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(71) Applicant: **Konami Corporation**  
**Chiyoda-ku, Tokyo 100-6330 (JP)**

(72) Inventor: **NAKANO, Makoto,**  
**KONAMI SPORTS LIFE CORPORATION**  
**Tokyo 140-0002 (JP)**

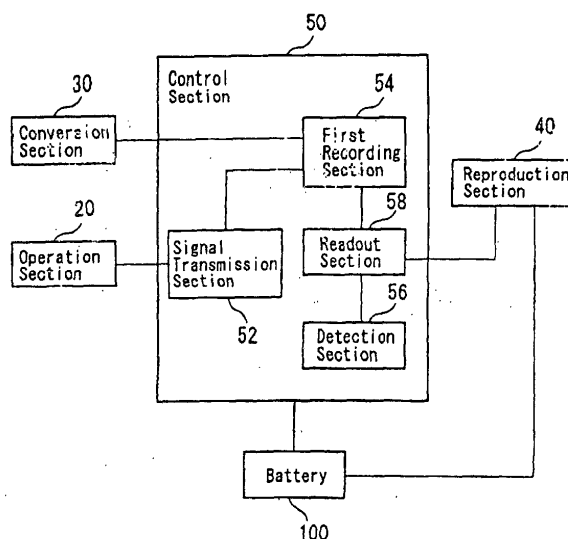
(74) Representative: **Curtis, Philip Anthony et al**  
**A.A. Thornton & Co.,**  
**235 High Holborn**  
**London WC1V 7LE (GB)**

(54) **BALL-SHAPED PLAY EQUIPMENT**

(57) A ball-shaped play equipment which can output speech corresponding to a shock and can be played in various ways. The ball-shaped play equipment includes a conversion unit (30) for converting external speech into first speech data, a first recording unit (54) for recording the first speech data, a detection unit (58) for detecting the shock applied to the ball-shaped play equipment, and a reproduction unit (40) for outputting speech according to the first speech data recorded in the first re-

cording unit (54) when the detection unit (58) detects a shock. Here, at least one of the conversion unit (30) and the first recording unit (54) operates when an operation signal is received and may further include an operation unit (20) operable from outside and a signal transmission unit (52) for transmitting an operation signal to at least one of the conversion unit and the first recording unit according to the operation applied to the operation unit (20).

**Fig. 4**



## Description

### Technical Field

**[0001]** The present invention relates to a ball-shaped play equipment, and more particularly to a ball-shaped play equipment which outputs voice in response to a shock, thereby diversifying the way of play compared with conventional art.

### Background Art

**[0002]** In respect of a ball-shaped play equipment which generates voice when detecting a shock, such techniques have been disclosed, for example, in Japanese Patent Application Laid-open Publication No. 154771/1990, Japanese Utility Model Application Laid-open Publication No. 50892/1989, and Japanese Utility Model Application Laid-open Publication No. 34660/1994. A technique relating to a ball-shaped play equipment which emits light when detecting a shock has been disclosed in Japanese Utility Model Registration Publication No. 3025968.

**[0003]** Some of the conventional techniques can output only predetermined voice. Thus, with such techniques, the way of play is limited.

**[0004]** Accordingly, an object of the present invention is to provide a ball-shaped play equipment which can solve the above-mentioned problems. This object will be attained with a combination of the features defined in the independent claims of the present invention. The dependent claims of the present invention define more advantageous embodiments.

### Disclosure of the Invention

**[0005]** According to one embodiment of the present invention, a ball-shaped play equipment is provided that outputs voice in response to a shock. The ball-shaped play equipment comprises a conversion section for converting external voice into an electronic signal, a recording section for recording voice data based on the electronic signal, a detection section for detecting a shock applied to the ball-shaped play equipment, and a reproduction section for outputting voice based on the voice data recorded in the recording section when the detection section detects the shock.

**[0006]** In this embodiment, at least one of the conversion and recording sections is activated on condition that it receives a command signal, and the ball-shaped play equipment may further comprise an operation section which is externally operable and a signal transmission section for transmitting the command signal to at least one of the conversion and recording sections according to an operation applied to the operation section.

**[0007]** In this case, the ball-shaped play equipment may further comprise a prohibition section for prohibiting at least one of the conversion and recording sections

from being activated irrespective of the operation applied to the operation section. Further, the recording section may include a first recording section for storing voice data based on the electronic signal as first voice data and a second recording section for pre-retaining second voice data. The reproduction section may retrieve the second voice data stored in the second recording section and output voice based on the second voice data when the detection section detects a shock while a changeover switch is prohibiting the signal transmission section from being activated.

**[0008]** The ball-shaped play equipment may further comprise a casing which receives therein the conversion, recording, detection, and reproduction sections. The casing may have a recess. The operation section may be provided at the recess. At least one of the conversion and recording sections may continuously receive the command signal for a predetermined period of time or longer. The ball-shaped play equipment may have a plurality of the operation sections. The signal transmission section may transmit the command signal when one of the operation sections is operated and at least another operation section is subsequently operated within a predetermined period of time. The ball-shaped play equipment may further comprise a detachable or movable covering member for disabling an operation portion of the signal transmission section to be externally operated by covering the operation portion. The ball-shaped play equipment may comprise a casing, at least part of which is made of an elastic member. The operation section may be a push switch and be arranged at a position which allows the switch to be pushed down through the elastic member of the casing with an external operation.

**[0009]** The ball-shaped play equipment may further comprise a casing which receives therein the conversion, recording, detection, and reproduction sections as well as a battery. The casing may have a voice pickup hole for facilitating the conversion section to pick up voice and a diffusion hole for helping the voice from the reproduction section to be externally diffused. The operation section may be arranged at a position almost along a line connecting the voice pickup hole and diffusion hole. In this case, the diffusion hole may preferably be arranged between the voice pickup hole and the operation section. The voice pickup hole may preferably be positioned 1 cm or more apart from the operation section on the casing.

**[0010]** In this embodiment, the recording section stores a plurality of voice data in such a manner that the data can be individually identified. The ball-shaped play equipment may further comprise a command section for giving the reproduction section an indication of which of the plurality of the voice data to retrieve, based on an external operation.

**[0011]** In this embodiment, the recording section may store a plurality of voice data. The ball-shaped play equipment may further comprise a selection section for

randomly selecting any of the plurality of the voice data with every processing by the reproduction section. The reproduction section outputs voice based on the voice data selected by the selection section. In this case, the selection section may select at least two of the plurality of the voice data at different probabilities.

**[0012]** Further, in this embodiment, the reproduction section may output voice based on the voice data after a predetermined period of time has passed since the detection section detects a shock. In this case, the predetermined period of time may preferably be 0.1 second to 1 second.

**[0013]** According to another embodiment of the present invention, a ball-shaped play equipment is provided that records external voice and reproduces the recorded voice when a shock is applied.

**[0014]** In this embodiment, the external voice may be recorded according to an operation of a user. The external voice may be kept being recorded while the user is operating the equipment. Recording of the external voice may selectively be prohibited. The recorded voice may be reproduced after a predetermined delay in time since the shock is applied.

**[0015]** The above-mentioned summary of the present invention does not enumerate all of the features required for the present invention and sub-combinations of these features may also be within the scope of the present invention.

#### Brief Description of the Drawings

##### **[0016]**

Fig. 1 is a schematic front side elevation view of a ball-shaped play equipment 10 according to a first embodiment of the present invention.

Fig. 2 is a schematic top plan view of the ball-shaped play equipment 10.

Fig. 3 is a schematic cross-sectional view of the ball-shaped play equipment 10.

Fig. 4 is a block diagram of electronic components of the ball-shaped play equipment 10.

Figs. 5(A) and 5(B) respectively show a construction of a shock sensor which is an example of a detection section 56, and Fig. 5(C) shows a construction of a vibration sensor which is another example of the detection section 36.

Fig. 6 is an example flow chart showing how the ball-shaped play equipment 10 works.

Fig. 7 is another example flow chart showing how the ball-shaped play equipment 10 works.

Fig. 8 is a schematic plan view of the ball-shaped play equipment 10 according to a second embodiment of the present invention.

Fig. 9 shows a construction of electronic components of the ball-shaped play equipment 10 according to the second embodiment of the present invention.

Fig. 10 is an example flow chart showing how the ball-shaped play equipment 10 works at time of recording according to the second embodiment of the present invention.

Fig. 11 is another example flow chart showing how the ball-shaped play equipment 10 works according to the second embodiment of the present invention.

Fig. 12 shows a construction of electronic components of the ball-shaped play equipment 10 according to a third embodiment of the present invention.

Fig. 13 is an example flow chart showing how the ball-shaped play equipment 10 works according to the third embodiment of the present invention.

Fig. 14 is another example flow chart showing how the ball-shaped play equipment 10 works according to the third embodiment of the present invention.

Fig. 15 is a schematic plan view of the ball-shaped play equipment 10 according to a fourth embodiment of the present invention.

Fig. 16 is an example flow chart showing how the ball-shaped play equipment 10 works at time of recording according to the fourth embodiment of the present invention.

Fig. 17 is a schematic cross-sectional view of the ball-shaped play equipment 10 according to a fifth embodiment of the present invention.

Fig. 18 is an example flow chart showing how the ball-shaped play equipment 10 works at time of recording according to a sixth embodiment of the present invention.

Fig. 19 shows a construction of a control section 50 of the ball-shaped play equipment 10 according to a seventh embodiment of the present invention.

Fig. 20 is an example flow chart showing how the ball-shaped play equipment 10 works at time of reproduction according to the seventh embodiment of the present invention.

Fig. 21 is a schematic perspective view of the ball-shaped play equipment 10 according to an eighth embodiment of the present invention.

Fig. 22 is a partial exploded view of a first casing 12 and a casing 102 according to the eighth embodiment of the present invention.

Fig. 23 is a schematic cross-sectional view of the first casing 12 according to the eighth embodiment of the present invention.

#### Best Mode for Implementing the invention

**[0017]** Now, the present invention will be described hereinafter by way of embodied examples. These embodied examples do not limit the invention as defined in the claims, and all of combinations of the features described in the embodied examples are not necessarily essential for implementing the invention.

(First Embodiment)

**[0018]** Fig. 1 is a schematic front side elevation view of a ball-shaped play equipment according to a first embodiment of the present invention. The ball-shaped play equipment 10 is almost spherical in shape, comprising two hemi-spherical casings, a first casing 12 and a second casing 14. The first casing 12 has an operation hole 22, a voice pickup hole 32, and a diffusion hole 42. Through the operation hole 22, an operation section 20 is so exposed as to be externally operated. The first casing 12 further includes a conversion section in the interior of the voice pickup hole 32 and a reproduction section in the interior of the diffusion hole 42, respectively.

**[0019]** The ball-shaped play equipment 10 converts external voice into an electronic signal using the conversion section, and records voice data based on this electronic signal as first voice data which is an example of voice data. Then, the ball-shaped play equipment 10 reproduces the first voice data using the reproduction section and outputs the voice when detecting a shock caused as the equipment is used for play such as catch ball and soccer.

**[0020]** The ball-shaped play equipment 10 records the external voice on condition that the operation section 20 is operated by a user. The operation section 20 is, for example, a push button which the user can push down.

**[0021]** Namely, since the ball-shaped play equipment 10 can reproduce voice arbitrarily recorded, it can be used as a communication tool.

**[0022]** It can also be used as a ball with an autograph. In other words, the ball-shaped play equipment 10 can be a memorial with celebrity's voice recorded.

**[0023]** In addition, it can be used as a language learning tool for little children. By recording the voice of a child's parent, it can also be a communication tool between the parents and children.

**[0024]** The outer shape of the ball-shaped play equipment 10 is almost spherical in Fig. 1, but it may be a polyhedron or porous body. Namely, it may be of any shape applicable to ball games such as catch ball and kick ball or similar plays.

**[0025]** An edge 120 of an outer peripheral surface of the first casing 12, which faces the second casing 14, is recessed inwardly over the whole circumference. This eliminates a need of completely aligning the first casing 12 with the second casing 14. Accordingly, by reducing required accuracy in manufacturing, the first casing 12 and second casing 14 can be manufactured at lower cost.

**[0026]** Here again, an edge 140 of an outer peripheral surface of the second casing 14, which faces the first casing 12, may be recessed inwardly over the whole circumference.

**[0027]** Fig. 2 is a schematic top plan view of the ball-shaped play equipment 10. The operation hole 22, voice pickup hole 32, and diffusion hole 42 are arranged in a

line on the casing of the ball-shaped play equipment 10. With this layout, it is possible to provide a space required for facilitating the user to operate the ball-shaped play equipment 10, respectively between the operation hole 22, namely, the operation section 20 and diffusion hole 42, and the voice pickup hole 32 and diffusion hole 42.

**[0028]** The diffusion hole 42 is positioned between the operation hole 22, namely, the operation section 20 and voice pickup hole 32. This makes it rare for an operation sound of the operation section 20 to be picked up by the conversion section.

**[0029]** The distance between the voice pickup hole 32 and the operation hole 22, namely, the operation section 20 may be 1 cm or longer. This makes it rare for the conversion section to pick up the operation sound of the operation section 20 as noise. In addition, when the ball-shaped play equipment 10 is constructed to be small enough to be held in a hand, for example, 7 to 10 cm in diameter, 5 cm or less is preferred. This allows the user to hold the equipment in a hand and readily operate the operation section 20 with this hand to input sound into the voice pickup hole 32.

**[0030]** Fig. 3 is a schematic cross-sectional view of the ball-shaped play equipment 10. In this figure, the first casing 12 and second casing 14 are separated.

**[0031]** The ball-shaped play equipment 10 has the operation section 20, conversion section 30, reproduction section 40, control section 50 and battery 100 in the first casing 12. All of electronic components of the ball-shaped play equipment are arranged in the first casing 12. Accordingly, both of the layout of the electronic components and construction of the control section 50 become simplified.

**[0032]** The operation section 20 is arranged in the operation hole 22, namely in the recess, the conversion section in the voice pickup hole 32, and the reproduction section 40 in the diffusion hole 42, respectively.

**[0033]** The battery 100 is positioned to the side of the second casing 14 in the first casing 12 relative to a surface 121 of the first casing 12 facing the second casing 14. With this arrangement, the user can replace the battery 100 merely by separating the first casing 12 and second casing 14. Compared with the surface 121 of the first casing 12, a surface 141 of the second casing 14 facing the first casing 12 is recessed inwardly by an amount corresponding to a protruding portion of the battery 100. Therefore, the battery 100 does not interfere with the surface 141 when the first casing 12 and second casing 14 are combined.

**[0034]** The first casing 12 has a raised portion 122 in proximity of an outer periphery of the surface 121. The raised portion 122 is formed in a circle. This circle is concentric with the central axis of the first casing 12. Relative to the raised portion 122, the edge 120 of the first casing 12 is recessed inwardly.

**[0035]** The raised portion 122 has on an end of an outer surface thereof an external thread portion 124 for

combining the first casing 12 with the second casing 14. The first casing 12 has the external thread portion 124 in an inner portion from the outer surface thereof.

**[0036]** The second casing 14 has a raised portion 142 in proximity of an outer periphery of the surface 142 facing the first casing 12. The raised portion 142 is so arranged as to face the raised portion 122. Relative to the raised portion 142, the edge 140 of the second casing 14 is recessed inwardly.

**[0037]** The raised portion 142 has on an end of an inner surface thereof an internal thread portion 144 for being threadably engaged with the external thread portion 124. The second casing 14 has the internal thread portion 144 in an inner portion from the outer surface thereof. With threadable engagement of the internal thread portion 144 and external thread portion 124, the first casing 12 and second casing 14 are engaged with each other, thereby forming a casing for the ball-shaped play equipment 10.

**[0038]** By the way, the operation section 20 may preferably be so constructed as not to be readily pushed down except the user's intentional operation of pushing down. This construction reduces inadvertent recording. For example, as mentioned above, the operation section 20 is arranged in the operation hole 22 which is recessed inwardly from the surface of the first casing 12. With this construction, the operation section 20 is not readily pushed inwardly unless the proximity of the operation hole 22 of the first casing 12 is deformed to some extent. Therefore, for example, when the ball-shaped play equipment is thrown and then caught, thereby applying a shock to the first casing 12, this construction can prevent such shock from causing the operation section 20 to be pushed down.

**[0039]** Fig. 4 is a block diagram of electronic components of the ball-shaped play equipment 10. The ball-shaped play equipment 10 comprises the operation section 20, conversion section 30, reproduction section 40, control section 50, and battery 100 as electronic components. The battery supplies required power to the reproduction section 40 and control section 50. The control section 50 includes a signal transmission section 52, a first recording section 54, a detection section 56, and a readout section 58. The first recording section 54 is an example of a recording section according to the present invention.

**[0040]** The operation section 20 activates the signal transmission section 52 according to the user's operation. The signal transmission section 52 outputs a command signal to the recording section 54 according to a physical operation of the operation section 20. The signal transmission section 52 is, for example, a contact switch or piezoelectric element. The operation section 20 is a push button of a contact switch type or push button conveying pressure to the piezoelectric element.

**[0041]** The conversion section 30 converts external voice, for example words spoken by the user, into an electronic signal on condition that it has received a com-

mand signal from the signal transmission section 52. Then, it outputs to the first recording section 54. For example, the conversion section 30 is a microphone.

**[0042]** The first recording section 54 has a rewritable recording medium therein. The first recording section 54 records onto the internal recording medium first voice data based on the electronic signal received from the conversion section 30. The first recording section 54 may record a plurality of the first voice data in such a manner that the data can individually be identified. In addition, the first recording section 54 overwrites the first voice data on the recording medium as occasion demands. The first recording section 54 has an auxiliary battery in order to prevent recorded data from being volatilized even if power is not supplied for a certain period of time when replacing the battery 100.

**[0043]** The detection section 56 is, for example, a vibration sensor. It detects a shock applied to the ball-shaped play equipment 10, and outputs a detection signal to the readout section 58. The detection sensitivity of the detection section 56 may properly be changed according to the usage of the ball-shaped play equipment 10. For example, when the ball-shaped play equipment 10 is intended for little children, the sensitivity may preferably be enough to detect a shock caused when the equipment is fallen down from a height of about 5 cm. When the intended users of the ball-shaped play equipment 10 are elementary school students or older, it is preferred to set the sensitivity not to output a detection signal corresponding to a shock caused when the equipment is fallen down from a height of 50 cm or less.

**[0044]** The readout section 58 reads out the first voice data stored in the first recording section 54 upon receipt of the detection signal from the detection section 56. Then, after a predetermined period of time has passed since the receipt of the detection signal, it outputs an electronic signal based on the read-out first voice data to the reproduction section 40. The predetermined period of time is typically 0.1 second to 1 second. The readout section 58 may amplify the electronic signal based on the first voice data for outputting.

**[0045]** The reproduction section 40 converts the electronic signal received from the readout section 58 into voice. The reproduction section 40 outputs the voice after a predetermined delay in time since the shock is applied according to the readout section 58. Thus, reproduced voice cannot readily be mixed with sound caused by the shock. The reproduction section 40 may have a function of amplifying the received electronic signal.

**[0046]** Fig. 5(A) shows a construction of a shock sensor which is an example of the detection section 56. In this example, the shock sensor includes a receiving member 200 which is hollow and is almost columnar in shape, a first electrode 210 provided at a side surface of the receiving member 200, and a second electrode 220 which is columnar in shape and stands up on one of inner surface of the receiving member 200. A tip of the second electrode 220 is preferably heavy so that the

second electrode 220 may easily bend due to a change in force of inertia.

**[0047]** The receiving member 200 is made of an insulator. The first electrode 210 is of a ring type and is exposed to the interior of the receiving member 200. Preferably, the exposed portion extends all over the circumference of the side surface of the receiving member 200. The second electrode 220 is elastic and elastically bends due to a change in force of inertia, thereby contacting the first electrode 210. By conduction of the first electrode 210 and second electrode 200, the shock sensor detects a shock.

**[0048]** Fig. 5(B) shows a variation of the shock sensor shown in Fig. 5(A). In this example, the shock sensor includes a second electrode 230 of a spring type in place of the columnar second electrode 220. The shock sensor of this example detects a shock in the same manner as the one shown in Fig. 5(A).

**[0049]** Fig. 5(C) shows a construction of a vibration sensor which is another example of the detection section 56. In this example, the vibration sensor has a distortion gauge 240 made of a piezoelectric material on a base member 201. When a shock is applied to this vibration sensor, distortion is caused on the piezoelectric material according to the applied shock, and this distortion, in turn, causes an electromotive force in the piezoelectric material. Based on this voltage caused, the vibration sensor detects the shock. The magnitude of the electromotive force caused in the piezoelectric material depends upon how big the shock was. Therefore, when the vibration sensor is used as the detection section 56, it can detect how big the shock applied to the ball-shaped play equipment is. In this case, it is possible to vary the first voice to be reproduced corresponding to the magnitude of the applied shock.

**[0050]** Fig. 6 is an example flow chart showing how the ball-shaped play equipment 10 works. This example shows how the ball-shaped play equipment 10 works when recording the external voice.

**[0051]** When the signal transmission section 52 detects an operation applied to the operation section 20 (as shown in Step S20: Yes), the conversion section 30 picks up the voice and converts it into an electronic signal (as shown in Step S40). The first recording section 54 records the first voice data based on the electronic signal received from the conversion section 30 (as shown in Step S60). Then, the first recording section 54 continues to record the first voice data while the operation section 20 is being operated (as shown in Step S80: No). When an operation onto the operation section 20 is completed (as shown in Step S80: Yes), the first recording section 54 completes recording of the first voice data.

**[0052]** Fig. 7 is another example flow chart showing how the ball-shaped play equipment 10 works. This example depicts how the ball-shaped play equipment 10 reproduces the first voice data.

**[0053]** When the detection section 56 detects a shock

(as shown in Step S120: Yes), the readout section 58 reads the first voice data out of the first recording section 54 (as shown in Step S140). Then, the reproduction section 40 receives the electronic signal based on the readout first voice data, and reproduces the first voice data by outputting the voice based on that electronic signal (as shown in Step S160).

(Embodiment 2)

**[0054]** Fig. 8 is a schematic plan view of the ball-shaped play equipment 10 according to a second embodiment of the present invention. As shown in this figure, the ball-shaped play equipment 10 according to this embodiment further comprises a prohibition switch 70 externally arranged in addition to the external construction of the ball-shaped play equipment 10 according to the first embodiment. The prohibition switch 70 is an example of a prohibition section according to the present invention, and is externally operable. Between the prohibition switch 70 and the operation section 20, other elements such as the diffusion hole 42 are located. With this arrangement, the user may less often operate the prohibition switch 70 inadvertently when he or she operates the operation section 20.

**[0055]** Fig. 9 shows a construction of electronic components of the ball-shaped play equipment 10 according to this embodiment. The construction is almost the same as the one shown in Fig. 4 except that the ball-shaped play equipment further comprises a second recording section 60 and the prohibition switch 70. In this embodiment the recording section includes the first recording section 54 and second recording section 60.

**[0056]** The second recording section 60 has a non-rewritable recording medium therein. Second voice data is pre-loaded into this recording medium. In response to a request from the readout section 58, the second voice data stored therein is provided to the readout section 58. The second voice data are, for example, voice data having memorial significance such as celebrity's voice.

**[0057]** The prohibition switch 70 is a switch for prohibiting or permitting activation of the signal transmission section 52. When prohibited by the prohibition switch 70, the signal transmission section 52 does not transmit a signal to the first recording section 54 in spite of an operation of the operation section 20.

**[0058]** Therefore, even if the user operates the operation section 20 by mistake while using the ball-shaped play equipment 10, the first voice data recorded on the first recording section 54 will not be overwritten inadvertently.

**[0059]** In this figure, the prohibition switch 70 is so constructed as to transmit an activation prohibiting signal to the signal transmission section 52. Instead, the signal transmission section 52 and the first recording section 54 may be constructed so that the connection therebetween is physically turned on and off. The prohibition switch 70 may be a sliding switch or the one of

a push button type.

**[0060]** The prohibition switch 70 transmits a signal to the readout section 58 when activation of the signal transmission section 52 is prohibited. While receiving a signal from the prohibition switch 70, the readout section 58 reads out the second voice data recorded in the second recording section 60 instead of reading out the first voice data recorded in the first recording section 54, and outputs an electronic signal based on the second voice data to the reproduction section 40.

**[0061]** Fig. 10 is an example flow chart showing how the ball-shaped play equipment 10 works at time of recording according to this embodiment.

**[0062]** Only when the signal transmission section 52 detects an operation applied to the operation section 20 (as shown in Step S20 : Yes) and the prohibition switch 70 permits recording (as shown in Step S21: Yes), the conversion section 30 picks up external voice and converts it into an electronic signal (as shown in Step S40). Then, the first recording section 54 records the first voice data based on the electronic signal received from the conversion section 30 (as shown in Step S60). The subsequent behaviors are the same as those according to the first embodiment shown in Fig. 6, and an explanation is omitted here.

**[0063]** Fig. 11 is another example flow chart showing how the ball-shaped play equipment 10 works according to this embodiment. This example depicts how the ball-shaped play equipment 10 reproduces the first voice data.

**[0064]** When the detection section 56 detects a shock (as shown in Step S120: Yes), the readout section 58 checks if the prohibition switch 70 permits recording (as shown in Step S130). If recording is permitted, the readout section 58 reads out the first voice data from the first recording section 54 (as shown in Step S142). If recording is not permitted, the readout section 58 reads out the second voice data from the second recording section 54 (as shown in Step S144). Then, the reproduction section 40 receives an electronic signal based on the read-out first or second voice data, and reproduces the first or second voice data by outputting the voice based on the electronic signal (as shown in Step S160).

**[0065]** Thus, according to this embodiment, the way of playing the ball-shaped play equipment 10 is further diversified.

(Third Embodiment)

**[0066]** Fig. 12 shows a construction of electronic components of a ball-shaped play equipment 10 according to a third embodiment of the present invention. The construction shown in this figure is almost the same as the one shown in Fig.4 except that the ball-shaped play equipment further comprises a selection switch 72. The selection switch 72 is an example of the command section according to the present invention. As with the pro-

hibition switch 70, the selection switch 72 is externally operable. Between the selection switch 72 and the operation section 20, other elements such as the diffusion hole 42 are located.

**[0067]** The selection switch 72 allows the first recording section 54 and readout section 58 to receive a selection signal. Namely, the first recording section 54 records a plurality of the first voice data individually corresponding to the selection signals from the selection switch 72. For example, the first recording section 54 records the first voice data in recording areas corresponding to the respective selection signals. The readout section 58 reads out of the first recording section 54 the first voice data corresponding to the selection signals from the selection switch 72, and outputs electronic signals based on the first voice data to the reproduction section 40.

**[0068]** Fig. 13 is an example flow chart showing how the ball-shaped play equipment 10 works according to this embodiment of the present invention. This embodiment shows how the ball-shaped play equipment 10 works at time of recording.

**[0069]** When the signal transmission section 52 detects an operation applied to the operation section 20 (as shown in Step S20: Yes), the conversion section 30 picks up external voice and converts it into an electronic signal (as shown in Step S40). The first recording section 54 records the first voice data based on the electronic signal received from the conversion section 30, corresponding to the selection by the selection switch 72 (as shown in Step S62). The subsequent behaviors are the same as those of the first embodiment, and a detailed description is omitted here.

**[0070]** Fig. 14 is another example flow chart showing how the ball-shaped play equipment 10 works according to this embodiment of the present invention. This embodiment shows how the ball-shaped play equipment 10 works at time of reproduction of the first voice data.

**[0071]** When the detection section 56 detects a shock (as shown in Step S120: Yes), the readout section 58 checks the selection by the selection switch 72 (as shown in Step S122). Then, the readout section 58 reads out of the first recording section 54 the first voice data corresponding to the selection by the selection switch 72 (as shown in Step S124). The reproduction section 40 receives an electronic signal based on the read-out first voice data, and reproduces the first voice data by outputting the voice based on that electronic signal (as shown in Step S160).

**[0072]** According to this embodiment, the user can record a plurality of voice onto the ball-shaped play equipment 10. The user can also select and reproduce desired voice with the ball-shaped play equipment 10. Thus, the ball-shaped play equipment 10 can provide the user with more diversified ways of play.

## (Fourth Embodiment)

**[0073]** Fig. 15 is a schematic plan view of the ball-shaped play equipment 10 according to a fourth embodiment of the present invention. In this embodiment, the ball-shaped play equipment 10 is almost the same as the one in the first embodiment except that the ball-shaped play equipment comprises a plurality of the operation sections 20. The plurality of the operation sections 20 may preferably be provided apart from one another. For example, as shown in this figure, the operation sections are arranged each at an angle of 90 degrees around the diffusion hole 42. With this arrangement, the user may less often operate inadvertently some operation sections 20 within a predetermined period of time.

**[0074]** Fig. 16 is an example flow chart showing how the ball-shaped play equipment 10 works at time of recording according to this embodiment of the present invention. When the signal transmission section 52 detects an operation applied to another operation section 20 within a predetermined period of time since an operation is applied to one of the operation sections 20 (as shown in Step S22), the conversion section 30 picks up external voice and converts it into an electronic signal (as shown in Step S40). The subsequent behaviors are the same as those of the first embodiment shown in Fig. 6, and a detailed description is omitted here. The predetermined period of time in Step S42 includes a value of zero. Namely, multiple operations simultaneously applied to the plurality of the operation sections 20 may be one condition for the first voice data to be recorded.

**[0075]** Therefore, even if the user operates one of the operation sections 20 by mistake while he or she is using the ball-shaped play equipment 10, the first voice data of the first recording section 54 will not inadvertently be overwritten.

**[0076]** The behaviors of the ball-shaped play equipment 10 at time of reproduction are the same as those of the first embodiment, and an explanation is omitted here.

## (Fifth Embodiment)

**[0077]** Fig. 17 is a schematic cross-sectional view of the ball-shaped play equipment 10 according to a fifth embodiment of the present invention. In this embodiment, the ball-shaped play equipment 10 further comprises a covering member 24 in addition to the construction of the first embodiment. The covering member 24 is, for example, made of a resin, and detachably covers the operation hole 22 having the operation section 20 therein. Thus, covering the operation hole 22 with the covering member 24 can prevent the user from inadvertently operating the operation section 20 when he or she does not wish to use the operation section 20.

**[0078]** In this embodiment, the covering member 24 is detachable. It may be so constructed as to slide for

covering or exposing the operation hole 22.

## (Sixth Embodiment)

**[0079]** The construction of the ball-shaped play equipment 10 according to a sixth embodiment is the same as the one of the first embodiment except that the behaviors at time of recording are different.

**[0080]** Fig. 18 is an example flow chart showing how the ball-shaped play equipment 10 works at time of recording according to this embodiment of the present invention.

**[0081]** In this embodiment, when the signal transmission section 52 detects that the operation section 20 is continuously being operated for a certain period of time (as shown in Step S24), the conversion section 30 picks up external voice and converts it into an electronic signal (as shown in Step S40). The first recording section 54 records the first voice data based on the electronic signal received from the conversion section 30, for a predetermined period of time (as shown in Step S64).

**[0082]** In this embodiment, the first recording section 54 does not record the first voice data unless the operation section 20 is continuously being operated for a certain period of time. Therefore, even if the user operates the operation section 20 by mistake while he or she is using the ball-shaped play equipment 10, the first voice data of the first recording section 54 will less often be overwritten inadvertently.

**[0083]** Also in this embodiment, the first recording section 54 may be so constructed as to continue to record the first voice data on condition that the operation section 20 is being operated after recoding of the first voice data is started.

## (Seventh Embodiment)

**[0084]** The construction of the ball-shaped play equipment 10 according to a seventh embodiment is the same as the one of the first embodiment except that the construction of the control section 50 is different.

**[0085]** Fig. 19 shows a construction of the control section 50 of the ball-shaped play equipment 10 according to this embodiment of the present invention. The construction of the control section 50 is almost the same as that of the control section 50 in the first embodiment except that a selection section 62 is provided between the first recording section 54 and the readout section 58. In addition, a plurality of the first voice data are stored in the first recording section 54.

**[0086]** When the selection section 62 receives a readout command of the first voice data from the readout section 58, it selects and reads out any of the first voice data from the plurality of the first voice data stored in the first recording section 54. Then, it outputs the read-out first voice data to the readout section 58.

**[0087]** The selection section 62 may select any two of the plurality of the first voice data at different probabili-

ties. For example, out of "Hit" and "Miss", "Hit" may be selected at higher probability than "Miss".

**[0088]** Fig. 20 is an example flow chart showing how the ball-shaped play equipment 10 works at time of reproduction according to this embodiment of the present invention.

**[0089]** When the detection section 56 detects a shock (as shown in Step S120; Yes), the readout section 58 outputs a readout command to the selection section 62 (as shown in Step S152). The selection section 62 randomly selects the first voice data from the first recording section 54 (as shown in Step S154). The readout section 58 retrieves through the selection section 62 the first voice data selected by the selection section 62 (as shown in Step S156). The reproduction section 40 receives an electronic signal based on the read-out first voice data, and reproduces the first voice data by outputting the voice based on that signal (as Shown in Step S160).

**[0090]** According to this embodiment, the user does not know which one of the first voice data will be reproduced. Thus, the way of play for the ball-shaped play equipment 10 is furthermore diversified. By selecting at least two of the first voice data at different probabilities, the way of play is diversified.

(Eighth Embodiment)

**[0091]** Fig. 21 is a schematic perspective view of the ball-shaped play equipment 10 according to an eighth embodiment of the present invention. The ball-shaped play equipment 10 according to this embodiment is the same as that of the first embodiment except for the construction of the casing. The second casing 14 accounts for the major part of the casing for the ball-shaped play equipment 10. The first casing 12 is so constructed as to be pushed into the second casing 14. In fixing the first casing 12 to the second casing 14, a screw not shown may be used.

**[0092]** According to the construction in this embodiment, even if at least one of the first casing 12 and second casing 14 is made of a material incapable of threadable engagement as with a hard ball for a baseball game, the first casing 12 and second casing 14 can be fixed to each other.

**[0093]** In this embodiment, the first casing 12 is fixed to the second casing 14 with screws 17. More specifically, the screws 17 penetrate through the first casing 12 from the outside. A member 300 is fixedly filled into an opening of the second casing 14. The member 300 has screw holes 302 to be threadably engaged with the screws 17. Namely, with threadable engagement of the screws 17 with the screw holes 302, the first casing 12 is fixed to the second casing 14. Likewise, by unscrewing the screws 17, the first casing 12 can easily be detached from the second casing 14. By detaching the first casing 12, interior components of the control section and other sections can readily be inspected.

**[0094]** In this embodiment, the member 300 is typically designed to be a hollow cylinder so that the casing 102 can be filled therinto. An outer wall 304 of the member 300 partially has raised portions 306 protruding toward the interior thereof.

**[0095]** In addition, part of the casing 102 has recesses 103 into which the raised portions 306 are filled. In other words, with the raised portions 306 being filled into the recesses 103, relative positions of the first casing 12 and the second casing 14 are easily determined. Therefore, the first casing 12 is easily mounted onto the second casing 14.

**[0096]** In this embodiment, at least a periphery of the operation section 20 is made of an elastic material such as polyurethane and sponge. The operation section 20 is a push switch, and is arranged in the operation hole 22, namely, a portion recessed inwardly from the surface of the first casing 12. With this arrangement, the operation section 20 is not pushed down inwardly unless the proximity of the operation hole 22 on the first casing 12 is deformed to some extent. Namely, the operation section 20 is so constructed as not to be easily pushed down by means of a shock. For example, although a shock is applied to the first casing 12 when a thrown ball-shaped play equipment 10 is caught in a hand, the operation section 20 can be prevented from being pushed down by means of the shock.

**[0097]** The operation hole 22 may be defined as about 3 mm to 8mm in diameter so that a finger should not insert therinto. In this case, the peak of the operation hole 22 may be widened like a bowl to allow a finger to slide therinto.

**[0098]** Fig. 22 is a partial exploded view of the first casing 12 and the casing 102. As shown in this figure, a battery 100 is exposed to the outside by detaching a face 104 of the casing 102. Therefore, the user can readily replace the battery 100. Here, the face 104 is fixed to the casing 102 with a screw 106. With this arrangement, even if a shock is applied to the ball-shaped play equipment 10, poor contact of the battery 100 will be less likely to occur. A hole provided at a rear cover 104 for inserting the screw 106 therinto may preferably be located in the center of the face 104 or around there. Likewise, a screw hole provided at the casing 102 corresponding to the screw 106 may preferably be located in a position corresponding to the center of the face 104 or its proximity. This eliminates a need of using a plurality of the screws 106. When a plurality of the batteries 100 are used, they may preferably be arranged concentrically relative to the screw 106. In this figure, a recess 103 is not shown.

**[0099]** Fig. 23 is a schematic cross-sectional view of the first casing 12 according to this embodiment of the present invention. In this figure, the peak 26 of the operation hole 22 is widened like a bowl. The head of the operation section 20 is located lower than a lower end of the peak 26 of the operation hole 22. With this arrangement, the user will less often operate the operation

section 20 inadvertently.

**[0100]** The present invention has been so far described by way of embodied examples, but technical scope of the present invention is not limited to those embodiments. Various modifications or improvements may be added to those embodiments. For example, any of the characteristic elements described in each of the embodied examples can be combined in any way. It is clearly understood from the claims of the present invention that embodiments with such modifications or improvements added may also be included in the scope of the present invention.

**[0101]** For example, in the first embodiment, the readout section 58 outputs an electronic signal based on the first voice data to the reproduction section 40 after a predetermined period of time has passed since it receives a detection signal from the detection section 56. Instead, the following construction may be possible. The readout section 58 outputs an electronic signal based on the first voice data to the reproduction section 40 immediately after it receives a detection signal. The reproduction section 40 converts the electronic signal after a predetermined period of time has passed since it receives the signal.

**[0102]** When the detection section 56 detects another shock while the voice data is being reproduced, the detection of that shock may be invalidated or effectuated. If effectuated, the reproduction section 40 resumes reproduction of the first voice data every time a shock is detected.

**[0103]** In the second embodiment, the prohibition switch 70 is so constructed as to prohibit the first recording section 53 from being activated by prohibiting the signal transmission section 52 from being activated. The prohibition switch 70 may be so constructed as to directly prohibit the first recording section 54 or conversion section 30 from being activated.

**[0104]** In the second embodiment, the conversion section 30 is so constructed as to be activated on condition that it receives a command signal. The first recording section 54, not the conversion section 30, may be so constructed as to be activated on condition that it receives a command signal. Alternatively, activation condition may be that both of the conversion section 30 and the first recording section 54 receive a command signal.

**[0105]** In addition, a plurality of voice data may be read out simultaneously and then be synthesized for outputting the voice. In this case, for example, only a plurality of the first voice data may be read out or only a plurality of the second voice data may be read out. Alternatively, a plurality of both of them may be read out.

**[0106]** From the foregoing embodiments, it is clear that the following techniques have been disclosed.

Item 1 A ball-shaped play equipment which outputs voice in response to a shock comprising: a conversion section for converting external voice into an

electronic signal; a recording section for recording voice data based on said electronic signal; a detection section for detecting a shock applied to said ball-shaped play equipment; a reproduction section for outputting voice based on said voice data recorded in said recording section when said detection section detects a shock; a battery which acts as a power source for the ball-shaped play equipment, and a casing for receiving therein said conversion section, said first recording section, said detection section, said reproduction section, and said battery; said casing having a first casing for holding in the inner side thereof said battery externally replaceable, and a second casing for forming said casing together with said first casing.

Item 2 A ball-shaped play equipment as defined in Item 1, wherein said first casing includes in an inner side thereof one of a spiral internal thread portion and a spiral external thread portion provided relative to a central axis of said casing; said second casing includes in an inner side thereof the other one of said spiral internal and external thread portions provided relative to said central axis of said casing so as to threadably engage with the one of said spiral internal and external thread portions of said first casing.

Item 3 A ball-shaped play equipment as defined in Item 1, wherein an edge of an outer peripheral surface of at least one of said first casing and said second casing that is facing the other casing is recessed over the whole circumference.

#### Industrial Applicability

**[0107]** As clearly known from the foregoing, according to the present invention, a ball-shaped play equipment can be provided that outputs voice in response to a shock, diversifying the way of play than ever.

#### **Claims**

1. A ball-shaped play equipment which outputs voice in response to a shock comprising:

a conversion section for converting external voice into an electronic signal;  
a recording section for recording voice data based on said electronic signal;  
a detection section for detecting a shock applied to said ball-shaped play equipment; and  
a reproduction section for outputting voice based on said voice data recorded in said recording section when said detection section detects said shock.

2. The ball-shaped play equipment as defined in claim 1 further comprising an operation section externally

operable and a signal transmission section:

wherein at least one of said conversion section and said recording section is activated on condition that it receives a command signal, and

wherein said signal transmission section transmits said command signal to at least one of said conversion section and said recording section according to an operation applied to said operation section.

3. The ball-shaped play equipment as defined in claim 2 further comprising a prohibition section for prohibiting at least one of said conversion section and said recording section from being activated irrespective of said operation applied to said operation section.

4. The ball-shaped play equipment as defined in claim 3,

wherein said recording section includes a first recording section for storing voice data based on said electronic signal as first voice data and a second recording section for pre-retaining second voice data, and

wherein said reproduction section retrieves the second voice data stored in said second recording section and outputs voice based on said second voice data when said detection section detects said shock while said changeover switch is prohibiting said signal transmission section from being activated.

5. The ball-shaped play equipment as defined in claim 2 further comprising a casing for receiving therein said conversion section, said recording section, said detection section, and said reproduction section,

wherein said casing has a recess, and said operation section is provided at said recess.

6. The ball-shaped play equipment as defined in claim 2,

wherein at least one of said conversion section and said recording section is activated on condition that it continuously receives said command signal for a predetermined period of time or longer.

7. The ball-shaped play equipment as defined in claim 2 having a plurality of said operation sections,

wherein said signal transmission section transmits said command signal when one of said operation sections is operated and at least another operation section is subsequently operated within a predetermined period of time.

8. The ball-shaped play equipment as defined in claim 2 further comprising a covering member, which is detachable or movable, for disabling an operation portion of said signal transmission section to be ex-

ternally operated by covering the operation portion.

9. The ball-shaped play equipment as defined in claim 1 further comprising a command section externally operable,

wherein said recording section stores a plurality of voice data in such a manner that the data can be individually identified, and based on an external operation, said command section gives said reproduction section an indication of which of the plurality of said voice data to retrieve.

10. The ball-shaped play equipment as defined in claim 2 further comprising a casing, at least part of which is made of an elastic member, for receiving said operation section therein,

wherein said operation section is a push switch and is arranged at a position which allows the switch to be pushed down through the elastic member of said casing with an external operation.

11. The ball-shaped play equipment as defined in claim 1 further comprising a selection section,

wherein said recording section stores a plurality of voice data, and said selection section randomly selects any of the plurality of said voice data with every processing by said reproduction section, and

wherein said reproduction section outputs voice based on said voice data selected by said selection section.

12. The ball-shaped play equipment as defined in claim 11,

wherein said selection section selects at least two of the plurality of said voice data at different probabilities.

13. The ball-shaped play equipment as defined in claim 1,

wherein said reproduction section outputs voice based on said voice data after a predetermined period of time has passed since said detection section detects said shock.

14. The ball-shaped play equipment as defined in claim 13,

wherein said predetermined period of time is 0.1 second to 1 second.

15. The ball-shaped play equipment as defined in claim 2 further comprising a casing for receiving therein said conversion section, said recording section, said detection section, said reproduction section, and said battery;

wherein said casing has a voice pickup hole for facilitating said conversion section to pick up voice, and a diffusion hole for helping the voice from

said reproduction section to be externally diffused,  
and

wherein said operation section is arranged at  
a position almost along a line connecting said voice  
pickup hole and said diffusion hole.

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- 16.** The ball-shaped play equipment as defined in claim  
15,

wherein said diffusion hole is positioned be-  
tween said voice pickup hole and said operation  
section.

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- 17.** The ball-shaped play equipment as defined in claim  
15,

wherein said voice pickup hole is positioned  
1 cm or more apart from said operation section on  
said casing.

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- 18.** A ball-shaped play equipment which records exter-  
nal voice and reproduces said recorded voice when  
a shock is applied.

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- 19.** The ball-shaped play equipment as defined in claim  
18,

wherein said external voice is recorded ac-  
cording to an operation of a user.

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- 20.** The ball-shaped play equipment as defined in claim  
18,

wherein said external voice is being recorded  
while said user is operating the equipment.

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- 21.** The ball-shaped play equipment as defined in claim  
18,

wherein recording of said external voice can  
selectively be prohibited.

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- 22.** The ball-shaped play equipment as defined in claim  
18,

wherein said recorded voice is reproduced af-  
ter a predetermined delay in time since said shock  
is applied.

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50

55

Fig. 1

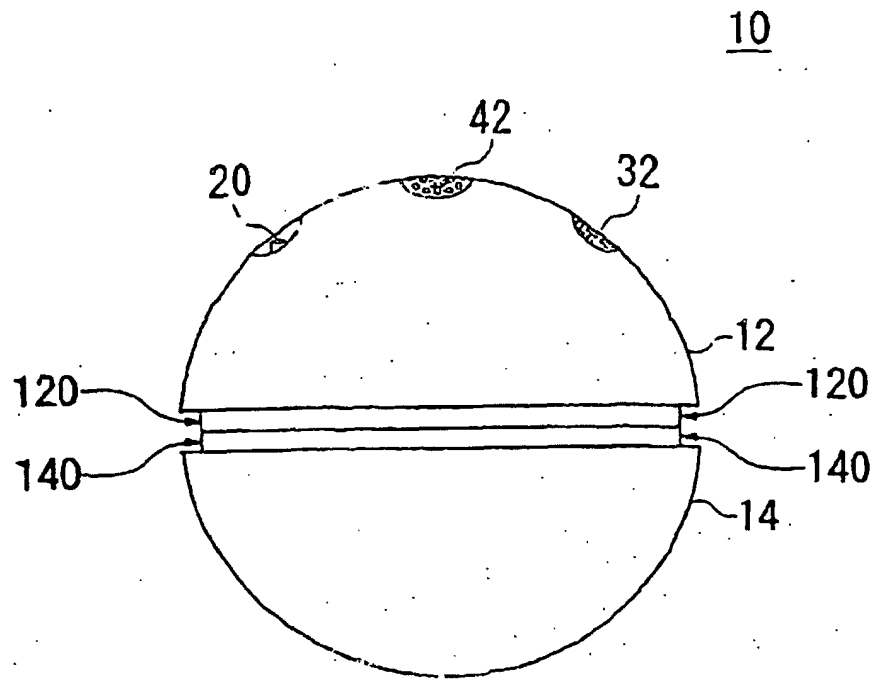


Fig. 2

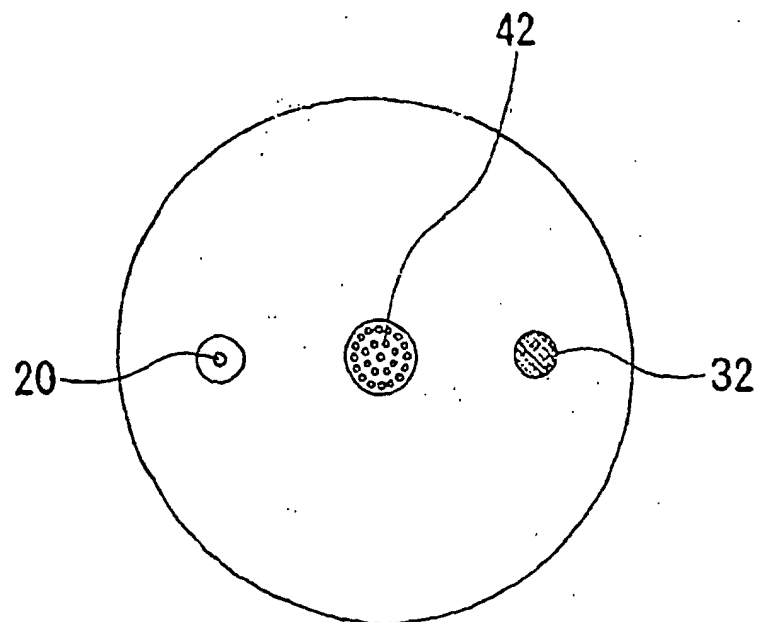


Fig. 3

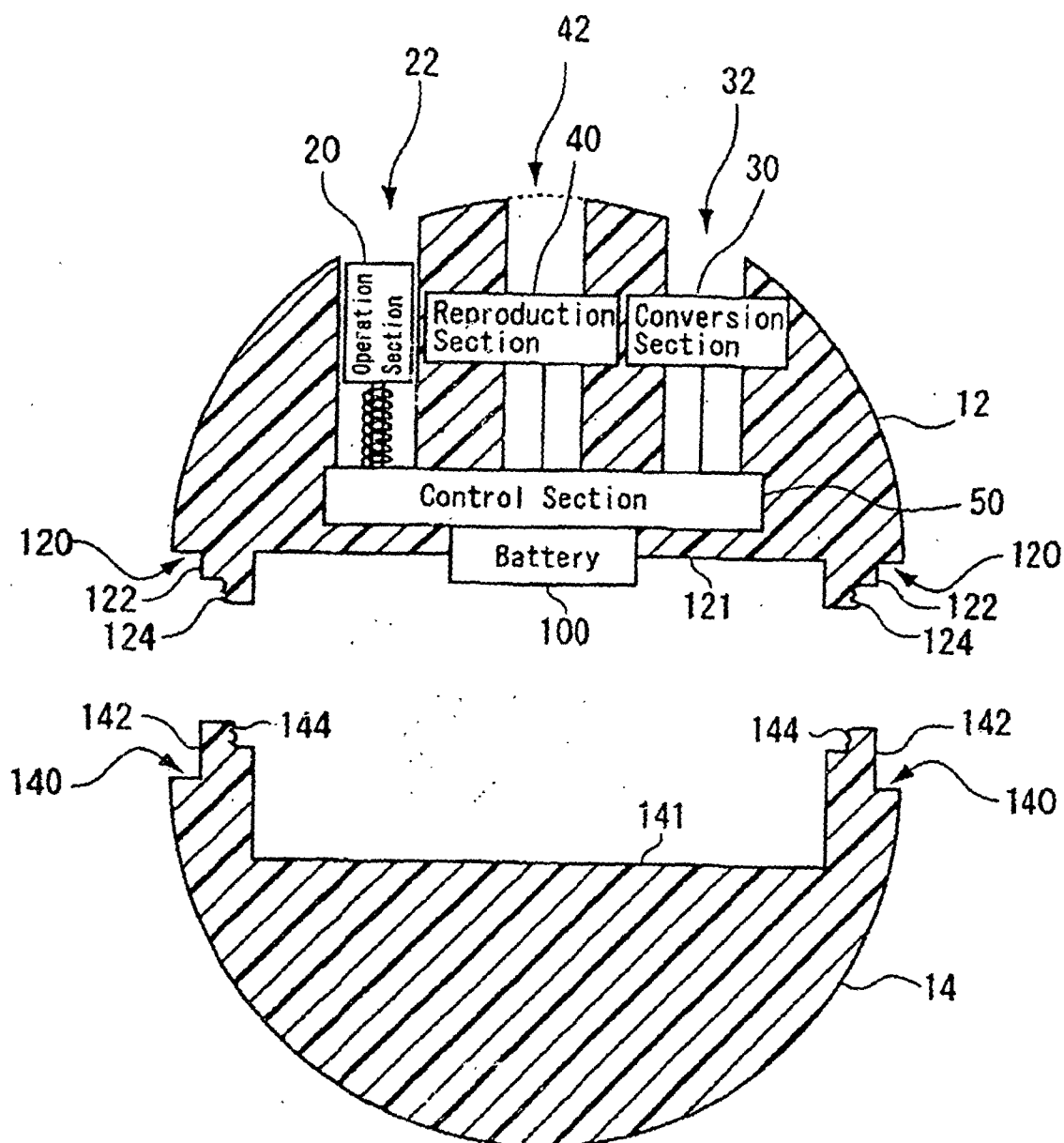


Fig. 4

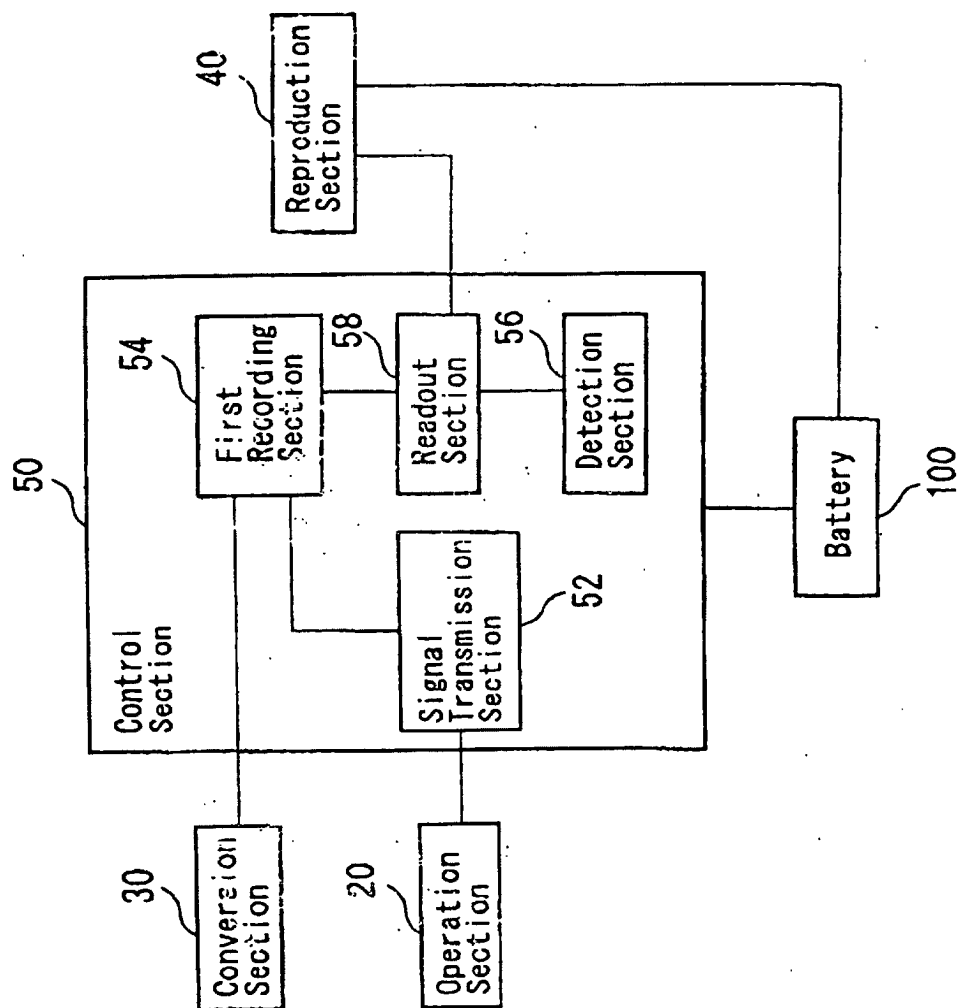


Fig. 5

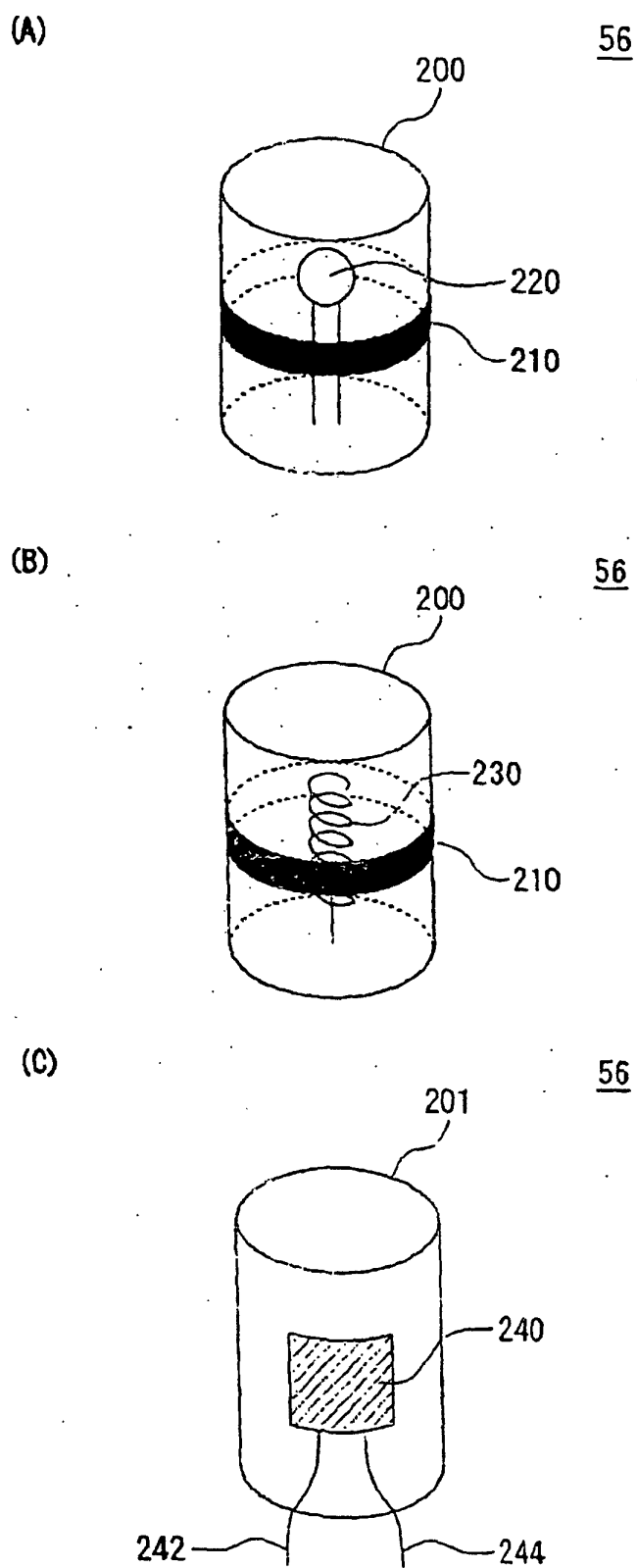


Fig. 6

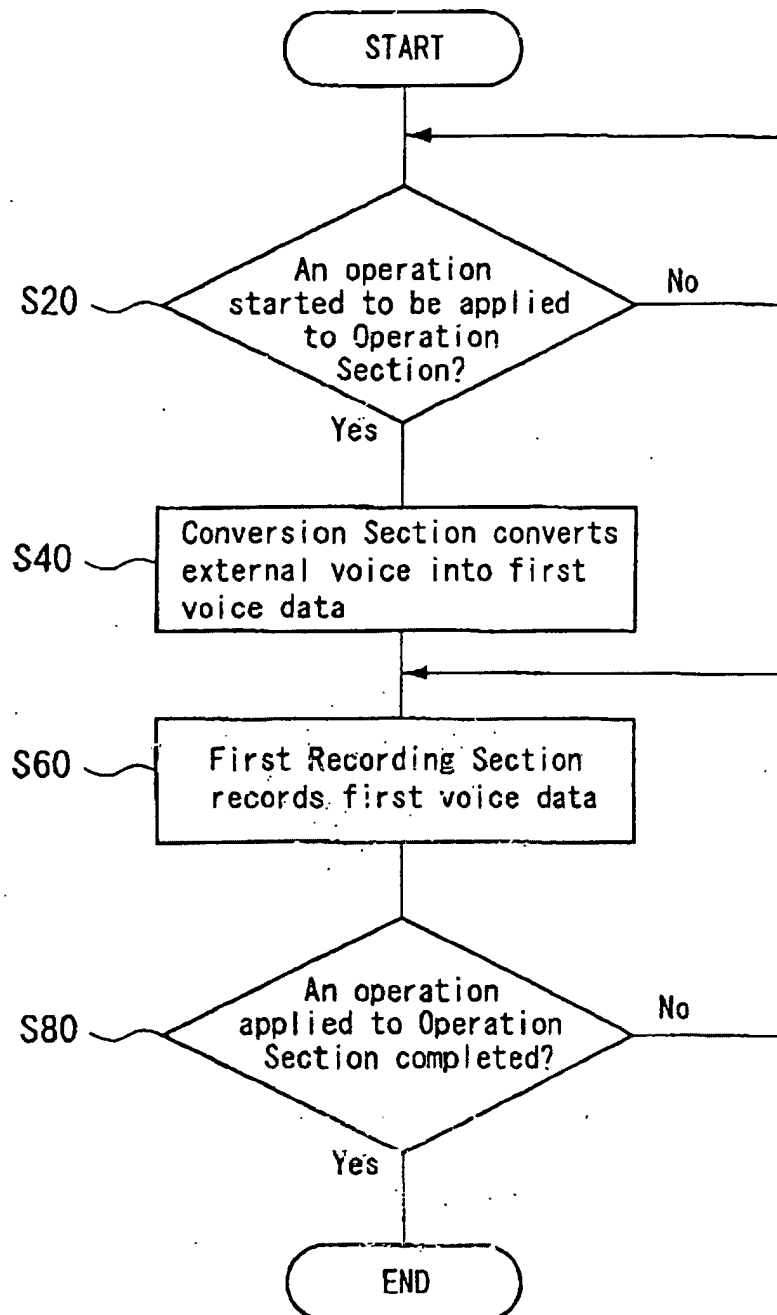


Fig. 7

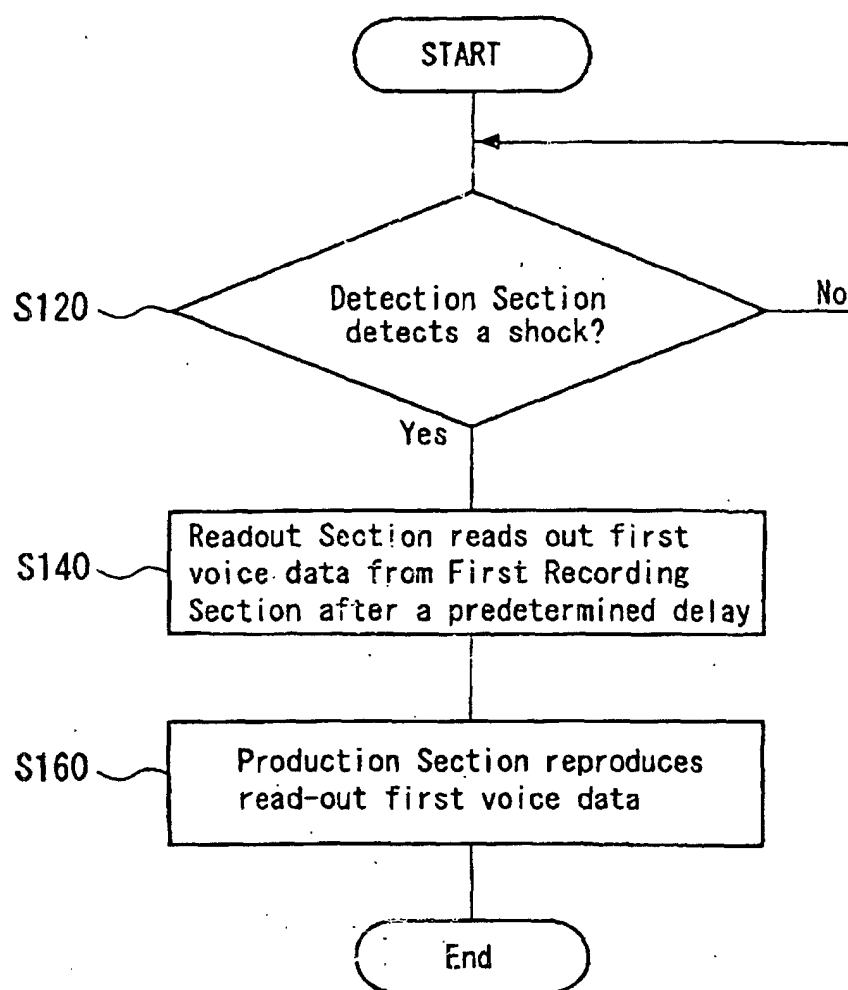


Fig. 8

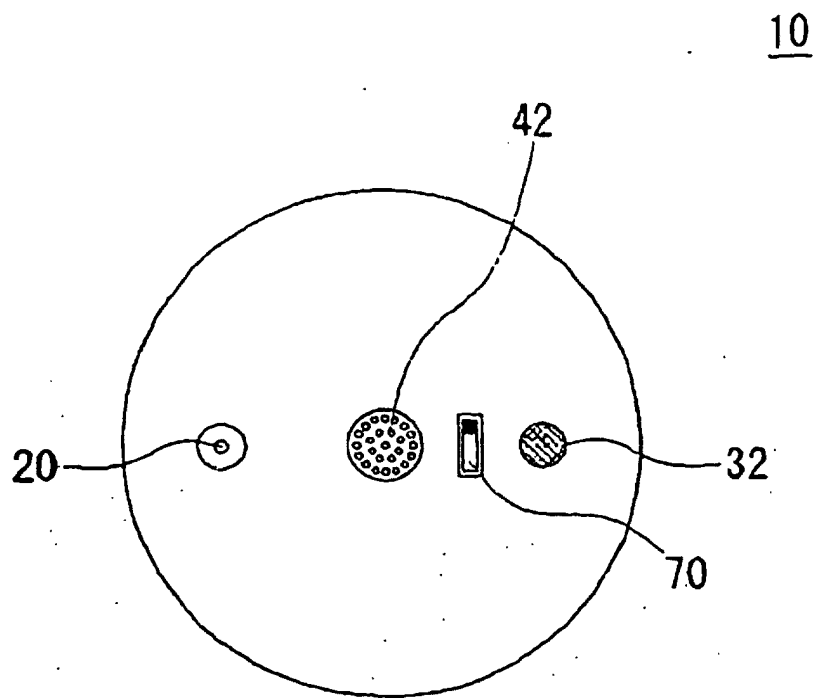


Fig. 9

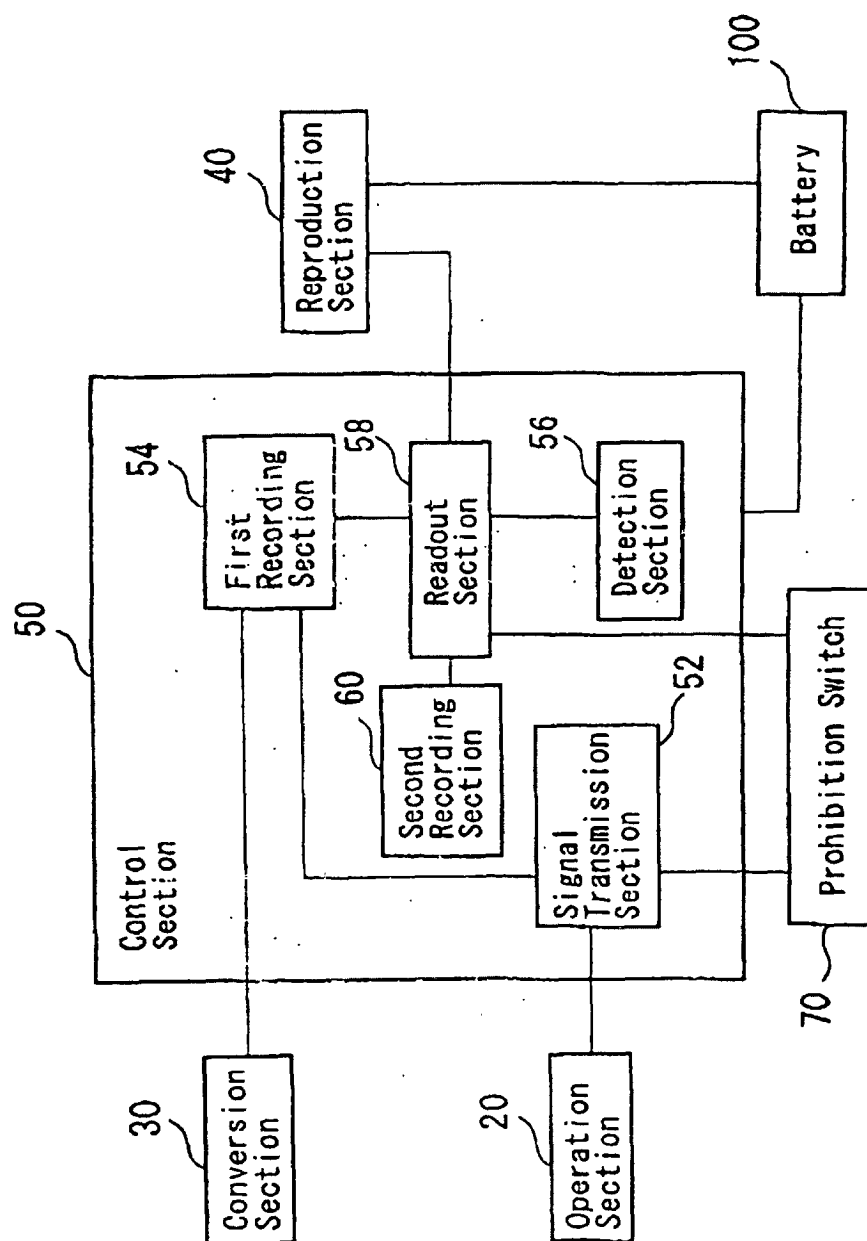


Fig. 10

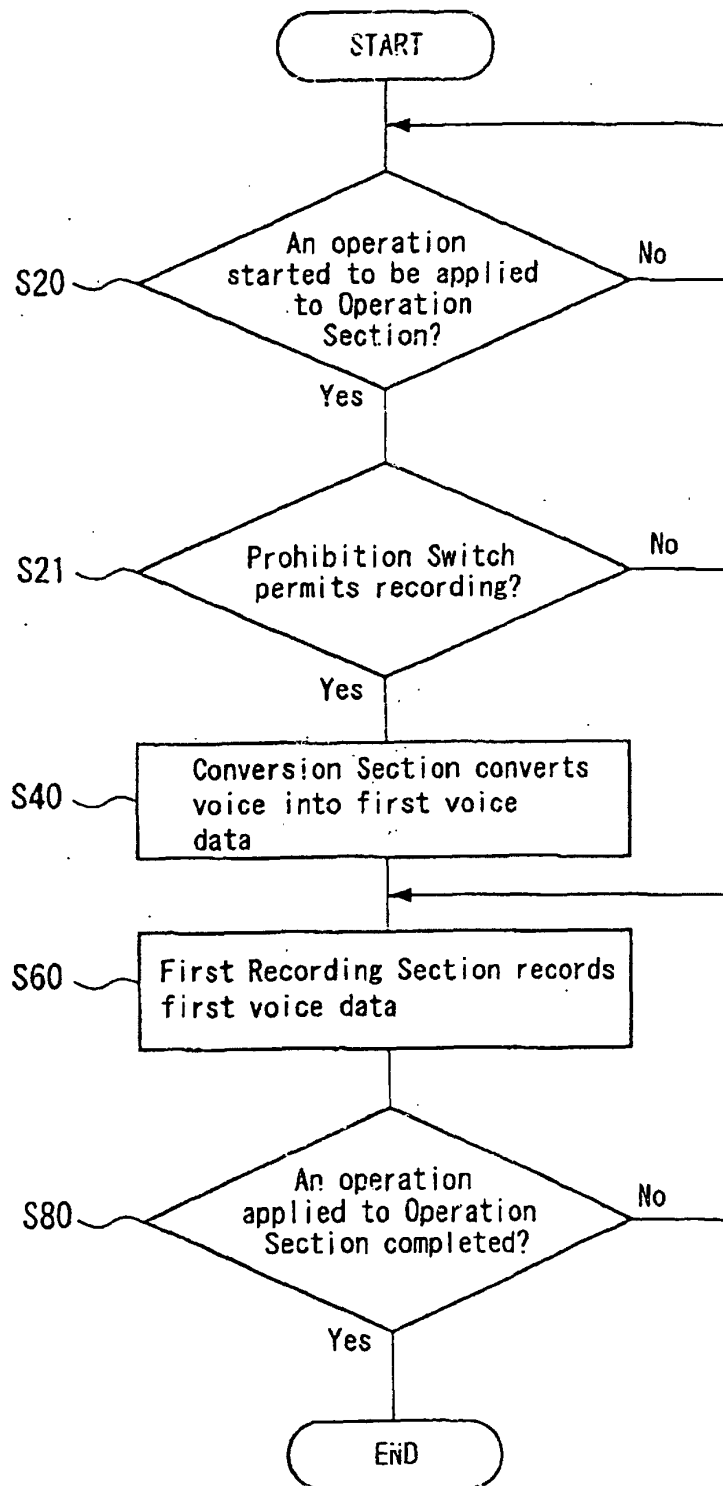


Fig. 11

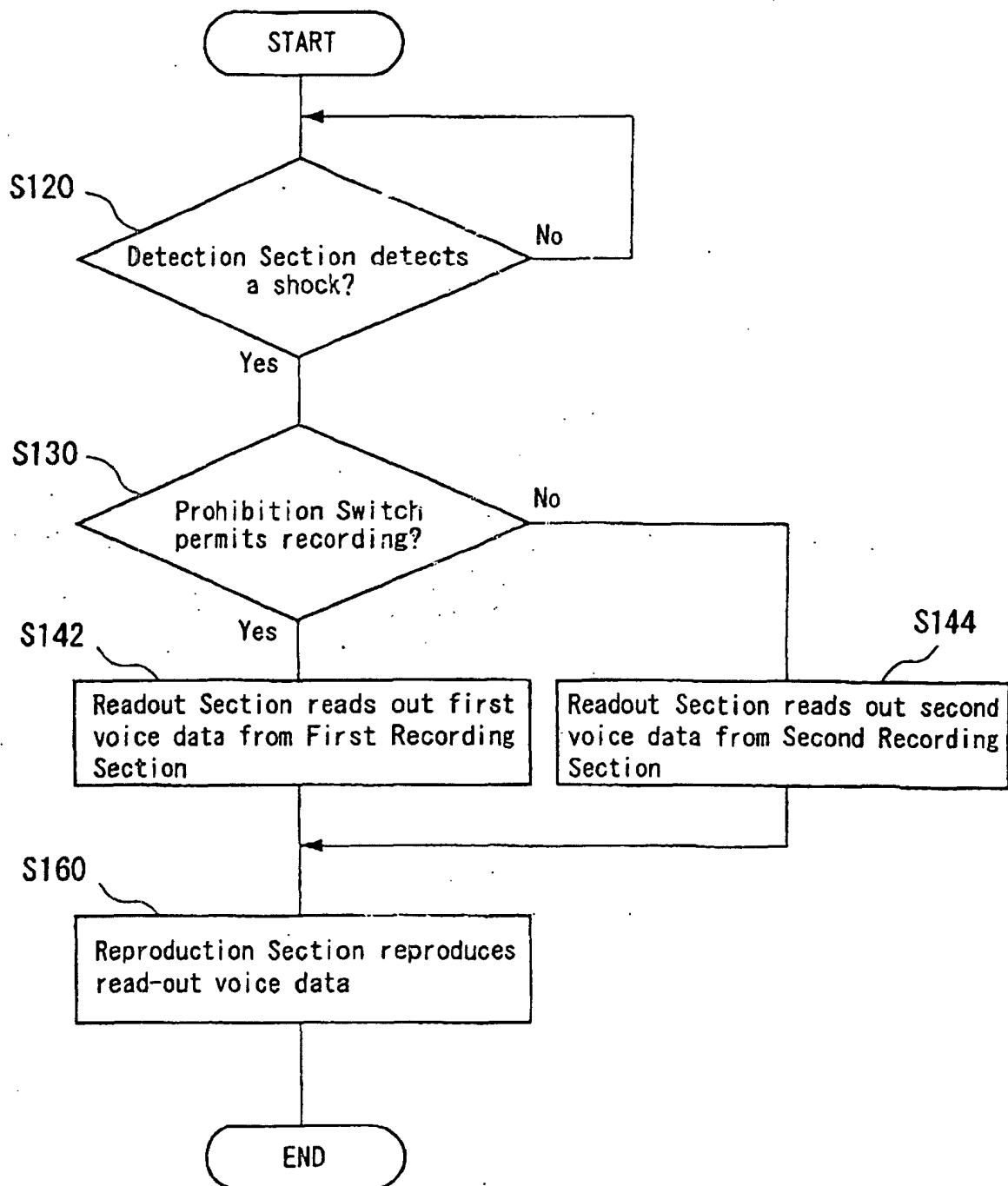


Fig. 12

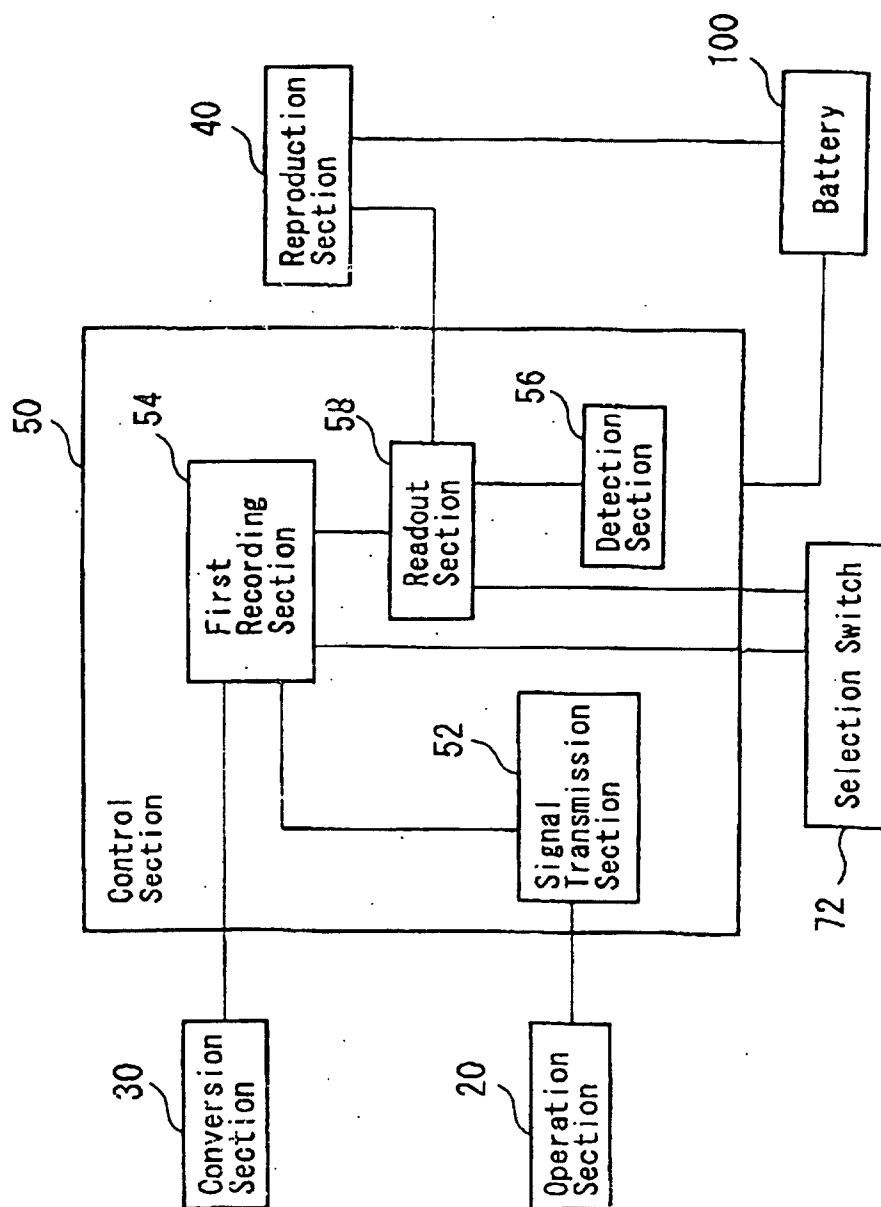


Fig. 13

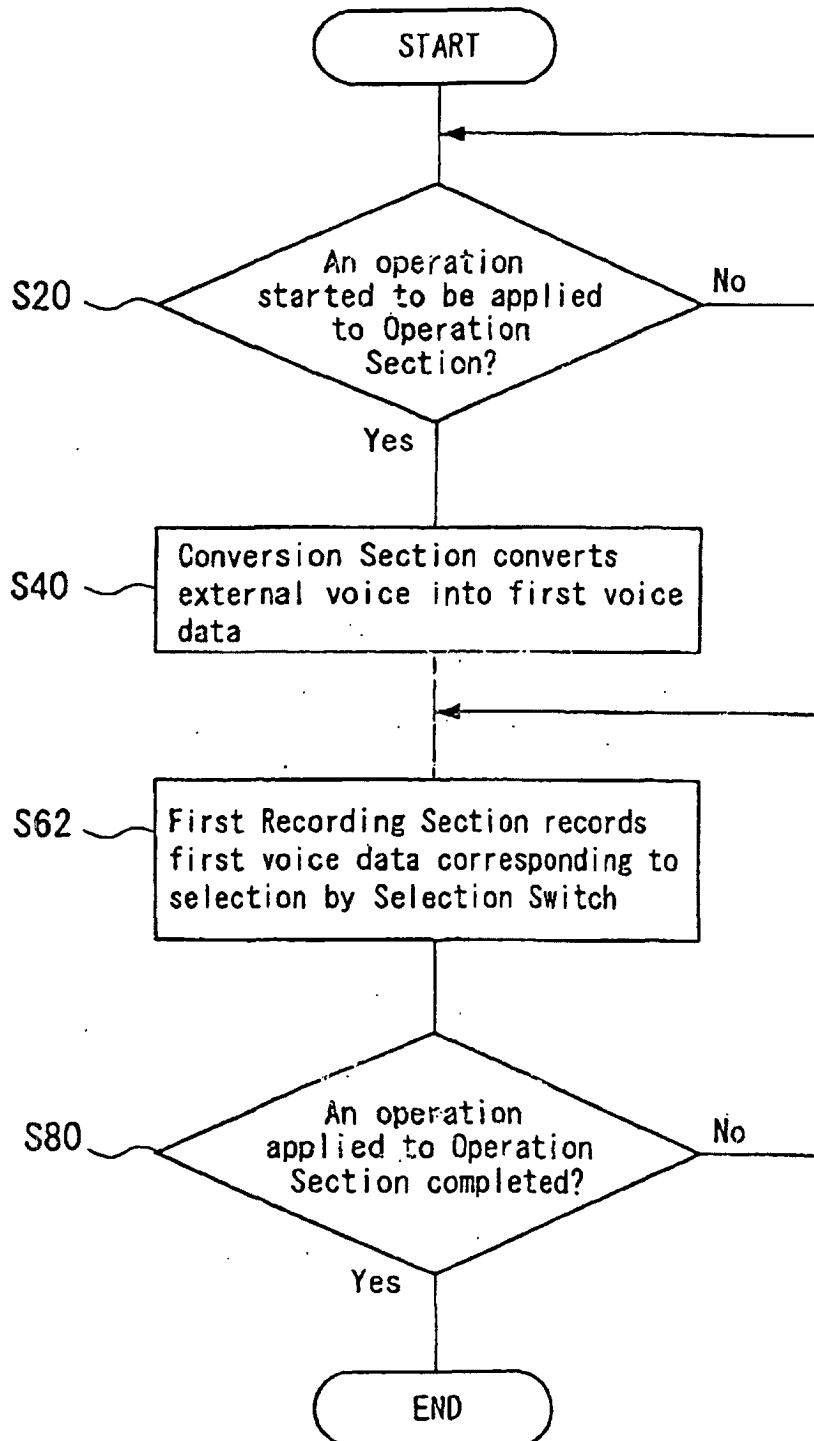


Fig. 14

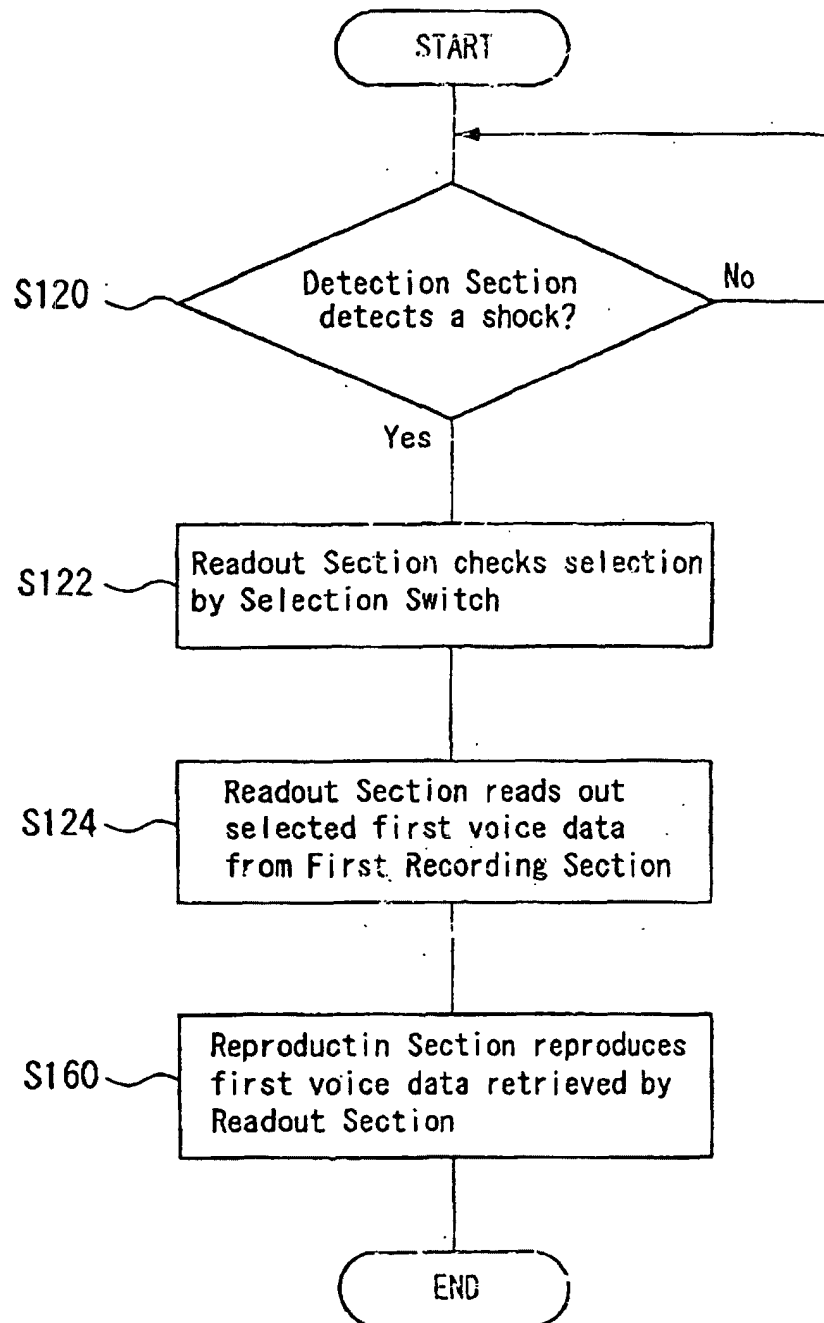


Fig. 15

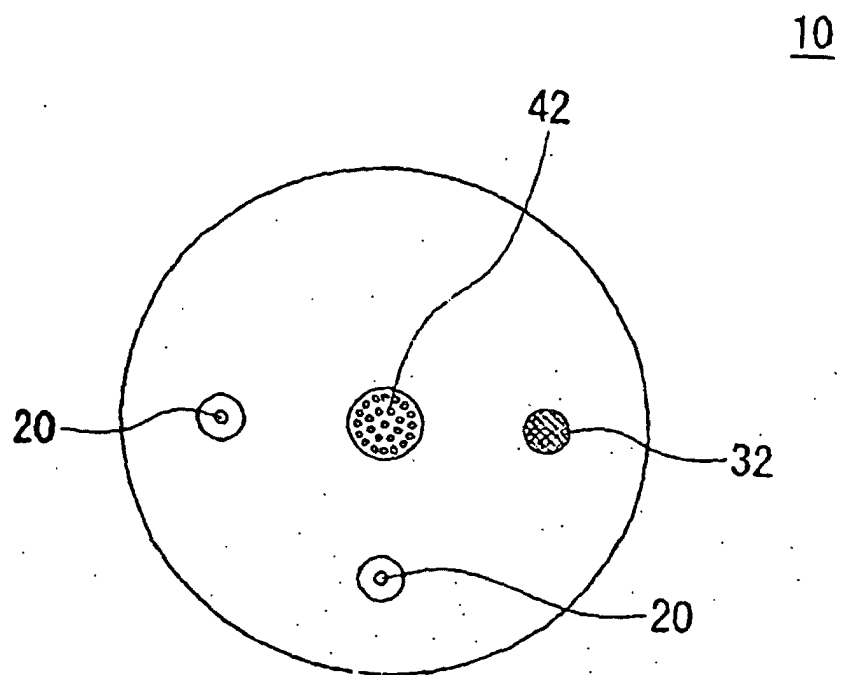


Fig. 16

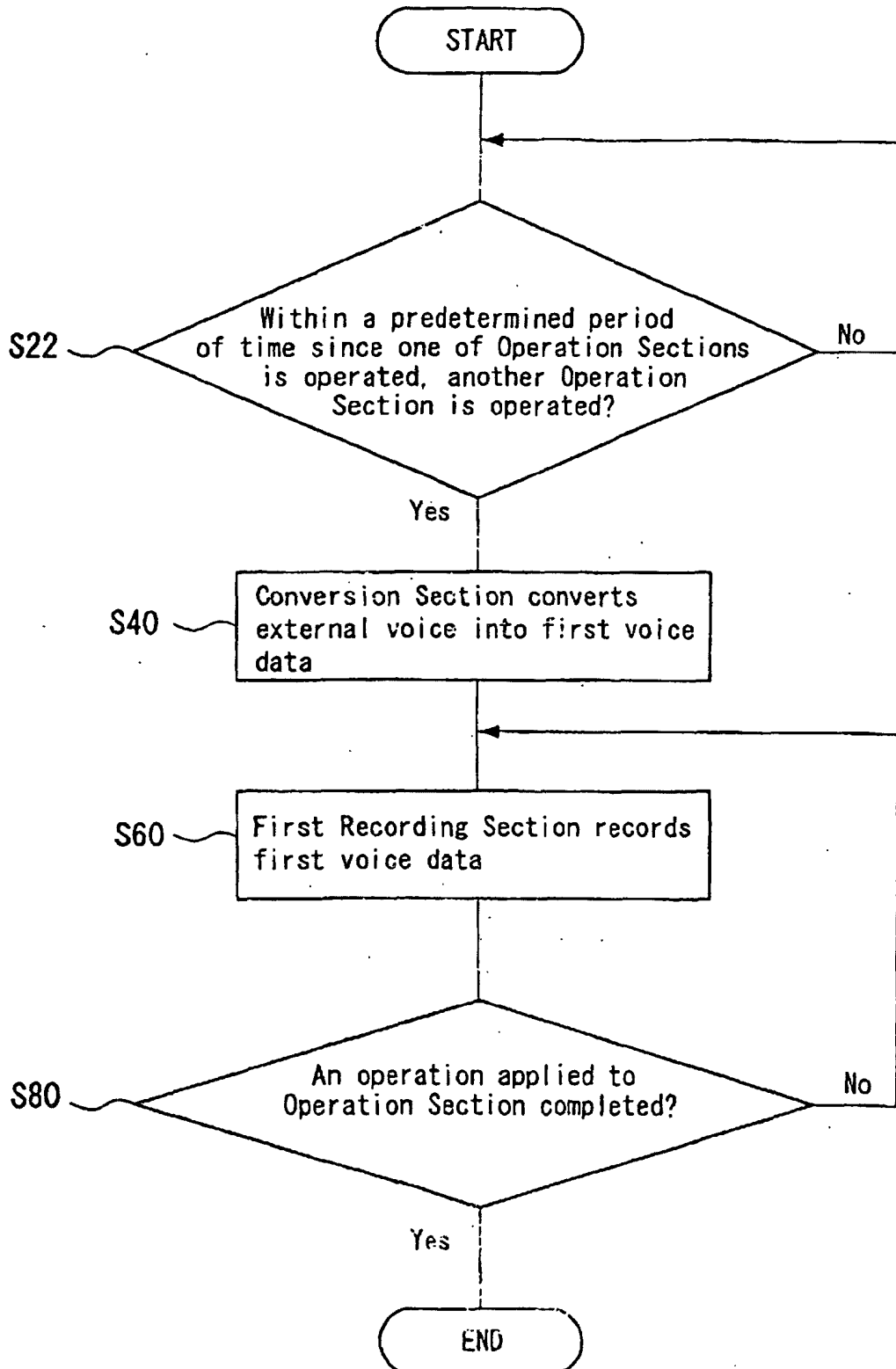


Fig. 17

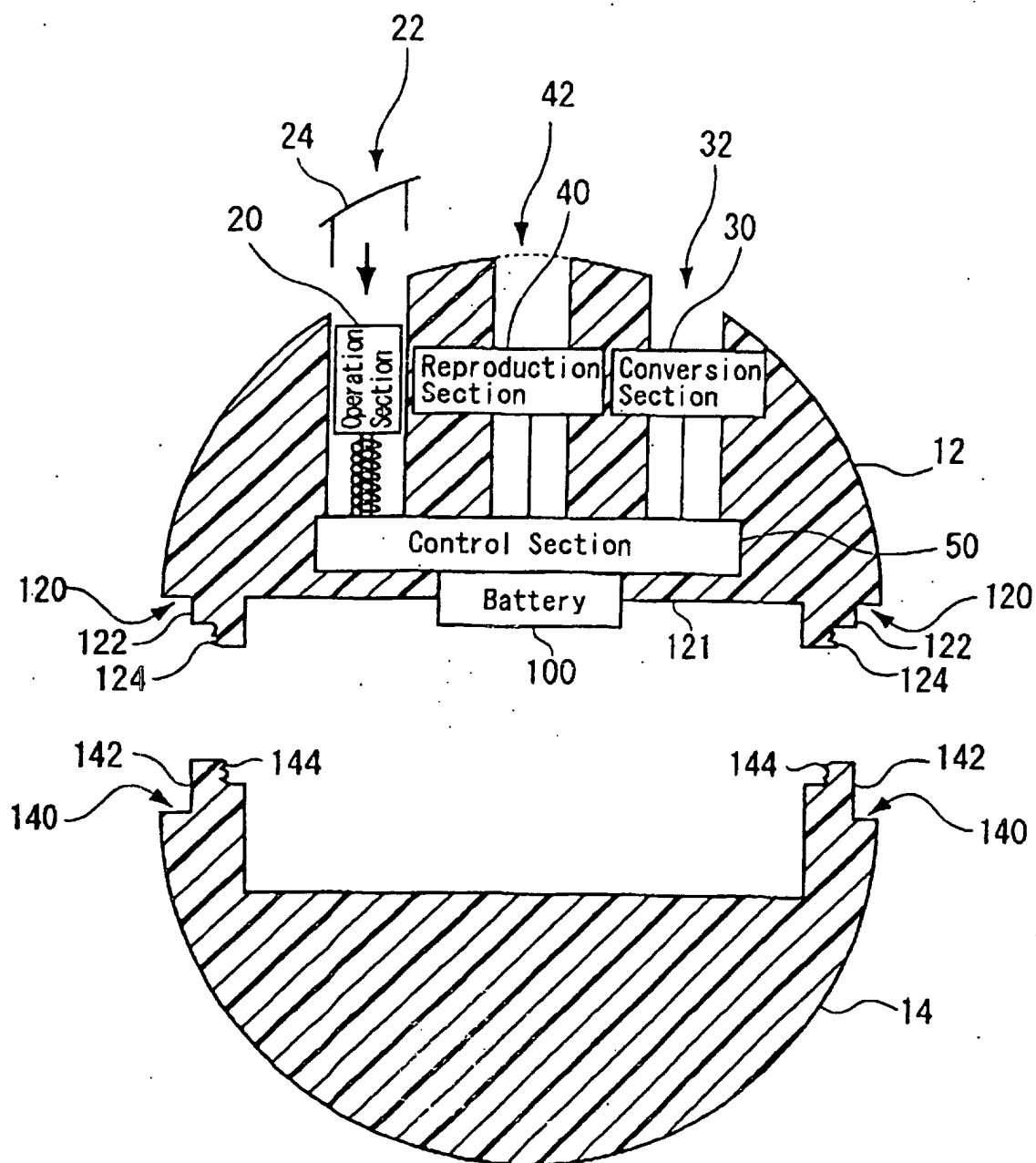


Fig. 18

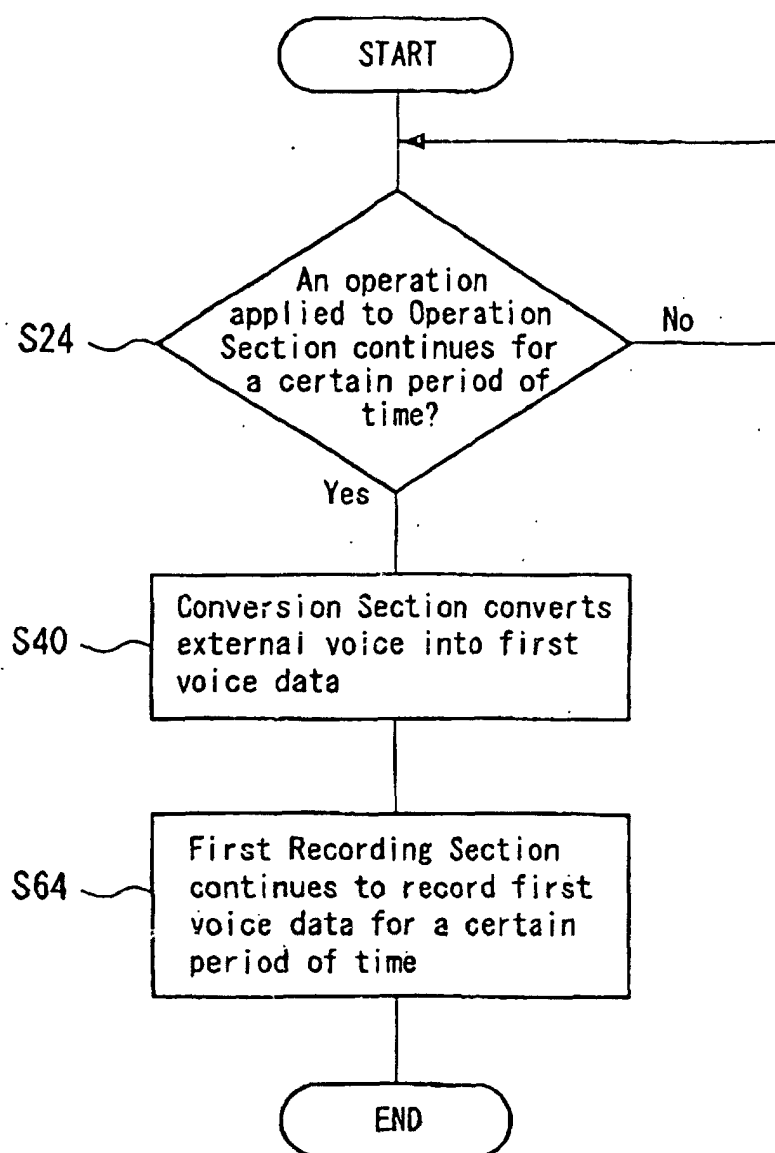


Fig. 19

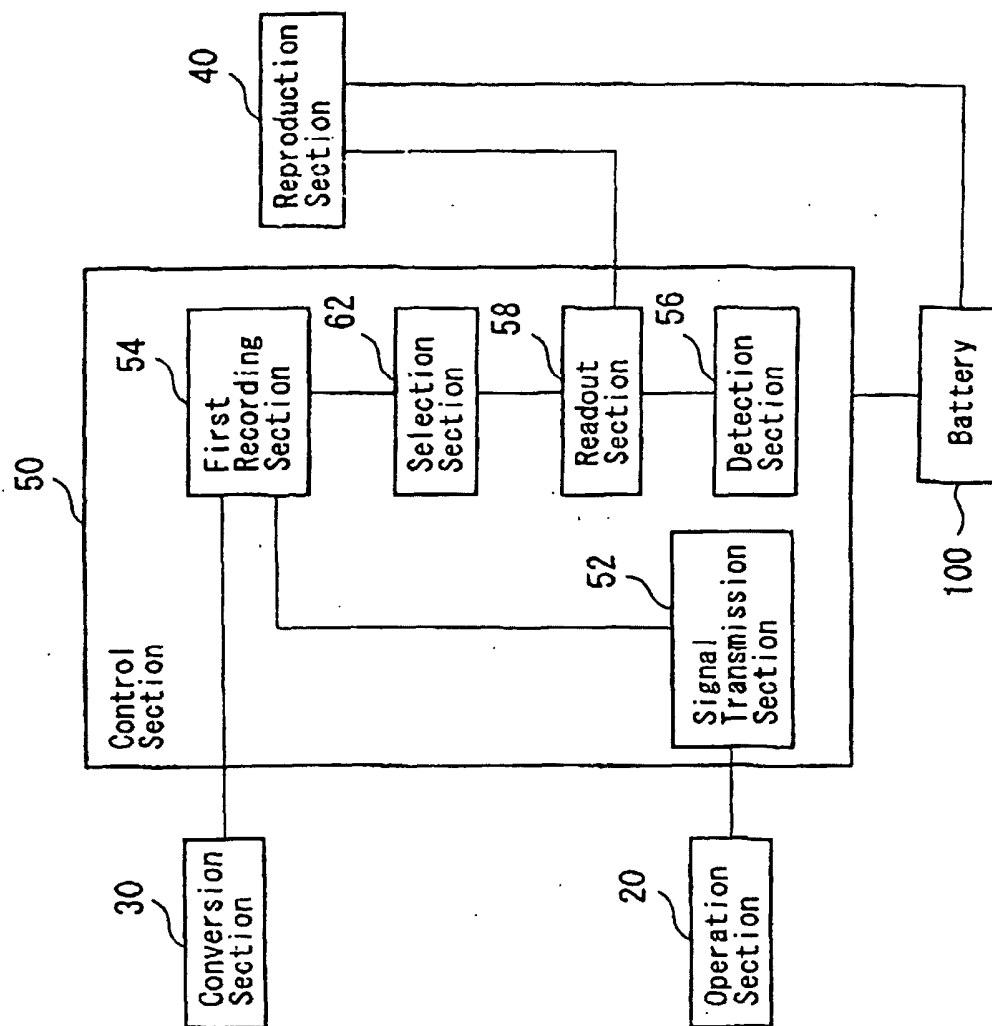


Fig. 20

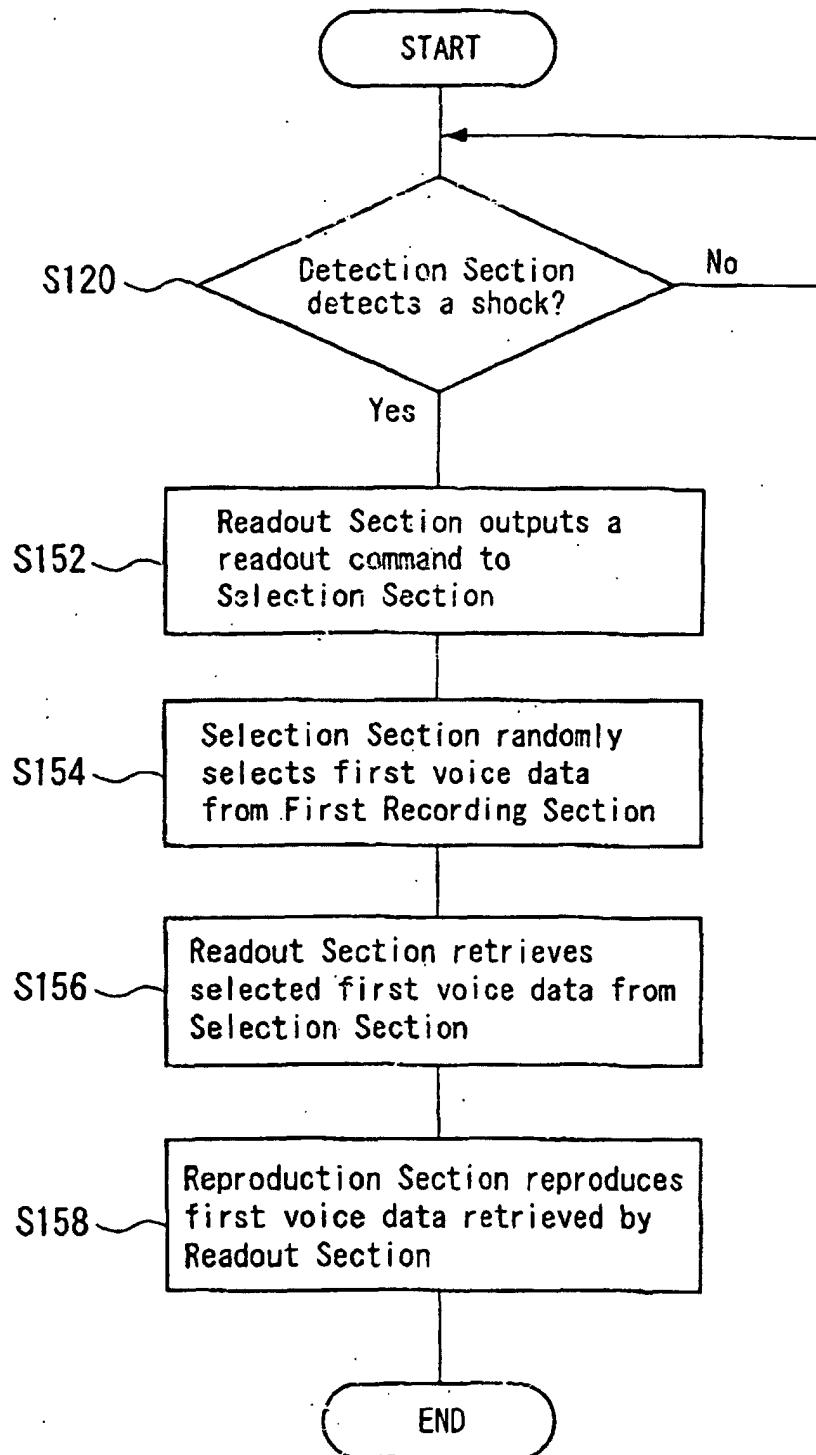


Fig. 21

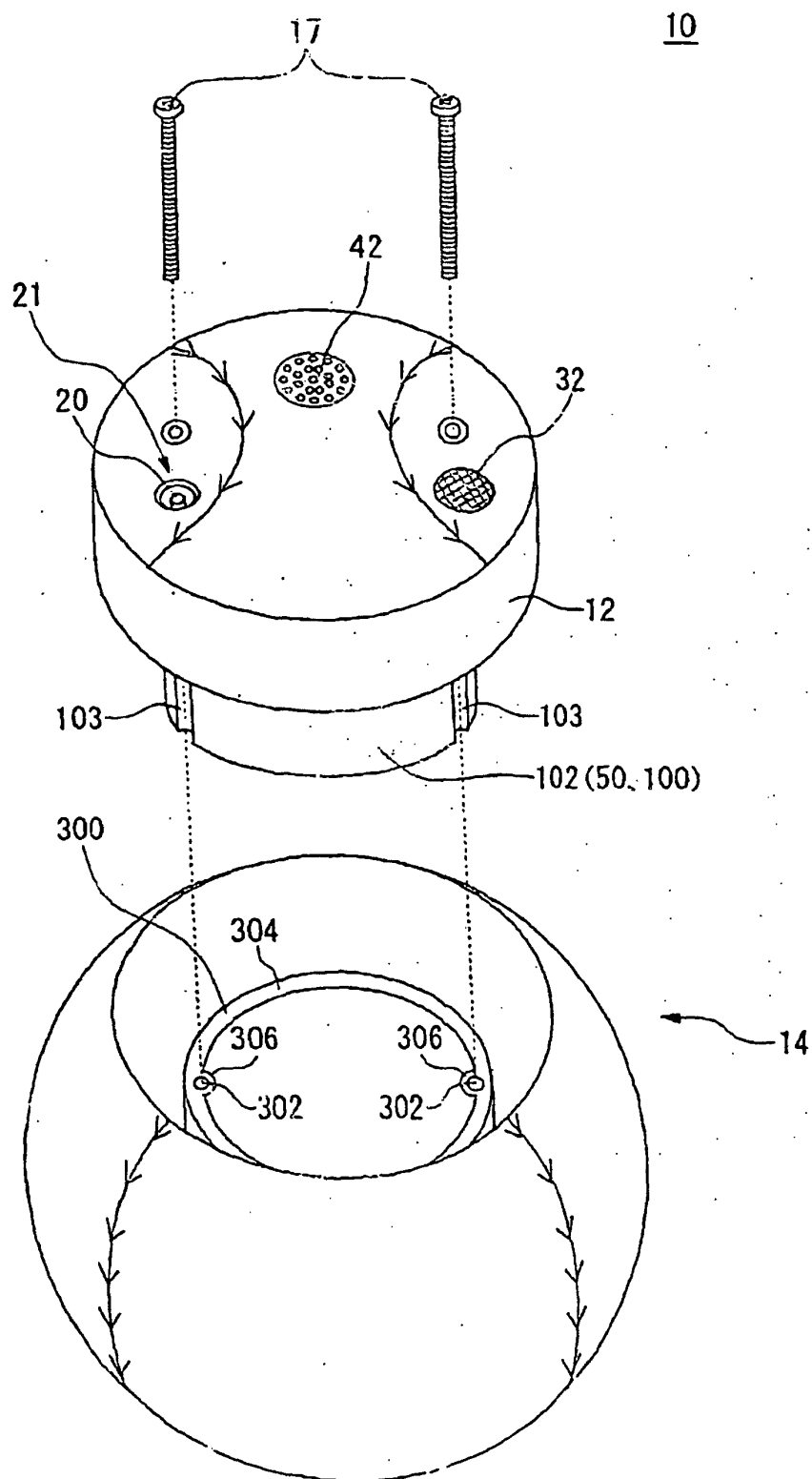


Fig. 22

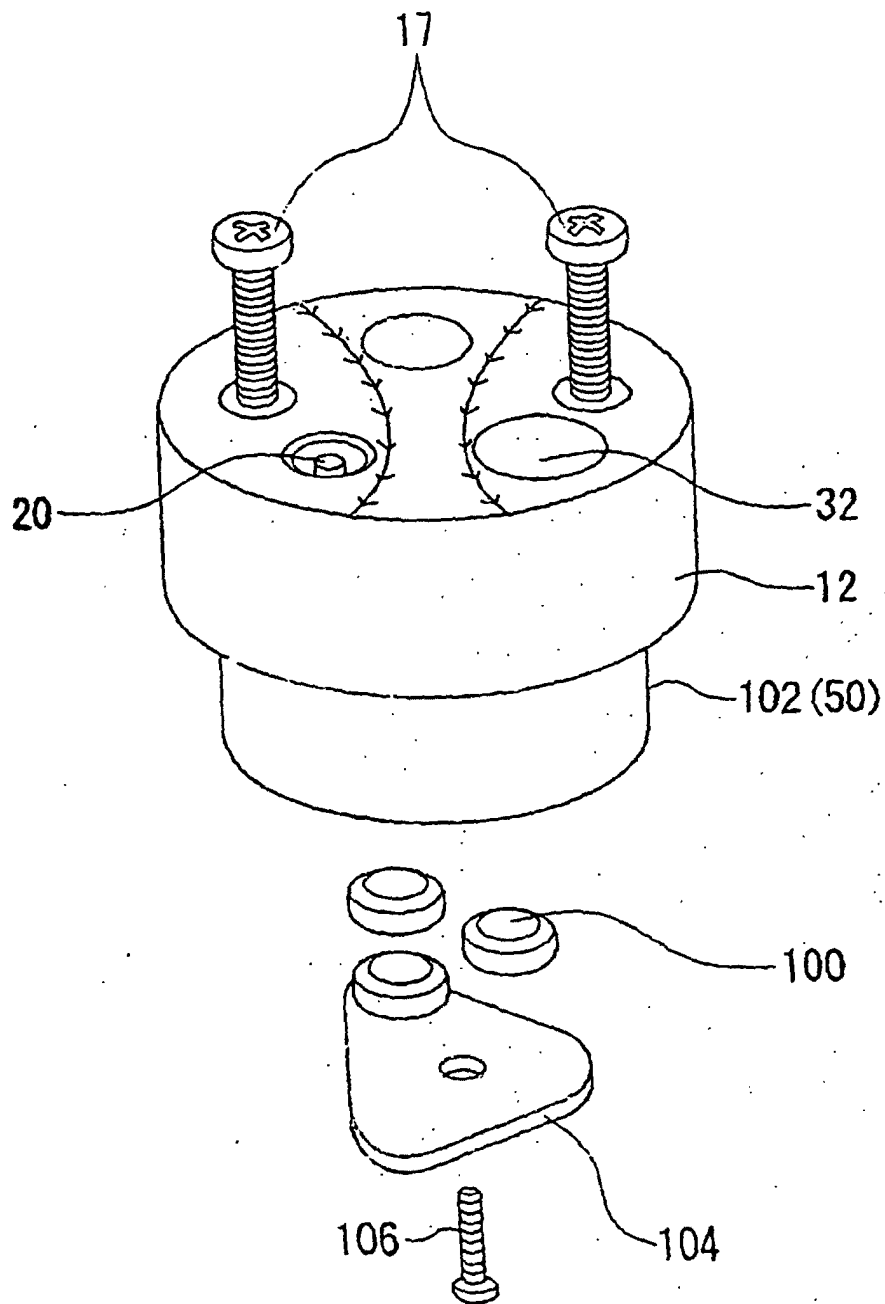
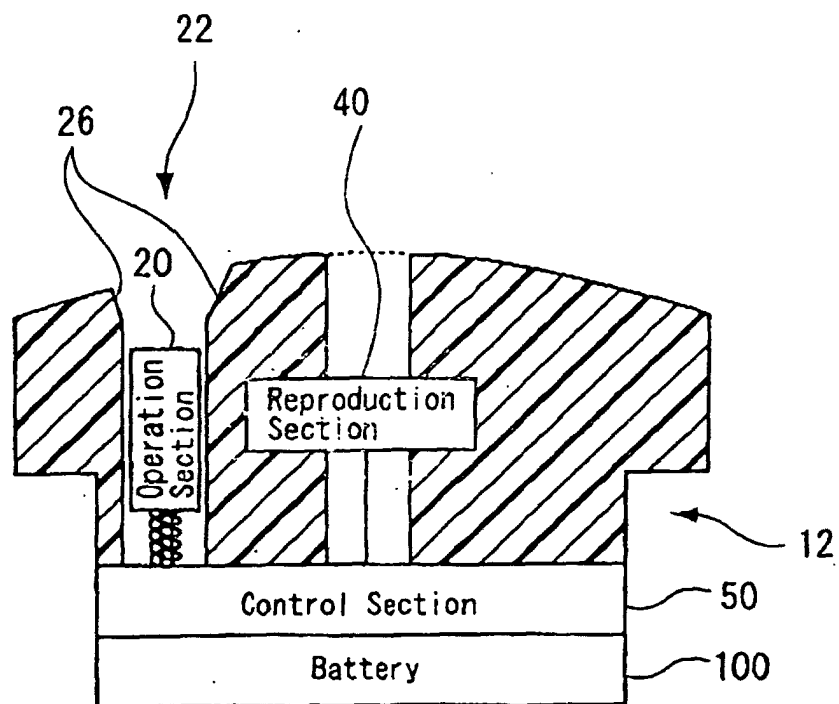


Fig. 23



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/JP02/13176

| <b>A. CLASSIFICATION OF SUBJECT MATTER</b><br>Int.Cl <sup>7</sup> A63B43/00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| According to International Patent Classification (IPC) or to both national classification and IPC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>B. FIELDS SEARCHED</b><br>Minimum documentation searched (classification system followed by classification symbols)<br>Int.Cl <sup>7</sup> A63B43/00, A63H1/00-37/00, G10K15/04                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched<br>Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-2003<br>Kokai Jitsuyo Shinan Koho 1971-2003 Jitsuyo Shinan Toroku Koho 1996-2003                                                                                                                                                                                                                                                                                                                           |                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Category*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Citation of document, with indication, where appropriate, of the relevant passages                                             | Relevant to claim No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | JP 2000-93661 A (Akira ABE),<br>04 April, 2000 (04.04.00),<br>Full text; Figs. 1 to 7<br>(Family: none)                        | 1-3, 5-22                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | JP 2-57275 A (Airemu Hanbai Kabushiki Kaisha),<br>27 February, 1990 (27.02.90),<br>Full text; Figs. 1 to 8<br>& GB 002213069 A | 1-3, 5-22                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | JP 2001-187275 A (Kabushiki Kaisha Toy Box),<br>10 July, 2001 (10.07.01),<br>Full text; Figs. 1 to 2<br>(Family: none)         | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| * Special categories of cited documents:<br>"A" document defining the general state of the art which is not considered to be of particular relevance<br>"E" earlier document but published on or after the international filing date<br>"I" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)<br>"O" document referring to an oral disclosure, use, exhibition or other means<br>"P" document published prior to the international filing date but later than the priority date claimed |                                                                                                                                | "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention<br>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone<br>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art<br>"&" document member of the same patent family |
| Date of the actual completion of the international search<br>24 March, 2003 (24.03.03)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                | Date of mailing of the international search report<br>08 April, 2003 (08.04.03)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Name and mailing address of the ISA/<br>Japanese Patent Office                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                | Authorized officer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Facsimile No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                | Telephone No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

Form PCT/ISA/210 (second sheet) (July 1998)

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP02/13176

| C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT |                                                                                                                              |                       |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Category*                                             | Citation of document, with indication, where appropriate, of the relevant passages                                           | Relevant to claim No. |
| Y                                                     | JP 11-59033 A (Kabushiki Kaisha Tsuchiya),<br>02 March, 1999 (02.03.99),<br>Full text; Figs. 1 to 10<br>(Family: none)       | 7                     |
| Y                                                     | JP 2001-54686 A (Nippon Columbia Co., Ltd.),<br>27 February, 2001 (27.02.01),<br>Full text; Figs. 1 to 9<br>(Family: none)   | 8                     |
| Y                                                     | JP 11-194789 A (Kabushiki Kaisha Furesshumun),<br>21 July, 1999 (21.07.99),<br>Full text; Figs. 1, 2<br>(Family: none)       | 9                     |
| Y                                                     | JP 10-57617 A (Sony Corp.),<br>03 March, 1998 (03.03.98),<br>Full text; Figs. 1 to 5<br>(Family: none)                       | 11,12                 |
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| A                                                     | JP 9-028929 A (Kabushiki Kaisha Warudopointo),<br>04 February, 1997 (04.02.97),<br>Full text; Figs. 1 to 2<br>(Family: none) | 4                     |

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