate container and applies the agent liberally over the probe head or the inside surface of the closed end of the cover tube. After applying the coupling agent, the cover tube is pulled over the transducer probe and electrical cable, as carefully as possible, while attempting to not disturb the thickness or coverage area of the coupling agent between the transducer probe head and closed end of the cover tube. In an ideal situation, the coupling agent maintains a continuous, airless transmission medium between the cover tube and probe head.

[0005] However, if the coupling agent is disturbed, thinned, or removed from part or all of the transducer probe head while placing the cover tube over the instrument, then the pressure wave transmission path is degraded resulting in poor image quality and resolution. The ultrasound test may become inaccurate and possibly lead to an erroneous diagnosis or unnecessary procedural challenges. The task of placing the cover tube over the probe head without disturbing or losing coverage of coupling agent is difficult and often requires multiple personnel to handle the procedure. The procedure can be messy as the coupling agent is invariably transferred to or tracked along the probe housing, electrical cable, and inside portion of the cover tube. Clean-up after the ultrasound procedure is time consuming.

SUMMARY OF THE INVENTION

[0006] A need exists for an efficient and effective manner of applying coupling agent between the transducer probe head and cover tube. Accordingly, in one embodiment, the present invention is a sterile cover tube for an ultrasound probe and electrical cable comprising a telescoping tube having a closed end and an open end. The telescoping tube is extendable to cover the ultrasound probe and electrical cable. A sealed pouch containing coupling agent is disposed adjacent to the closed end of the telescoping tube. The sealed pouch is ruptured to release the coupling agent over the ultrasound probe after the telescoping tube has been extended over the ultrasound probe and electrical cable.

[0007] In another embodiment, the present invention is a medical instrument cover for enclosing an ultrasound probe and electrical cable comprising a cover tube having a closed end and an open end. The cover tube is extendable to cover the ultrasound probe and electrical cable. A sealed compartment containing coupling agent is disposed adjacent to the closed end of the cover tube. The sealed pouch is ruptured to release the coupling agent over the ultrasound probe after the cover tube has been extended over the ultrasound probe and electrical cable.

[0008] In another embodiment, the present invention is a medical instrument cover for enclosing an ultrasound probe and electrical cable comprising a tube having a closed end and an open end. A sealed compartment containing coupling agent is disposed adjacent to the closed end of the cover tube.

[0009] In another embodiment, the present invention is a method of covering an ultrasound probe and electrical cable comprising the steps of providing a telescoping tube having a closed end and an open end, disposing a sealed compartment containing coupling agent adjacent to the closed end of the telescoping tube, extending the telescoping tube to cover the ultrasound probe and electrical cable, and rupturing the sealed pouch to release the coupling agent over the ultrasound probe after the telescoping tube has been extended over the ultrasound probe and electrical cable.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. **1** illustrates ultrasound equipment to give a patient an ultrasound diagnosis procedure;

[0011] FIGS. **2***a*-**2***c* illustrate various embodiments of the transducer probe head and electrical cable;

[0012] FIGS. **3***a*-**3***b* illustrate embodiments of a sterile telescoping cover tube with sealed pouch(s) containing coupling agent disposed adjacent to the closed-end of the tube;

[0013] FIGS. **4***a*-**4***c* illustrate placing the telescoping cover tube with sealed pouch containing coupling agent over transducer head and electrical cable;

[0014] FIG. **5** illustrates a breakable seam or membrane in the sealed pouch for releasing coupling agent under pressure;

[0015] FIG. **6** illustrates a sealed pouch containing coupling agent disposed over the probe head prior to placing the cover tube over the probe and electrical cable; and

[0016] FIG. **7** illustrates a solid form of coupling agent disposed on the closed-end of the cover tube.

DETAILED DESCRIPTION OF THE DRAWINGS

[0017] The present invention is described in one or more embodiments in the following description with reference to the Figures, in which like numerals represent the same or similar elements. While the invention is described in terms of the best mode for achieving the invention's objectives, it will be appreciated by those skilled in the art that it is intended to cover alternatives, modifications, and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims and their equivalents as supported by the following disclosure and drawings.

[0018] Turning to FIG. **1**, a patient **10** is shown undergoing an ultrasound testing procedure. Patient **10** rests on bed or examination table **12** with sterile covering **13** to form a sterile field. Health care provider or operator **14** stands or sits adjacent to patient **10**. Operator **14** holds ultrasound transducer probe **16** in his or her hand. Probe **16** is connected by electrical cable **18** to computer analysis system **20**. Operator **14** places probe **16** over the soft tissue over the area of interest of patient **10**. For example, operator **14** places probe **16** over the abdomen of patient **10**. Probe **16** emits a cyclic mechanical sound or pressure wave, with a frequency typically greater than 20 kHz. The pressure wave travels through the body tissue to the internal region or structure of interest. The pressure wave incident to the region of interest is reflected back to the probe. The reflected pressure wave is converted to an electrical signal by the transducer probe which provides a representation of the inner structure of interest. The electrical signal is routed to computer analysis system **20**, which performs signal processing on the electrical signals and displays a visual representation or image **21** of the internal structure of interest.

[0019] The ultrasound testing procedure allows the health care provider to image muscles, tendons, blood vessels, and internal organs, such as the heart, respiratory system, and digestive system. The images can help determine physical attributes of the region of interest including size, structure, and abnormalities in real-time tomographic images. Ultrasound has applications in many medical fields such as cardiology, OB/GYN, internal medicine, radiology, urology, emergency medicine, breast imaging, and anesthesiology, including procedures for intracorporeal, intraoperative ultrasonography, ultrasound guided biopsy techniques, pericardialcentesis, central venous access, thoracostomy, and ultrasound guided central line placement. For example, ultrasound can be used during the third trimester to monitor and analyze the condition of the fetus, e.g., gestational age, fetal viability, physical abnormalities, fetal growth, fetal movement and heartbeat, and sex of the fetus, as part of routine and diagnostic prenatal care.

[0020] FIG. **2***a* illustrates an exemplary transducer probe **30** including housing **32** containing pressure wave transceiver **34** and electronic circuits for pressure wave generation, sensors, transducer, filtering, and amplification. An electrical cable **36** and connector **38** connects transducer probe **30** to computer analysis system **20**.

[0021] FIG. **2***b* shows another transducer probe **40** including housing **42** containing pressure wave transceiver **44** and electronic circuits for pressure wave generation, sensors, transducer, filtering, and amplification. An electrical cable **46** and connector **48** connects transducer probe **40** to computer analysis system **20**.

[0022] FIG. **2***c* shows another transducer probe **50** including housing **52** containing pressure wave transceiver **54** and electronic circuits for pressure wave generation, sensors, transducer, filtering, and amplification. An electrical cable **56** and connector **58** connects transducer probe **50** to computer analysis system **20**.

[0023] In an effort to limit central line related infections, generally accepted recommendations call for a sterile ultrasound guided central line placement. Accordingly, ultrasound imaging is typically performed in a sterile manner. Since the transducer probe and electrical cable shown in FIGS. **2***a*-**2***c* are non-sterile, a sterile cover must be placed over the instrument. FIG. **3***a* shows a sterile cover tube **60** including closed-end **62** and open-end **64**. In one embodiment, cover tube **60** is a radiosterilizable plastic foil tube of high-density and low-density polyethylene and copolymers of ethyl/butyl acrylate or ethylene/methyl acrylate (EMA). Cover tube **60** has a diameter of 14 centimeters (cm) and material thickness of 15 micrometers (μm) to 50 μm. Cover tube **60** is made of sufficient length, typically 2.5 meters, to completely cover the transducer probe and a portion of electrical cable that may come in contact with the sterile field, e.g., patient covering. In some cases, cover tube **60** extends up to the connector of computer analysis system **20**. In its initial form, sidewalls **66** of cover tube **60** are telescopically folded over each other in short sections to reduce the length of the tube to a manageable size. Each telescopic fold has length of 25 cm and are mutually superimposed radially to the longitudinal axis of cover tube **60**.

[0024] The inside surface of closed-end **62** includes pouch or compartment **68** containing coupling agent or medium **70**. Pouch **68** is attached or otherwise disposed adjacent to the inside surface of closed-end **62** of cover tube **60** with an adhesive. The adhesive seam of pouch **68** is located on the lateral sidewalls of cover tube **60**, i.e., just outside closed-end **62**, to avoid impairing the transmission path directly in-line with the pressure wave transceiver. Coupling agent **70** is a hypo-allergenic, water-soluble, greaseless, high transmission conductivity, non-staining gel or physiological saline solution. The primary purpose of the coupling agent or medium is to facilitate transmission of the ultrasound energy from the probe head to tissue and back again. The greater the difference in impedance at a boundary, the smaller the amount of energy that will be transferred. Accordingly, coupling agent **70** and the lining of cover tube **60** are designed to match the impedance of human tissue.

[0025] The outside surface of closed-end **62** may also include a pouch or compartment **69** containing coupling agent or medium **71**, as shown in FIG. **3***b*. Pouch **69** is attached or otherwise disposed adjacent to the outside surface of closed-end **62** of cover tube **60** with an adhesive. The adhesive seam of pouch **69** is located on the lateral sidewalls of cover tube **60**, i.e., just outside closed-end **62**, to avoid impairing the transmission path directly in line with the pressure wave transceiver. Coupling agent **71** is a hypo-allergenic, water-soluble, greaseless, high transmission conductivity, non-staining gel or physiological saline solution. The primary purpose of the coupling agent or medium is to facilitate transmission of the ultrasound energy from the probe head to tissue and back again.

[0026] In FIG. **4***a*, transducer probe **30** is placed adjacent to cover tube **60**. Using the embodiment from FIG. **2***a* and leading with pressure wave transceiver **34**, probe **30** is inserted through open-end **64** such that the surface of pressure wave transceiver **34** contacts pouch **68**. Coupling agent **70** remains within sealed pouch **68** at this time.

[0027] With the pressure wave transceiver contacting sealed pouch **68**, sidewalls **66** of cover tube **60** are elongated in a telescoping manner away from transducer probe **30** to cover electrical cable **36**, as shown in FIG. **4***b*. The sterile cover tube **60** extends over non-sterile housing **32** and electrical cable **36** beyond potential contact with the sterile field, possibly up to computer analysis system **20** to maintain a sterile field. Since coupling agent **70** remains in sealed pouch **68**, the coupling agent is not disturbed nor is it inadvertently transferred to or tracked along sidewalls **66** as cover tube **60** is unfolded.

[0028] In FIG. **4***c*, with cover tube **60** securely in place over transducer probe **30** and electrical cable **36**, pouch **68** is ruptured to release coupling agent **70** over pressure wave transceiver **34**. Pouch **68** contains a breakable seam or membrane. In one embodiment, a plurality of parallel breakable seams **72** runs along a surface of closed-end **62** adjacent to pressure wave transceiver **34**, as shown in FIG. **5**. Breakable seams **72** are relatively thin material which is easily broken with application of pressure, e.g., by pressing against the pouch with the fingers or palm. Sealed pouch **68** is thus manually ruptured along breakable seam **72** when pressure is applied to release coupling agent **70**. The tensile strength of breakable seam **72** of pouch **68** is less than the lining of cover tube **60**. In one embodiment, the lining of cover tube **60** has twice the tensile strength of the breakable seam **72**. Accordingly, cover tube **60** remains intact when pouch **68** is ruptured. The position of coupling agent and discrepancy in tensile strength of pouch **68** and outer tube cover provides for optimal positioning of coupling agent **70** after manual rupture of the pouch. Coupling agent **70** is dispersed over pressure wave transceiver **34** to the proper thickness and coverage. In the case of FIG. **3***b*, pouch **69** is also ruptured by the pressure and coupling agent **71** is dispersed over the patient within the sterile field. In one embodiment, coupling agent **70** ranges from 0.2-6.0 millimeters (mm) in thickness to negate any air pockets and provide an airless medium between pressure wave transceiver **34** and closed-end **62** of cover tube **60** for optimal visualization of the regional anatomy of interest, while the sterile cover tube decreases the possibility of infection. Coupling agents **70** and **71** are not disturbed and remain within the narrow confines of pressure wave transceiver **34** because cover tube **60** has already been elongated to obtain the sterile field prior to dispersement of the coupling agent. The ultrasound test is conducted with the proper concentration and coverage of coupling agents **70** and **71** over pressure wave transceiver **34** and patient **10**. The visual image displayed on computer analysis system **20** is an accurate representation of the body region of interest.

[0029] Another embodiment of the medical instrument cover is shown in FIG. **6**. A separate pouch or compartment **74** is placed over pressure wave transceiver **34** of transducer probe **30** prior to placing the cover tube over the probe. Pouch **74** contains coupling agent or medium **76**. Cover tube **78** is then placed over transducer probe **30**, similar to FIG. **4***a*-**4***c*. Probe **30** is inserted through the open-end of cover tube **78** such that the surface of pressure wave transceiver **34**, with sealed pouch **74**, contacts closed-end **80**. Coupling agent **76** remains within sealed pouch **74** at this time.

[0030] With sealed pouch **74** contacting closed-end **80**, sidewalls **82** of cover tube **78** are elongated in a telescoping manner away from transducer probe **30** to cover electrical cable **36**. The sterile cover tube **78** extends over non-sterile housing **32** and electrical cable **36** beyond potential contact with the sterile field, possibly up to computer analysis system **20** to maintain a sterile field. Since coupling agent **76** remains in sealed pouch **74**, the coupling agent is not disturbed nor is it inadvertently transferred to or tracked along sidewalls **82** as cover tube **78** is unfolded.

[0031] With cover tube **78** securely in place over transducer probe **30** and electrical cable **36**, pouch **74** is ruptured to release coupling agent **76** over pressure wave transceiver **34**. Pouch **78** contains a breakable seam or membrane, similar to FIG. **5**, on one or both sides of the pouch. The sealed pouch is manually ruptured along the breakable seam when pressure is applied, e.g., by pressing the pouch with the fingers or palm, to release coupling agent **76**. The tensile strength of the breakable seam or membrane is less than the lining of cover tube **78**. Accordingly, cover tube **78** remains intact when sealed pouch **74** is ruptured. Coupling agent **76** is dispersed over pressure wave transceiver **34** to the proper thickness and coverage. In one embodiment, coupling agent **70** ranges from 0.2-6.0 mm in thickness to negate any air pockets and provide an airless medium between pressure wave transceiver **34** and closed-end **80** of cover tube **78** for optimal visualization of regional anatomy, while the sterile cover tube decreases the possibility of infection. Coupling agent **76** is not disturbed and remains within the narrow confines of pressure wave transceiver **34** because cover tube **78** has already been elongated to obtain the sterile field prior to dispersement of the coupling agent. The ultrasound test is conducted with the proper concentration and coverage of coupling agent **76** over pressure wave transceiver **34**. The visual image displayed on computer analysis system **20** is an accurate representation of the body region of interest.

[0032] In another embodiment, a coupling agent **90** is placed directly on closed-end **92** of cover tube **94**, as shown in FIG. **7**. Coupling agent **90** is in solid or semi-solid form when placed on closed-end **92**. Alternatively, the solid or semi-solid coupling agent is placed on the pressure wave transceiver **34**. While coupling agent **90** is in a solid or semi-solid form, cover tube **94** is placed over probe **30** and electrical cable **36**, similar to FIGS. **4***a*-**4***c*. Coupling agent **90** is then heated to a gel state. The gel form of coupling agent **90** disperses over pressure wave transceiver **34** to the proper thickness and coverage. In one embodiment, coupling agent **90** ranges from 0.2-6.0 mm in thickness to negate any air pockets and provide an airless medium between pressure wave transceiver **34** and closed-

end **92** of cover tube **94** for optimal visualization of regional anatomy, while the sterile cover tube decreases the possibility of infection. Coupling agent **90** is not disturbed and remains within the narrow confines of pressure wave transceiver **34** because cover tube **78** has already been elongated to obtain the sterile field prior to heating the solid form of coupling agent **90** into a gel state. The ultrasound test is conducted with the proper concentration and coverage of coupling agent **90** over the pressure wave transceiver. The visual image displayed on computer analysis system **20** is an accurate representation of the body region of interest.

[0033] While one or more embodiments of the present invention have been illustrated in detail, the skilled artisan will appreciate that modifications and adaptations to those embodiments may be made without departing from the scope of the present invention as set forth in the following claims.

What is claimed:

1. A sterile cover tube for an ultrasound probe and electrical cable, comprising:
- a telescoping tube having a closed end and an open end, the telescoping tube being extendable to cover the ultrasound probe and electrical cable; and
- a sealed pouch containing coupling agent disposed adjacent to the closed end of the telescoping tube, wherein the sealed pouch is ruptured to release the coupling agent over the ultrasound probe after the telescoping tube has been extended over the ultrasound probe and electrical cable.

2. The sterile cover tube of claim **1**, wherein the sealed pouch includes a breakable seam or membrane.

3. The sterile cover tube of claim **1**, wherein the sealed pouch is ruptured by application of pressure.

4. The sterile cover tube of claim **1**, wherein the coupling agent covers the ultrasound probe to a thickness of 0.2-6.0 millimeters after the sealed pouch is ruptured.

5. The sterile cover tube of claim **1**, wherein the coupling agent includes gel or saline solution.

6. A medical instrument cover for enclosing an ultrasound probe and electrical cable, comprising:
- a cover tube having a closed end and an open end, the cover tube being extendable to cover the ultrasound probe and electrical cable; and
- a sealed compartment containing coupling agent disposed adjacent to the closed end of the cover tube, wherein the sealed compartment is ruptured to release the coupling agent over the ultrasound probe after the cover tube has been extended over the ultrasound probe and electrical cable.

7. The medical instrument cover of claim **6**, wherein the sealed compartment includes a breakable seam or membrane.

8. The medical instrument cover of claim **6**, wherein the sealed compartment is ruptured by application of pressure.

9. The medical instrument cover of claim **6**, wherein the coupling agent covers the ultrasound probe to a thickness of 0.2-6.0 millimeters after the sealed compartment is ruptured.

10. The medical instrument cover of claim **6**, wherein the coupling agent includes gel or saline solution.

11. The medical instrument cover of claim **6**, wherein the cover tube is telescoping to extend over the ultrasound probe and electrical cable.

12. A medical instrument cover for enclosing an ultrasound probe and electrical cable, comprising:
- a tube having a closed end and an open end; and
- a first sealed compartment containing coupling agent disposed adjacent to a first side of the closed end of the tube.

13. The medical instrument cover of claim **12**, wherein the tube is extendable to cover the ultrasound probe and electrical cable and the first sealed compartment is ruptured to release the coupling agent over the ultrasound probe after the tube has been extended over the ultrasound probe and electrical cable.

14. The medical instrument cover of claim **12**, wherein the first sealed compartment includes a breakable seam or membrane.

15. The medical instrument cover of claim **12**, wherein the first sealed compartment is ruptured by application of pressure.

16. The medical instrument cover of claim **12**, wherein the coupling agent covers the ultrasound probe to a thickness of 0.2-6.0 millimeters after the first sealed compartment is ruptured.

17. The medical instrument cover of claim **12**, wherein the coupling agent includes gel or saline solution.

18. The medical instrument cover of claim **12**, wherein the first sealed compartment is placed over a head of the probe head prior to placing the cover tube over the probe and electrical cable.

19. The medical instrument cover of claim **12**, wherein the cover tube is telescoping to extend over the ultrasound probe and electrical cable.

20. The medical instrument cover of claim **12**, further including a second sealed compartment containing coupling agent disposed adjacent to a second side of the closed end of the tube opposite the first side of the closed end of the tube.

21. A method of providing sterile covering for an ultrasound probe and electrical cable, comprising:
- providing a telescoping tube having a closed end and an open end;
- disposing a sealed compartment containing coupling agent adjacent to the closed end of the telescoping tube;
- extending the telescoping tube to cover the ultrasound probe and electrical cable; and
- rupturing the sealed compartment to release the coupling agent over the ultrasound probe after the telescoping tube has been extended over the ultrasound probe and electrical cable.

22. The method of claim **21**, further including forming a breakable seam or membrane in the sealed compartment.

23. The method of claim **21**, further including applying pressure to rupture the sealed compartment.

24. The method of claim **21**, wherein the coupling agent includes gel or saline solution.

25. The method of claim **21**, wherein the cover tube is telescoping to extend over the ultrasound probe and electrical cable.

* * * * *

专利名称(译)	无菌超声探头盖和从密封隔室中释放偶联剂的方法		
公开(公告)号	US20100234733A1	公开(公告)日	2010-09-16
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摘要(译)

用于超声探头和电缆的无菌盖管具有伸缩管，该伸缩管具有封闭端和开口端。伸缩管可伸展以覆盖超声探头和电缆。含有偶联剂的密封袋邻近伸缩管的封闭端设置。密封袋具有易碎的接缝或膜。在将盖管放置在探针和电缆上之前，可以将密封袋放置在探头上。在伸缩管已经在超声探头和电缆上延伸之后，通过压力使密封袋破裂以在超声探头上释放耦合剂。在密封袋破裂后，偶联剂覆盖探针头，厚度为0.2-6.0毫米，以提供无空气介质，以获得感兴趣的身体区域的精确图像。