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(54) **Anti-intrusion security system suitable for generating a fog**

(57) Anti-intrusion security system (100) comprising fog-generating devices (2, 3, 4) which impairs the sight of the intruder when activated. The devices for generating the fog comprise a heat exchanger (3) for heating and vaporising the fluid with a resistor (34) embedded on a

body (31). The generated vapour is released by a nozzle. To make the device more lightweight and immune to vibrations, the body (31) of the heat exchanger is made of ceramic.

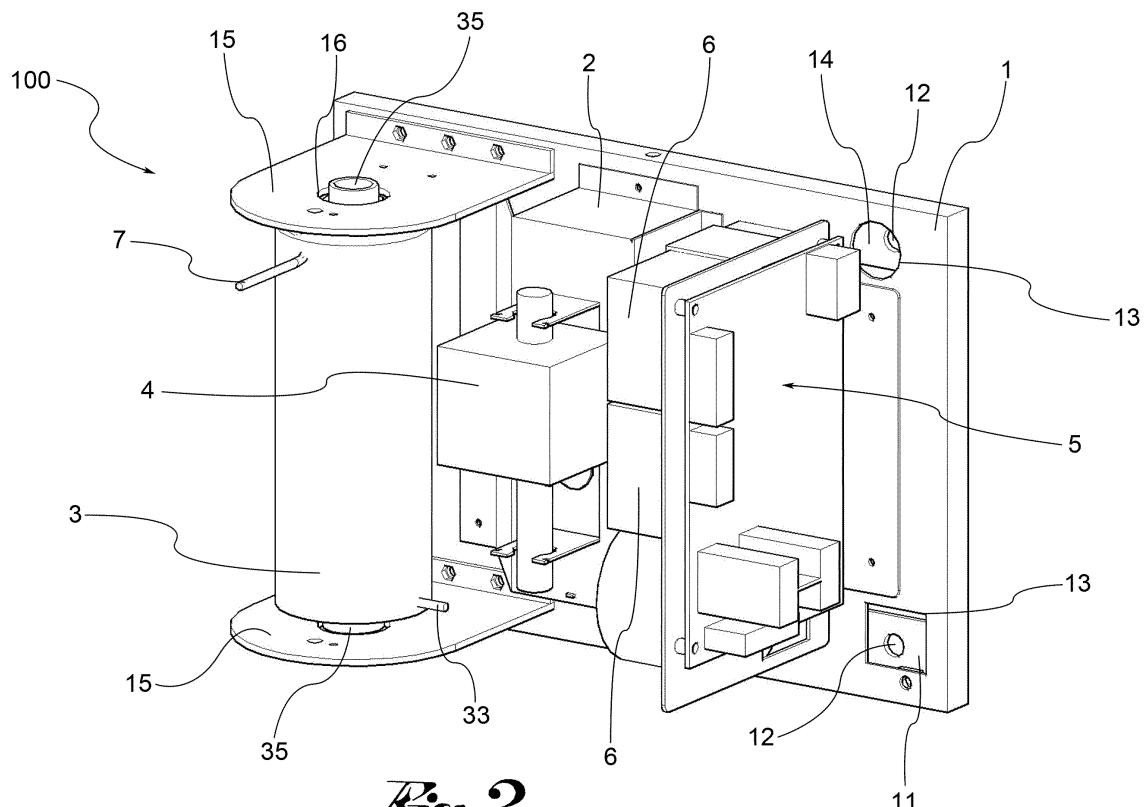


Fig. 2

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Description

[0001] The object of the present invention is an anti-intrusion security system of the type that generates a dense curtain of fog.

[0002] The search for the best security system that can stop thieves in an effective manner has been going on forever.

[0003] One of these systems is represented by anti-intrusion devices or fog generating systems which act at a time when the criminal act begins by creating a barrier of high density smoke, vapour or fog, which hides the assets and protects them from the sight of criminals.

[0004] Known anti-intrusion systems are provided with known means for the generation of fog, comprising a pump unit adapted to pump the fluid from a reservoir to a heat exchanger, generally made of metal, usually iron. The fluid inside the heat exchanger is heated to a suitable temperature which determines the transformation thereof into vapour under pressure, and is then expelled through an exit hole.

[0005] The known intrusion systems require a lot of energy for heating and maintaining the heat required to obtain the vapour, since a traditional heat exchanger of metal dissipates heat quickly.

[0006] Moreover, the known intrusion systems are particularly heavy due to the presence of a large sized metal heat exchanger. Given the presence of a heavy component such as the heat exchanger, additional technical measures are needed to solve problems related to vibration. In fact, in case of special applications as on trains, ships or vehicles for the transport of valuables, or in airport stations, the system is constantly subjected to high vibration, also present in the case of standard applications, for example during transportation to the installation site or during a seismic event. In addition, in order to obtain the certification required by the CEI (Italian Electrotechnical Committee) regulations (CENELE EN 50131-8), in particular by the CEI 79-2 for building anti-intrusion and burglar equipment, it is necessary to pass a specific EMC vibration test. In particular, the vibration test comprises an operating test - in which the equipment is subjected for a few minutes (e.g. 10 minutes) to vibrations between 10-150Hz with an acceleration of 2ms^{-2} - and a duration test - in which the equipment is subjected for a few hours (e.g. 2 hours) to vibrations between 10-150Hz with an acceleration of 5ms^{-2} .

[0007] Some known technical measures to solve problems related to vibration are represented by damping elements, for example arranged about the heat exchanger, measures which make the anti-intrusion systems complex and expensive.

[0008] The perceived need related to an anti-intrusion security system is to ensure operating efficacy even in case of vibrations, by means of simple and efficient systems.

[0009] The object of the present invention is to solve the problems of the prior art taking into account the needs

of the sector.

[0010] Such an object is achieved by an anti-intrusion security system made according to the following claim 1. The dependent claims describe preferred or advantageous embodiments of the anti-intrusion security system.

[0011] The features and the advantages of the anti-intrusion security system according to the present invention will appear more clearly from the following description, made by way of an indicative and nonlimiting example with reference to the accompanying figures, in which:

[0012] - figure 1 shows an axonometric view of the anti-intrusion security system, closed and in operation, according to the present invention;

[0013] - figure 2 shows a top view of the anti-intrusion security system, open, according to the present invention;

[0014] - figure 3 shows an axonometric view of a heat exchanger of the anti-intrusion security system according to the present invention;

[0015] - figure 4 shows the inner section of the heat exchanger in figure 2 in a first embodiment;

[0016] - figure 5 shows the inner section of the heat exchanger in figure 2 in a further embodiment.

[0017] With reference to the accompanying figures, and in particular to figure 2, there is shown an anti-intrusion security system 100, suitable for generating a dense curtain of fog 30. In particular, the anti-intrusion security system 100 is able to saturate in a few seconds (e.g. 60 seconds) rooms of different cubage (e.g. from 80 sqm to over 180 sqm) by dispensing a thick fog 30 that prevents the criminal from moving using his/her view. Furthermore, the anti-intrusion security system 100 may generate one or more emissions of fog 30 to keep the room constantly in safety.

[0018] As shown in figure 1, the anti-intrusion security system 100 comprises:

[0019] - devices 2, 3, 4 for generating a fog starting from a fluid;

[0020] - a control system 5 suitable for activating the anti-intrusion security system 100 for the emission of the fog;

[0021] - a base 1 to which at least one device 2, 3, 4 for generating the fog is fixed.

[0022] A particular fluid is used to make the fog, for example a mixture of water and glycol which, under appropriate conditions of temperature and/or pressure, is transformed into vapour, harmless to human health and not harmful to electronic equipment and furniture in the room of use.

[0023] The fluid generating the fog is conveyed within a heat exchanger 3, through a pump 4 or a propellant gas; in the heat exchanger 3, the fluid is heated and transformed into vapour which, increasing in volume/pressure, is vented through a nozzle 7.

[0024] The devices for generating the fog comprise a storage tank 2, wherein the fluid generating the fog is contained at atmospheric pressure or under pressure. In a variant, the storage tank 2 contains a fluid generating

the fog and a propellant gas.

[0025] The devices for generating the fog comprise a heat exchanger 3 for the heating and vaporisation of the fluid. In order to make the anti-intrusion security system 100 suitable for use even in conditions of high vibration,

[0026] As shown in figures 4 and 5, the heat exchanger 3 comprises a solid body 31, preferably cylindrical.

[0027] An inner spiral channel 32 is formed within body 31 which passes through the heat exchanger 3. Preferably, the spiral channel 32 longitudinally crosses the heat exchanger 3.

[0028] Channel 32 has a diameter of between 1 mm and 10 mm.

[0029] Channel 32 is obtained directly during the moulding of body 31, inserting a special spiral shape during the casting of the ceramic. Preferably, after the casting of the ceramic, the mould is disposable (e.g. is made of sand or other removable material) so as to form a channel 32 within body 31, as shown in figure 5. In an embodiment variant, the mould is permanent, for example is a tube, which remains inside body 31 and which forms channel 32, as shown in figure 4.

[0030] Preferably, the heat exchanger 3 comprises, at the exit hole 321 of channel 32, a nozzle 7. Preferably, the nozzle is directional, preferably made of brass or other material resistant to high temperatures (320 °C or higher), with one or more holes, radial or partially inclined, which direct the fog to the desired direction.

[0031] Furthermore, the heat exchanger 3 comprises, at the inlet hole 322 of channel 32, a connector 33 connectable to the tube (not shown) for the transport of the liquid in output from pump 4.

[0032] The heat exchanger 3 comprises a resistor 34, connectable to an electrical power supply for heating body 31. Resistor 34 is embedded in the ceramic body 31.

[0033] The heat exchanger 3 is fixed to base 1 with a rigid connection.

[0034] As shown in figure 2, the heat exchanger 3 is fixed to base 1 by means of plates 15. Such plates 15, fixed to base 1 for example by means of screws and bolts and rivets, are provided with holes 16.

[0035] In an embodiment variant (not shown), the heat exchanger 3 is covered by an outer insulation layer. The insulation layer adheres to the outer surface of the heat exchanger 3 so as to fully cover it, and is made for example of rock wool, glass-ceramic or phirogel. The outer insulation layer is further covered by an outer covering, such as sheet metal, which can be anchored to plates 15. In this configuration, the outer insulation layer dampens any jolts of the ceramic and the outer coating supports the heat exchanger 3.

[0036] In a variant shown in figure 3, the heat exchanger 3 includes supports 35, for example arranged at the bases of the cylindrical body 31, for attaching the heat exchanger 3 to base 1 of the anti-intrusion security system 100. As shown in figure 2, supports 35 are inserted into holes 16 of plates 15.

[0037] The anti-intrusion security system 100 includes a control system 5, provided with an interface to an intruder detection system, for example a conventional anti-theft system. When the intruder detection system is activated, an appropriate signal is sent to the anti-intrusion security system 100 that initiates the delivery of fog 30. In a variant, the intruder detection system is formed integrally with the anti-intrusion security system 100.

[0038] The control system 5 includes a TCP/IP (Transmission Control Protocol/Internet Protocol) remote management software controlled by web browser. In this way it is possible to manage via the internet the status and functioning of the anti-intrusion security system 100, store events and provide alarm, tank 2 level, temperature of the heat exchanger 3 reports, etc.

[0039] The anti-intrusion security system 100 also includes a power supply unit connectable to the mains. Preferably, the power supply unit also includes an internal battery pack 6 which guarantees a supply of fog of a few hours (e.g. 3 hours) without external power supply, thus ensuring the operation even in case of tampering with the mains.

[0040] The anti-intrusion security system 100 comprises a base 1. Base 1 is a plate, for example metal, on which tank 2, the heat exchanger 3, the pump unit 4, the control system 5 and the possible power supply unit 6 are attached.

[0041] The anti-intrusion security system 100 also includes a box cover 8, applicable to base 1 to cover the internal components. The box cover 8 is provided with a special opening 9 through which fog 30 exits. The box cover 9 is attached to base 1 by fixing means (for example screws and bolts) housed in special holes or openings provided on base 1.

[0042] The anti-intrusion security system 100 is positioned within the space to be protected (e.g., a room, a shed, a train compartment, a vault) on the wall or ceiling, recessed into the wall or on the outside. The fixing into position is achieved for example through appropriate fixing bars 11, each attached to the desired wall by fixing means (for example screws and bolts) housed in special holes 12. Also base 1 is fixed to the fixing bars 11 by fixing means (for example screws and bolts) housed at the same time into special openings 13 provided on base 1 and in holes 12 provided on the fixing bars 11.

[0043] Innovatively, an anti-intrusion security system according to the present invention is efficient and particularly suitable for use in high vibration conditions.

[0044] Advantageously, an anti-intrusion security system according to the present invention is particularly light and compact. In fact, the presence of a heat exchanger in ceramic allows the weight of the notoriously heavier, represented by the heat exchanger itself, to be drastically reduced, and therefore helps to lighten all the support structures present in the anti-intrusion security system. Moreover, the presence of a lighter heat exchanger greatly reduces the problems related to vibrations, and makes technical measures such as damping or yielding

elements unnecessary. Therefore, the heat exchanger can be fixed to the base with a rigid connection.

[0045] Advantageously, an anti-intrusion security system according to the present invention is particularly efficient. In fact, the presence of a ceramic heat exchanger allows considerable energy savings in the step of heating and maintaining the heat even in the case of mains interruption, thanks to a lower heat dispersion.

[0046] It is clear that a man skilled in the art can make changes and variations to the anti-intrusion security system described above, all falling within the scope of protection as defined in the following claims.

Claims

1. Anti-intrusion security system (100) suitable for generating a fog (30), comprising:

- devices (2,3,4) for generating a fog starting from a fluid;
- a control system (5) suitable for activating the anti-intrusion security system (100) for the emission of the fog;
- a base (1) to which at least one device (2,3,4) for generating the fog is fixed;

wherein the devices for generating the fog comprise a heat exchanger (3) for heating and vaporising the fluid, provided with a body (31) in ceramic and a resistor (34) embedded in the body (31).

2. Anti-intrusion security system (100) according to claim 1 wherein the heat exchanger (3) comprises a solid body (31).

3. Anti-intrusion security system (100) according to claim 2 wherein the body (31) is provided with an inner spiral channel (32), which crosses the heat exchanger (3).

4. Anti-intrusion security system (100) according to claim 3 wherein the body (31) contains a tube which defines the channel (32).

5. Anti-intrusion security system (100) according to claim 3 or 4 wherein the inner channel (32) has a diameter of 1 mm to 10 mm.

6. Anti-intrusion security system (100) according to any of the previous claims from 3 to 5, wherein a nozzle (7) is present at an exit hole (321) of the channel (32).

7. Anti-intrusion security system (100) according to claim 6, wherein the nozzle (7) is directional, made in material resistant to high temperatures, and fitted with one or more holes suitable for directing the fog (30) in the desired direction.

8. Anti-intrusion security system (100) according to any of the previous claims, wherein the heat exchanger (3) is attached to the base (1) with a rigid connection.

9. Anti-intrusion security system (100) according to claim 8, wherein the heat exchanger (3) is attached to the base (1) by means of plates (15).

10. Anti-intrusion security system (100) according to any of the previous claims, wherein the heat exchanger (3) is covered by an outer insulating layer in rock wool, glass-ceramic or phirogel.

11. Anti-intrusion security system (100) according to claim 10 when dependent on claim 9, wherein the outer insulating layer is further covered by an outer coating, suitable for being anchored to the plates (15).

12. Anti-intrusion security system (100) according to claim 9, wherein the heat exchanger (3) comprises supports (35) attached to the body (31) and suitable for being inserted in suitable holes (16) provided on the plates (15).

13. Anti-intrusion security system (100) according to any of the previous claims, wherein the devices for generating the fog comprise a storage reservoir (2) of a fluid.

14. Anti-intrusion security system (100) according to any of the previous claims, wherein the devices for generating the fog comprise a pump unit (4) suitable for transferring the fluid.

15. Anti-intrusion security system (100) according to any of the previous claims, comprising an internal battery unit (6).

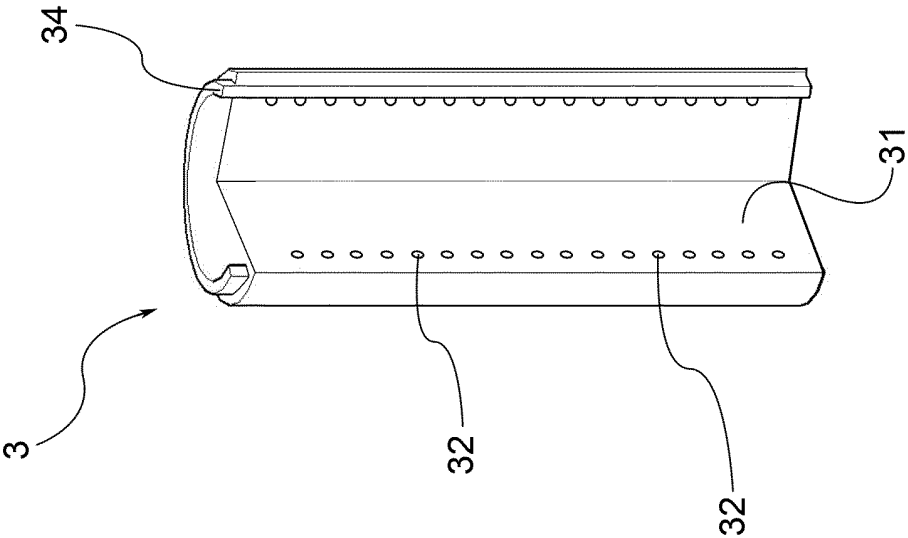


Fig. 5

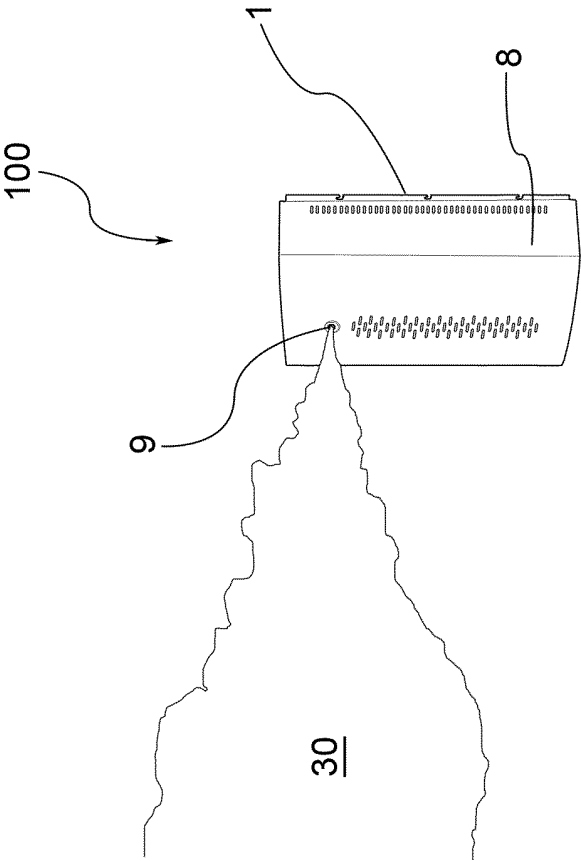


Fig. 1

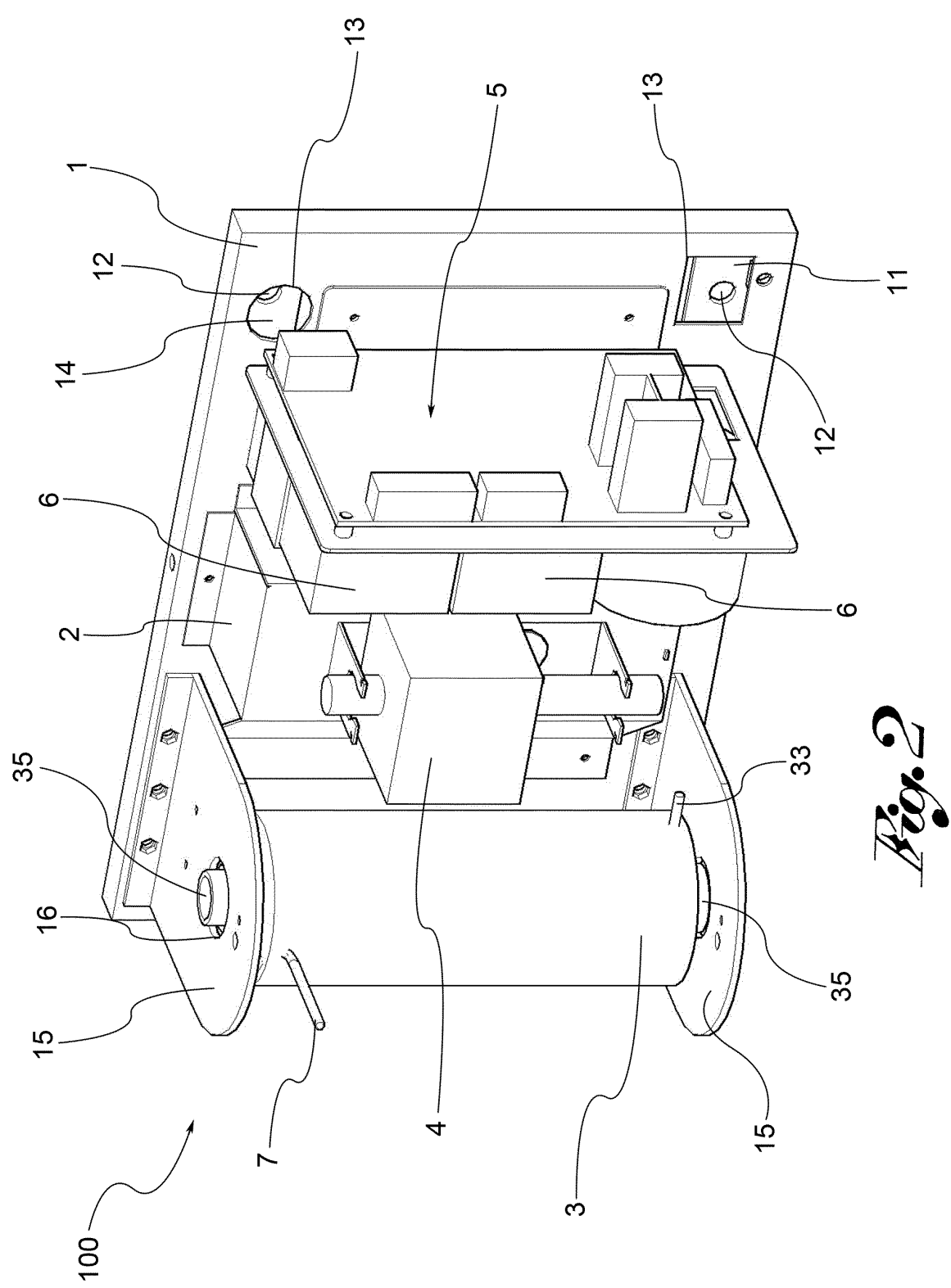


Fig. 2

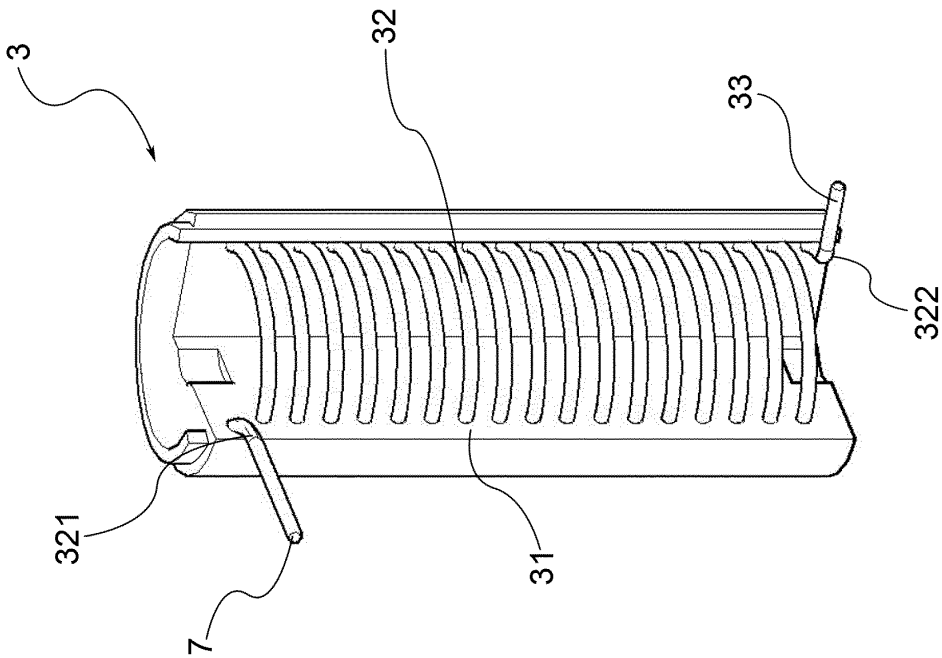


Fig. 4

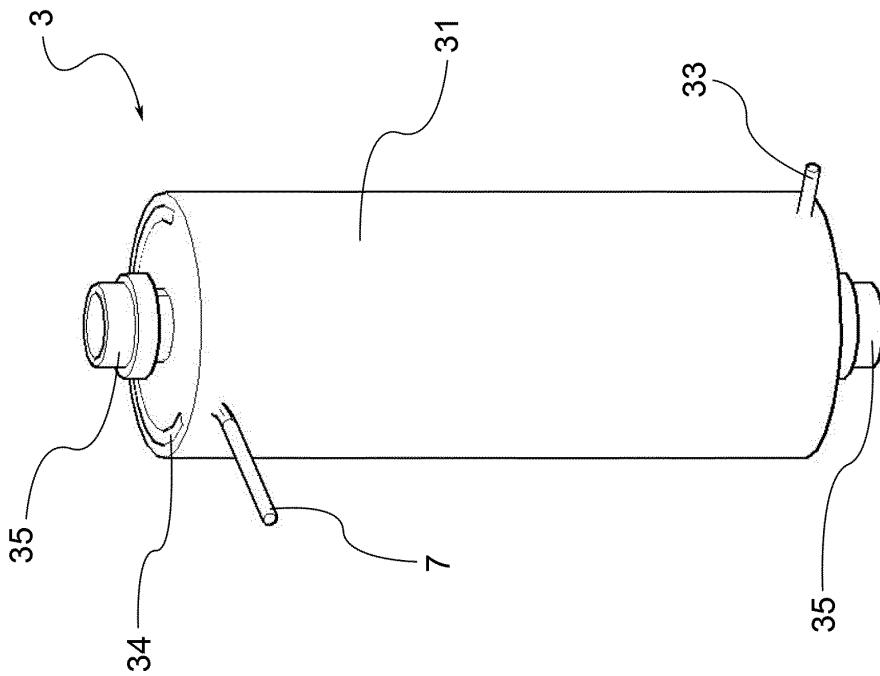


Fig. 3



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Application Number
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