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(54) **PROBE CABLE ACCOMMODATION APPARATUS AND ULTRASOUND DIAGNOSTIC SYSTEM**

(76) Inventors: **Akimasa Asai**, Tokyo (JP); **Kazuhiko Hayakawa**, Tokyo (JP)

Correspondence Address:
PATRICK W. RASCHE (20459)
ARMSTRONG TEASDALE LLP
ONE METROPOLITAN SQUARE, SUITE 2600
ST. LOUIS, MO 63102-2740 (US)

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(57) **ABSTRACT**

A probe cable accommodation apparatus includes a receptacle housing accommodating a plurality of probe cables. Each of the probe cables is connected at one end thereof to an ultrasound diagnostic system and has at an opposite end thereof an ultrasound probe. The interior of the receptacle housing is partitioned by a partition plate to form a plurality of receptacle chambers. The probe cables are accommodated in the receptacle chambers respectively.

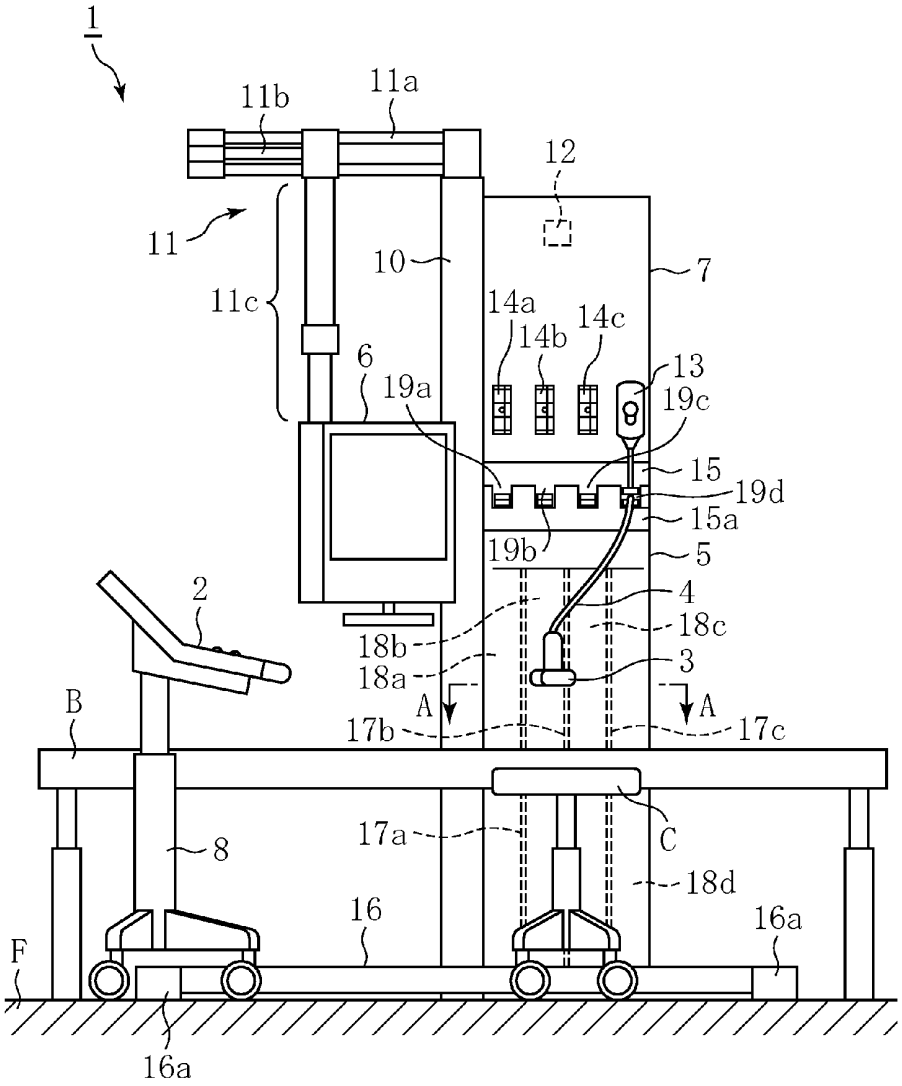
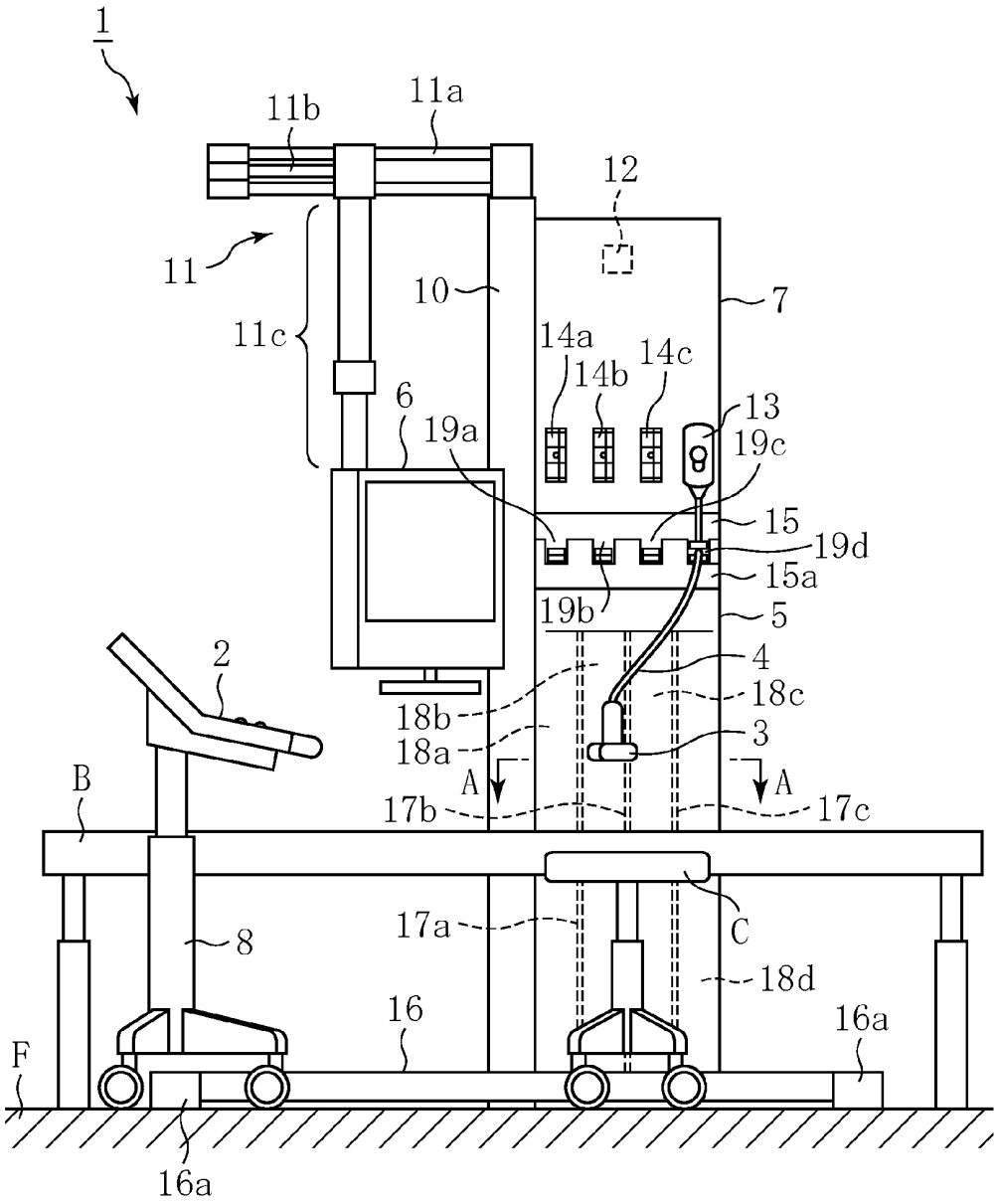


FIG. 1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11a
12
11
10
7
11c
14a
14b
14c
6
19a
13
19c
15
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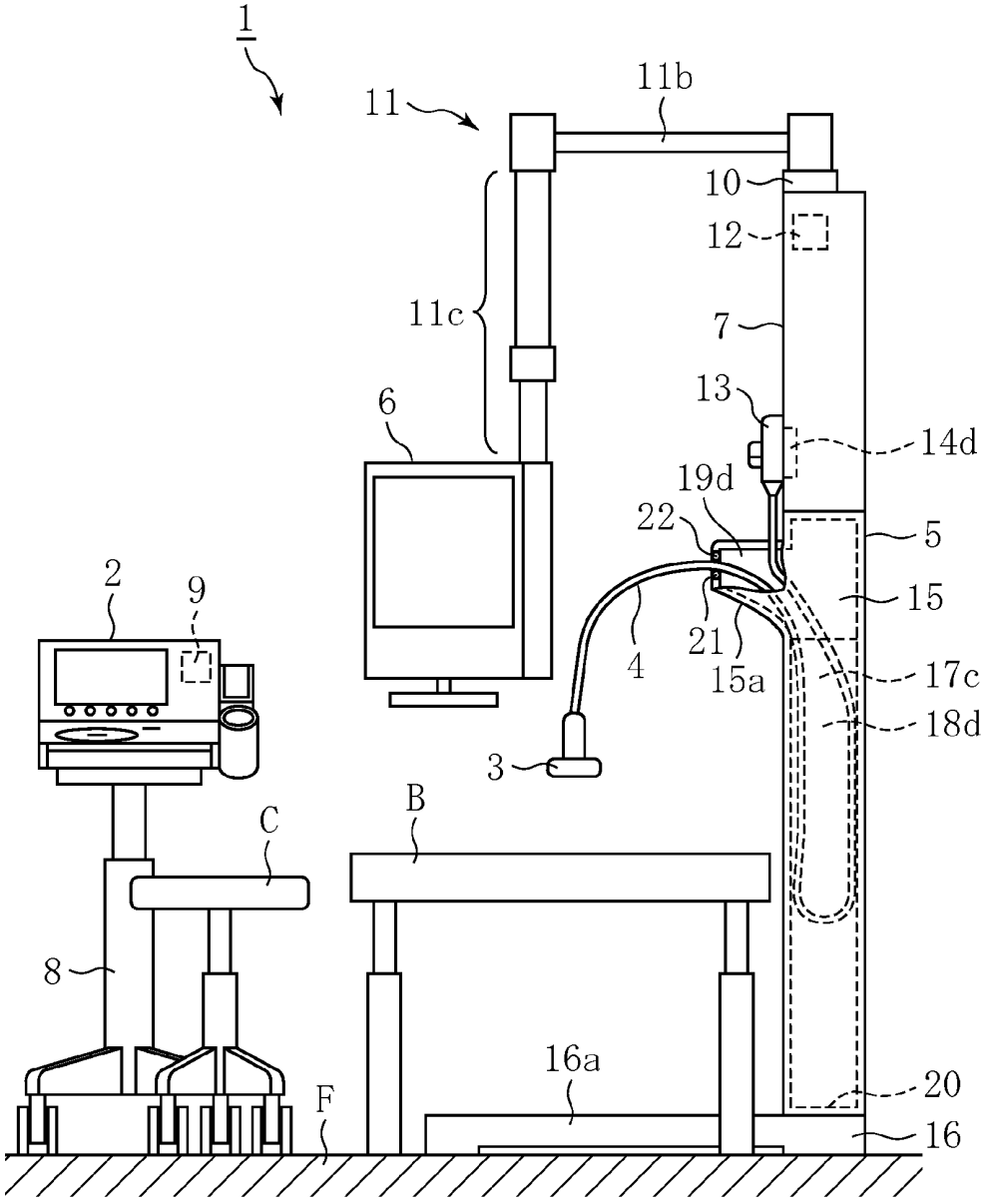
15a
19b
5
2
4
18c
18b
3
18a
A
A
B
17b
17c
C
17a
8
18d
16
16a
F
16a

FIG. 2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11
11b
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12
11c
7
6
13
14d
19d
22
5
2
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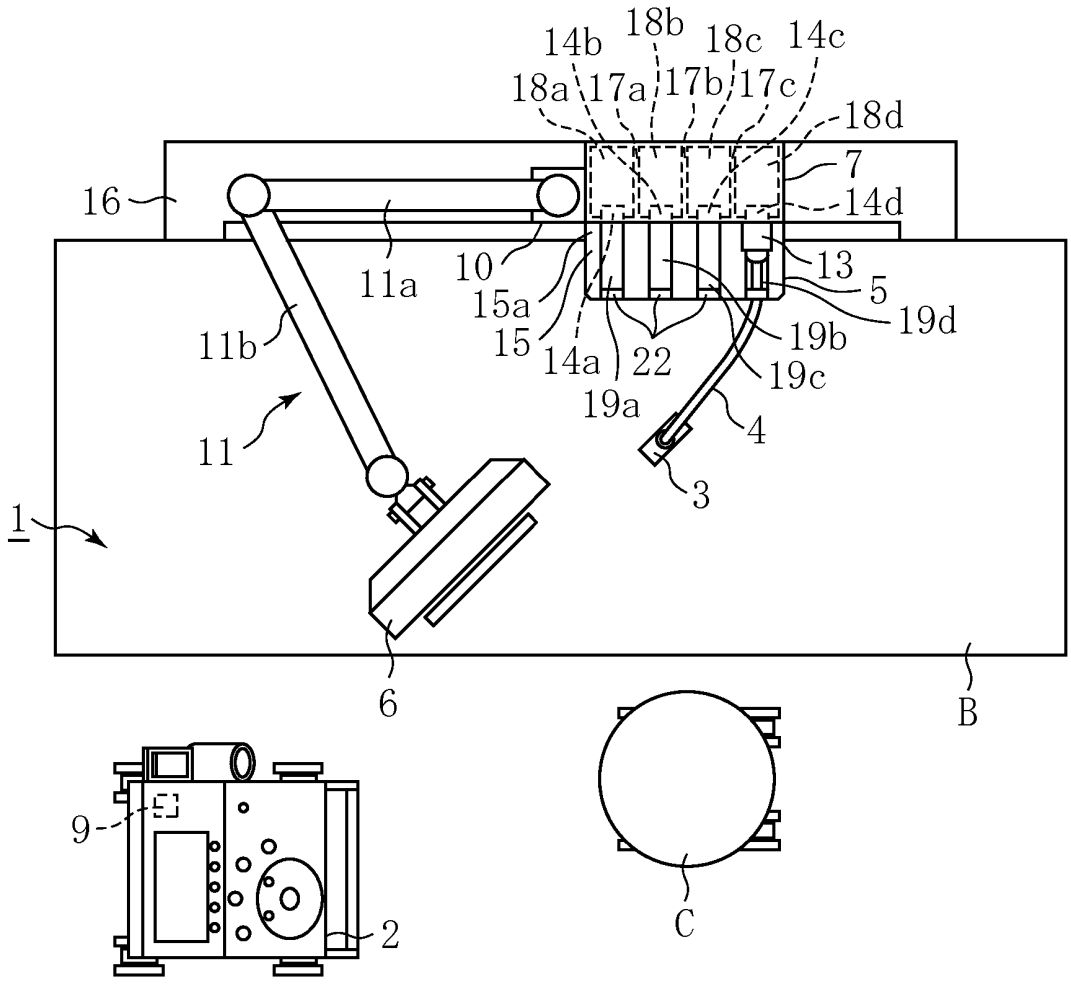
21
15a
17c
18d
3
B
C
8
16a
20
F
16

FIG. 3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14c
18a
17a
17b
17c
18d
7
16
14d
10
11a
13
5
15a
19d
15
14a
22
19b
19c
11b
19a
4
11
3
1
6
B
9
2
C

FIG. 4

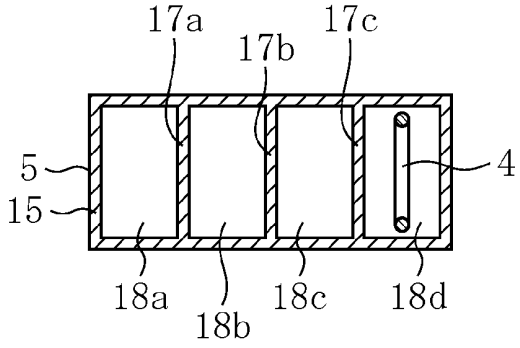
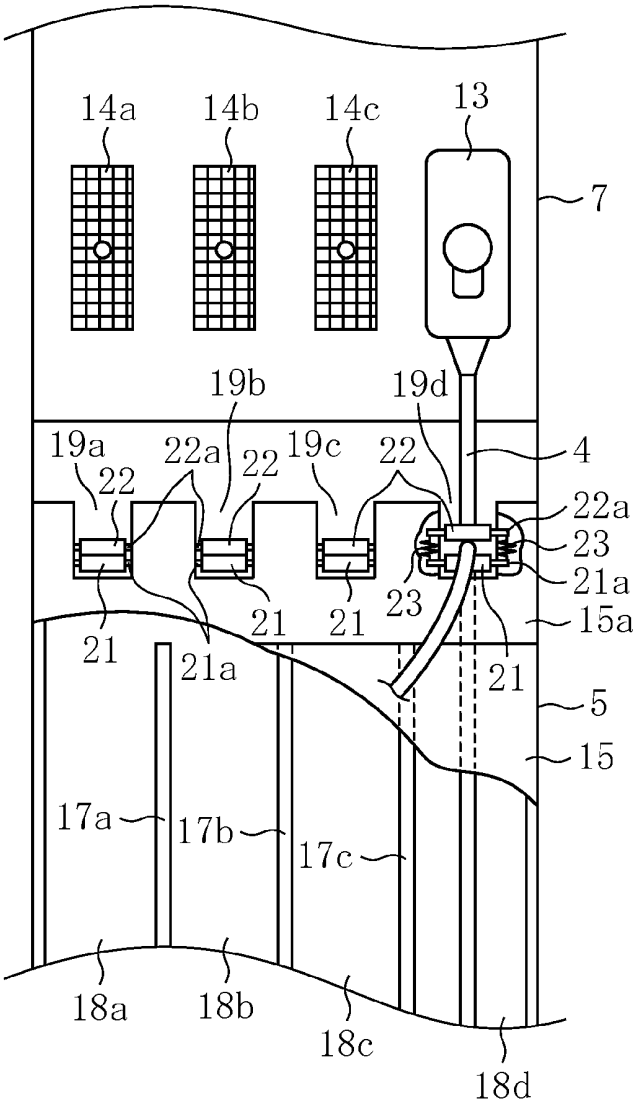

17a
17b
17c
5
15
4
18a
18b
18c
18d

FIG. 5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14b
14c
13
7
19b
19d
19a
22a
22
19c
22
4
22
22a
23
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21
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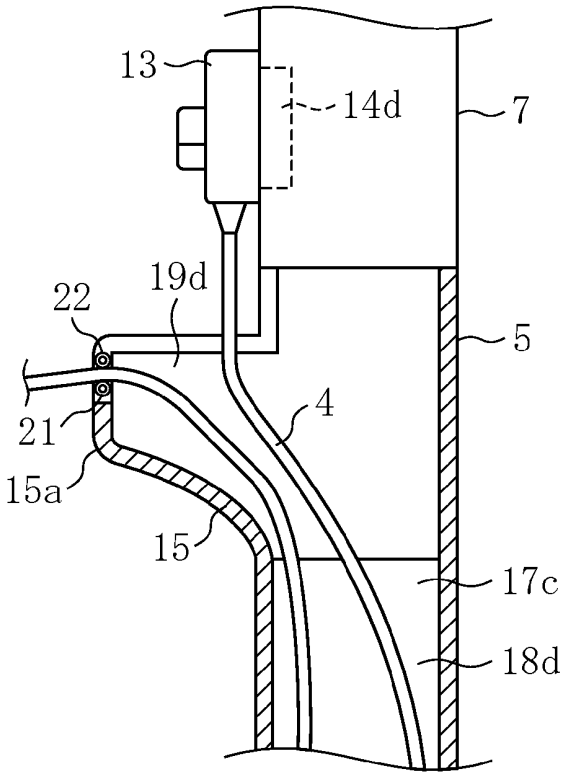
17b
17c
18a
18b
18c
18d

FIG. 6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14d
7
19d
22
5
4
21
15a
15
17c
18d

FIG. 7

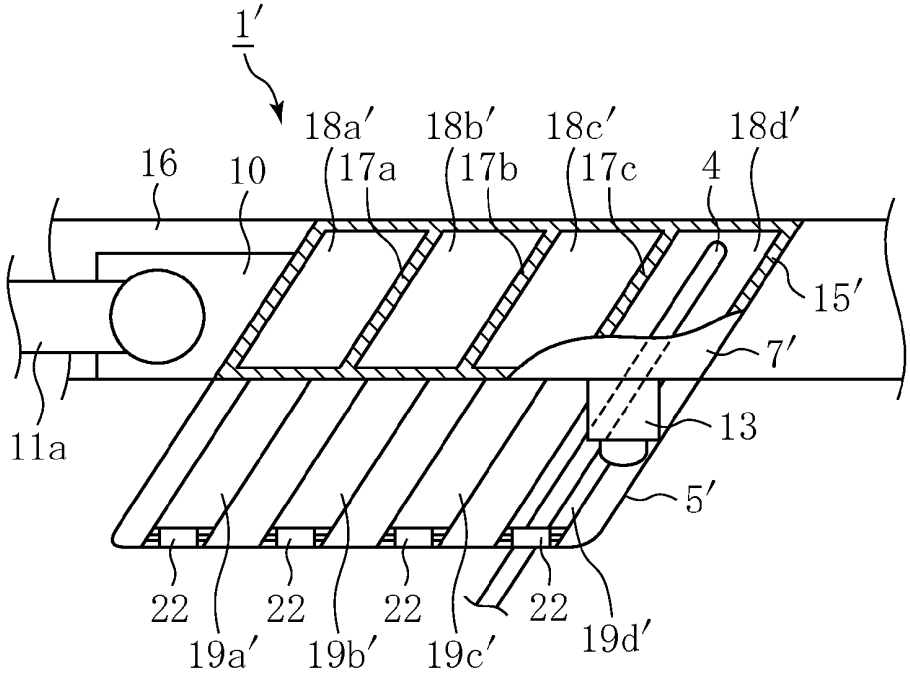
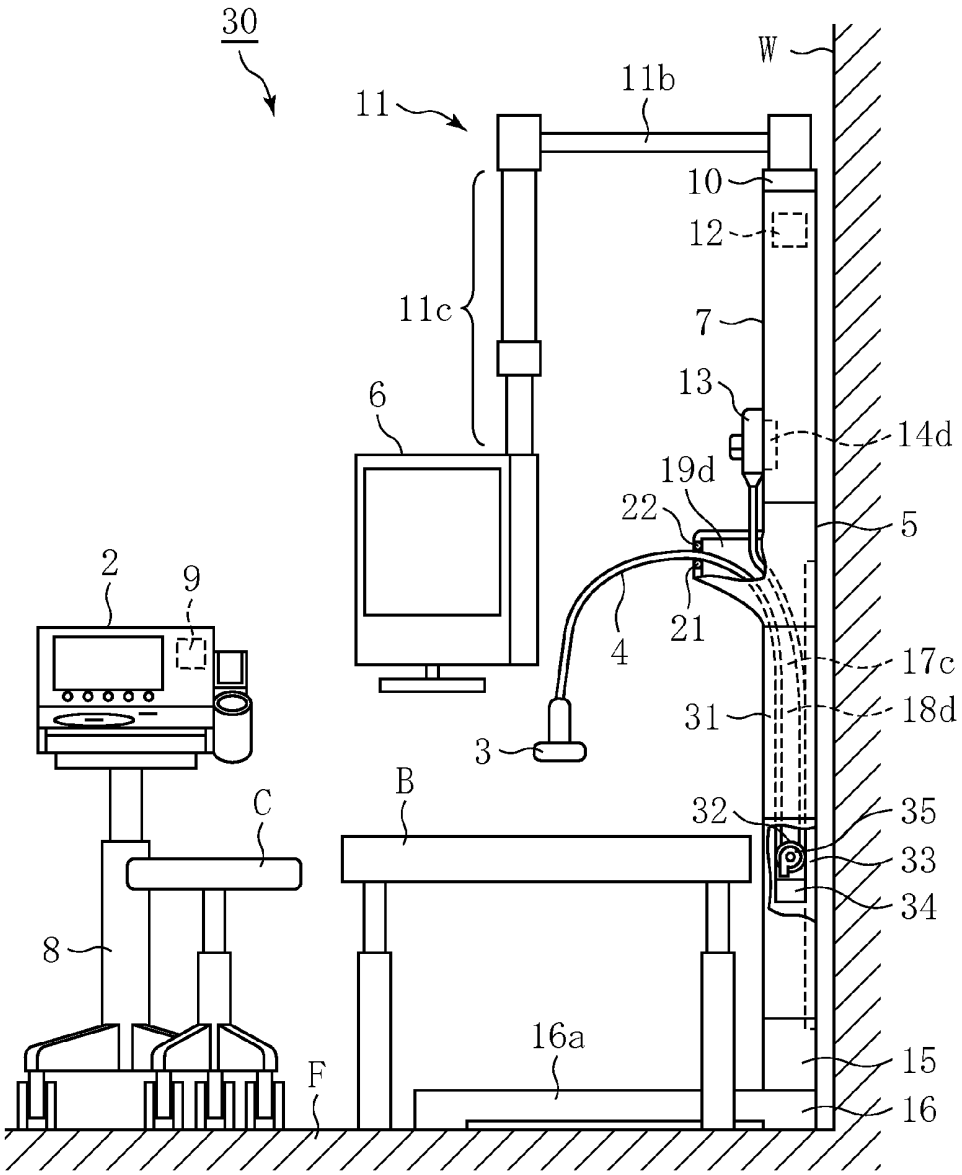

1′
18a′
18b′
18c′
18d′
16
10
17a
17b
17c
4
15′
7′
11a
13
5′
22
22
22
22
19a′
19b′
19c′
19d′

FIG. 8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W
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12
11c
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14d
19d
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5
2
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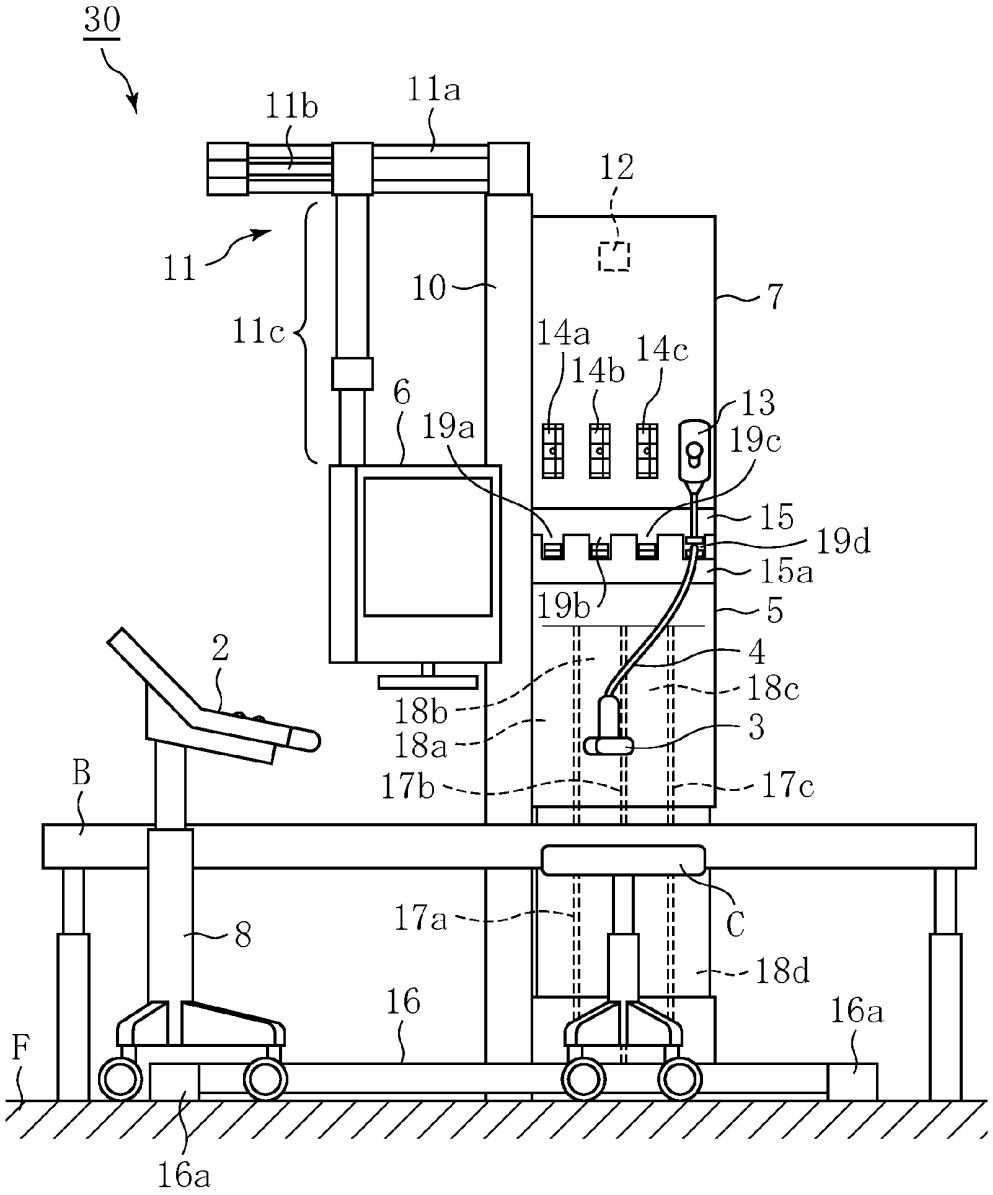
17c
31
18d
3
B
C
32
35
33
34
8
16a
15
F
16

FIG. 9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12
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10
7
11c
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14b
14c
6
19a
13
19c
15
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15a
19b
5
2
4
18c
18b
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B
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17c
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17a
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18d
16
16a
F
16a

FIG. 10

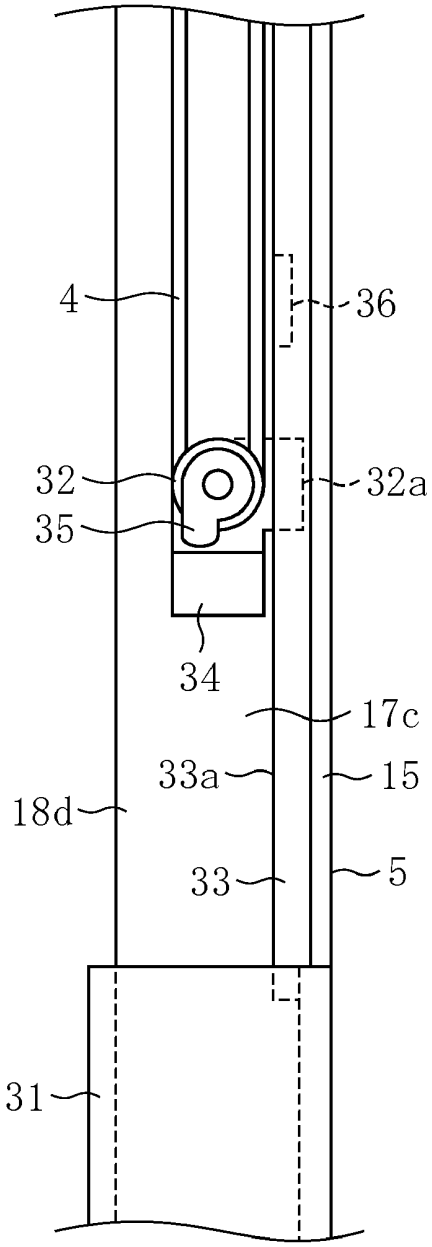


FIG. 11

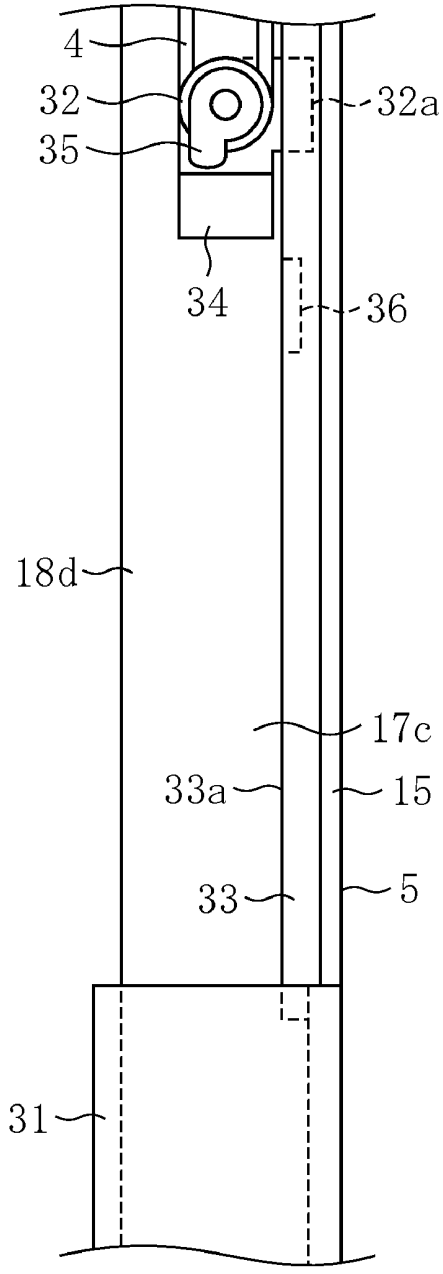


FIG. 12

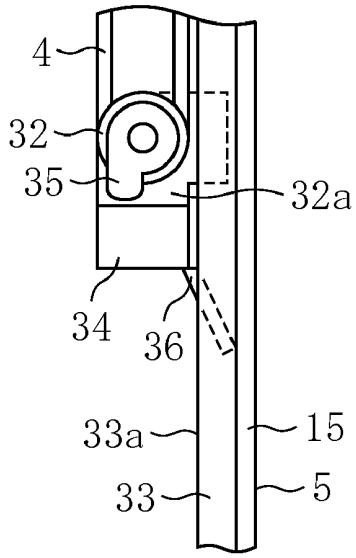


FIG. 13

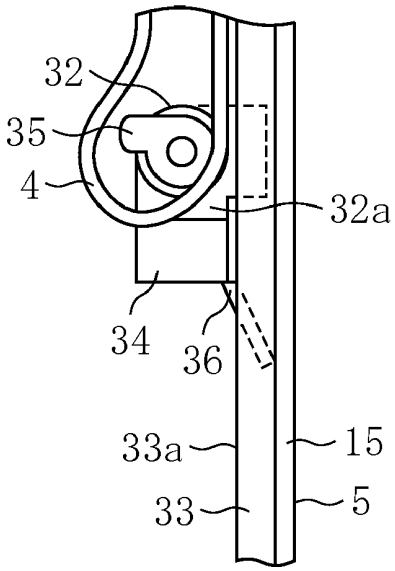
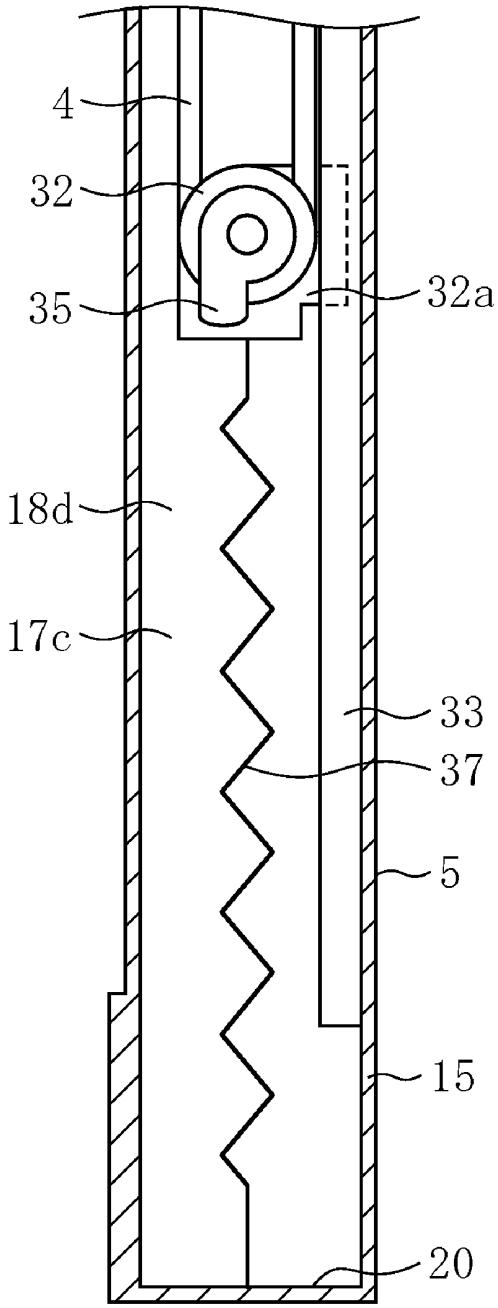


FIG. 14



PROBE CABLE ACCOMMODATION APPARATUS AND ULTRASOUND DIAGNOSTIC SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Japanese Patent Application No. 2008-316791 filed Dec. 12, 2008, which is hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] The embodiments described herein relate to a probe cable accommodation apparatus for accommodating probe cables, as well as an ultrasound diagnostic system.

[0003] An ultrasound diagnostic system that generates an ultrasound image on the basis of an echo signal obtained by transmitting an ultrasound wave to a subject is provided with an ultrasound probe for transmission and reception of an ultrasound wave, the probe being connected to the ultrasound diagnostic system through a probe cable (see, for example, Japanese Unexamined Patent Publication No. 2003-339708).

[0004] In the conventional ultrasound diagnostic system, the probe cable is disposed as it is in the exterior of the system and is therefore an obstacle when the ultrasound probe is not in use; besides, the whole of the ultrasound diagnostic system is bad to look at.

[0005] In this connection the applicant of the present application has made a study about a probe cable accommodation apparatus capable of accommodating the probe cable. As a result there occurred the following problem. In an ultrasound diagnostic system to which a plurality of ultrasound probes can be connected, plural probe cables are used, and when an attempt is made to accommodate those plural probe cables, the cables get entangled each other and the operator feels the cable accommodation operation troublesome.

BRIEF DESCRIPTION OF THE INVENTION

[0006] In a first aspect of the invention there is provided a probe cable accommodation apparatus including a receptacle housing accommodating a plurality of probe cables, the probe cables being each connected at one end thereof to an ultrasound diagnostic system and having at an opposite end thereof an ultrasound probe, the interior of the receptacle housing being partitioned by a partition plate to form a plurality of receptacle chambers, the probe cables being accommodated in the receptacle chambers respectively.

[0007] In a second aspect of the invention there is provided, in combination with the above first aspect, a probe cable accommodation apparatus wherein the receptacle housing has openings for the probe cables accommodated in the receptacle chambers to get in and out, and the probe cables are received in U shape from the openings into the receptacle chambers respectively.

[0008] In a third aspect of the invention there is provided, in combination with the above first or second aspect, a probe cable accommodation apparatus wherein rollers for abutment thereagainst of each of the probe cables are provided in each of the openings.

[0009] In a fourth aspect of the invention there is provided, in combination with the above third aspect, a probe cable accommodation apparatus further including as the rollers a first roller and a second roller both sandwiching the probe cable therebetween, the first and second rollers being rotatable as the probe cable gets in or out of the associated receptacle chamber and mutually pressing the probe cable to prevent the probe cable from getting and out of the receptacle chamber.

[0010] In a fifth aspect of the invention there is provided, in combination with any of the above first to third aspects, a probe cable accommodation apparatus wherein a cable stopper for preventing each of the probe cables from getting in and out of the associated receptacle chamber is provided in each of the openings.

[0011] In a sixth aspect of the invention there is provided, in combination with any of the above second to fifth aspects, a probe cable accommodation apparatus wherein the receptacle chambers are each formed in a tubular shape having a parallelogrammic or rhombic section.

[0012] In a seventh aspect of the invention there is provided, in combination with any of the above second to sixth aspects, a probe cable accommodation apparatus wherein the probe cables are received in U shape from the openings toward bottoms of the receptacle chambers respectively and a movable pulley is engaged on a lower end of each of the U-shaped probe cables.

[0013] In an eighth aspect of the invention there is provided, in combination with the above seventh aspect, a probe cable accommodation apparatus wherein the movable pulley is urged toward the bottom by a weight.

[0014] In a ninth aspect of the invention there is provided, in combination with the above seventh or eighth aspect, a probe cable accommodation apparatus wherein the movable pulley is held vertically movably by a rail.

[0015] In a tenth aspect of the invention there is provided, in combination with any of the above seventh to ninth aspects, a probe cable accommodation apparatus wherein the movable pulley is supported by an elastic member fixed to the bottom of the associated receptacle chamber.

[0016] In an eleventh aspect of the invention there is provided, in combination with the above tenth aspect, a probe cable accommodation apparatus wherein the elastic member is a spring.

[0017] In a twelfth aspect of the invention there is provided, in combination with any of the above second to sixth aspects, a probe cable accommodation apparatus wherein the probe cables are received in U shape from the openings toward bottoms of the receptacle chambers respectively, and a weight is engaged on a lower end of each of the U-shaped probe cables in a slidable state with respect to the probe cable.

[0018] In a thirteenth aspect of the invention there is provided an ultrasound diagnostic system including the probe cable accommodation apparatus described in any of the above first to twelfth aspects.

[0019] In a fourteenth aspect of the invention there is provided, in combination with the above thirteenth aspect, an ultrasound diagnostic system further including, in addition to the probe cable accommodation apparatus, an operating device for operator's input of instructions, an ultrasound probe for ultrasound wave transmission and reception, an image display device for display of an ultrasound image, and a processing device for making control to generate an ultrasound image on the basis of an echo signal obtained by activating the ultrasound probe and display the ultrasound image on the image display device, the operating device being separate from all of the probe cable accommodation apparatus, the image display device and the processing device and

disposed on the side opposite to the processing device with a subject-carrying table therebetween.

[0020] In a fifteenth aspect of the invention there is provided, in combination with the above fourteenth aspect, an ultrasound diagnostic system further including a mounting section for mounting the image display device and wherein the image display device is mounted to the mounting section through an arm having a movable portion for changing the position of the image display device.

[0021] According to the first aspect, since the interior of the receptacle housing for accommodating a plurality of the probe cables is partitioned by the partition plate to form plural receptacle chambers and the probe cables are accommodated in the receptacle chambers respectively, the plural probe cables can be accommodated without mutual entanglement.

[0022] According to the second aspect the probe cables accommodated in U shape within the receptacle chambers can be allowed to get in and out of the openings.

[0023] According to the third aspect, with the rollers, the probe cables can be allowed to get in and out of the receptacle chambers smoothly.

[0024] According to the fourth aspect, with the first and second rollers, not only the probe cables can be allowed to get in and out of the receptacle chambers smoothly, but also the probe cables can be prevented from going out of the openings or being drawn into the receptacle chambers against the operator's will.

[0025] According to the fifth aspect, with the cable stoppers, the probe cables can be prevented from going out of the openings or being drawn into the receptacle chambers against the operator's will.

[0026] According to the sixth aspect, since the probe cables are accommodated in U shape respectively into receptacle chambers formed in a tubular shape of a parallelogrammic or rhombic section, the probe cables can be accommodated in a state in which the radius of curvature of a lower end portion of each of the U-shaped probe cables is large, for example in comparison with a case where the receptacle chambers are formed in a tubular shape of a rectangular section. Therefore, as compared with the case where the receptacle chambers are each formed in a tubular shape of a rectangular section, the probe cables can be accommodated at a large radius of curvature and without forced bending, even if the thickness of the receptacle housing is made small. Thus, the receptacle housing can be made thin.

[0027] According to the seventh aspect, with the movable pulley engaged on the lower end of each of the probe cables, it is possible to restrict the radius of curvature of the lower end portion of each of the U-shaped probe cables accommodated in the receptacle chambers. Consequently, it is possible to thin the receptacle housing.

[0028] According to the eighth aspect, the weight permits the probe cables to be drawn into the receptacle chambers easily.

[0029] According to ninth aspect, since the movable pulley is held vertically movably by the rail, it is possible to stabilize the vertical movement of the movable pulley.

[0030] According to the tenth aspect, since the probe cables are each urged toward the bottom by the elastic member, they can be drawn into the receptacle chambers easily.

[0031] According to the eleventh aspect, the probe cables drawn out from the receptacle chambers can each be urged toward the bottom by the spring.

[0032] According to the twelfth aspect, since the probe cables are each urged toward the bottom by the weight, they can be drawn into the receptacle chambers easily.

[0033] According to the thirteenth aspect it is possible to obtain an ultrasound diagnostic system having the effects of the inventions in the first to twelfth aspects.

[0034] According to the fourteenth aspect, the operating device is disposed on the operator side with respect to the table, and the probe cable accommodation apparatus, the image display device and the processing device are disposed on the side opposite to the operating device with the table therebetween. Therefore, as compared with the conventional ultrasound diagnostic system in which the operating device, the image display device and the processing device are integral, the operator-side space becomes wider and it is possible to effectively utilize the space of the room where the ultrasound diagnostic system is installed.

[0035] According to the fifteenth aspect, since the image display device is mounted through the arm having the movable portion, the image display device can be disposed at a position where it can be seen easily by the operator.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] FIG. **1** is a front view showing a probe cable accommodation apparatus and an ultrasound diagnostic system according to an embodiment of the invention.

[0037] FIG. **2** is a partially cutaway right side view of the probe cable accommodation apparatus and the ultrasound diagnostic system both shown in FIG. **1**.

[0038] FIG. **3** is a plan view of the probe cable accommodation apparatus and the ultrasound diagnostic system both shown in FIG. **1**.

[0039] FIG. **4** is a sectional view taken on line A-A in FIG. **1**.

[0040] FIG. **5** is a partially cutaway, enlarged front view of openings and the vicinity thereof in the probe cable accommodation apparatus and the ultrasound diagnostic system both shown in FIG. **1**.

[0041] FIG. **6** is a partially cutaway, enlarged side view of an opening and the vicinity thereof in the probe cable accommodation apparatus and the ultrasound diagnostic system both shown in FIG. **1**.

[0042] FIG. **7** is a partially enlarged plan view of a probe cable accommodation apparatus in an ultrasound diagnostic system according to a modification of the first embodiment.

[0043] FIG. **8** is a partially cutaway side view of a probe cable accommodation apparatus and an ultrasound diagnostic system according to a second embodiment of the invention.

[0044] FIG. **9** is a front view of the probe cable accommodation apparatus and the ultrasound diagnostic system both shown in FIG. **8**.

[0045] FIG. **10** is an enlarged side view of a movable pulley and the vicinity thereof in an exposed state of the interior by downwardly sliding a cover attached to a receptacle housing of the probe cable accommodation apparatus according to the second embodiment.

[0046] FIG. **11** is an enlarged side view of a movable pulley lock and the vicinity thereof in a released state of the movable pulley lock.

[0047] FIG. **12** is an enlarged side view of the movable pulley lock and the vicinity thereof in an operating state of the movable pulley lock.

[0048] FIG. **13** is an enlarged side view of the movable pulley and the vicinity thereof in a released state of the cable lock.

[0049] FIG. **14** is a partially enlarged sectional view of a cable accommodation apparatus according to a modification of the second embodiment.

DETAILED DESCRIPTION OF THE INVENTION

[0050] Embodiments of the invention will be described below in detail with reference to the drawings.

First Embodiment

[0051] A first embodiment of the invention will first be described. FIG. **1** is a front view showing a probe cable accommodation apparatus and an ultrasound diagnostic system according to a first embodiment of the invention, FIG. **2** is a partially cutaway right side view of the probe cable accommodation apparatus and the ultrasound diagnostic system both shown in FIG. **1**, FIG. **3** is a plan view of the probe cable accommodation apparatus and the ultrasound diagnostic system both shown in FIG. **1**, FIG. **4** is a sectional view taken on ling A-A in FIG. **1**, FIG. **5** is a partially cutaway, enlarged front view of openings and the vicinity thereof in the probe cable accommodation apparatus and the ultrasound diagnostic system both shown in FIG. **1**, and FIG. **6** is a partially cutaway, enlarged side view of an opening and the vicinity thereof in the probe cable accommodation apparatus and the ultrasound diagnostic system both shown in FIG. **1**.

[0052] An ultrasound diagnostic system **1** includes an operating device **2** for operator's input of instructions, an ultrasound probe **3** for ultrasound wave transmission and reception, a probe cable accommodation apparatus **5** for accommodating a probe cable **4** of the probe **3**, an image display device **6** for display of an ultrasound image, and a processing device **7** for making control to generate an ultrasound image on the basis of an echo signal obtained by activating the ultrasound probe **3** in accordance with an instruction of the operator and display the ultrasound image on the image display device **6**.

[0053] The operating device **2** is separate from all of the probe cable accommodation apparatus **5**, the image display device **6** and the processing device **7** and is installed on a carrier **8** with caster so that the position thereof can be changed freely. With respect to a bed B on which a subject lies down, the operating device **2** is positioned on the side where a chair C for the operator is placed. The bed B is an example of the table defined in the invention. The operating device **2** has an operating device-side radio communication section **9** for radio communication with the processing device **7**. When the operator inputs an instruction through the operating device **2**, that instruction signal is transmitted to the processing device **7** by the operating device-side radio communication section **9**.

[0054] The image display device **6** is mounted through an arm **11** to a support post **10** that is fixed to side faces of both probe cable accommodation apparatus **5** and processing device **7**. The support post **10** is an example of the mounting section defined in the invention. Though not shown, the image display device **6** may be mounted to the processing device **7** through an arm. Or, though not shown, the image display device **6** may be mounted through an arm to the ceiling or wall of the room in which the ultrasound diagnostic system is installed.

[0055] The arm **11** is made up of a first horizontal arm **11***a* extending from the support post **10**, a second horizontal arm **11***b* extending horizontally from the first arm **11***a*, and a vertical arm **11***c* extending perpendicularly from the second horizontal arm **11***b*. A cable (not shown) is disposed within the arm **11** and data of the ultrasound image generated in the processing unit **7** are inputted to the image display device **6** through the cable.

[0056] The first horizontal arm **11***a* is adapted to rotate horizontally at the connection thereof with the support post **10**. The second horizontal arm **11***b* is adapted to rotate horizontally at the connection thereof with the first horizontal arm **11***a*. Further, the vertical arm **11***c*, whose length is variable, is adapted to rotate horizontally at the connection thereof with the second horizontal arm **11***b*. Since the arm **11** has such movable portions, the image display device **6** can be moved according to the attitude of an inspector to a position where it is easy to see, thus permitting the inspector to make inspection at a natural attitude.

[0057] The image display device **6** is adapted to rotate vertically at the connection thereof with the vertical arm **11***c*, thus making it possible to adjust the screen angle.

[0058] The processing device **7** has a processing device-side radio communication section **12** for radio communication with the operating device **2**. Moreover, the processing device **7** has probe connectors **14***a*, **14***b*, **14***c* and **14***d* for connection thereto of a connector **13** of the probe cable **4** which connects the ultrasound probe **3** and the processing device **7** with each other. In this embodiment, the connector **13** is connected to only the probe connector **14***d*.

[0059] The processing device **7** and the cable accommodation apparatus **5** are integral with each other and are disposed on the side opposite to the operating device **2** side with respect to the bed B. The probe cable accommodation apparatus **5** includes a receptacle housing **15** for accommodating the probe cable **4**. The receptacle housing **15** is mounted on a base **16** that is installed on a floor surface F. The base **16** is provided at both ends thereof with a pair of tipping preventing legs **16***a* and is U-shaped in plan. With the tipping preventing legs **16***a*, it is possible to prevent tipping of the cable accommodation apparatus **5**, as well as the image display device **6** and the processing device **7** which are integral with the cable accommodation apparatus **5**. The base **16** may be fixed to the floor surface F with anchor bolts or the like though not specially shown.

[0060] The receptacle housing **15** has an upper projecting portion **15***a* and is formed in an inverted L shape in side view. The interior of the receptacle housing **15** is partitioned with three partition plates **17***a*, **17***b* and **17***c* into four receptacle chambers **18***a*, **18***b*, **18***c* and **18***d*. The receptacle chambers **18***a*-**18***d* are each formed in a tubular shape of a rectangular section to accommodate probe cables **4** respectively. Thus, the receptacle housing **15** can accommodate a total of four probe cables. In the illustrated example there is shown one probe cable **4** accommodated in only the receptacle chamber **18***d*.

[0061] Four openings **19***a*, **19***b*, **19***c* and **19***d* are formed in the projecting portion **15***a* of the cable receptacle housing **15**. Probe cables get in and out of the receptacle chambers **18***a*-**18***d* through the openings **19***a*-**19***d*. The openings **19***a*-**19***d* are positioned at a height of approximately 120.0 centimeters (cM) or more from the floor surface F. With the openings **19***a*-**19***d* formed at such a position of approximately 120.0 cm or more in height from the floor surface F, probe cables **4** get

in or out of the receptacle chambers from a position sufficiently higher than the patient lying down on the bed B. Thus, it is possible to prevent probe cables **4** from giving an unpleasant feeling to the patient.

[0062] The probe connectors **14***a*-**14***d* are positioned higher than the openings **19***a*-**19***d* and probe cables **4** connected to the probe connectors **14***a*-**14***d* are accommodated in the receptacle chambers **18***a*-**18***d* through the openings **19***a*-**19***d* respectively. More specifically, probe cables **4** (the illustrated probe cable **4**) are accommodated in U shape from the openings **19***a*-**19***d* toward a bottom **20** of the receptacle housing **15** (the bottom of the receptacle chamber **18***d*).

[0063] A first roller **21** and a second roller **22** are provided in each of the openings **19***a*-**19***d* so as to sandwich the illustrated probe cable **4** in between the rollers. The first and second rollers **21**, **22** are provided in a number corresponding to the number of probe cables capable of being accommodated in the probe cable accommodation apparatus **5**. In this embodiment there are provided four pairs of first rollers **21** and second rollers **22**.

[0064] A further description will now be given about the first and second rollers **21**, **22**. The first and second rollers **21**, **22** are adapted to rotate as probe cables **4** get in or out of the receptacle chambers **18***a*-**18***d*, whereby probe cables **4** can get in and out of the receptacle chambers **18***a*-**18***d* smoothly. As shown in FIG. **5**, shafts **21***a* and **22***a* of the first and second rollers **21** are connected together by tension springs **23** (only the first and second rollers **21**, **22** disposed in the opening **19***d* are shown). Consequently, the first and second rollers **21**, **22** mutually urge the probe cable **4** sandwiched in between the rollers to prevent the probe cable from getting in or out with respect to the receptacle chambers **18***a*-**18***d*. Thus, with the first and second rollers **21**, **22**, probe cables **4** can be prevented from getting out of the openings **19***a*-**19***d* or being drawn into the receptacle chambers **18***a*-**18***d* against the operator's will. The first and second rollers **21**, **22** are an example of the rollers and cable stopper defined in the invention. However, the rollers and cable stopper defined in the invention are not limited to the above construction. For example, slits capable of grippingly holding probe cables **4** in an elastically deformed state may be formed in the openings **19***a*-**19***d* to constitute cable stoppers.

[0065] Each of the second rollers **22** is movable vertically, and when the pressure imposed on the illustrated probe cable **4** by the associated first and second rollers **21**, **22** is relieved by moving the associated second roller **22** vertically against the resilience of the tension spring **23**, it becomes possible to let the probe cable **4** get in or out of the receptacle chamber **18***d* smoothly. However, a modification may be made such that the pressure imposed on the probe cable **4** by the first and second rollers **21**, **22** is relieved by moving not the second roller **22** but the first roller **21** downward. Further, for relieving the pressure on the probe cable **4** by the first roller **21** or the second roller **22**, there may be used a button connected to the first or the second roller mechanically to move the roller or there may be used a motor for moving the first or the second roller.

[0066] In the cutaway portion of FIG. **5**, as to the structure for mounting the shafts **21***a* and **22***a* and as to the structure for mounting the tension springs **23** to the shafts **21***a* and **22***a*, though the details are not shown, the shafts **21***a* and **22***a* are mounted in a rotatable state and the tension springs **23** are mounted to the shafts **21***a* and **22***a* so as to permit rotation of those shafts.

[0067] According to the first embodiment described above, since probe cables **4** are accommodated in the receptacle chambers **18***a*-**18***d* respectively, it is possible to accommodate plural probe cables without mutual entanglement.

[0068] According to the above embodiment, moreover, the operating device **2** is separate from all of the probe cable accommodation apparatus **5**, the image display device **6** and the processing device **7**, and the probe cable accommodation apparatus **5**, the image display device **6** and the processing device **7** are disposed on the side opposite to the operating device **2** with the bed B therebetween. With such a construction, the operator-side space becomes wider than in the prior art and it is possible to effectively utilize the space of the room where the ultrasound diagnostic system **1** is installed, as compared with the conventional ultrasound diagnostic system wherein the operating device, image display device and processing device are integral with one another.

[0069] Moreover, since the image display device **6** is supported by the arm **11** extending from the support post **10**, the operator-side space with respect to the bed B is not occupied by a supporting structure for the image display device **6**. Further, with the arm **11**, the image display device **6** can be moved to a position where the operator is easy to see the display device, so that the operator can see the image display device **6** at an easy attitude at the time of inspection or the like.

[0070] Next, a modification of the first embodiment will be described below with reference to FIG. **7**. FIG. **7** is a partially enlarged plan view of a probe cable accommodation apparatus and the vicinity thereof in an ultrasound diagnostic system according to a modification of the first embodiment.

[0071] In a probe cable accommodation apparatus **5'** in an ultrasound diagnostic system **1'** according to this modification, a receptacle housing **15'** is formed in the shape of a parallelogram in plan and receptacle chambers **18***a'*, **18***b'*, **18***c'* and **18***d'* are each formed in a tubular shape having a parallelogrammic section. A processing device **7'**, which is integral with the probe cable accommodation apparatus **5'** is also formed in the shape of a parallelogram in plan. Further, openings **19***a'*, **19***b'*, **19***c'* and **19***d'* are also formed in a parallelogrammic shape in plan. However, the receptacle chambers **18***a'*-**18***d'* may be rhombic in section and in this case the receptacle housing **15'**, the processing device **7'** and the openings **19***a'*-**19***d'* may also be formed in a rhombic shape in section.

[0072] According to this modification, by accommodating probe cables **4** in U shape into the receptacle chambers **18***a'*-**18***d'* of a parallelogrammic section, the probe cables can each be accommodated in a state in which the radius of curvature of the cable lower end portion is larger than in the case of accommodating probe cables in the receptacle chambers **18***a*-**18***d* of a rectangular section. The probe cables **4**, with the rigidity thereof, have a certain extent when accommodated in U shape. Therefore, the thinner the receptacle housing **15**, the more forcibly are bent the probe cables **4** and urged against the inner wall surfaces of the receptacle chambers **18***a*-**18***d*. According to this modification, however, even if the receptacle housing **15'** is made thin, the probe cables **4** can be accommodated at a large radius of curvature without being bent forcibly, as compared with the receptacle housing **15** having the receptacle chambers **18***a*-**18***d* of a rectangular section. Consequently, the probe cables **4** can be allowed to get in and out smoothly without being caught on the inner wall surfaces of the receptacle chambers **18***a*-**18***d*. Thus, according to this modification, the receptacle housing **15'** can be made thin without impairing the smooth getting-in and -out motion of the probe cables **4** and hence the space of the installed room of the ultrasound diagnostic system **1** can be utilized more effectively.

Second Embodiment

[0073] A second embodiment of the invention will be described below with reference to FIGS. **8** to **13**. FIG. **8** is a partially cutaway side view showing a probe cable accommodation apparatus and an ultrasound diagnostic system according to a second embodiment of the invention, FIG. **9** is a front view of the probe cable accommodation apparatus and the ultrasound diagnostic system both shown in FIG. **8**, FIG. **10** is an enlarged side view of a movable pulley and the vicinity thereof in an exposed state of the interior by downwardly sliding a cover attached to a receptacle housing of the probe cable accommodation apparatus according to the second embodiment, FIG. **11** is an enlarged side view of a movable pulley lock and the vicinity thereof in a released state of the movable pulley lock, FIG. **12** is an enlarged side view of the movable pulley lock and the vicinity thereof in an operating state of the movable pulley lock, and FIG. **13** is an enlarged side view of the movable pulley and the vicinity thereof in a released state of a cable lock.

[0074] The ultrasound diagnostic system **30** according to this second embodiment is the same in basic construction as the ultrasound diagnostic system **1** of the first embodiment, provided a vertically slidable cover **31** is provided on the receptacle housing **15** of the probe cable accommodation apparatus **5**. The partition plates **17***a*-**17***c* are in a separated state from the cover **31** so as to permit sliding of the cover **31**. The receptacle chambers **18***a*-**18***d* are partially exposed by sliding the cover **31**.

[0075] Movable pulleys **32** are engaged respectively on lower ends of U-shaped probe cables **4** accommodated in the receptacle chambers **18***a*-**18***d* of the probe cable accommodation apparatus **5**. The movable pulleys **32** are held by rails **33** respectively so as to be vertically movable through holders **32***a*, the rails **33** being fixed vertically to a rear surface of the receptacle housing **15** within the receptacle chambers **18***a*-**18***d*. The movable pulleys **32** move vertically in a stable manner because they are held by the rails **33**.

[0076] With weights **34**, the movable pulleys **32** are urged toward the bottom **20** (downward). The weights **34** act as a force for drawing probe cables **4** smoothly into the receptacle chambers **18***a*-**18***d*. How heavy the weights **34** should be is set at a value which makes it possible to prevent the probe cables **4** from getting in and out of the receptacle chambers under the pressure imposed thereon by the first and second rollers **21**, **22**.

[0077] Further, a cable lock **35** is installed in each movable pulley **32**. The cable lock **35** is constructed of a rotatable lever-like member. With the cable lock **35**, each probe cable **4** is prevented from being disengaged from the movable pulley **32**, whereby both stability and reliability are improved.

[0078] A movable pulley lock **36** is attached to each rail **32**. The movable pulley lock **36** is a seesaw-like member adapted to move like a seesaw and thereby change the attitude. The movable pulley lock **36** is disposed at a position where it can be exposed when the cover **31** is slid downward. With the movable pulley lock **36**, as will be described later, the movable pulley **32** with probe cable **4** disengaged therefrom can be allowed to stop at a predetermined position and thus it becomes easier to carry out the probe cable engaging and disengaging work for the movable pulley **32**.

[0079] FIGS. **11** to **13** shows in what procedure the illustrated probe cable **4** is to be disengaged from the movable pulley **32**. For disengaging the cable **4** from the movable pulley **32**, first the cover **31** is slid downward, then in a partially exposed state of the receptacle chambers **18***a*-**18***d*, the probe cable **4** is drawn out and the movable pulley **32** is raised to a position higher than the movable pulley lock **36**, as shown in FIG. **11**.

[0080] Next, as shown in FIG. **12**, the movable pulley lock **36** is moved like a seesaw, allowing it to project beyond an upper surface **33***a* of the rail **33**, and the movable pulley **32** is lowered and put on the movable pulley lock **36**. Then, as shown in FIG. **13**, the cable lock **35** is turned up and the probe cable **4** is disengaged from the movable pulley **32**.

[0081] The procedure for engaging the movable pulley **32** on the probe cable **4** is reverse to the procedure for disengaging the probe cable **4** from the movable pulley **32**.

[0082] According to this second embodiment described above, the radius of curvature of each of U-shaped probe cables accommodated in the receptacle chambers **18***a*-**18***d* can be restricted by the movable pulleys **32**. Consequently, as compared with the case where the movable pulleys **32** are not used, even if the receptacle chambers **18***a*-**18***d* become narrower as a result of thinning the receptacle housing **15**, probe cables **4** can be allowed to get in and out of the receptacle chambers **18***a*-**18***d* smoothly without being caught on the inner wall surfaces of the receptacle chambers. Thus, it is possible to thin the receptacle housing **15** without impairing the smoothness in ingress and egress of the probe cables **4**, so that when the probe cable accommodation apparatus **5** and the processing apparatus **7** are disposed near a wall W, it is possible to narrow the gap between the bed B and the wall W. As a result, the space on the operating device **2** side becomes wider and hence the space of the room where the ultrasound diagnostic system **1** is installed can be utilized more effectively.

[0083] A modification of the second embodiment will be described below. FIG. **14** is a partially enlarged sectional view of a cable accommodation apparatus according to a modification of the second embodiment, provided the base **16** is not shown therein.

[0084] In this modification of the second embodiment the interior construction of the receptacle chambers **18***a*-**18***d* is different from that in the first embodiment. The movable pulleys **32** disposed within the receptacle chambers **18***a*-**18***d* (only the receptacle chamber **18***d* is shown in FIG. **14**) are held by the rails **33** and are supported by springs **37** fixed to the bottom **20**. The springs **37** are secured to the holders **32***a*. In this modification the weights **34** are not provided, but instead the springs **37** are provided. With the springs **37**, the movable pulleys **32** are urged toward the bottom **20** (downward), whereby the illustrated probe cable **4** can be smoothly drawn into the receptacle chamber **18***d*. The springs **37** are an example of the elastic member defined in the invention.

[0085] The resilience of each of the springs **37** is set to the extent that the ingress and egress of the associated probe cable **4** can be stopped with the pressure imposed thereon by the first and second rollers **21**, **22**.

[0086] Although the invention has been described above by way of embodiments thereof, it goes without saying that various changes may be made within the scope not altering the gist of the invention. For example, though not specially shown, a weight, in place of the movable pulley **32**, may be engaged on the lower end of the U-shaped probe cable accommodated in each of the receptacle chambers. With this weight, the probe cable is urged downward and hence can be drawn into the receptacle chamber easily.

[0087] In the case where friction induced by contact between the inner surfaces of the receptacle chambers **18***a*-**18***d* or **18***a*'-**18***d*' (shown in FIG. **7**) and the probe cables **4** at the time of ingress or egress of the cables poses a problem, the inner surfaces of the receptacle chambers **18***a*-**18***d* or **18***a*'-**18***d*' may be coated so as to diminish the frictional force or a less frictional material may be used as the material of the receptacle housing **15** and that of the partition plates **17***a*-**17***c*.

[0088] Many widely different embodiments of the invention may be configured without departing from the spirit and the scope of the present invention. It should be understood that the present invention is not limited to the specific embodiments described in the specification, except as defined in the appended claims.

1. A probe cable accommodation apparatus comprising a receptacle housing sized to house a plurality of probe cables, the plurality of probe cables each connected at a first end to an ultrasound diagnostic system and at a second end to an ultrasound probe, an interior of the receptacle housing partitioned by a partition plate to form a plurality of receptacle chambers, the probe cables each positioned within a respective receptacle chamber of the plurality of receptacle chambers.

2. The probe cable accommodation apparatus according to claim **1**, wherein the receptacle housing includes a plurality of openings that enable the plurality of probe cables to selectively be inserted into and removed from the receptacle chambers such that each probe cable is received in U shape through a respective opening of the plurality of openings into the respective receptacle chamber of the plurality of receptacle chambers.

3. The probe cable accommodation apparatus according to claim **1**, further comprising a plurality of rollers each positioned in a respective opening of a plurality of openings for abutment against each of the plurality of probe cables.

4. The probe cable accommodation apparatus according to claim **2**, further comprising a plurality of rollers each positioned in a respective opening of the plurality of openings for abutment against each of the plurality of probe cables.

5. The probe cable accommodation apparatus according to claim **3**, wherein the plurality of rollers comprises a first roller and a second roller positioned on either side of a respective probe cable, the first and second rollers being rotatable as the probe cable is selectively inserted into and removed from a respective receptacle chamber, the first and second rollers mutually pressing the probe cable.

6. The probe cable accommodation apparatus according to claim **4**, wherein the plurality of rollers comprises a first roller and a second roller positioned on either side of a respective probe cable, the first and second rollers being rotatable as the probe cable is selectively inserted into and removed from a respective receptacle chamber, the first and second rollers mutually pressing the probe cable.

7. The probe cable accommodation apparatus according to claim **1**, further comprising a cable stopper positioned in each of a plurality of openings to prevent each of the probe cables from being selectively inserted into and removed from the respective receptacle chamber.

8. The probe cable accommodation apparatus according to claim **2**, wherein each of the plurality of receptacle chambers is formed in a tubular shape having a parallelogrammic or rhombic section.

9. The probe cable accommodation apparatus according to claim **3**, wherein each of the plurality of receptacle chambers is formed in a tubular shape having a parallelogrammic or rhombic section.

10. The probe cable accommodation apparatus according to claim **4**, wherein each of the plurality of receptacle chambers is formed in a tubular shape having a parallelogrammic or rhombic section.

11. The probe cable accommodation apparatus according to claim **5**, wherein each of the plurality of receptacle chambers is formed in a tubular shape having a parallelogrammic or rhombic section.

12. The probe cable accommodation apparatus according to claim **2**, wherein each of the plurality of probe cables is received in U shape through a respective opening toward a bottom of the respective receptacle chamber, said probe cable accommodation apparatus further comprising a movable pulley coupled to a lower end of each of the U-shaped probe cables.

13. The probe cable accommodation apparatus according to claim **12**, wherein the movable pulley is urged toward the bottom by a weight.

14. The probe cable accommodation apparatus according to claim **12**, wherein the movable pulley is held vertically movably by a rail.

15. The probe cable accommodation apparatus according to claim **12**, wherein the movable pulley is supported by an elastic member fixed to the bottom of the associated receptacle chamber.

16. The probe cable accommodation apparatus according to claim **15**, wherein the elastic member is a spring.

17. The probe cable accommodation apparatus according to claim **2**, wherein each of the plurality of probe cables is received in U shape through a respective opening toward a bottom of the respective receptacle chamber, said probe cable accommodation apparatus further comprising a weight coupled to a lower end of each of the U-shaped probe cables in a slidable state with respect to the probe cable.

18. An ultrasound diagnostic system comprising:

at least one ultrasound probe;

a plurality of probe cables, one of the plurality of probe cables coupled to the at least one ultrasound probe; and

probe cable accommodation apparatus comprising a receptacle housing sized to house a plurality of probe cables, the plurality of probe cables each connected at a first end to an ultrasound diagnostic system and at a second end to an ultrasound probe, an interior of the receptacle housing partitioned by a partition plate to form a plurality of receptacle chambers, the probe cables each positioned within a respective receptacle chamber of the plurality of receptacle chambers.

19. The ultrasound diagnostic system according to claim **18**, further comprising:

an operating device configured to receive input of instructions;

an image display device configured to display of an ultrasound image; and

a processing device configured to generate the ultrasound image based on an echo signal obtained by activating the at least one ultrasound probe and to control display of the ultrasound image on the image display device, the operating device being separate from the probe cable accommodation apparatus, the image display device and the processing device and disposed on a side opposite to the processing device with a subject-carrying table positioned therebetween.

20. The ultrasound diagnostic system according to claim **19**, further comprising a mounting section for mounting the image display device, and wherein the image display device is mounted to the mounting section through an arm having a movable portion for changing the position of the image display device.

* * * * *

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申请(专利权)人(译)	ASAI AKIMASA 早川和彦		
当前申请(专利权)人(译)	ASAI AKIMASA 早川和彦		
[标]发明人	ASAI AKIMASA HAYAKAWA KAZUHIKO		
发明人	ASAI, AKIMASA HAYAKAWA, KAZUHIKO		
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摘要(译)

探针电缆容纳装置包括容纳多个探针电缆的插座壳体。每个探针电缆在其一端连接到超声诊断系统，并且在其相对端具有超声探头。插座壳体的内部由隔板分隔以形成多个插座腔室。探针电缆分别容纳在插座室中。