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(54) **ULTRASONIC DIAGNOSTIC APPARATUS AND ULTRASONIC DIAGNOSTIC APPARATUS SYSTEM**

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(57) **ABSTRACT**

An ultrasonic diagnostic apparatus includes a contrast timer starting time measurement by a start signal and an external input device for externally inputting said start signal.

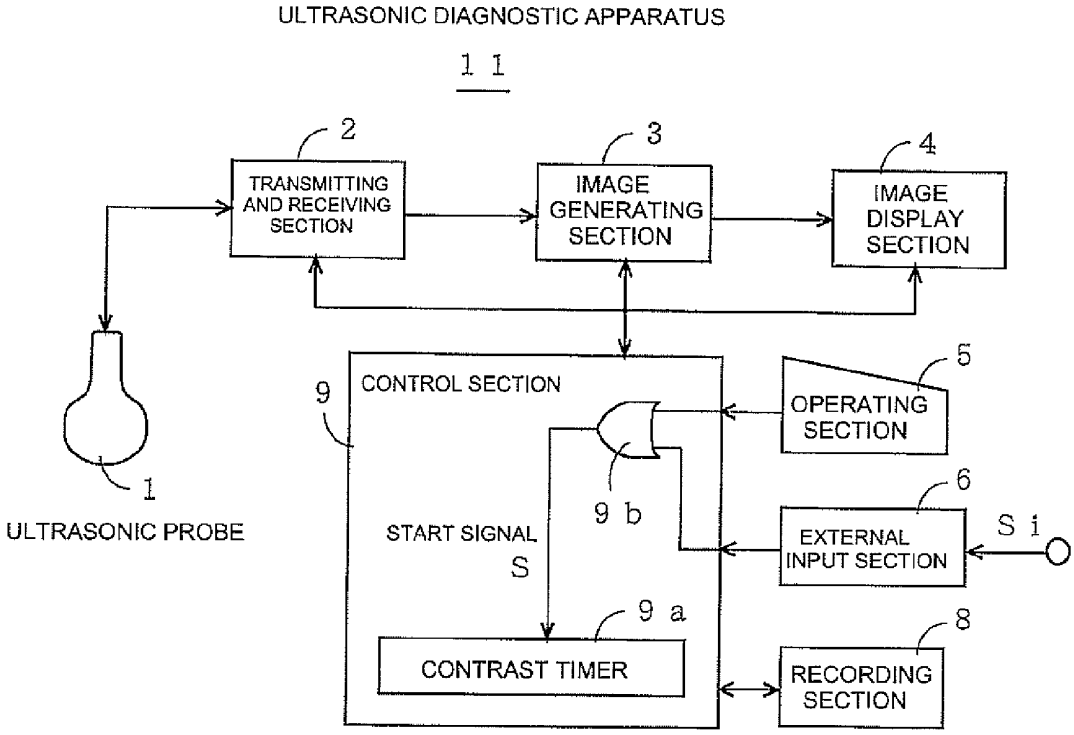


Fig. 1

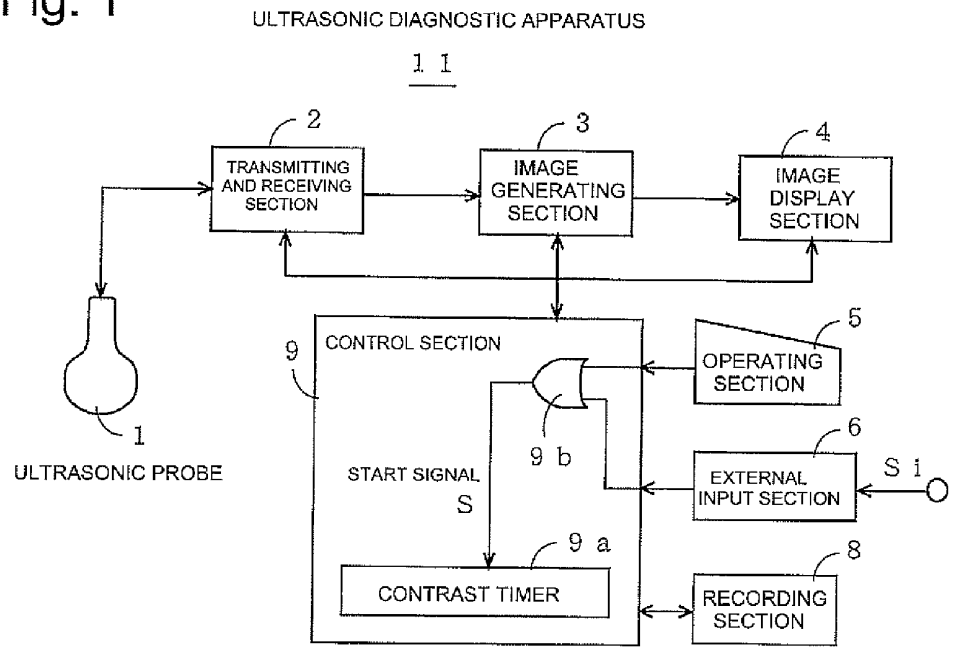

ULTRASONIC DIAGNOSTIC APPARATUS
1 1
2
TRANSMITTING AND RECEIVING SECTION
3
IMAGE GENERATING SECTION
4
IMAGE DISPLAY SECTION
9
CONTROL SECTION
5
OPERATING SECTION
9 b
6
EXTERNAL INPUT SECTION
S i
START SIGNAL
S
9 a
CONTRAST TIMER
8
RECORDING SECTION
1
ULTRASONIC PROBE

Fig. 2

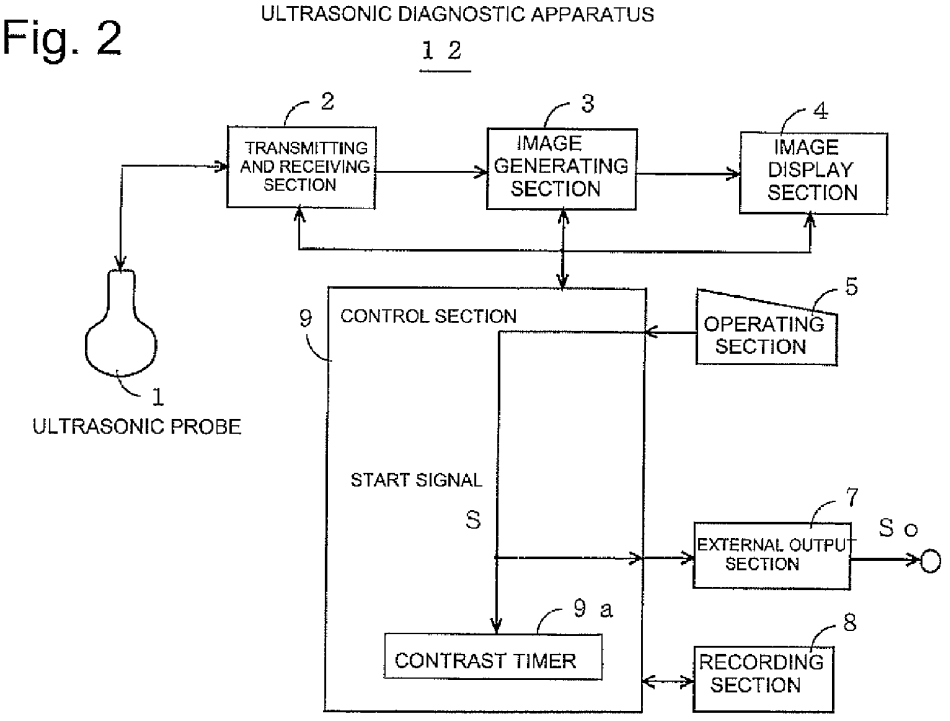

ULTRASONIC DIAGNOSTIC APPARATUS
1 2
2
TRANSMITTING AND RECEIVING SECTION
3
IMAGE GENERATING SECTION
4
IMAGE DISPLAY SECTION
9
CONTROL SECTION
5
OPERATING SECTION
START SIGNAL
S
7
EXTERNAL OUTPUT SECTION
S o
9 a
CONTRAST TIMER
8
RECORDING SECTION
1
ULTRASONIC PROBE

Fig. 3

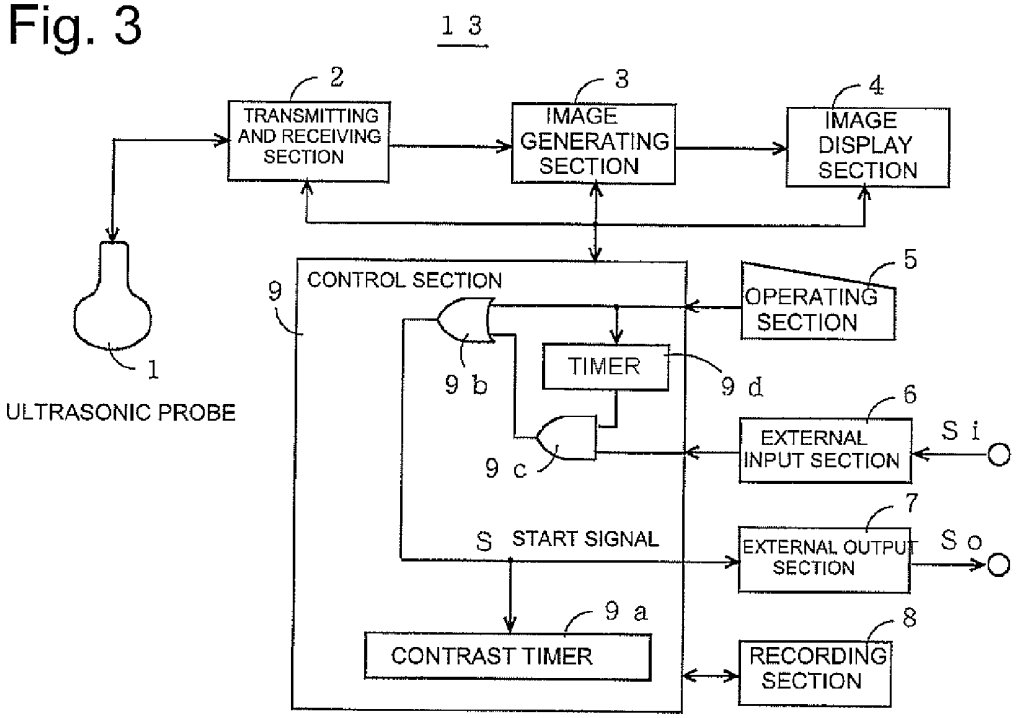


Fig. 4

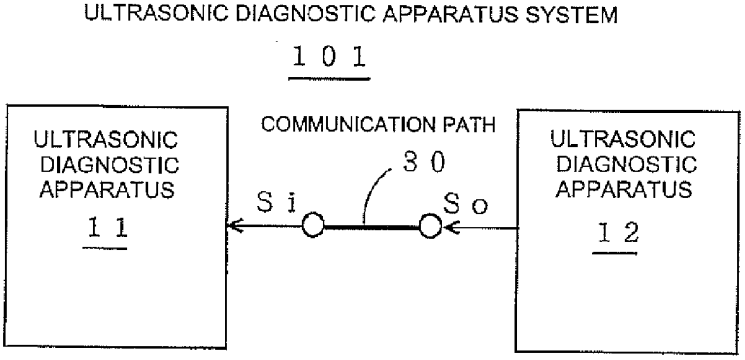


Fig. 5

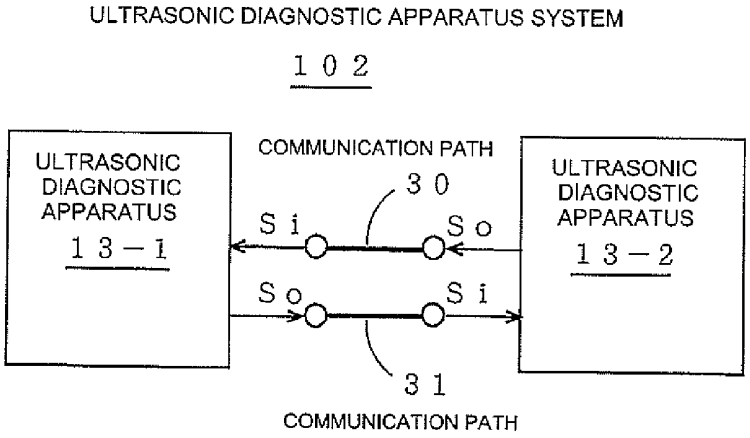


Fig. 6

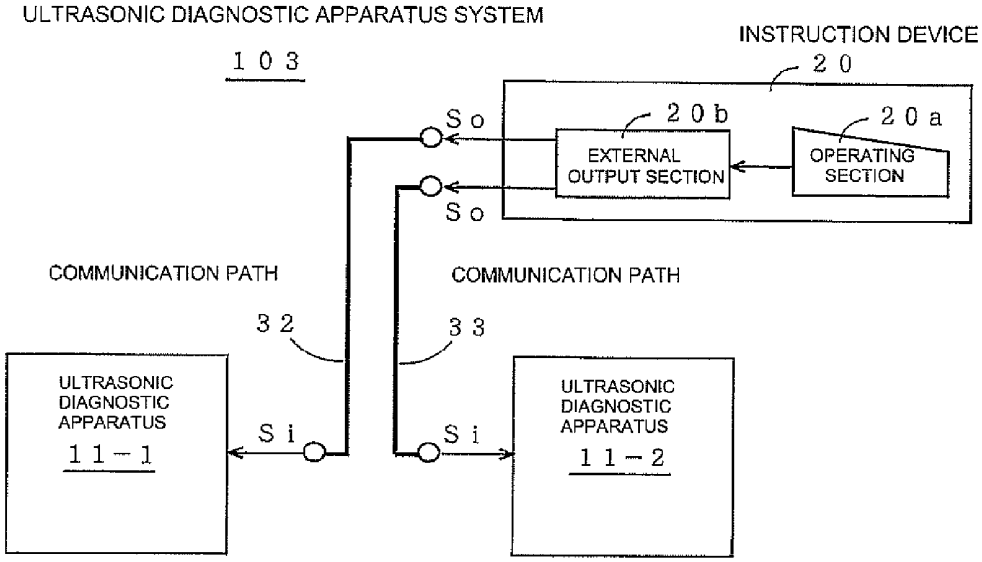

ULTRASONIC DIAGNOSTIC APPARATUS SYSTEM
103
INSTRUCTION DEVICE
20
So
20b
EXTERNAL OUTPUT SECTION
20a
OPERATING SECTION
So
COMMUNICATION PATH
COMMUNICATION PATH
32
33
ULTRASONIC DIAGNOSTIC APPARATUS
11-1
Si
Si
ULTRASONIC DIAGNOSTIC APPARATUS
11-2

Fig. 7

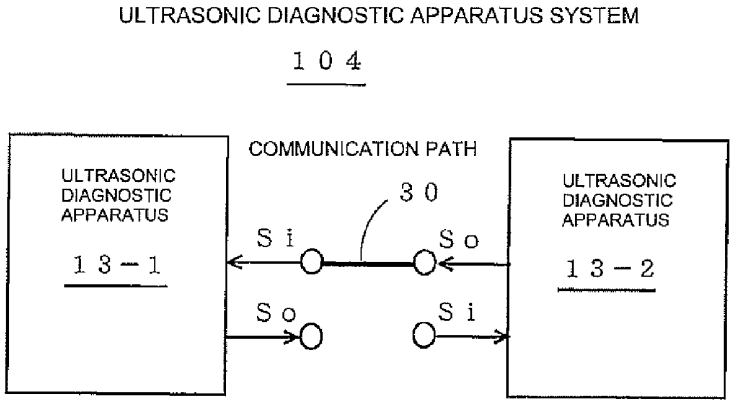

ULTRASONIC DIAGNOSTIC APPARATUS SYSTEM
104
COMMUNICATION PATH
ULTRASONIC DIAGNOSTIC APPARATUS
13-1
30
Si
So
So
Si
ULTRASONIC DIAGNOSTIC APPARATUS
13-2

Fig. 8

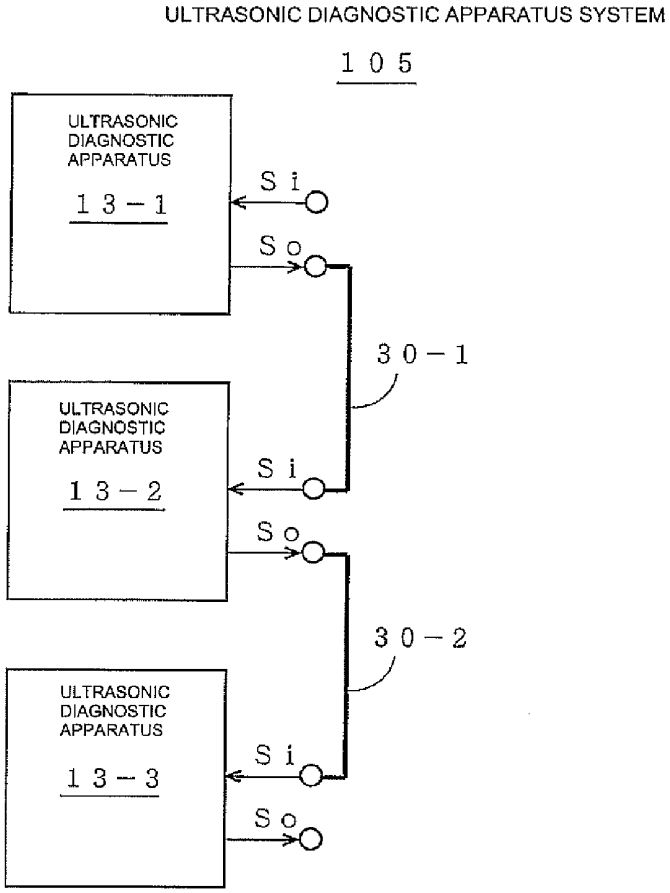

ULTRASONIC DIAGNOSTIC APPARATUS SYSTEM
105
ULTRASONIC DIAGNOSTIC APPARATUS
13-1
Si
So
30-1
ULTRASONIC DIAGNOSTIC APPARATUS
13-2
Si
So
30-2
ULTRASONIC DIAGNOSTIC APPARATUS
13-3
Si
So

Fig. 9

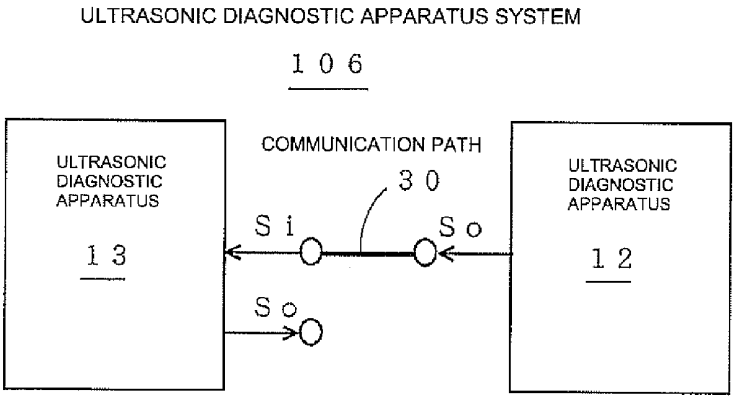

ULTRASONIC DIAGNOSTIC APPARATUS SYSTEM
106
ULTRASONIC DIAGNOSTIC APPARATUS
13
COMMUNICATION PATH
30
Si
So
So
ULTRASONIC DIAGNOSTIC APPARATUS
12

Fig. 10

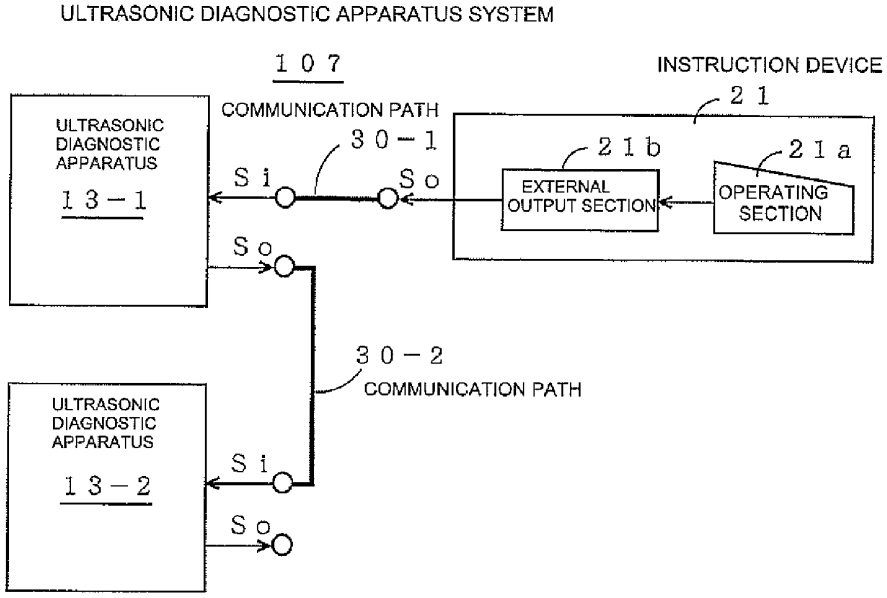

ULTRASONIC DIAGNOSTIC APPARATUS SYSTEM
107
INSTRUCTION DEVICE
21
COMMUNICATION PATH
30－1
ULTRASONIC DIAGNOSTIC APPARATUS
13－1
Si
So
21b
21a
EXTERNAL OUTPUT SECTION
OPERATING SECTION
So
30－2
COMMUNICATION PATH
ULTRASONIC DIAGNOSTIC APPARATUS
13－2
Si
So

Fig. 11

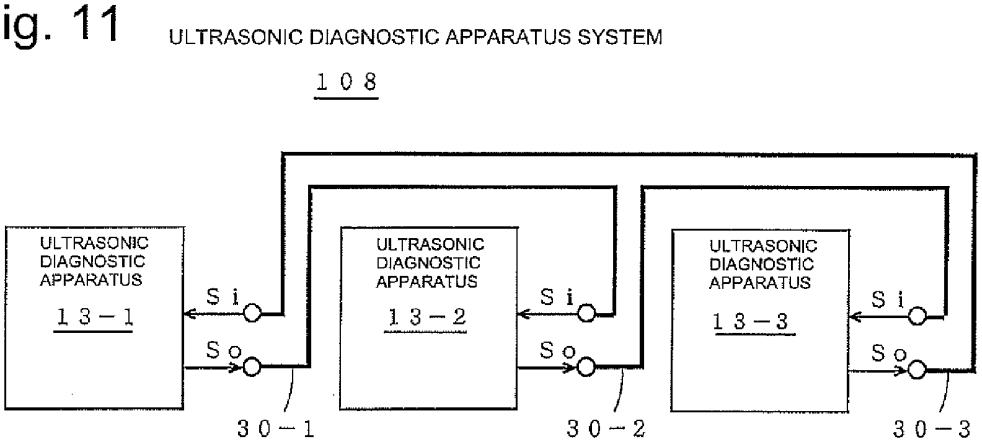
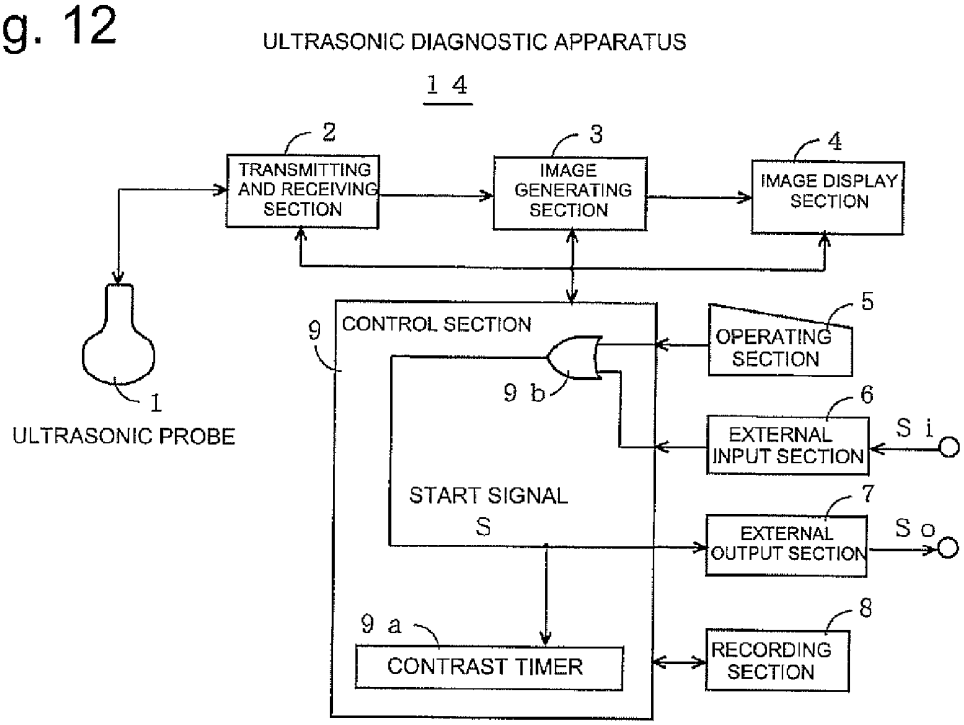

ULTRASONIC DIAGNOSTIC APPARATUS SYSTEM
108
ULTRASONIC DIAGNOSTIC APPARATUS
13－1
Si
So
30－1
ULTRASONIC DIAGNOSTIC APPARATUS
13－2
Si
So
30－2
ULTRASONIC DIAGNOSTIC APPARATUS
13－3
Si
So
30－3

Fig. 12


ULTRASONIC DIAGNOSTIC APPARATUS
14
2
TRANSMITTING AND RECEIVING SECTION
3
IMAGE GENERATING SECTION
4
IMAGE DISPLAY SECTION
1
ULTRASONIC PROBE
9
CONTROL SECTION
9 b
5
OPERATING SECTION
6
EXTERNAL INPUT SECTION
S i
START SIGNAL
S
7
EXTERNAL OUTPUT SECTION
S o
9 a
CONTRAST TIMER
8
RECORDING SECTION

ULTRASONIC DIAGNOSTIC APPARATUS AND ULTRASONIC DIAGNOSTIC APPARATUS SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Japanese Patent Application No. 2007-0431139 filed Feb. 23, 2007.

BACKGROUND OF THE INVENTION

[0002] The field of the present invention relates to an ultrasonic diagnostic apparatus and an ultrasonic diagnostic apparatus system. More specifically, the present invention relates to an ultrasonic diagnostic apparatus and an ultrasonic diagnostic apparatus system that can synchronize contrast timers of a plurality of ultrasonic diagnostic apparatuses with each other.

[0003] There is an ultrasonic diagnostic apparatus having a stopwatch function which starts time measurement by start operation of an operator, stops time measurement by a freeze instruction of the operator, and displays an elapsed time from start on a screen. The function is called a contrast timer.

[0004] Using the stopwatch function, start operation is performed when a contrast agent is injected into a subject, and then, operation of the freeze instruction is performed at a suitable point in time. An elapsed time from injection of the contrast agent to photographing of a freeze ultrasonic image can be checked on a screen (For instance, see Patent Document 1).

[0005] Patent Document 1. Japanese Unexamined Patent Publication No. 148015/2004.

[0006] There may be cases where plural sites (for instance, a liver and a thyroid gland) of a subject with a contrast agent injected thereinto are desired to be photographed by a plurality of ultrasonic diagnostic apparatuses.

[0007] The prior art ultrasonic diagnostic apparatus is required to perform start operation of the contrast timers of the respective ultrasonic diagnostic apparatuses. The operation can be troublesome. Simultaneous start cannot be accurate.

SUMMARY OF THE INVENTION

[0008] It is desirable that the problem described previously is solved.

[0009] In a first aspect, the invention provides an ultrasonic diagnostic apparatus including a contrast timer starting time measurement by a start signal, and an external input device for externally inputting the start signal.

[0010] In the ultrasonic diagnostic apparatus according to the first aspect, the start signal is externally inputted to a plurality of ultrasonic diagnostic apparatuses at the same time. The contrast timers of the plurality of ultrasonic diagnostic apparatuses can be started at the same time.

[0011] In a second aspect, the invention provides an ultrasonic diagnostic apparatus including a contrast timer starting time measurement by a start signal, an operating device for use by an operator to perform operation for producing the start signal, and an external output device for externally outputting the start signal.

[0012] In the ultrasonic diagnostic apparatus according to the second aspect, the start signal is transmitted to the ultrasonic diagnostic apparatus according to the first aspect. The contrast timer of the ultrasonic diagnostic apparatus according to the first aspect and the contrast timer of the ultrasonic diagnostic apparatus according to the second aspect can be started at the same time.

[0013] In a third aspect, the invention provides an ultrasonic diagnostic apparatus including a contrast timer starting time measurement by a start signal, an operating device for use by an operator to perform operation for producing the start signal, an external output device for externally outputting the start signal, and an external input device for externally inputting the start signal.

[0014] In the ultrasonic diagnostic apparatus according to the third aspect, the start signal is externally inputted to a plurality of ultrasonic diagnostic apparatuses at the same time. The contrast timers of the plurality of ultrasonic diagnostic apparatuses can be started at the same time. The start signal is transmitted from one ultrasonic diagnostic apparatus to another ultrasonic diagnostic apparatus. Accordingly, the contrast timers of the plurality of ultrasonic diagnostic apparatuses can be started at the same time.

[0015] In a fourth aspect, the invention provides the ultrasonic diagnostic apparatus according to the third aspect further including an external input inhibiting device for inhibiting an external input of the start signal for a predetermined time after the start signal is produced by operation of the operating device.

[0016] When the ultrasonic diagnostic apparatus according to the fourth aspect is connected in a loop, the start signal can be transmitted from any ultrasonic diagnostic apparatus to another ultrasonic diagnostic apparatus. Since the external input of the start signal is inhibited for a predetermined time after the start signal is produced by operation of the operating device, the start signal can be prevented from being circulated in the loop.

[0017] In a fifth aspect, the invention provides an ultrasonic diagnostic apparatus system including an ultrasonic diagnostic apparatus according to the first aspect, an ultrasonic diagnostic apparatus according to the second aspect, and a communicating device for connecting the external input device of the ultrasonic diagnostic apparatus according to the first aspect and the external output device of the ultrasonic diagnostic apparatus according to the second aspect.

[0018] In the ultrasonic diagnostic apparatus system according to the fifth aspect, the start signal is transmitted from the ultrasonic diagnostic apparatus according to the second aspect to the ultrasonic diagnostic apparatus according to the first aspect. Accordingly, the contrast timers of both the ultrasonic diagnostic apparatuses can be started at the same time.

[0019] In a sixth aspect, the invention provides an ultrasonic diagnostic apparatus system including a first ultrasonic diagnostic apparatus according to the fourth aspect, a second ultrasonic diagnostic apparatus according to the fourth aspect, a first communicating device for connecting the external output device of the first ultrasonic diagnostic apparatus and the external input device of the second ultrasonic diagnostic apparatus, and a second communicating device for connecting the external input device of the first ultrasonic diagnostic apparatus and the external output device of the second ultrasonic diagnostic apparatus.

[0020] In the ultrasonic diagnostic apparatus system according to the sixth aspect, the start signal is transmitted from the first ultrasonic diagnostic apparatus to the second ultrasonic diagnostic apparatus, whereby the contrast timers of both the ultrasonic diagnostic apparatuses can be started at

the same time. The start signal is transmitted from the second ultrasonic diagnostic apparatus to the first ultrasonic diagnostic apparatus, whereby the contrast timers of both the ultrasonic diagnostic apparatuses can be started at the same time.

[0021] In a seventh aspect, the invention provides an ultrasonic diagnostic apparatus system including a first ultrasonic diagnostic apparatus according to the first aspect, a second ultrasonic diagnostic apparatus according to the first aspect, an instruction device having operating device for use by an operator to perform operation for producing a start signal and external output device for externally outputting a plurality of the start signals, and a communicating device for connecting the external input device of the first ultrasonic diagnostic apparatus, the external input device of the second ultrasonic diagnostic apparatus, and the external output device of the instruction device.

[0022] In the ultrasonic diagnostic apparatus system according to the seventh aspect, the start signal is transmitted from the instruction device to the first and second ultrasonic diagnostic apparatuses. Accordingly, the contrast timers of both the ultrasonic diagnostic apparatuses can be started at the same time.

[0023] In an eighth aspect, the invention provides an ultrasonic diagnostic apparatus system including a first ultrasonic diagnostic apparatus according to the third or fourth aspect, a second ultrasonic diagnostic apparatus according to the third or fourth aspect, and a communicating device for connecting the external output device of the first ultrasonic diagnostic apparatus and the external input device of the second ultrasonic diagnostic apparatus.

[0024] In the ultrasonic diagnostic apparatus system according to the eighth aspect, the start signal is transmitted from the first ultrasonic diagnostic apparatus to the second ultrasonic diagnostic apparatus. Accordingly, the contrast timers of both the ultrasonic diagnostic apparatuses can be started at the same time.

[0025] In a ninth aspect, the invention provides an ultrasonic diagnostic apparatus system including, when n=1, 2, . . . , N−1, N≧3, the first to N-th ultrasonic diagnostic apparatuses according to the third or fourth aspect, and the n-th communicating device for connecting external output device of the n-th ultrasonic diagnostic apparatus and the external input device of the (n+1)-th ultrasonic diagnostic apparatus.

[0026] In the ultrasonic diagnostic apparatus system according to the ninth aspect, the start signal is outputted from the first ultrasonic diagnostic apparatus. Accordingly, the contrast timers of three or more ultrasonic diagnostic apparatuses can be started at the same time.

[0027] In a tenth aspect, the invention provides an ultrasonic diagnostic apparatus system including an ultrasonic diagnostic apparatus according to the second aspect, an ultrasonic diagnostic apparatus according to the third aspect, and communicating device for connecting external output device of the ultrasonic diagnostic apparatus according to the second aspect and external input device of the ultrasonic diagnostic apparatus according to the third aspect.

[0028] In the ultrasonic diagnostic apparatus system according to the tenth aspect, the start signal is transmitted from the ultrasonic diagnostic apparatus according to the second aspect to the ultrasonic diagnostic apparatus according to the third aspect. Accordingly, the contrast timers of both the ultrasonic diagnostic apparatuses can be started at the same time.

[0029] In an eleventh aspect, the invention provides an ultrasonic diagnostic apparatus system including an ultrasonic diagnostic apparatus according to the second aspect, an ultrasonic diagnostic apparatus according to the fourth aspect, and communicating device for connecting the external output device of the ultrasonic diagnostic apparatus according to the second aspect and external input device of the ultrasonic diagnostic apparatus according to the fourth aspect.

[0030] In the ultrasonic diagnostic apparatus system according to the eleventh aspect, the start signal is transmitted from the ultrasonic diagnostic apparatus according to the second aspect to the ultrasonic diagnostic apparatus according to the fourth aspect. Accordingly, the contrast timers of both the ultrasonic diagnostic apparatuses can be started at the same time.

[0031] In a twelfth aspect, the invention provides an ultrasonic diagnostic apparatus system including a first ultrasonic diagnostic apparatus according to the third or fourth aspect, a second ultrasonic diagnostic apparatus according to the third or fourth aspect, an instruction device having an operating device for use by an operator to perform operation for producing a start signal and an external output device for externally outputting the start signal, a first communicating device for connecting the external input device of the first ultrasonic diagnostic apparatus and the external output device of the instruction device, and a second communicating device for connecting the external output device of the first ultrasonic diagnostic apparatus and the external input device of the second ultrasonic diagnostic apparatus.

[0032] In the ultrasonic diagnostic apparatus system according to the twelfth aspect, the start signal is transmitted from the instruction device to the first ultrasonic diagnostic apparatus. Accordingly, the contrast timers of the first and second ultrasonic diagnostic apparatuses can be started at the same time.

[0033] In a thirteenth aspect, the invention provides an ultrasonic diagnostic apparatus system including, when n=1, 2, . . . , N−1, N≧3, first to N-th ultrasonic diagnostic apparatuses according to the fourth aspect, the n-th communicating device for connecting the external output device of the n-th ultrasonic diagnostic apparatus and the external input device of the (n+1)-th ultrasonic diagnostic apparatus, and the N-th communicating device for connecting the external output device of the N-th ultrasonic diagnostic apparatus and the external input device of the first ultrasonic diagnostic apparatus.

[0034] In the ultrasonic diagnostic apparatus system according to the thirteenth aspect, three or more ultrasonic diagnostic apparatuses are connected in a loop. Accordingly, the start signal can be transmitted from any ultrasonic diagnostic apparatus to another ultrasonic diagnostic apparatus. The external input of the start signal is inhibited for a predetermined time after the start signal is produced by operation of the operating device. Accordingly, the start signal can be prevented from being circulated in the loop.

[0035] In a fourteenth aspect, the invention provides an ultrasonic diagnostic apparatus including a contrast timer starting time measurement by a start signal and stopping time measurement by a stop signal, an operating device for use by an operator to perform operation for producing the start signal and the stop signal, an external output device for externally

outputting the start signal and the stop signal, and an external input device for externally inputting the start signal and the stop signal.

[0036] In the ultrasonic diagnostic apparatus according to the fourteenth aspect, the start signal or the stop signal is externally inputted to a plurality of ultrasonic diagnostic apparatuses at the same time. Accordingly, the contrast timers of the plurality of ultrasonic diagnostic apparatuses can be started or stopped at the same time. The start signal or the stop signal is transmitted from one ultrasonic diagnostic apparatus to another ultrasonic diagnostic apparatus. Accordingly, the contrast timers of the plurality of ultrasonic diagnostic apparatuses can be started or stopped at the same time.

[0037] In a fifteenth aspect, the invention provides an ultrasonic diagnostic apparatus system including a first ultrasonic diagnostic apparatus according to the fourteenth aspect, a second ultrasonic diagnostic apparatus according to the fourteenth aspect, and a communicating device for connecting the external output device of the first ultrasonic diagnostic apparatus and the external input device of the second ultrasonic diagnostic apparatus.

[0038] In the ultrasonic diagnostic apparatus system according to the fifteenth aspect, the start signal or the stop signal is transmitted from the first ultrasonic diagnostic apparatus to the second ultrasonic diagnostic apparatus. Accordingly, the contrast timers of both the ultrasonic diagnostic apparatuses can be started or stopped at the same time.

[0039] In a sixteenth aspect, the invention provides an ultrasonic diagnostic apparatus system including, when n=1, 2, . . . , N−1, N≧3, the first to N-th ultrasonic diagnostic apparatuses according to the first aspect, and the n-th communicating device for connecting the external output device of the n-th ultrasonic diagnostic apparatus and the external input device of the (n+1)-th ultrasonic diagnostic apparatus.

[0040] In the ultrasonic diagnostic apparatus system according to the sixteenth aspect, the start signal or the stop signal is outputted from the first ultrasonic diagnostic apparatus. Accordingly, the contrast timers of three or more ultrasonic diagnostic apparatuses can be started or stopped at the same time.

[0041] According to the ultrasonic diagnostic apparatus and the ultrasonic diagnostic apparatus system of the invention, contrast timers of a plurality of ultrasonic diagnostic apparatuses can be easily and accurately synthesized with each other.

[0042] The ultrasonic diagnostic apparatus and the ultrasonic diagnostic apparatus system of the invention can be used for photographing plural sites (for instance, a liver and a thyroid gland) of a subject with a contrast agent injected thereinto by a plurality of ultrasonic diagnostic apparatuses.

[0043] Further objects and advantages of the present invention will be apparent from the following description of the preferred embodiments of the invention as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0044] FIG. **1** is a configuration explanatory view showing an ultrasonic diagnostic apparatus according to Embodiment 1.

[0045] FIG. **2** is a configuration explanatory view showing an ultrasonic diagnostic apparatus according to Embodiment 2.

[0046] FIG. **3** is a configuration explanatory view showing an ultrasonic diagnostic apparatus according to Embodiment 3.

[0047] FIG. **4** is a configuration explanatory view showing an ultrasonic diagnostic apparatus system according to Embodiment 4.

[0048] FIG. **5** is a configuration explanatory view showing an ultrasonic diagnostic apparatus system according to Embodiment 5.

[0049] FIG. **6** is a configuration explanatory view showing an ultrasonic diagnostic apparatus system according to Embodiment 6.

[0050] FIG. **7** is a configuration explanatory view showing an ultrasonic diagnostic apparatus system according to Embodiment 7.

[0051] FIG. **8** is a configuration explanatory view showing an ultrasonic diagnostic apparatus system according to Embodiment 8.

[0052] FIG. **9** is a configuration explanatory view showing an ultrasonic diagnostic apparatus system according to Embodiment 9.

[0053] FIG. **10** is a configuration explanatory view showing an ultrasonic diagnostic apparatus system according to Embodiment 10.

[0054] FIG. **11** is a configuration explanatory view showing an ultrasonic diagnostic apparatus system according to Embodiment 11.

[0055] FIG. **12** is a configuration explanatory view showing an ultrasonic diagnostic apparatus according to Embodiment 12.

DETAILED DESCRIPTION OF THE INVENTION

[0056] The invention will be described below in more detail with embodiments shown in drawings. This does not limit the invention.

[0057] Embodiment 1. FIG. **1** is a configuration explanatory view of an ultrasonic diagnostic apparatus **11** according to Embodiment 1.

[0058] The ultrasonic diagnostic apparatus **11** includes an ultrasonic probe **1**, a transmitting and receiving section **2** for driving the ultrasonic probe **1** to scan the inside of a subject with ultrasonic beams, an image generating section **3** for generating an ultrasonic image, an image display section **4** for displaying the ultrasonic image, an operating section **5** for use by an operator to provide an instruction and data for producing a start signal (hereinafter, simply called a start signal) S of a contrast timer, an external input section **6** for externally inputting the start signal S_t, a recording section **8** for recording the ultrasonic image, and a control section **9** for controlling the whole.

[0059] The control section **9** includes a contrast timer **9***a*, and an OR circuit **9***b* inputting the start signal S produced by operation of the operating section **5** and the externally inputted start signal S to the contrast timer **9***a*.

[0060] Embodiment 2. FIG. **2** is a configuration explanatory view of an ultrasonic diagnostic apparatus **12** according to Embodiment 2.

[0061] The ultrasonic diagnostic apparatus **12** includes the ultrasonic probe **1**, the transmitting and receiving section **2** for driving the ultrasonic probe **1** to scan the inside of a subject with ultrasonic beams, the image generating section **3** for generating the ultrasonic image, the image display section **4** for displaying the ultrasonic image, the operating section **5** for use by an operator to provide an instruction and data for

producing the start signal S_o, an external output section **7** for externally outputting the start signal S_t, the recording section **8** for recording the ultrasonic image, and the control section **9** for controlling the whole.

[0062] The control section **9** includes the contrast timer **9***a*.

[0063] Embodiment 3. FIG. **3** is a configuration explanatory view of an ultrasonic diagnostic apparatus **13** according to Embodiment 3.

[0064] The ultrasonic diagnostic apparatus **13** includes the ultrasonic probe **1**, the transmitting and receiving section **2** for driving the ultrasonic probe **1** to scan the inside of a subject with ultrasonic beams, the image generating section **3** for generating the ultrasonic image, the image display section **4** for displaying the ultrasonic image, the operating section **5** for use by an operator to provide an instruction and data for producing the start signal S, the external input section **6** for externally inputting the start signal S_t, the external output section **7** for externally outputting the start signal S_o, the recording section **8** for recording the ultrasonic image, and the control section **9** for controlling the whole.

[0065] The control section **9** includes the contrast timer **9***a*, a gate circuit **9***c* controlling whether the externally inputted start signal S is passed therethrough or not, the OR circuit **9***b* inputting the start signal S produced by operation of the operating section **5** and the start signal S passed through the gate circuit **9***c* to the contrast timer **9***a*, and a timer circuit **9***d* which does not pass the externally inputted start signal through the gate circuit **9***c* for a predetermined time after the start signal S is produced by operation of the operating section **5**.

[0066] Embodiment 4. FIG. **4** is a configuration explanatory view of an ultrasonic diagnostic apparatus system **101** according to Embodiment 4.

[0067] The ultrasonic diagnostic apparatus system **101** connects the external input section **6** of the ultrasonic diagnostic apparatus **11** according to Embodiment 1 and the external output section **7** of the ultrasonic diagnostic apparatus **12** according to Embodiment 2 by a (wired or wireless) communication path **30**.

[0068] In the ultrasonic diagnostic apparatus system **101**, the start signal S is produced by operation of the operating section **5** of the ultrasonic diagnostic apparatus **12**. Accordingly, the contrast timers **9***a* of the ultrasonic diagnostic apparatus **11** and the ultrasonic diagnostic apparatus **12** can be started at the same time.

[0069] Embodiment 5. FIG. **5** is a configuration explanatory view of an ultrasonic diagnostic apparatus system **102** according to Embodiment 5.

[0070] The ultrasonic diagnostic apparatus system **102** connects the external input section **6** of a first ultrasonic diagnostic apparatus **13-1** according to Embodiment 3 and the external output section **7** of a second ultrasonic diagnostic apparatus **13-2** according to Embodiment 3 by the communication path **30**, and connects the external output section **7** of the first ultrasonic diagnostic apparatus **13-1** and the external input section **6** of the second ultrasonic diagnostic apparatus **13-2** by a communication path **31**.

[0071] In the ultrasonic diagnostic apparatus system **102**, the start signal S is produced by operation of the operating section **5** of the ultrasonic diagnostic apparatus **13-1** or **13-2**. Accordingly, the contrast timers **9***a* of the ultrasonic diagnostic apparatuses **13-1** and **13-2** can be started at the same time. The gate circuit **9***c* and the timer **9***d* can prevent the start signal S from being circulated in a loop.

[0072] Embodiment 6. FIG. **6** is a configuration explanatory view of an ultrasonic diagnostic apparatus system **103** according to Embodiment 6.

[0073] The ultrasonic diagnostic apparatus system **103** includes an instruction device **20**.

[0074] The instruction device **20** includes an operating section **20***a* for use by an operator to provide an instruction for producing the start signal S and an external output section **20***b* for externally outputting a plurality of the start signals S_o. The instruction device **20** connects the external input section **6** of a first ultrasonic diagnostic apparatus **11-1** according to Embodiment 1 and the external output section **20***b* of the instruction device **20** by a communication path **32**, and connects the external input section **6** of a second ultrasonic diagnostic apparatus **11-2** according to Embodiment 1 and the external output section **20***b* of the instruction device **20** by a communication path **33**.

[0075] In the ultrasonic diagnostic apparatus system **103**, the start signal S is produced by operation of the operating section **20***a* of the instruction device **20**. Accordingly, the contrast timers **9***a* of the ultrasonic diagnostic apparatuses **11-1** and **11-2** can be started at the same time.

[0076] Embodiment 7. FIG. **7** is a configuration explanatory view of an ultrasonic diagnostic apparatus system **104** according to Embodiment 7.

[0077] The ultrasonic diagnostic apparatus system **104** connects the external input section **6** of the first ultrasonic diagnostic apparatus **13-1** according to Embodiment 3 and the external output section **7** of the second ultrasonic diagnostic apparatus **13-2** according to Embodiment 3 by the communication path **30**.

[0078] In the ultrasonic diagnostic apparatus system **104**, the start signal S is produced by operation of the operating section **5** of the ultrasonic diagnostic apparatus **13-2**. Accordingly, the contrast timers **9***a* of the ultrasonic diagnostic apparatuses **13-1** and **13-2** can be started at the same time.

[0079] Embodiment 8. FIG. **8** is a configuration explanatory view of an ultrasonic diagnostic apparatus system **105** according to Embodiment 8.

[0080] The ultrasonic diagnostic apparatus system **105** connects the external output section **7** of the first ultrasonic diagnostic apparatus **13-1** according to Embodiment 3 and the external input section **6** of the second ultrasonic diagnostic apparatus **13-2** according to Embodiment 3 by a communication path **30-1**, and connects the external output section **7** of the second ultrasonic diagnostic apparatus **13-2** and the external input section **6** of a third ultrasonic diagnostic apparatus **13-3** according to Embodiment 3 by a communication path **30-2**.

[0081] In the ultrasonic diagnostic apparatus system **105**, the start signal S is produced by operation of the operating section **5** of the ultrasonic diagnostic apparatus **13-1**. Accordingly, the contrast timers **9***a* of the ultrasonic diagnostic apparatuses **13-1**, **13-2**, and **13-3** can be started at the same time.

[0082] Embodiment 9. FIG. **9** is a configuration explanatory view of an ultrasonic diagnostic apparatus system **106** according to Embodiment 9.

[0083] The ultrasonic diagnostic apparatus system **106** connects the external input section **6** of the ultrasonic diagnostic apparatus **13** according to Embodiment 3 and the external output section **7** of the ultrasonic diagnostic apparatus **12** according to Embodiment 2 by the communication path **30**.

[0084] In the ultrasonic diagnostic apparatus system **106**, the start signal S is produced by operation of the operating

section **5** of the ultrasonic diagnostic apparatus **12**. Accordingly, the contrast timers **9***a* of the ultrasonic diagnostic apparatuses **11** and **13** can be started at the same time.

[0085] Embodiment 10. FIG. **10** is a configuration explanatory view of an ultrasonic diagnostic apparatus system **107** according to Embodiment 10.

[0086] The ultrasonic diagnostic apparatus system **107** includes an instruction device **21**.

[0087] The instruction device **21** includes an operating section **21***a* for use by an operator to provide an instruction for producing the start signal S and an external output section **21***b* for externally outputting the start signal S_o. The instruction device **21** connects the external input section **6** of the first ultrasonic diagnostic apparatus **13-1** according to Embodiment 3 and the external output section **21***b* of the instruction device **21** by the communication path **30-1**, and connects the external input section **6** of the second ultrasonic diagnostic apparatus **13-2** according to Embodiment 3 and the external output section **7** of the first ultrasonic diagnostic apparatus **13-1** by the communication path **30-2**.

[0088] In the ultrasonic diagnostic apparatus system **107**, the start signal S is produced by operation of the operating section **21***a* of the instruction device **21**. Accordingly, the contrast timers **9***a* of the ultrasonic diagnostic apparatuses **13-1** and **13-2** can be started at the same time.

[0089] Embodiment 11. FIG. **11** is a configuration explanatory view of an ultrasonic diagnostic apparatus system **108** according to Embodiment 11.

[0090] The ultrasonic diagnostic apparatus system **108** connects the external output section **7** of the first ultrasonic diagnostic apparatus **13-1** according to Embodiment 3 and the external input section **6** of the second ultrasonic diagnostic apparatus **13-2** according to Embodiment 3 by the communication path **30-1**, connects the external output section **7** of the second ultrasonic diagnostic apparatus **13-2** and the external input section **6** of the third ultrasonic diagnostic apparatus **13-3** according to Embodiment 3 by the communication path **30-2**, and connects the external output section **7** of the third ultrasonic diagnostic apparatus **13-3** and the external input section **6** of the first ultrasonic diagnostic apparatus **13-1** by a communication path **30-3**.

[0091] In the ultrasonic diagnostic apparatus system **108**, the start signal S is produced by operation of the operating section **5** of any one of the ultrasonic diagnostic apparatuses **13-1**, **13-2**, and **13-3**. Accordingly, the contrast timers **9***a* of the ultrasonic diagnostic apparatuses **13-1**, **13-2**, and **13-3** can be started at the same time. The gate circuit **9***c* and the timer **9***d* of the ultrasonic diagnostic apparatus (any one of **13-1**, **13-2**, and **13-3**) producing the start signal S by operation of the operating section **5** can prevent the start signal S from being circulated in a loop.

[0092] Embodiment 12. FIG. **12** is a configuration explanatory view of an ultrasonic diagnostic apparatus **14** according to Embodiment 12.

[0093] The ultrasonic diagnostic apparatus **14** includes the ultrasonic probe **1**, the transmitting and receiving section **2** for driving the ultrasonic probe **1** to scan the inside of a subject with ultrasonic beams, the image generating section **3** for generating an ultrasonic image, an image display section **4** for displaying the ultrasonic image, the operating section **5** for use by an operator to provide an instruction and data for producing the start signal S, the external input section **6** for externally inputting the start signal S_i, the external output section **7** for externally outputting the start signal S_o, the recording section **8** for recording the ultrasonic image, and the control section **9** for controlling the whole.

[0094] The control section **9** includes the contrast timer **9***a* and the OR circuit **9***b* inputting the start signal S produced by operation of the operating section **5** and the externally inputted start signal S to the contrast timer **9***a*.

[0095] The ultrasonic diagnostic apparatus **14** which is not connected in a loop can configure the same ultrasonic diagnostic apparatus system as the ultrasonic diagnostic apparatus **13** according to Embodiment 3.

[0096] Embodiment 13. In Embodiments 1 to 12, only the start signal S starting time measurement of the contrast timer **9***a* is described. The invention can be applied likewise for a stop signal (or a freeze signal) stopping time measurement of the contrast timer **9***a* and a reset signal returning the time measured value of the contrast timer **9***a* to "0". In this case, the contrast timers of a plurality of ultrasonic diagnostic apparatuses can be started/stopped/reset at the same time.

[0097] 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. An ultrasonic diagnostic apparatus comprising:
- a contrast timer starting time measurement by a start signal; and
- an external input device for externally inputting said start signal.

2. An ultrasonic diagnostic apparatus comprising:
- a contrast timer starting time measurement by a start signal;
- an operating device for use by an operator to perform operation for producing said start signal; and
- an external output device for externally outputting said start signal.

3. An ultrasonic diagnostic apparatus according to claim **1**, further comprising:
- an operating device for use by an operator to perform operation for producing said start signal; and
- an external output device for externally outputting said start signal.

4. The ultrasonic diagnostic apparatus according to claim **3**, farther comprising:
- an external input inhibiting device for inhibiting an external input of the start signal for a predetermined time after the start signal is produced by operation of said operating device.

5. An ultrasonic diagnostic apparatus system comprising:
- a first ultrasonic diagnostic apparatus comprising:
  - a contrast timer starting time measurement by a start signal; and
  - an external input device for externally inputting said start signal;
- a second ultrasonic diagnostic apparatus comprising:
  - a contrast timer starting time measurement by a start signal;
  - an operating device for use by an operator to perform operation for producing said start signal; and
  - an external output device for externally outputting said start signal; and

a communicating device for connecting the external input device of said first ultrasonic diagnostic apparatus and the external output device of said second ultrasonic diagnostic apparatus.

6. An ultrasonic diagnostic apparatus system comprising:

a first and a second ultrasonic diagnostic apparatus each of said first and second ultrasonic diagnostic apparatus comprising:

a contrast timer starting time measurement by a start signal;

an external input device for externally inputting said start signal:.

an operating device for use by an operator to perform operation for producing said start signal;

an external output device for externally outputting said start signal; and

an external input inhibiting device for inhibiting an external input of the start signal for a predetermined time after the start signal is produced by operation of said operating device;

a first communicating device for connecting the external output device of said first ultrasonic diagnostic apparatus and the external input device of said second ultrasonic diagnostic apparatus; and

a second communicating device for connecting the external input device of said first ultrasonic diagnostic apparatus and the external output device of said second ultrasonic diagnostic apparatus.

7. An ultrasonic diagnostic apparatus system comprising:

a first and a second ultrasonic diagnostic each of said first and second ultrasonic diagnostic apparatus comprising:

a contrast timer starting time measurement by a start signal; and

an external input device for externally inputting said start signal;

an instruction device having an operating device for use by an operator to perform operation for producing a start signal and an external output device for externally outputting a plurality of said start signals; and

a communicating device for connecting the external input device of said first ultrasonic diagnostic apparatus, the external input device of said second ultrasonic diagnostic apparatus, and the external output device of said instruction device.

8. An ultrasonic diagnostic apparatus system comprising:

a first and a second ultrasonic diagnostic apparatus each of said first and second ultrasonic diagnostic apparatus comprising:

a contrast timer starting time measurement by a start signal;

an external input device for externally inputting said start signal;

an operating device for use by an operator to perform operation for producing said start signal; and

an external output device for externally outputting said start signal; and

a communicating device for connecting the external output device of said first ultrasonic diagnostic apparatus and the external input device of said second ultrasonic diagnostic apparatus.

9. An ultrasonic diagnostic apparatus system comprising:

a first and a second ultrasonic diagnostic apparatus each of said first and second ultrasonic diagnostic apparatus comprising:

a contrast timer starting time measurement by a start signal,

an external input device for externally inputting said start signal,

an operating device for use by an operator to perform operation for producing said start signal:

an external output device for externally outputting said start signal; and

an external input inhibiting device for inhibiting an external input of the start signal for a predetermined time after the start signal is produced by operation of said operating device, and

a communicating device for connecting the external output device of said first ultrasonic diagnostic apparatus and the external input device of said second ultrasonic diagnostic apparatus.

10. An ultrasonic diagnostic apparatus system comprising, when n=1, 2, . . . , N−1, N≧3:

first to N-th ultrasonic diagnostic apparatuses comprising:

a contrast timer starting time measurement by a start signal,

an external input device for externally inputting said start signal;

an operating device for use by an operator to, perform operation for producing said start signal, and

an external output device for externally outputting said start signal; and

an n-th communicating device for connecting the external output device of said n-th ultrasonic diagnostic apparatus and the external input device of said (n+1)-th ultrasonic diagnostic apparatus.

11. An ultrasonic diagnostic apparatus system comprising, when n=1, 2, . . . , N−1,N≧3:

first to N-th ultrasonic diagnostic apparatuses and comprising:

a contrast timer starting time measurement by a start signal,

an external input device for externally inputting said start signal:

an operating device for use by an operator to perform operation for producing said start signal;

an external output device for externally outputting said start signal; and

an external input inhibiting device for inhibiting an external input of the start signal for a predetermined time after the start signal is produced by operation of said operating device; and

an n-th communicating device for connecting the external output device of said n-th ultrasonic diagnostic apparatus and the external input device of said (n+1)-th ultrasonic diagnostic apparatus.

12. An ultrasonic diagnostic apparatus system comprising:

a first ultrasonic diagnostic apparatus comprising:

a contrast timer starting time measurement by a start signal;

an operating device for use by an operator to perform operation for producing said start signal; and

an external output device for externally outputting said start signal;

a second ultrasonic diagnostic apparatus comprising:

a contrast timer starting time measurement by a start signal;

an external input device for externally inputting said start signal;

an operating device for use by an operator to perform operation for producing said start signal; and

an external output device for externally outputting said start signal; and

a communicating device for connecting the external output device of said first ultrasonic diagnostic and the external input device of said second ultrasonic diagnostic apparatus.

13. An ultrasonic diagnostic apparatus system comprising:

a first ultrasonic diagnostic apparatus comprising:

a contrast timer starting time measurement by a start signal;

an operating device for use by an operator to perform operation for producing said start signal; and

an external output device for externally outputting said start signal;

a second ultrasonic diagnostic apparatus comprising:

a contrast timer starting time measurement by a start signal;

an external input device for externally inputting said start signal;

an operating device for use by an operator to perform operation for producing said start signal;

an external output device for externally outputting said start signal; and

an external input inhibiting device for inhibiting an external input of the start signal for a predetermined time after the start signal is produced by operation of said operating device; and

a communicating device for connecting the external output device of said first ultrasonic diagnostic apparatus and the external input device of said second ultrasonic diagnostic apparatus.

14. An ultrasonic diagnostic apparatus system comprising:

a first and a second ultrasonic diagnostic apparatus each of said first and second ultrasonic diagnostic apparatus comprising;

a contrast timer starting time measurement by a start signal;

an external input device for externally inputting said start signal

an operating device for use by an operator to perform operation for producing said start signal; and

an external output device for externally outputting said start signal;

an instruction device having an operating device for use by an operator to perform operation for producing a start signal and an external output device for externally outputting said start signal;

a first communicating device for connecting the external input device of said first ultrasonic diagnostic apparatus and the external output device of said instruction device; and

a second communicating device for connecting the external output device of said first ultrasonic diagnostic apparatus and the external input device of said second ultrasonic diagnostic apparatus.

15. An ultrasonic diagnostic apparatus system comprising:

a first and a second ultrasonic diagnostic apparatus each of said first and second ultrasonic diagnostic apparatus comprising:

a contrast timer starting time measurement by a start signal;

an external input device for externally inputting said start signal;

an operating device for use by an operator to perform operation for producing said start signal;

an external output device for externally outputting said start signal; and

an external input inhibiting device for inhibiting an external input of the start signal for a predetermined time after the start signal is produced by operation of said operating device;

an instruction device having an operating device for use by an operator to perform operation for producing a start signal and an external output device for externally outputting said start signal;

a first communicating device for connecting the external input device of said first ultrasonic diagnostic apparatus and the external output device of said instruction device; and

a second communicating device for connecting the external output device of said first ultrasonic diagnostic apparatus and the external input device of said second ultrasonic diagnostic apparatus.

16. An ultrasonic diagnostic apparatus system comprising, when $n=1, 2, \ldots, N-1$, $N \geqq 3$:

first to N-th ultrasonic diagnostic apparatuses; comprising:

a contrast timer starting time measurement by a start signal;

an external input device for externally inputting said start signal;

an operating device for use by an operator to perform operation for producing said start signal;

an external output device for externally outputting said start signal; and

an external input inhibiting device for inhibiting an external input of the start signal for a predetermined time after the start signal is produced by operation of said operating device;

an n-th communicating device for connecting external output device of said n-th ultrasonic diagnostic apparatus and the external input device of said (n+1)-th ultrasonic diagnostic apparatus; and

an N-th communicating device for connecting the external output device of said N-th ultrasonic diagnostic apparatus and the external input device of said first ultrasonic diagnostic apparatus.

17. An ultrasonic diagnostic apparatus comprising:

a contrast timer starting time measurement by a start signal and stopping time measurement by a stop signal;

an operating device for use by an operator to perform operation for producing said start signal and said stop signal;

an external output device for externally outputting said start signal and said stop signal; and

an external input device for externally inputting said start signal and said stop signal.

18. An ultrasonic diagnostic apparatus system comprising:

a first and a second ultrasonic diagnostic apparatus each of said first and second ultrasonic diagnostic apparatus comprising:

a contrast timer starting time measurement by a start signal and stopping time measurement by a stop signal;

an operating device for use by an operator to perform operation for producing said start signal and said stop signal;

an external output device for externally outputting said start signal and said stop signal; and

an external input device for externally inputting said start signal and said stop signal, and

a communicating device for connecting the external output device of said first ultrasonic diagnostic apparatus and the external input device of said second ultrasonic diagnostic apparatus.

19. An ultrasonic diagnostic apparatus system comprising, when n=1, 2, . . . , N−1, N≧3:

first to N-th ultrasonic diagnostic apparatuses comprising:

a contrast timer starting time measurement by a start signal; and

an external input device for externally inputting said start signal; and

an n-th communicating device for connecting the external output device of said n-th ultrasonic diagnostic apparatus and the external input device of said (n+1)-th ultrasonic diagnostic apparatus.

* * * * *

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摘要(译)

超声波诊断装置包括通过启动信号进行的对比度计时器开始时间测量和用于从外部输入所述启动信号的外部输入装置。