



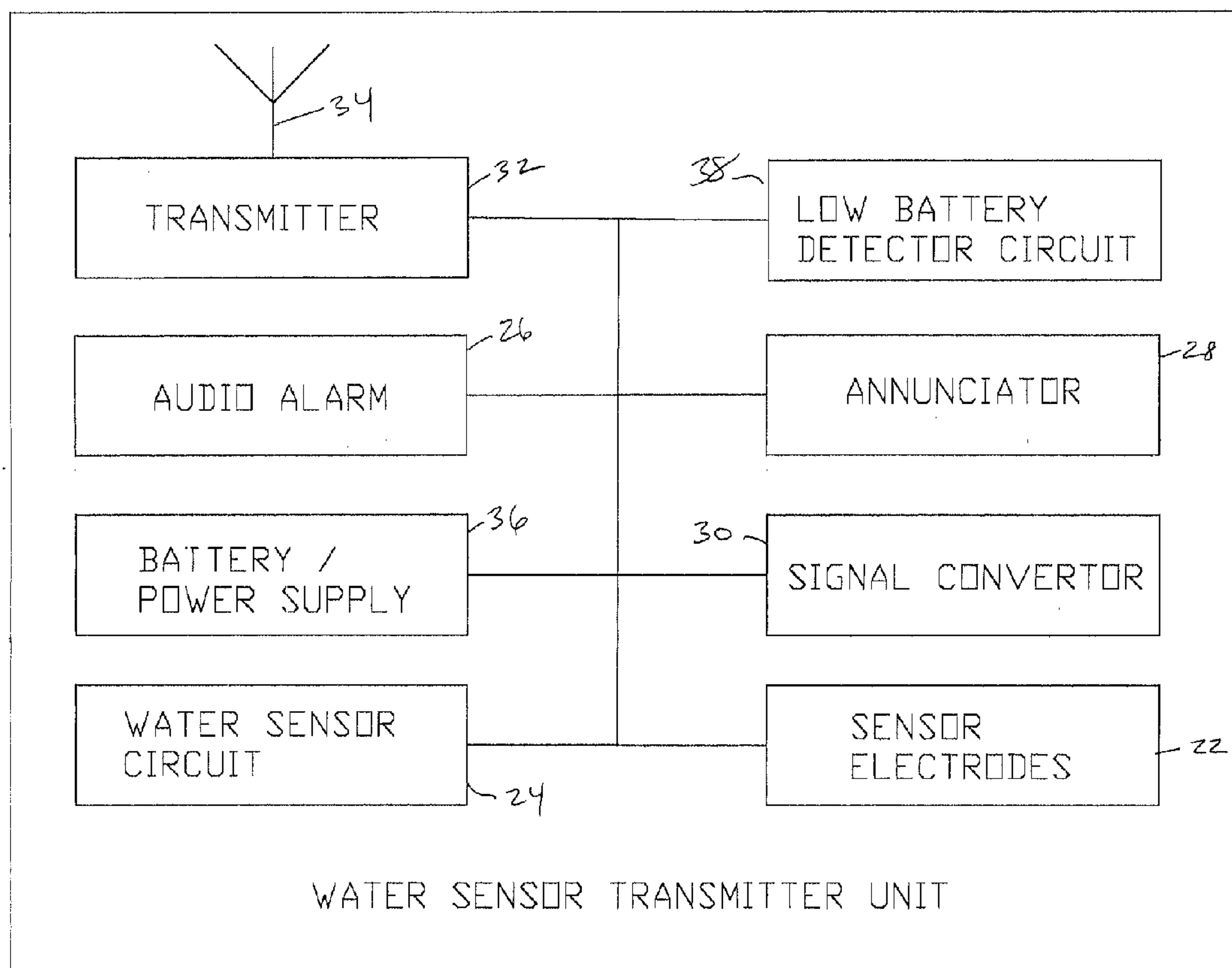
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(54) **ALARME DE DETECTION DES FUITES OU DEBORDEMENTS
D'EAU**

(54) **WATER LEAKAGE OR OVERFLOW DETECTION ALARM**



(57) The present invention is directed to a wireless water detection alarm for detecting water leakage or overflow in a basement, kitchen, laundry or washroom. The detection alarm is comprised of a detection module for detecting the presence of water and communicating an alarm condition and a water shut off module, the detection module when water is detected sounding an audio alarm and also sending a wireless signal to the water shut off module to shut off the main water supply valve. In an aspect of this invention, the wireless water detection alarm also includes a remote audio alarm module which receives the wireless signal from the detection module and sounds an audio alarm.

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ABSTRACT OF THE DISCLOSURE

The present invention is directed to a wireless water detection alarm for detecting water leakage or overflow in a basement, kitchen, laundry or washroom. The detection alarm is comprised of a detection module for detecting the presence of water and communicating an alarm condition and a water shut off module, the detection module when water is detected sounding an audio alarm and also sending a wireless signal to the water shut off module to shut off the main water supply valve.

In an aspect of this invention, the wireless water detection alarm also includes a remote audio alarm module which receives the wireless signal from the detection module and sounds an audio alarm.

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TITLE: WATER LEAKAGE OR OVERFLOW DETECTION ALARMFIELD OF THE INVENTION

5 The present invention is directed to a detection alarm for detecting water leakage and in particular to a water leakage or overflow detection alarm for use in basement, kitchen, laundry or washroom.

BACKGROUND OF THE INVENTION

10 Many homeowners finish the basements of their homes, installing recreation or family rooms, investing large sums of money in the process. In most homes, the basement is the part of entry of services such as water and sewer. In the event of a burst water pipe or clogged
15 sewer/drain line, the potential for damage can be great. Similar situations arise in the case of kitchens, bathrooms and laundry rooms, all of which have water services and are located on the upper floor of the house. If a burst water pipe or clogged drain line occurs in these rooms, the
20 damage can be more extensive, as not only is the room itself affected, but also any rooms on the floors below. The homeowner may not be aware of any problem when it occurs unless they happen to be in the premises at the time. This can be especially alarming if the homeowner is
25 away from the home either at work or particularly when on vacation. Some homeowner insurance policies may not cover the cost of repair if the homeowner is away from the home for an extended time unless a responsible person is monitoring the house on a regular basis.

30 Thus, there remains a need for a detection alarm for detecting a water leakage, particularly in the basement, kitchen, bathroom or laundry room of a house, that is capable of warning the homeowner of the leakage or
35 overflow while at the same time shutting off the water supply to the premises as a prior step taken to minimize the potential damage.

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SUMMARY OF THE INVENTION

The present invention is directed to a wireless water detection alarm for detecting water leakage or overflow in a basement, kitchen, laundry or washroom. The detection alarm is comprised of a detection module for detecting the presence of water and communicating an alarm condition and a water shut off module, the detection module when water is detected sounding an audio alarm and also sending a wireless signal to the water shut off module to shut off the main water supply valve.

In an aspect of this invention, the wireless water detection alarm also includes a remote audio alarm module which receives the wireless signal from the detection module and sounds an audio alarm.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention are shown in the drawings, wherein:

Figure 1 is a block diagram of a detection module of a wireless detection alarm according to the present invention;

Figure 2 is a block diagram of a water supply shut off module of a wireless detection alarm according to the present invention;

Figure 3 is a block diagram of a remote audio alarm module of a wireless detection alarm according to the present invention;

Figure 4 is a perspective view of the top of the detection module of Figure 1;

Figure 5 is a perspective view of the bottom of the detection module of Figure 1;

Figure 6 is a perspective view of the water supply shutoff module of Figure 2;

Figure 7 is a front plan view of the interior of the water valve shutoff module of Figure 6;

Figure 8 is a perspective view of the remote module of the detection alarm of Figure 3;

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Figure 9 is a wiring diagram of the water detector sensor circuit of the detection module of Figure 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

5 A preferred embodiment of a wireless water detection alarm of the present invention for detecting water leakage or overflow in the basement, kitchen, laundry or washroom of a home is illustrated in the attached figures. The water detection alarm has a detection module
10 12 for detecting water leakage, including an audio alarm for communicating the alarm, a water valve shutoff module 16 for shutting off the main water valve 18 and a remote audio unit 20 for use in a location remote from the basement, kitchen, laundry or washroom.

15 The detection module 12 is provided with a means for detecting the presence of water. Preferably the means for detecting the presence of water are the sensor electrodes 22 which will cause activation of a water sensor
20 circuit 24 when the sensor 22 is immersed or in contact with a conducting fluid. The water sensor circuit 24 when activated sends a signal to an audio alarm circuit 26 which in turn activates an annunciator or alarm 28 producing an audio alarm of sufficient intensity to alert a person on
25 the premises at which the detection module 12 is located that a leak or overflow has occurred. Preferably the annunciator 28 is capable of producing a sound having an intensity of at least 80 decibels more preferably about 120 decibels. The sound produced by the annunciator may be
30 continuous or intermittent. Preferably the sound produced by the annunciator 28 of the detection module 12 is intermittent with a longer sound separated by shorter pauses. For example, the annunciator may produce a two or three second sound separated by a one-second pause.

35 The water sensor circuit 24 also sends a signal to a converter circuit 30, which converts the signal into a radio frequency signal. The radio frequency signal output

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by the converter circuit 30 is passed to a transmitter circuit 32 which transmits the momentary radio frequency signal through an antenna 34 to be received by the water shutoff module 16 and remote audio unit 20 as will be
5 described further below.

The detection module 12 is powered by a suitable power source such as batteries 36, that powers each of the circuits of the detection module 12. If batteries 36 are
10 used as the power source for the detection module 12, a low battery detector circuit 38 is also provided which monitors the current or voltage level of the batteries 36. If the current or voltage level detected by the low battery detector circuit 38 drops below an acceptable level, the
15 low battery detector circuit 38 causes the annunciator to produce a sound to alert the owner that the batteries 36 need to be changed. The signal from the low battery detector circuit 38 may be passed directly to the annunciator 28 to cause the annunciator 28 to sound the low
20 battery alarm or the signal may be passed through the audio alarm circuit 26 and then to the annunciator 28. The low battery alarm signal has a different sound than the water alarm signal. Preferably the low battery alarm signal is a short sound followed by a long pause such as for example
25 0.5 to 1 second sound followed by a 3 second pause. The detection module 12 may also be powered by the regular home electrical circuits by providing the detection module 12 with a plug to plug into a receptacle of the home electrical circuit. In these circumstances, the detection
30 module 12 would be provided with a suitable power supply to convert the 110 volts AC into a suitable DC voltage and current level for operation of the various circuits of the detection module.

35 The radio frequency signal output by the detection module 12 through its antenna 34 is received by a water valve shutoff module 16, which upon receiving the signal from the detection module 12 shuts off the main water

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supply valve 18 for the house. The water valve shutoff module 16 has an antenna 40 which receives the R.F. signal and passes the received signal to a receiver circuit 42 matched to the frequency of the transmitter 32 of the
5 detection module 12. The received signal is processed by a receiver circuit 42 and passed to a converter circuit 44 to convert the R.F. signal to a suitable DC output utilized to operate the motor 46 of the water valve shutoff module 16 as will be explained further below. The water valve
10 shutoff module 16 is also provided with a motor monitoring circuit 48 which acts to prevent the motor 46 from potential damage such as being burned out. Similar to the detection module 12, the water valve shutoff module is powered by a suitable power source such as batteries 50 or
15 powered by the regular home electrical circuit. If batteries 50 power the water valve shutoff module 16, a low battery detector circuit 52 is provided to operate the same as the low battery detector circuit 38 of the detection module 12.

20

The water leakage detection alarm of the present invention is also preferably provided with a remote receiver audio unit 20, which can be used at a location remote from the detection module 12 and water shutoff
25 module 16 to alert the user when a water leakage or overflow has been detected. The remote receiver audio unit 20 receives the signal from the detection module 12 and alerts the user that the detection module 12 has detected the presence of water or other conductive fluid. The
30 remote receiver audio unit 20 receives the signal from the detection module 12 on an antenna 54 and passes it to a receiver circuit 56 for conversion. The output of the receiver circuit 56 is passed to an audio alarm circuit 58 which in turn activates an annunciator or alarm 60
35 producing an audio signal indicating to the user that the detector module 12 has detected conductive fluid. The remote receiver audio unit 20 is powered by suitable batteries 62 which provide the power for the various

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circuits and annunciator 60. Similar to the other modules, the remote receiver audio unit 20 is provided with a low battery detector circuit 64 to alert the user when the batteries 62 need to be replaced. The remote receiver
5 audio unit 20 is also provided with a reset switch 66 to enable deactivation of the audio alarm 60.

The details of a preferred embodiment of the water valve shutoff module 16 are illustrated in figures 6 and 7.
10 The water valve shutoff module 16 is contained within a suitable waterproof case 70 to protect the internal electronic circuitry from the presence of water or other conductive fluids. The motor 46 is mounted on the interior of the case 70 and is provided with a shaft 72 to which a
15 worm gear 74 is attached. The end of the shaft distant the motor 46 is provided with a suitable worm bushing 76 to retain the shaft 72 in position during operation of the motor 46. The worm gear 74 drives a circular gear 78, which is attached to the case 70 by a suitable gear bushing
20 80. The circular gear 78 is in turn attached to an adapter 82 on the exterior of the case 70 for coupling to the main water valve 18. The adapter 82 is attached to the handle or knob of the main water valve 18 to turn the handle or knob when the adapter 82 is rotated by the activation of
25 the motor 46. The water valve shutoff module 16 is provided with the reversing switch 84 which when pressed reverses the rotation of the motor 46 to allow the main water valve 18 to be opened once the unit is installed.

30 The detection module 12 is also provided in a suitable waterproof case 90 capable of floating, in the event of flooding, and continues to function. The sensor electrodes 22 are located on the under surface of the case 90 and the annunciator 28 is located on the upper surface
35 of the case 90. The remote unit 20 is provided in a suitable case 100 of the size to enable it to be carried up by a user. The case 100 of the remote unit 20 is provided with the reset switch 66 and annunciator 60.

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The operation of the water leakage detection alarm of the present invention will now be described with reference to the preferred embodiment illustrated in the figures. The detection module 12 is placed on the floor of the space to be monitored for water leakage or overflow. The detection module 12 may be provided with small feet on the bottom surface to space the sensor electrodes 22 slightly above the surface of the floor of the space to be monitored. However spacing the electrodes 22 slightly above the surface of floor would require that some water leakage occur before the unit would be activated. If the floor is covered with expensive floor covering or has other valuable items in contact with it this may result in some damage to the floor covering or contents prior to the detector module detecting the leakage and shutting off the water valve. In these circumstances it is preferred if the sensor electrodes 22 are directly in contact with the surface of the floor. In order for the sensor electrodes 22 not to activate the alarm if some condensation or moisture is in contact with the sensor electrodes 22, the sensitivity of the water sensor circuit 24 may be adjusted so that only if the sensor electrodes 22 are bridged by a significant amount of water will the alarm circuit be activated.

Once the sensor electrodes 22 are bridged by water, the water sensor circuit 24 is complete and it sends a signal to the audio alarm circuit 26 to activate the annunciator 28 to produce an audible alarm. The water sensor circuit 24 also sends a signal to the converter circuit 30 which in turn converts the signal into an RF signal which is transmitted by the transmitter circuit 32 over the antenna 34. The frequency of the radio signal is selected based upon the spectrum allocation for radio frequency of remote controlled units. For example in Canada the frequency of the radio signal must comply with

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RSS 210 of the Industry Canada regulations. Similar regulations also apply to other countries in the world.

5 An example circuit for the water sensor circuit of the detection module is illustrated in Figure 9. The circuit consists of three transistors, these resistors and one capacitor connected to a speaker/piezo electric sounder. The circuit draws so little current that the shelf life of the battery is its life limiting factor. The
10 only current drawn is the leakage of the transistors. The circuit works on the following principle: When water or other conductive fluid bridges the electrodes, the electrodes are partially shorted. Anything from 0 to 1 Meg Ohm between the electrodes can trigger the alarm. Q1
15 starts conducting and acts as a switch, which applies current to the UNI JUNCTION RELAXATION OCILATOR or Q2. The alarm signal frequency is controlled by values and ratio of C1 and R2, which pulses switch Q3 on and off applying a signal to the speaker or annunciator. Almost any NPN
20 silicon transistor can be used for Q1 and Q3 while any unijunction transistor for Q2 could be used. The circuit could be operated with 3 or 12 Volt DC from a battery.

The radio frequency signal from the detector module
25 12 is received by the receiver circuit 42 of the water shutoff module 16. Once the signal is received the receiver circuit processes the signal and passes it to the converter circuit 30 which converts the signal to a DC output to activate the motor 46. Once the motor 46 is
30 activated it rotates the shaft 72 and attached worm gear 74. The worm gear 74 in turn drives the circular gear 78 causing the attached adapter 82 to rotate. The adapter 82 is further attached to the handle or knob of the main water valve 18 and the rotation of the adapter 82 rotates the
35 main water valve 18 turning off the water supply to the premises. The motor monitoring circuit 48 monitors the current drain of the motor 46 and is provided with a preset limit for the current drain for the motor 46. When the

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current drain of the motor 46 exceeds the preset limit, the motor monitoring circuit 48 sends a signal to the converter circuit 44 to shutoff the DC output of the converter circuit 44 to the motor 46. The motor monitoring circuit 5 48 is also provided with a preset time limit for the operation of the motor 46. Once the time during which the motor 46 is receiving the DC output of the converter circuit 44 exceeds the preset time limit the motor monitoring circuit 48 sends a signal to the converter circuit 44 to shutoff to DC output of the converter circuit 10 44 to the motor 46.

The radio frequency signal from the detector module 12 is also received by the receiver circuit 56 of the 15 remote audio unit 20. Once the signal is received, the receiver circuit 56 processes a signal and passes it to the audio alarm circuit 58 which activates the annunciator 60 to notify the user that a water leakage or overflow has been detected.

20

When the user receives an alarm from either the detector module 12 or the remote unit 20, they would first deactivate the alarm. To shutoff the alarm from the detector module 12, the module 12 is lifted away from the 25 fluid to remove the sensors 22 from contact with the conductive fluid. The sensors 22 are then dried so that no moisture or other conductive fluid remains in contact with the sensors 22. At that time the detector module 12 will then return to a resting state and the audio alarm circuit 30 26 will deactivate the annunciator 28. Once the detector module 12 has been reset, the alarm from the remote unit 20 then de-activated by pressing the reset switch 66, which shuts off the alarm.

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The user would then determine the source of the water leakage or overflow and take whatever corrective steps are necessary to repair or replace the damage caused. Once the repairs or replacements have been made, the main

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water valve 18 is opened by pressing the reversing switch 84. The reversing switch 84 provides a signal to the converter circuit 44 to provide a DC output of reverse polarity to the motor 46. This DC output of reverse
5 polarity reverses the direction of rotation of the motor 46 to open the main water valve 18 through the rotation of the gears 74 and 78 and attached adapter 82.

While the water shutoff module 16 has been
10 described utilizing a motor 46 for operation of the main water valve 18, other means for operating the water valve 18 are possible. For example, the water shutoff module may utilize a biased or spring wind up, which is tightened when the water valve 18 is opened. Once the wind up is
15 tightened it is held in the proper tension by a suitable stop, which is in turn connected to a solenoid. The solenoid is operated by the converter circuit 44 which, when it receives a signal from the receiver circuit 42, activates the solenoid to remove the stop from the wind up.
20 The wind up is then relaxed which causes the water valve 18 to be shutoff. In order to provide for enough tension on the wind up to shutoff the water valve 18, the wind up is preferably provided in a pretensioned condition prior to opening of the water valve 18.

25 The water leakage or overflow detection alarm of the present invention provides for a simple to utilize detection alarm which is capable of alerting the homeowner of a water leakage or overflow and shutting off the main
30 water valve to the house. As the detection alarm of the present invention is wireless, it can also be incorporated into the regular alarm system of any house which is provided with such an alarm system. The detection module could then send a signal to the control panel of the alarm
35 system to cause the alarm system to announce an alarm condition. In those alarm systems in which the alarm conditions are remotely monitored, the detection of the presence of water or other conductive fluid would also be

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transmitted to the remote monitoring station so that appropriate steps for correction of the problem can be taken. Many such control panels developed today can differentiate between the types of detection modules
5 utilized and therefore can indicate to the remote monitoring station that it is a water leakage module which has been activated.

Although various preferred embodiments of the
10 present invention have been described herein in detail, it will be appreciated by those skilled in the art that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

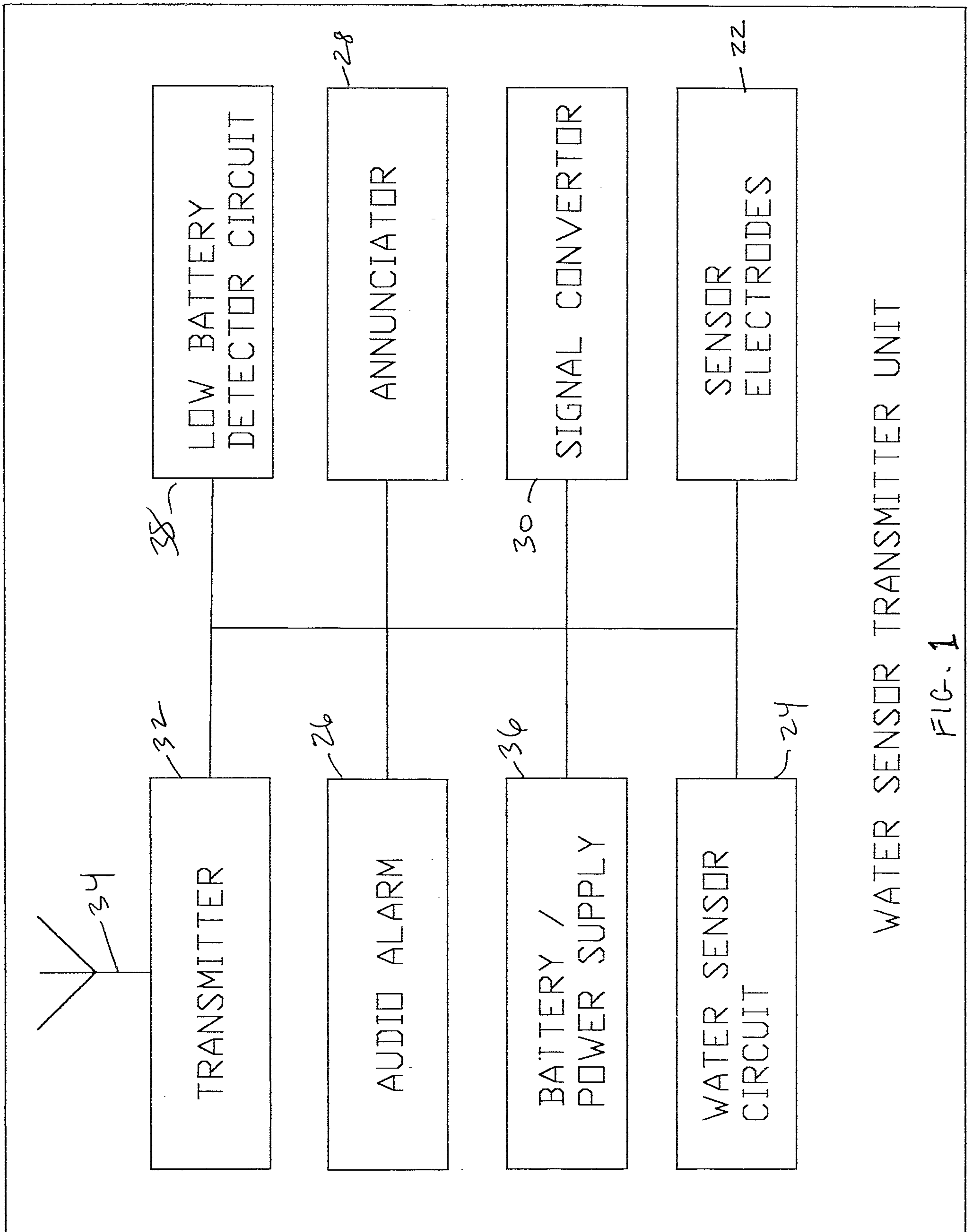
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THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

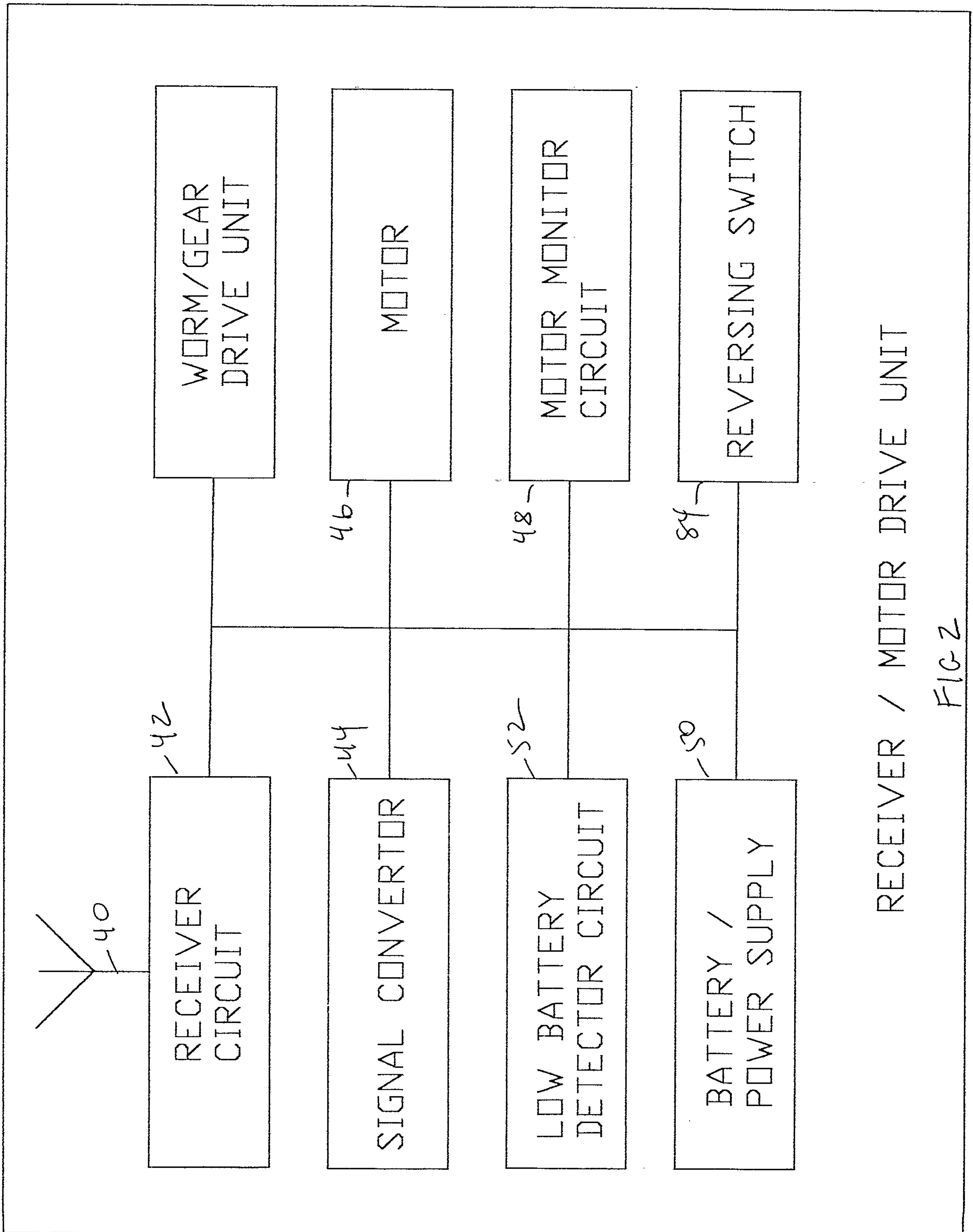
1. A wireless water detection alarm for detecting
5 water leakage or overflow in a basement, kitchen, laundry
or washroom, the detection alarm comprising a detection
module for detecting the presence of water and
communicating an alarm condition, and a water valve shutoff
module, the detection module when water is detected
10 sounding an audio alarm and also sending a wireless radio
frequency signal to the water valve shutoff module that
water or conductive fluid has been detected to shut off the
main water supply valve.

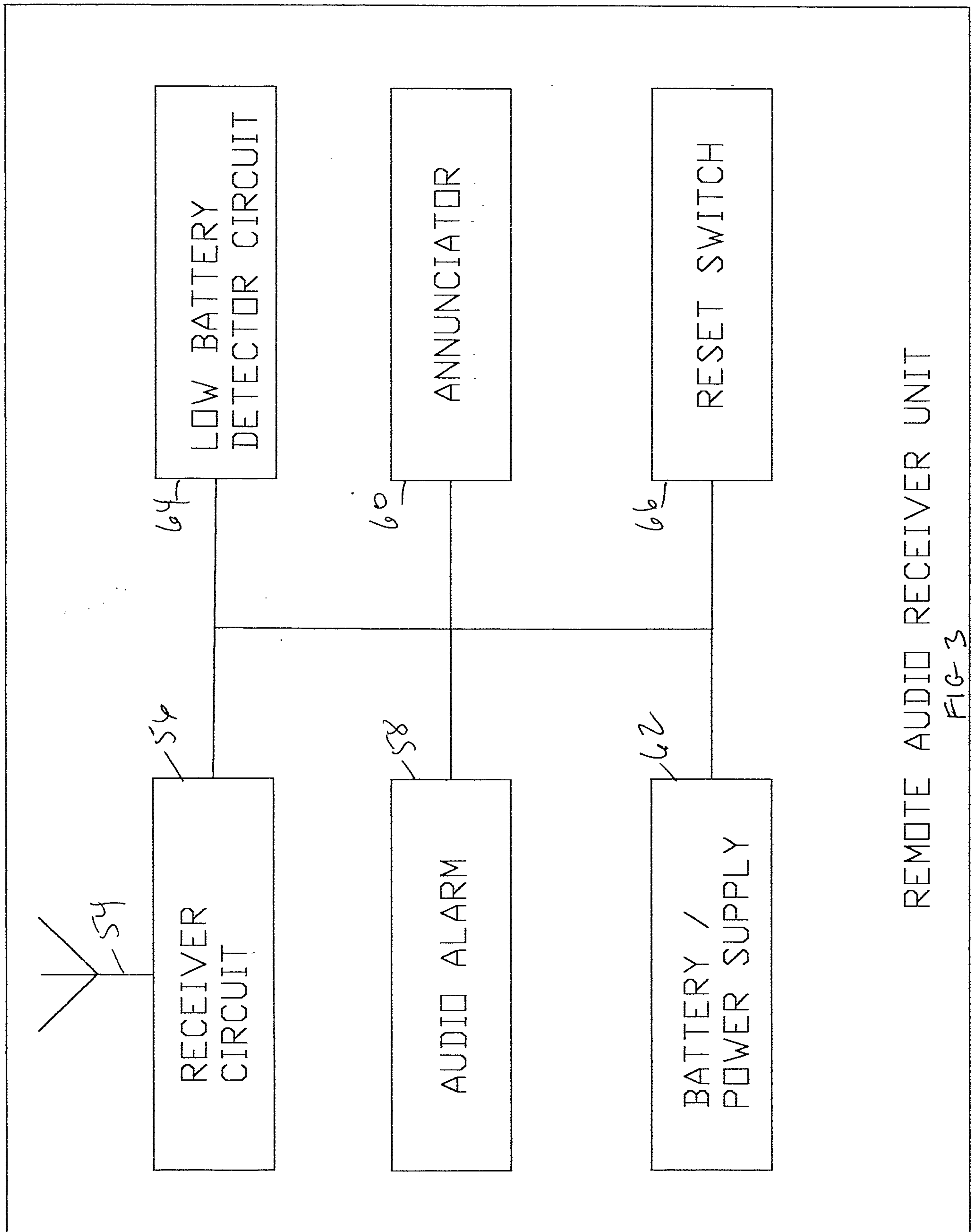
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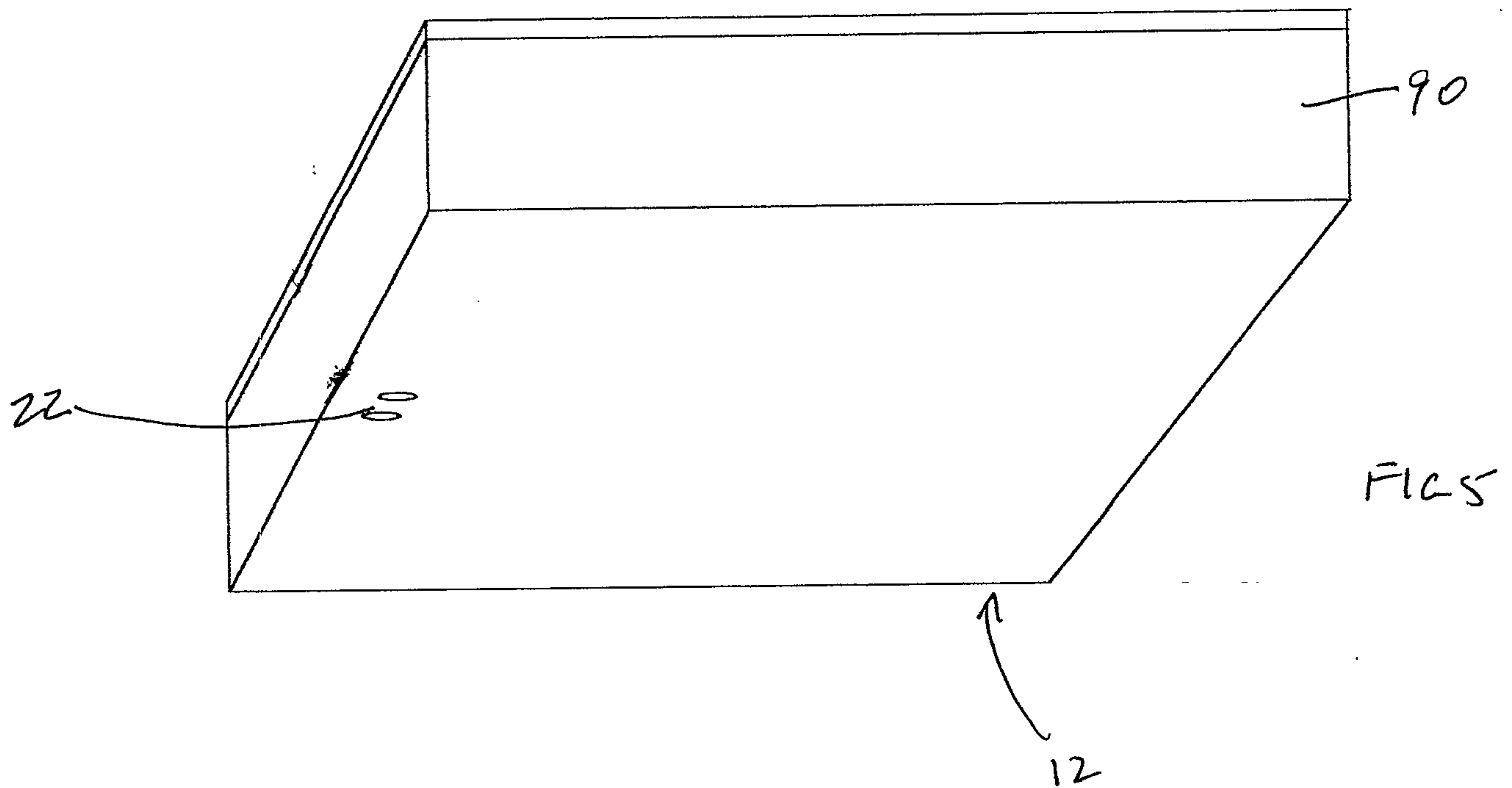
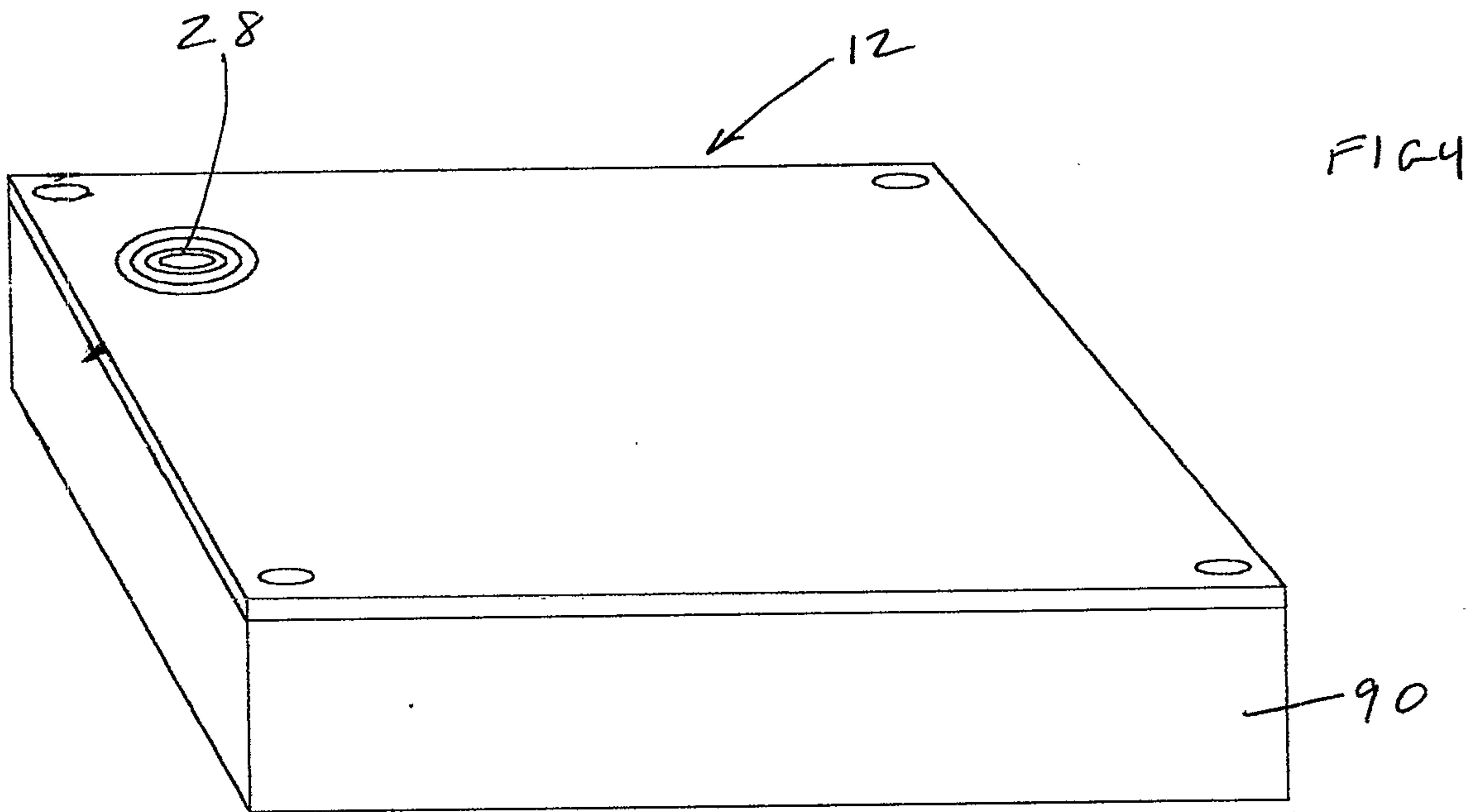
WATER SENSOR TRANSMITTER UNIT

FIG. 1





REMOTE AUDIO RECEIVER UNIT



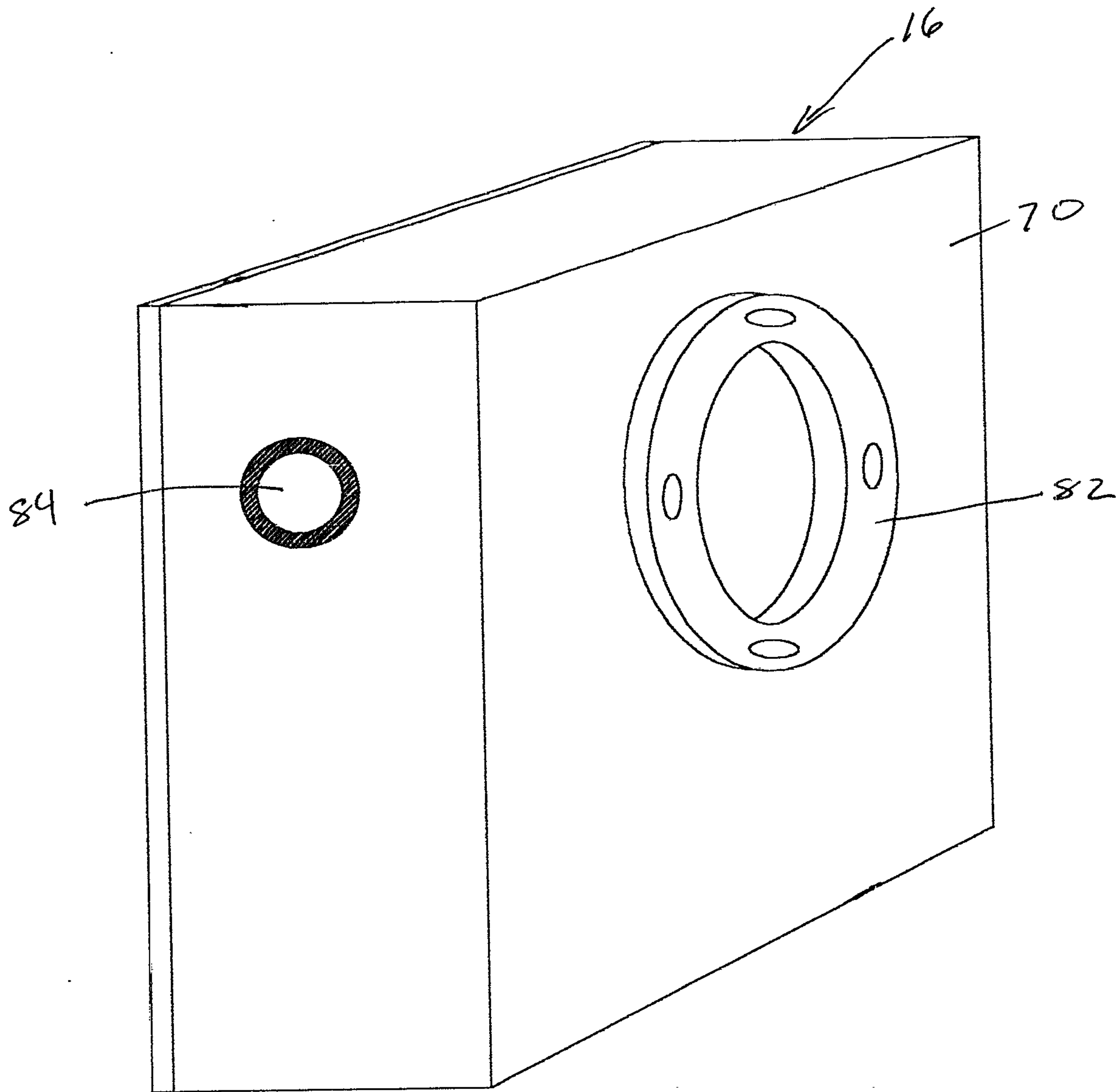


FIG 6

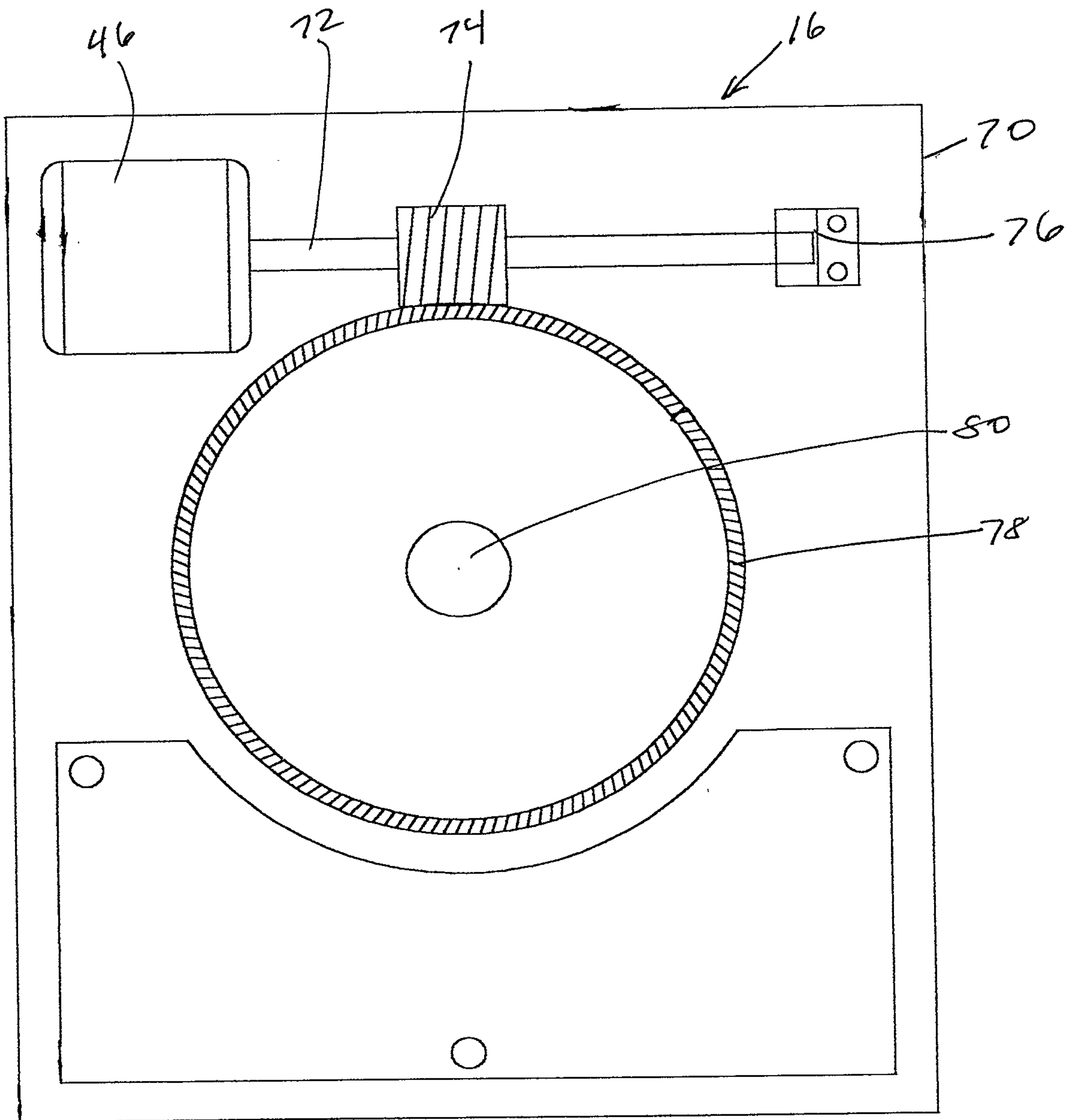


FIG 7

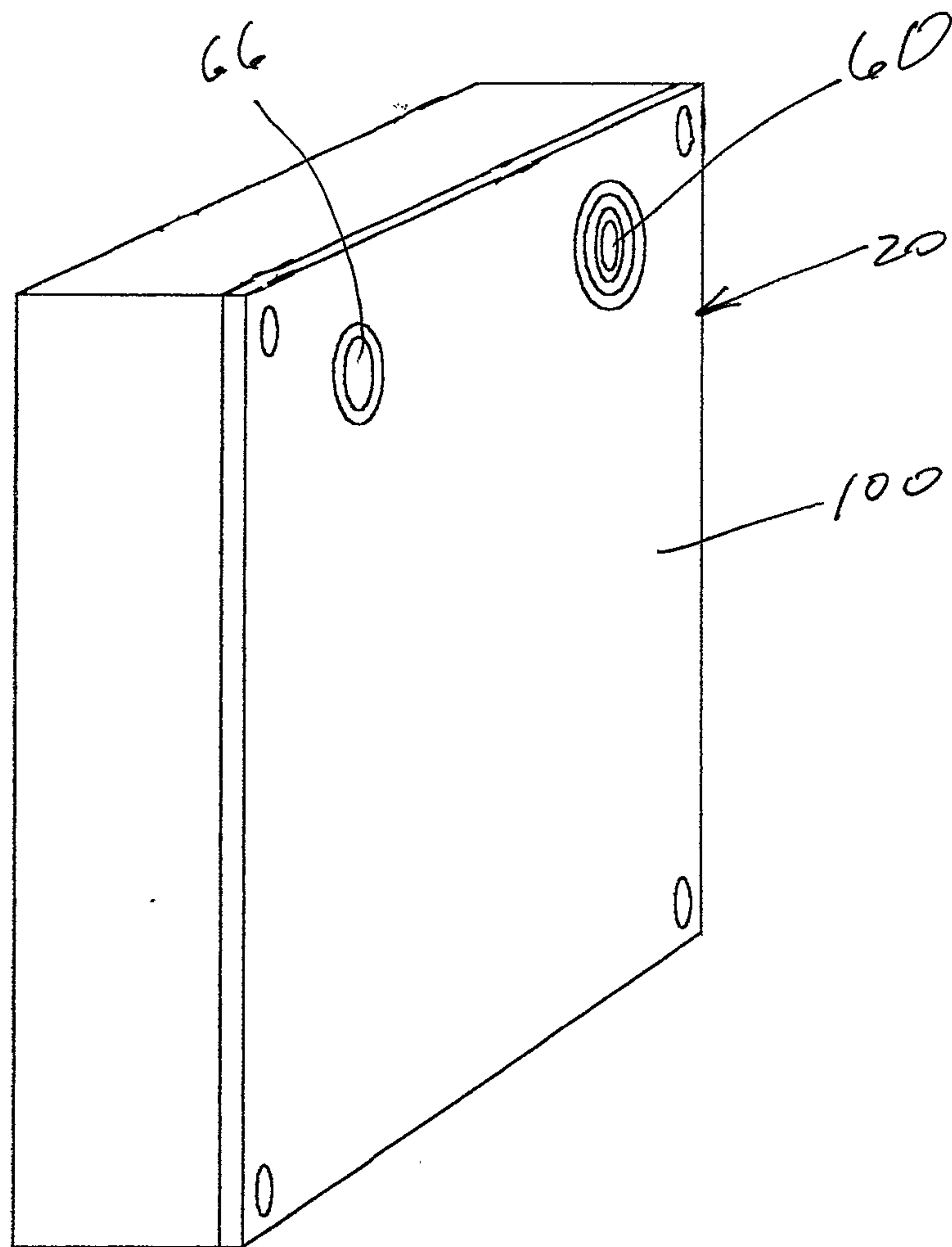


FIG 8

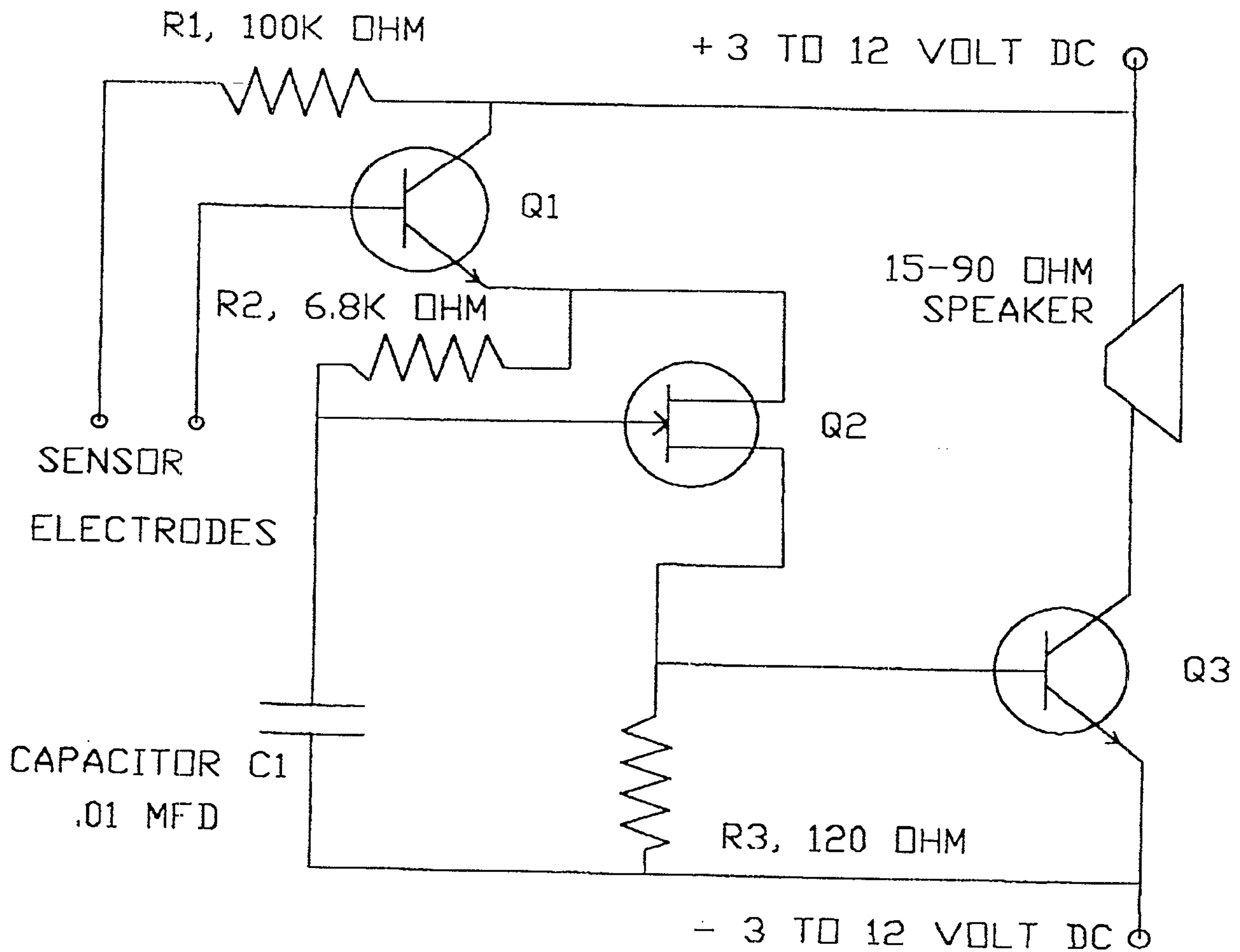


FIG 9

