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(54) **FIRE-EXTINGUISHING AEROSOL GENERATOR**

(57) The invention belongs to the field of fire extinguishing, particularly to devices generating gas-aerosol flame retardants, produced as a result of pyrotechnical compound combustion and directed in a controlled manner into a protected volume and designed for use in both manual and stationary embodiments both in autonomous and automated fire-extinguishing systems.

The technical result of the invention is to increase the device reliability, expanding the options for device activation and reducing the temperature of housing parts during the combustion of pyrotechnical aerosol-forming compound.

Said technical result is achieved by the fact that each charge of pyrotechnical aerosol-forming compound (2) is located in a sheathing made of moisture-proof polymeric material (3), the initiation unit (4) is an ignition dose of highly flammable compound designed as a match head/set of match heads which can be ignited both by electric current pulse and manually by short rubbing of at least one match head (9) on any surface, and the device parts in contact with the pyrotechnical aerosol-forming charge (2) are covered with swelling fire-retardant paint, preventing the overheating of housing parts.

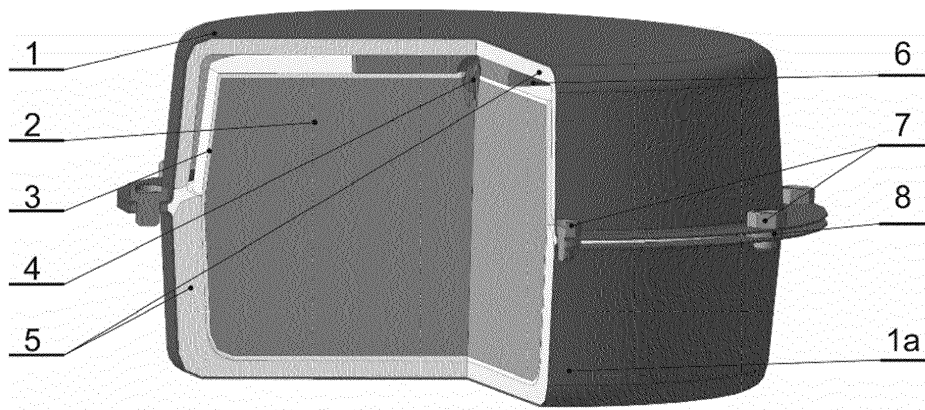


Fig.1

Description

Field of Invention

[0001] The invention falls into the field of fire extinguishing, namely devices generating gas-aerosol flame retardants that are formed during combustion of pyrotechnical compositions and directed to the protected volume in controlled manner, and intended for use in both manual and stationary embodiments both in autonomous and automated fire-extinguishing systems of highly flammable and combustible agents, solid materials and electrical equipment, including live electrical equipment.

Background of the Invention

[0002] There is a known device for aerosol fire smothering containing an initiation unit, a charge of an aerosol-forming compound installed with a gap filled with a bonding agent in a perforated metallic housing in the shape of a glass so that the open end of the glass in open space forms a receiver connected via communication openings with receiver ring channel between the perforated metallic housing and the perforated metallic shell ring installed with a gap filled with a bonding agent in a cylindrical metallic housing closed with a metal cover, under which there is a chamber with outlets, and which has a receiver ring channel opened into it (patent of the RF No. 2164808 published on April 10, 2001).

[0003] The downsides of this device are the need of use of an intermediary charge of other chemical composition in the initiation unit, which results in occurrence of components not characteristic for the generated aerosol in the product of combustion during the initial time period, inability of charge ignition without an impact of an electric current pulse, lack of waterproofing of the pyrotechnical aerosol-forming compound, which, due to the hygroscopic properties of the latter, leads to complications in the use of device in increased moisture conditions, which limits the area of application of the device, as well as high temperature of the retardant being formed, which often leads to adverse effects in device use.

[0004] Mentioned downsides are partially eliminated in a known technical solution, namely in the device for fire smothering with aerosol, including a perforated metallic housing in the shape of a glass with a gap filled with a bonding agent, a charge of aerosol-forming compound, and an initiation unit with formation at the open end of the glass of a receiver connected via communication ports with the receiver ring channel formed between the perforated metallic housing and the perforated metallic shell ring placed with a gap filled with a bonding agent in a cylindric metallic housing, closed with a metal cover, a chamber located under the cover, and outlets located on the cylindric metallic housing near the metallic cover and/or on it (patent RU No. 2206353 published on June 20, 2003).

[0005] However, the mentioned technical solution

does not solve the issue of waterproofing of the pyrotechnical aerosol-forming compound, extension of the capability of starting the initiation unit and has insufficient insulation of the housing from the combustion products of the pyrotechnical compound, which leads to its overheating.

Summary of the Invention

[0006] The technical result, at which the claimed invention is aimed, is the increase of reliability of device use in different climatic conditions, extension of the ways of device start, increase of quality and generation of the required direction of aerosol flow during operation, ease of use of the device at different fire-extinguishing locations, as well as decrease of the temperature of housing parts during combustion of the pyrotechnical aerosol-forming compound.

[0007] The mentioned technical result is ensured by the fact that in order to achieve waterproofing, each charge of pyrotechnical aerosol-forming compound is placed in a sheathing made of moisture-proof polymer material.

[0008] In order to increase reliability and extend the options of starting, the initiation unit of pyrotechnical aerosol-forming compound combustion represents an ignition dose of a highly flammable compound sufficient to ignite the main pyrotechnical charge, made as a match head/set of match heads of incendiary mixture with the capability of ignition both by an electric current pulse, and manually, by short-time rubbing of the match heads/one of the match heads on any surface or pulling along a body with a rough surface (friction surface) of at least one match head. At the same time, in case of manual activation, ignition of one head through friction is enough, and in case of the use as part of generators for automatic fire extinguishing or remote start, it is reasonable to use a set of match heads of incendiary mixture that contact with each other, at least one of which has a close contact with the hard-alloy conductor, connected to an external electric current source with wires and allowing its heating to the point of ignition under the impact of an electric current pulse.

[0009] In order to reduce the temperature of the obtained aerosol-containing compound and housing parts, device parts having contact with the charge of a pyrotechnical aerosol-forming compound, in case of the need to reduce the temperature, are covered with swelling fire-retardant paint, the decomposition thermodynamics of which causes the release of a certain amount of water, which through evaporation and transformation into hot vapour consumes part of the energy, produced by the combustion of the charge, actively cooling the generated aerosol-containing fire-extinguishing compound, and the fire-retardant paint swells and its thickness multiplies, forming a porous heat-insulation layer, which prevents overheating of housing parts.

[0010] In order to extend functional capabilities, ease

of use, ease of initiation of ignition and generation of the required direction of retardant distribution, different embodiments are provided:

1 - embodiment with manual operation with mechanical initiation of ignition of the pyrotechnical aerosol-forming compound, where water-proofed charge of pyrotechnical aerosol-forming compound encased in a moisture-proof polymer sheathing is located in the cylindrical housing, made of, e.g., pressboard. At the same time, the set may comprise a friction surface;

2 - stationary operated embodiment with volumetric distribution of the retardant and initiation of ignition by electric current pulse, wherein the water-proofed pyrotechnical aerosol-forming compound in a moisture-proof polymer sheathing is mounted at the bottom of one of the two housing parts, covered with heat-insulation layer from the inside, which are stacked edge-to-edge forming an outlet slot nozzle, wherein there is a cavity, formed above the open end of the pyrotechnical aerosol-forming compound, forming a receiver which communicates with the outlet slot nozzle forming the exit direction of the retardant.

3 - stationary embodiment with directed frontal distribution of the retardant and initiation of ignition by an electric current pulse, wherein the charge of pyrotechnical aerosol-forming compound is mounted at the bottom of one of the two housing vessels, covered from the inside with a heat-insulation layer, which are stacked edge-to-edge and form a cavity forming a receiver which communicates via a reverse channel with outlets which form directed nozzles.

[0011] Also possible are embodiments of fire-extinguishing aerosol generators intended for manual start with initiation of ignition by pulling a rough body along at least one match head ensuring their contact.

Brief Description of the Drawings

[0012] The device is illustrated by drawings, where

- Fig. 1 schematically shows a general view of the device in a stationary embodiment with a radial distribution of the retardant and initiation of ignition by electric current pulse using a single charge of a pyrotechnic aerosol-forming compound,
- Fig. 2 shows a general view of the same device with two charges of pyrotechnic aerosol-forming compound,
- Fig. 3 shows a general view of the initiation unit of ignition of pyrotechnic aerosol-forming compound containing a refractory conductor for igniting an ignition dose by advancing an electric current pulse,
- Fig. 4 shows a general view of the device with frontal

release of the aerosol,

- Fig. 5 shows a general view of the device in the embodiment for manual use,
- Fig. 6 is a photo of a generator sample during moisture resistance tests.

Preferred Embodiments of the Invention

[0013] A device for fire smothering with aerosol in general contains an assembled housing, 1 and 1a (Figures 1, 2), covered with a heat-insulation layer 5, within said housing a charge of pyrotechnic aerosol-forming compound 2 is arranged, covered, for waterproofing purposes, with a sheathing of moisture-proof polymeric material 3, which contacts the initiation unit 4. At the same time, there is a gap between the pyrotechnic aerosol-forming compound and the upper part of the housing, which forms a cavity, acting as a receiver 6, and connected to an annular gap, acting as a slotted nozzle, formed at the junction by means of bolts 7 of the detachable parts of the housing, the size of which is determined by washers 8.

[0014] Initiation unit (Fig. 3) is an ignition dose of highly flammable compound of incendiary mixture 9, designed as a match head or a set of match heads in order to increase starting capabilities. To enable remote or automatic actuation of the unit by an electric current pulse, at least one of the incendiary mixture heads is in close contact with the refractory conductor 10 connected via wires 11 to an external source of electric current and capable of heating it to the ignition temperature after being subjected to an electric current pulse, causing ignition.

[0015] Fig. 4 is a general view of the device in embodiment for stationary use with frontal release of aerosol. The figure indicates: 1 - housing parts; 2 - charge of pyrotechnic aerosol-forming compound; 3 - sheathing made of moisture-proof polymeric material; 4 - initiation unit; 5 - heat-insulation layer; 6 - receiver cavity; 12 - front outlet nozzles for exit of aerosol-containing retardant.

[0016] In the manual embodiment - Fig. 5 - the pyrotechnical aerosol-forming compound (not shown in the Figure) is located in the housing 1, equipped with a handle 13 for convenience. Device operation is carried out similarly, but ignition of initiation unit is performed manually by rubbing the ignition dose of highly flammable compound of the initiation unit 4, designed as a match head, against any surface (in a manner similar to matches). Embodiments containing additional friction surface 14 are possible.

[0017] The tests of prototypes confirmed the accomplishment of all claimed objects of the invention. In particular, after staying in water for 15 hours the devices (Fig. 6) demonstrated reliable operation of initiation unit and normal operation, initiation units are reliably triggered by both electric current pulse and by rubbing along a surface or by pulling of a rough body along at least one match head ensuring their contact, without faulty ignitions

and misfires, various embodiments provide the desired outflow direction of the retardant, which ensures reliability and ease of use of the device at different fire extinguishing locations.

[0018] Thus, the claimed objects of this invention are achieved.

Claims

1. Fire-extinguishing aerosol generator, containing at least one charge of pyrotechnical aerosol-forming compound (2) mounted in a housing (1), **characterized in that** the pyrotechnic aerosol-forming compound ignition initiation unit (4) is an ignition dose of highly flammable compound, designed as a match head/set of match heads, and the charge of pyrotechnic aerosol-forming compound (2) is isolated from the environment with a sheathing made of moisture-proof polymeric material (3). 5 10 15 20
2. Fire-extinguishing aerosol generator according to claim 1 **characterized in that** the ignition dose of highly flammable compound (9) designed as match head/set of match heads comes in close contact with the refractory conductor (10) made with the ability to conduct electric current pulse, which causes its heating and ignites the ignition dose of highly flammable compound. 25 30
3. Fire-extinguishing aerosol generator according to claim 1 **characterized in that** the ignition dose of highly flammable compound designed as a match head/set of match heads (9) is adapted to ignite by friction of least one match head on any surface. 35
4. Fire-extinguishing aerosol generator according to claim 1 **characterized in that** the ignition dose of highly flammable compound designed as a match head/set of match heads (9) is adapted to ensure ignition by pulling a rough body along at least one match head ensuring contact between them. 40
5. Fire-extinguishing aerosol generator according to claim 1 and one of the claims 2, 3 or 4 **characterized in that** one or several charges of pyrotechnical aerosol-forming compound (2) are mounted inside the housing, whose parts are internally covered with heat-insulation layer (5) which are stacked edge-to-edge, forming an outlet slot nozzle, wherein above the open end of the pyrotechnical aerosol-forming compound (2), when using one charge (2) or between them, if there are more of them, a cavity (6) is formed acting as a receiver, connected to outlet slot nozzle, and the parts in contact with the pyrotechnical aerosol-forming charge (2) are covered with swelling fire-retardant paint, if necessary. 45 50 55
6. Fire-extinguishing aerosol generator according to claim 1 and one of the claims 2, 3 or 4 **characterized in that** one or several charges of pyrotechnical aerosol-forming compound (2) are mounted inside the housing parts, internally covered with heat-insulation layer (5) which are stacked edge-to-edge and form a receiver (6) which communicates via a reverse channel with outlets which form directing nozzles, and the parts in contact with the pyrotechnical aerosol-forming charge (2) are covered with swelling fire-retardant paint, if necessary. 5

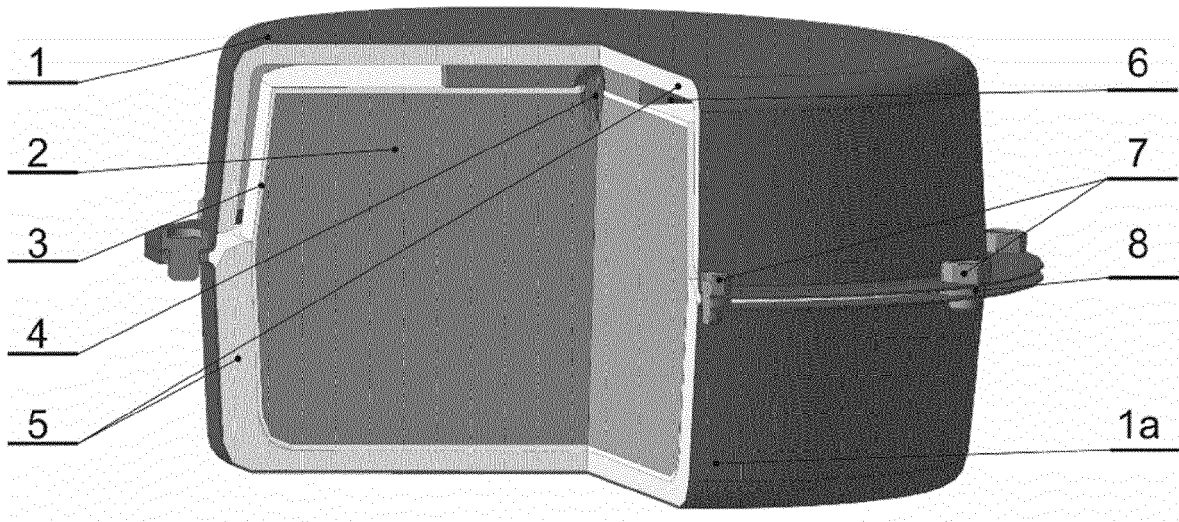


Fig.1

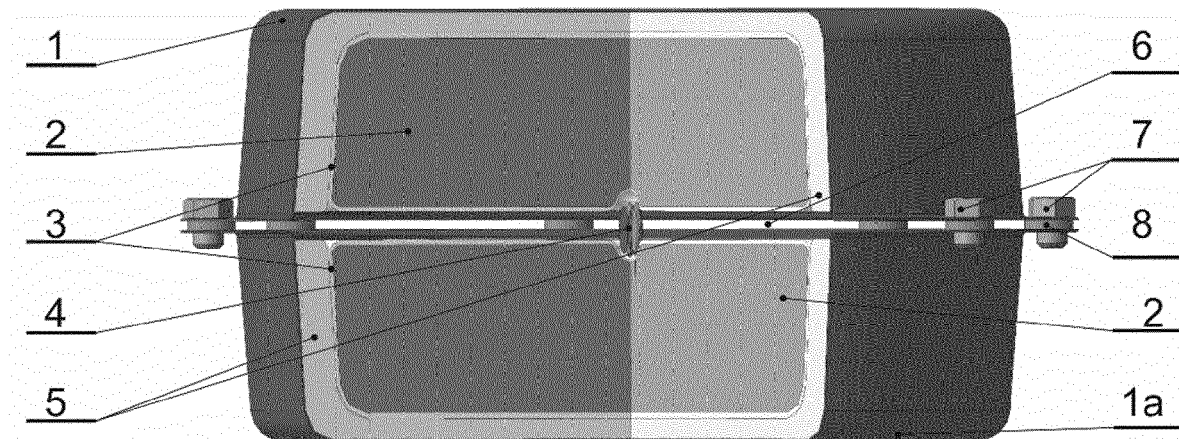


Fig.2

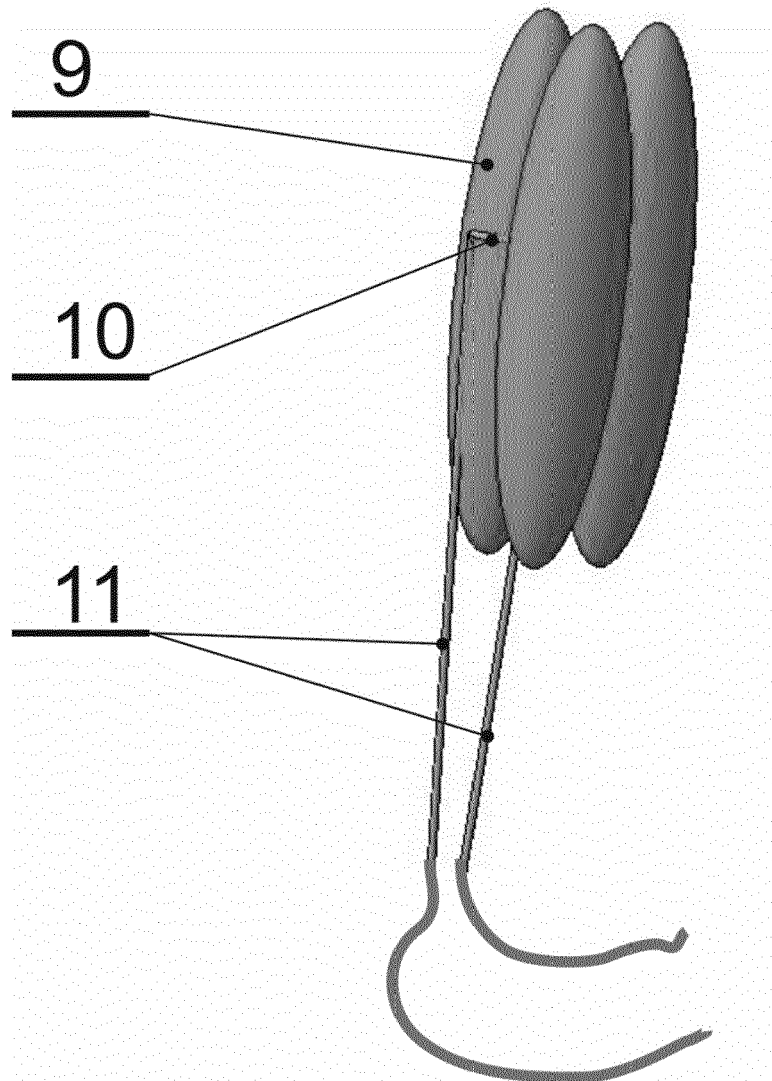


Fig.3

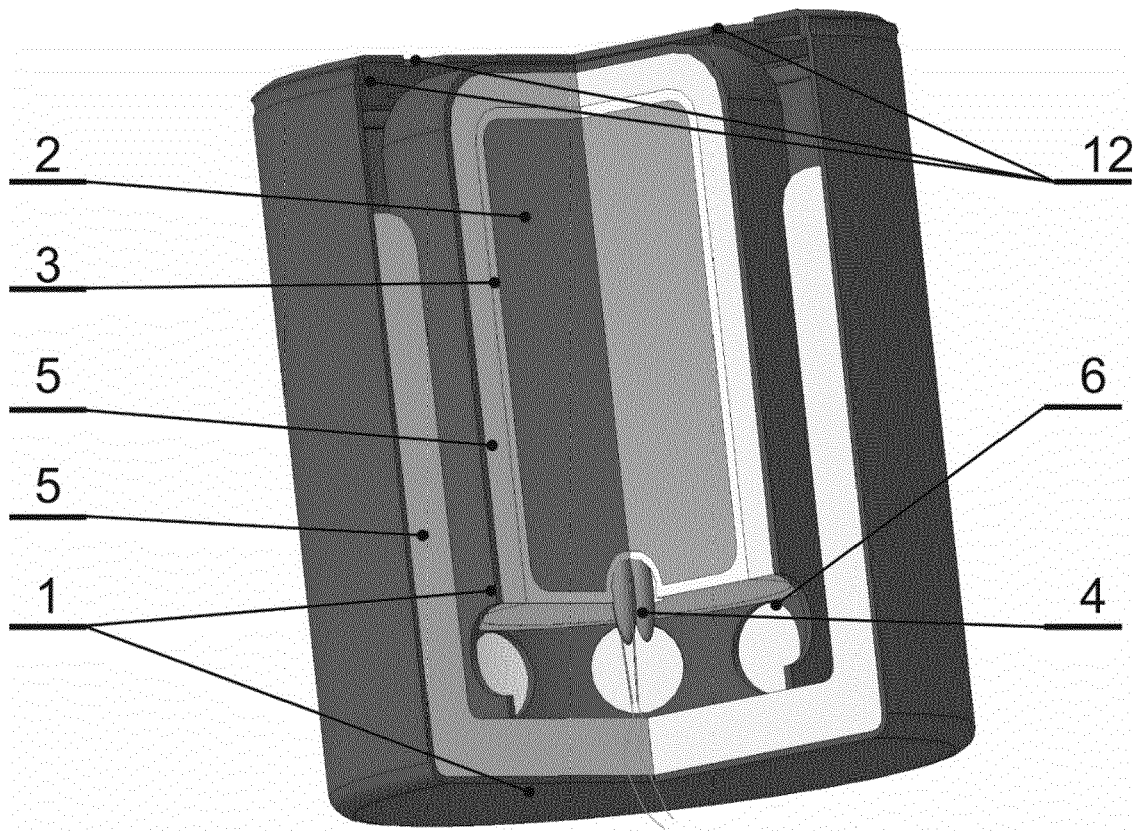


Fig.4

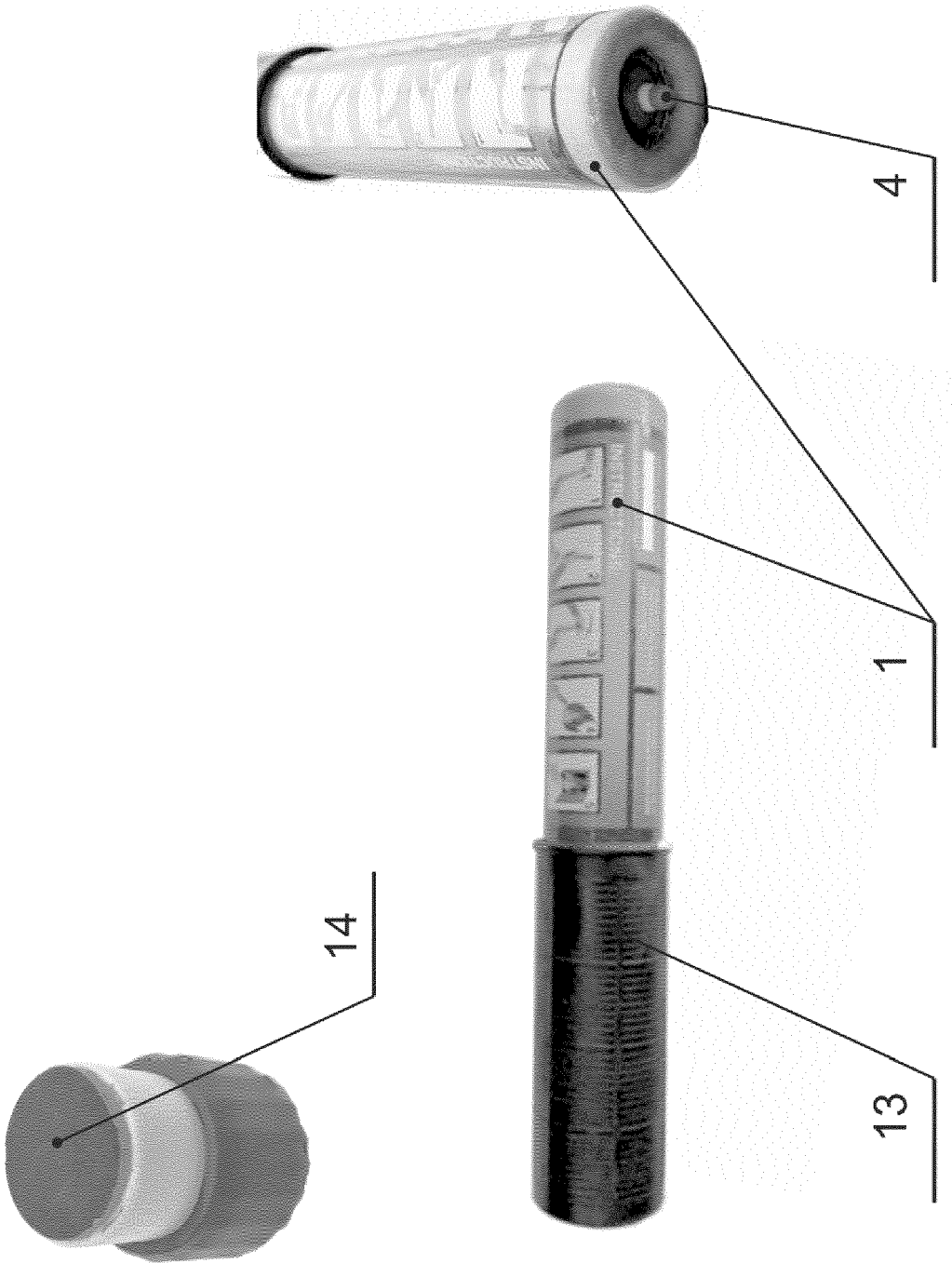


Fig.5

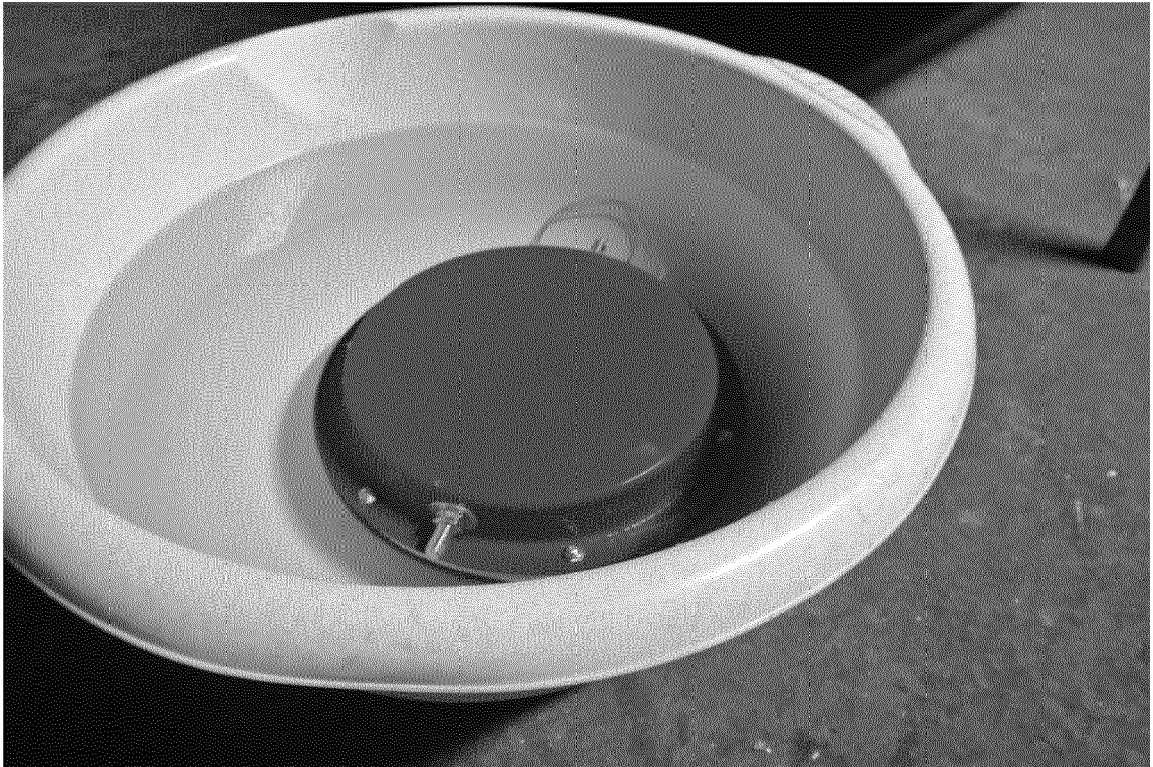


Fig.6



EUROPEAN SEARCH REPORT

Application Number
EP 19 16 6108

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 29 October 2019	Examiner Vervenne, Koen
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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