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(54) **Device for artificially causing an avalanche**

Einrichtung zum küntlichen Auslösen von Lawinen

Dispositif por déclencher une avalanche

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Description

[0001] The present invention relates to a device for artificially causing an avalanche.

[0002] As known, avalanches - that prevalently form in wintertime and that hurtle down to the valley in areas where tourist or sports activities are carried out, or where there are human settlements - are a serious problem

[0003] In fact, said phenomenon frequently originates dangerous situations for people, since they can be suddenly swept away by huge snow masses. In addition, it often affects the practicability of ski tracks or installations since the latter can be remarkably blocked by the avalanche masses.

[0004] Avalanches are generally originated by large amounts of snow that usually settles in the valleys below the mountain crest-line, where slopes are more marked and that, due to thermal variations or other stress, suddenly break off and fall downstream at increasing speed.

[0005] Snow masses, which can potentially cause avalanches, for reasons depending on the meteorological situations of the environment, can be essentially made up of masses of powdery snow possibly covered with a superficial icy layer originated by low temperatures.

[0006] Normally, after a heavy snowfall, or whenever the environmental situation leads to believe that dangerous avalanches may occur, a visual inspection is carried out to locate the sites where said phenomenon may occur.

[0007] Then, through the blasting of explosive charges placed on the surface of the snow mass, avalanches are caused in the sites thus determined.

[0008] Another system consists in using an apparatus transported by helicopter, adapted to launch explosive charges on the snow.

[0009] This apparatus is extremely expensive, very bulky and unsafe.

[0010] In addition, in some cases fixed systems are used, called "gas-exp", which are capable of causing avalanches as a consequence of the explosion of a particular gas.

[0011] Nevertheless, being said systems fixed, they do not feature flexibility of use.

[0012] EP-A-0 108 013 discloses a device according to preamble of present claim 1. In this situation, the object of the present invention is that of solving the abovementioned disadvantages of the prior art.

[0013] Within the scope of this technical task, an important purpose of the present invention is that of devising a device for artificially causing an avalanche, which could be extremely safe in that they are not subject to environmental stresses and are provided with an actuation system having two different safeties, an ignition-based one and a mechanical one, operating in cascade.

[0014] Another purpose of the present invention is that of manufacturing a device for artificially causing an avalanche, using a type of explosive especially insensitive to any type of stress and which, in addition, should be provided with a double system for priming the explosive charge instead of a single one so as to guarantee a complete operation safety.

[0015] A further purpose of the present invention is that of providing for a device for artificially causing an avalanche, which allow the recovery of the explosive charge, in the very remote case of explosion failure, in total safety conditions since the charge is not capable of accidentally blasting because of external pressures such as, for example, extraneous currents or shocks.

[0016] Another purpose of the present invention is that of providing for a device for artificially causing an avalanche, which would be extremely easy to use and have great flexibility of use since the explosive mass can be of different weight according to the situation.

[0017] A further purpose of the present invention is that of providing for a device for artificially causing an avalanche, which allow to transporting the explosive charge by helicopter and releasing it in extremely fast and safe way, allowing to placing the explosive charge in the selected point, thus optimising the effects of the explosion and preventing the explosive charge from moving from where it has been placed, even in case of very leaning slopes and icy snow.

[0018] Another purpose of the present invention is that of providing for a device for artificially causing an avalanche, which is completely safe and prevents possible undesired explosions also in the remote case of accidental shocks or falls from the helicopter used to transport the explosive charge.

[0019] Last but not least, a further purpose of the present invention is that of providing for a device for artificially causing an avalanche, to be used in a range of temperatures comprised between -40 and +70 °C, having an extremely simple structure together with a valid functionality and having a reasonable price, so as to be widely used at low prices.

[0020] These objects, as well as the other purposes, are substantially achieved by a device for artificially causing an avalanche, comprising an explosive mass and a system for activating the same, that said actuation system comprising an actuator provided with first safety means insensitive to all types of electric currents, and to environmental stresses, and at least second safety means that can be actuated by said first safety means only when said device is placed on the fixed mass of snow, characterized in that the operation of said first safety means is ignition-based.

Brief description of the drawings

[0021] Further features and advantages of the present invention will appear more clearly from the following detailed description of a preferred but not exclusive embodiment of a device and a method for artificially causing an avalanche, made by way of a not limitative example with reference to the attached drawings.

[0022] In such drawings:

- Figure 1 shows a perspective exploded view of the actuation system according to the invention;
- Figure 2 shows a perspective exploded view of the device according to the invention, wherein it is possible to see the container containing the explosive mass and the actuation system of the same according to the invention;
- Figure 3 schematically shows the assembled device with the anti-rolling devices according to the invention;
- Figures 4, 5 and 6 schematically show how the device is arranged on the mantle of snow to artificially cause an avalanche according to the invention;
- Figure 7 shows a different type of embodiment of the device according to the invention.

[0023] With reference to the above figures, the device for artificially causing an avalanche according to the invention, referred to as a whole with the reference numeral 1, comprises an explosive mass, as a whole referred to with numeral 2, and an actuation system of the same, referred to as 3, as shown in figure 2.

[0024] Advantageously, the actuation system 3 comprises an actuator 4, provided with first safety means 5, insensitive to all types of electric current, and to environmental stresses, and at least second safety means 6, which can be actuated by the first safety means only when the device is arranged in the selected point of the mantle of snow so as to cause an avalanche in optimum conditions.

[0025] Actuator 4 is provided with a hollow body having a cylindrical shape 7, suitably made of a biodegradable material, which can be closed on the upper side with an upper plate 8 and on the lower side with a lower plate 9 through a "bayonet" joint 19.

[0026] In particular, the body 7 of the actuator is made of an extremely stiff and resistant material having a coefficient of thermal expansion which is practically equal to zero, and the ignition temperature is equal to about 430 °C.

[0027] Body 7 does not shrink at low temperatures, and thus it allows adjusting the operation of the mobile mechanisms with minimal dimensional tolerance.

[0028] In addition, the low ignition temperature causes an immediate combustion of the material on the explosion, and the formation of micro-fragments originated by the collapse of the structure, thus preventing environmental pollution.

[0029] In particular, the operation of the first safety means 5 is ignition-based, free from any type of stress, including those due to electric currents.

[0030] The first safety means 5 is defined by an igniter, and in particular by two frictioned igniters 9 that are connected to at least one fuse, and in particular, to two respective fuses 10, connected in turn to at least one detonator, and more precisely, to two detonators 11.

[0031] Suitably, each of the two portions of safety fuse 10 has a length of 100 centimetres and a combustion rate equal to 0.4 centimetres/second.

[0032] In this way, each of them burns within 4 minutes and 10 seconds.

[0033] Respective end portions of fuses 10 are connected to the frictioned igniters 9 inserted into respective holes 12 located on the upper plate 8.

[0034] After exiting the body 7 of the actuator, fuses 10 are externally wound around it, and are housed at their opposed ends into horizontal cylindrical seats 13, where they are fixedly held inside the same seats as detonators 11.

[0035] Also detonators 11 are provided in pairs to guarantee an ignition safety in at least one of them, and seats 13 are in reciprocal communication with one another so as to allow the blasting of both detonators also in the case one of them is not actuated by the relating fuse 10.

[0036] Once detonators 11 have been inserted into seats 13, the latter are closed through two rubber plugs 14.

[0037] The second safety means comprises a throttle element 15 having an elongated shape, which is provided with at least one explosive charge, or "booster", referred to with 16, in one end portion.

[0038] On its face, the lower plate 9 is provided with an aperture 20, which is occluded by the throttle element 15.

[0039] In particular, the throttle element 15 is mobile from a first position wherein the explosive charge 16 is not aligned with the two detonators 11, and at least a second position wherein the explosive charge 16 is aligned with detonators 11.

[0040] More precisely, the throttle element is mobile from the second position to the first position and vice versa in contrast to and for the action of a mechanical timer 21.

[0041] Timer 21 is provided with a quadrangular shaft 22 which engages in the relating seat 23 of the throttle element 15, which can rotate around pivot 24 located on the lower plate 9.

[0042] The throttle element is held into the first position of non-alignment of the explosive charge 16 with detonators 11 thanks to the engagement of a split pin 25, which passes through hole 26 of the upper plate 8 and of the housing seat 27 of timer 21 to engage with a hole 28 located on the throttle element.

[0043] When the split pin 25 is extracted from hole 28, timer 21 aligns the throttle element and thus, the explosive charge 16 with detonators 11, and consequently, with the explosive mass inserted by fusion into a cylindrical container 31 inside which, into seat 32, actuator 4 is housed.

[0044] In particular, the explosive mass 30, which can be made up of trinitrotoluene or tritolite, is actuated by detonators 11 through the explosive charge 16 present on the throttle element 15 when the latter is in the sec-

ond alignment position, through aperture 20, also with the explosive mass 30.

[0045] Advantageously, the device also comprises some means to release container 31 from a helicopter, as a whole referred to with numeral 40, see figures 4 and 5, in the selected point of the mantle of snow, and adapted to cause the avalanche.

[0046] Additionally, the release means 40 is adapted - as it will be better detailed hereafter - to actuate the mechanical timer 21, thus bringing the throttle element 15 into an armament position.

[0047] In particular, the release means 40 comprises a "throwaway" cable 41, also made with a biodegradable material, and wound around a special roller arranged on the helicopter, which is provided at one end with the split pin or gudgeon 25 adapted to lock the throttle element 15 into the second position of non-alignment with detonators I 1 and with the explosive mass 30.

[0048] In the proximity of the split pin or gudgeon 25, the cable is provided with a slot 42 adapted to engage with a hook 43 hinged on the edge of container 31 and mobile in contrast to and for the action of, a pre-calibrated spring 44.

[0049] In this way, once the device has been laid on the mantle of snow, slot 42 disengages from hook 43, which returns to its initial position thanks to spring 44.

[0050] At this point, as it can be seen in figure 6, the split pin or gudgeon 25 is disconnected from the device through a traction of the cable operated from the helicopter and, as already pointed out, this operation will allow the rotation of the throttle element and thus, the alignment of the explosive charge 16 with the explosive mass 30 and detonators 11.

[0051] Finally, the cable is cut onboard of the helicopter and is released on the snow.

[0052] In addition, the device comprises anti-rolling means for the container; in particular, two bars 45 that are inserted into respective through holes 46 present on the same so as to create a hindrance to the rolling of container 31 along the mass of snow. container, not shown, made up of steel sheets welded to one another, and also provided with a cover that is fixed to the body thereof through suitable means.

[0053] The invention achieves the proposed purposes, obtaining several important advantages.

[0054] In fact, a device for artificially causing an avalanche have been invented which carry out the priming steps in a totally mechanical-igniferous way, so as to prevent the explosive charge from running the risk of untimely explosions caused by all types of extraneous currents that can generate in high-mountain environments and in a helicopter.

[0055] In addition, thanks to the presence of two ignitions that operate concurrently, there is a complete operation safety.

[0056] Always as regards to safety, should the device according to the invention not explode once positioned on the snow, it would not have any other chance of blasting since it is not provided with mechanisms that may cause it to explode.

[0057] Additionally, the explosive charge is available with different weights of the explosive mass.

[0058] The invention thus conceived can be subject to several modifications and variants, all falling within the scope of the concept of the present invention.

[0059] For example, an alternative of embodiment, shown in figure 10, actuator 4 is provided with an additional safety made up of a split pin 80 adapted to hold the throttle element 15 into position, locked into the first position.

[0060] Additionally, container 31 can be provided with horizontal ribs 81 for the purpose of having a greater surface resistance and for holding the explosive it contains, inserted by fusion, with greater efficacy.

[0061] In a different embodiment, a metal mass 83, weighing about 1 kg, is provided at the end of cable 41, and a half ring 84 is provided in the lower side of said metal mass.

[0062] Spaced from the metal mass, the cable is also provided with three safety hooks 85, the first two of which are connected to igniters 9 so as to actuate them when the explosive charge is laid on the snow through cable 41, instead of activating it onboard of the helicopter.

[0063] The third hook is connected to split pin 80, which is disconnected from its seat during the cable recovery and the actuation of the igniters.

[0064] Additionally, all parts can be replaced with technically equivalent elements.

[0065] The materials, shapes and dimensions used can be of any type according to the needs.

Claims

1. Device for artificially causing an avalanche, comprising an explosive mass (2) and an actuation system (3) of the same, **characterised in that** said actuation system (3) comprises an actuator (4) provided with first safety means (5) insensitive to all types of electric currents, and to environmental stresses, and at least second safety means (6) that can be actuated by said first safety means (5) only when said device is placed on the fixed point of the mass of snow, the operation of said first safety means (5) being ignition-based, **characterised in that** said first safety means (5) comprises at least one frictioned igniter (9) connected to at least one fuse (10), connected in turn to at least one detonator (11).

2. Device according to claim 1, **characterised in that** said actuator (4) is provided with a substantially hollow body (7) made of a biodegradable material, closed by an upper plate (8) and by a lower plate (9).

3. Device according to one or more of the previous

claims, **characterised in that** said second safety means comprises a throttle element (15) having an elongated shape, which is provided with at least one explosive charge (16) in one end portion.

4. Device according to one or more of the previous claims, **characterised in that** said lower plate (9) is provided with an aperture (20) occluded by said throttle element (15).

5. Device according to one or more of the previous claims, **characterised in that** said throttle element (15) is mobile from a first position wherein said explosive charge (16) is not aligned with said detonator (11), and at least a second position wherein said explosive charge (16) is aligned with said detonator (11).

6. Device according to one or more of the previous claims, **characterised in that** said throttle element (15) is mobile from said second position to said first position and vice versa in contrast to and for the action of, a mechanical timer (21).

7. Device according to one or more of the previous claims, **characterised in that** said actuator is housed into a container (31) wherein said explosive mass made up of a blasting explosive is inserted by fusion.

8. Device according to one or more of the previous claims, **characterised in that** said explosive mass is actuated by said detonator (11) through said explosive charge (16) present onto said throttle element (15).

9. Device according to one or more of the previous claims, **characterised in that** it comprises means (40) for releasing said container in said selected point, said release means being adapted to actuate said mechanical timer (21).

10. Device according to one or more of the previous claims, **characterised in that** said release means (40) comprises a "throwaway" cable (41) provided at one end with a split pin (25) for locking said throttle element (15) and, in the proximity of said split pin (25) a slot (42) adapted to engage with a hook (43) associated to said container (31) and mobile in contrast to, and for the action of, a spring (44).

11. Device according to one or more of the previous claims, **characterised in that** it comprises anti-rolling means for the container onto said mantle of snow.

12. Device according to one or more of the previous claims, **characterised in that** said anti-rolling means comprises at least two bars (45) inserted into respective through holes (46) present on said container (31).

13. Device according to one or more of the previous claims, **characterised in that** said actuator (4) is provided with an additional safety made up of a split pin (80) adapted to hold said throttle element (15) into said first position.

14. Device according to one or more of the previous claims, **characterised in that** one end of said release cable is provided with a metal mass (83), provided in turn with a half ring (84) at its lower side; and, at a certain distance therefrom, with three safety hooks (85) of which the first two are connected to said igniters (9) so as to activate them when the explosive charge is laid on the snow, instead of activating it onboard of the helicopter; and **in that** the third hook is connected to said additional split pin (80) which is disconnected from its seat during the recovery of said cable and the actuation of said igniters.

Patentansprüche

1. Gerät zur künstlichen Auslösung einer Lawine, bestehend aus einer Explosivstoffmasse (2) und einem dazugehörigen Zündsystem (3), **dadurch gekennzeichnet, dass** das genannte Zündsystem (3) aus einem Zünder (4) besteht, der mit einer ersten Sicherheits-vorkehrung (5), die unempfindlich gegenüber allen Arten des elektrischen Stromes und gegenüber Umweltbelastungen ist, und mindestens einer zweiten Sicherheitsvorkehrung (6) versehen ist, die durch die genannte erste Sicherheitsvorkehrung (5) erst dann ausgelöst werden kann, wenn das genannte Gerät auf den festgelegten Punkt der Schneemasse gestellt ist, wobei die Auslösung der genannten ersten Sicherheitsvorkehrung (5) durch eine Zündung geschieht, **dadurch gekennzeichnet, dass** die genannte erste Sicherheitsvorkehrung (5) mindestens aus einem Reisszünder (9) besteht, der mindestens mit einer Zündschnur (10) verbunden ist, die wiederum mit mindestens einer Sprengkapsel (11) verbunden ist.

2. Gerät nach Anspruch 1, **dadurch gekennzeichnet, dass** der genannte Zünder (4) mit einem im wesentlichen hohlen Körper (7) versehen ist, der aus einem biologisch abbaubaren Material gefertigt ist und durch eine obere Platte (8) und eine untere Platte (9) abgeschlossen ist.

3. Gerät nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die genannte zweite Sicherheitsvorkehrung aus ei-

nem Drosselelement (15) mit einer langgezogenen Form besteht, welches mindestens mit einer Sprengladung (16) in einem Endstück versehen ist.

4. Gerät nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die genannte untere Platte (9) mit einer Öffnung (20) versehen ist, die durch das genannte Drosselelement (15) verschlossen wird.

5. Gerät nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das genannte Drosselelement (15) von einer ersten Position, an der die genannte Sprengladung (16) nicht mit der genannten Sprengkapsel (11) verbunden ist, und mindestens einer zweiten Position, an der die genannte Sprengladung (16) mit der genannten Sprengkapsel (11) verbunden ist, bewegt werden kann.

6. Gerät nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das genannte Drosselelement (15) von der genannten zweiten Position zu der genannten ersten Position und umgekehrt bewegt werden kann, entgegen und gleich-gerichtet zur Wirkung eines mechanischen Zeitgebers (21).

7. Gerät nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der genannte Zünder in einen Behälter (31) eingebaut ist, in den die genannte Explosivstoffmasse bestehend aus Sprengstoff als Schmelzmasse eingefüllt wird.

8. Gerät nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die genannte Explosivstoffmasse durch die genannte Sprengkapsel (11) mittels der im genannten Drosselelement (15) vorhandenen genannten Sprengladung (16) gezündet wird.

9. Gerät nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es aus einem Hilfsmittel (40) zum Absetzen des genannten Behälters an dem genannten ausgewählten Punkt besteht, wobei das genannte Hilfsmittel (40) zum Absetzen angebracht ist, um den genannten mechanischen Zeitgeber (21) auszulösen.

10. Gerät nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das genannte Hilfsmittel (40) zum Absetzen aus einem Wegwerfkabel (41) besteht, das an einem Ende mit einem Splint (25) zum Sperren des genannten Drosselelementes (15) versehen ist und in der Nähe des genannten Splintes (25) eine Schlaufe (42) zum Einführen in einen Haken (43) angebracht ist, der am genannten Behälter (31) beweglich entgegen und gleichgerichtet zur Wirkung einer Feder (44) befestigt ist.

11. Gerät nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es aus einem Hilfsmittel gegen eine Rollbewegung des Behälters auf der genannten Schneedecke besteht.

12. Gerät nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das genannte Hilfsmittel gegen eine Rollbewegung mindestens aus zwei Stangen (45) besteht, die jeweils in am genannten Behälter (31) vorhandene Öffnungen (46) eingeführt sind.

13. Gerät nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der genannte Zünder (4) mit einer zusätzlichen Sicherheitsvorrichtung versehen ist, die von einem Splint (80) gebildet wird, der angebracht ist, um das genannte Drosselelement (15) in der genannten ersten Position zu halten.

14. Gerät nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** ein Ende des genannten Kabels zum Absetzen mit einer Metallmasse (83) versehen ist, die wiederum an ihrer unteren Seite mit einem Halbring (84) versehen ist; und, in einer bestimmten Entfernung davon, mit drei Sicherheitshaken (85), von denen die ersten beiden mit den genannten Zündern (9) so verbunden sind, um sie zu aktivieren, sobald die Sprengladung auf den Schnee gesetzt ist, anstatt sie an Bord des Hubschraubers zu aktivieren; und **dadurch gekennzeichnet, dass** der dritte Haken mit dem genannten zusätzlichen Splint (80) verbunden ist, welcher während der Bergung des genannten Kabels und der Aktivierung der genannten Zünder von seinem Sitz entfernt wird.

Revendications

1. Dispositif pour susciter artificiellement une avalanche, comprenant une masse explosive (2) et un système d'actionnement (3) de cette dernière, **caractérisé en ce que** ledit système d'actionnement (3) comprend un actionneur (4) muni d'un premier moyen de sécurité (5) insensibles à toute sorte de courant électrique ainsi qu'aux contraintes environnementales, et d'au moins un deuxième système de sécurité (6) qui ne peut être actionné par ledit premier moyen de sécurité que lorsque ledit dispositif est aménagé sur le point fixe de la masse de neige, l'opération dudit premier moyen de sécurité (5) se déroulant par un dispositif d'allumage, **carac-**

térisé en ce que ledit premier moyen de sécurité (5) comprend au moins un allumeur par friction (9) relié à au moins un fusible (10), à son tour relié à au moins une amorce (11).

2. Dispositif, selon la revendication 1, **caractérisé en ce que** ledit actionneur (4) est muni d'un corps substantiellement creux (7) se composant d'un matériau biodégradable, fermé par une plaque supérieure (8) et par une plaque inférieure (9).

3. Dispositif selon l'une ou l'autre des revendications précédentes, **caractérisé en ce que** ledit deuxième moyen de sécurité comprend un élément d'étranglement (15) ayant une forme allongée, qui est muni d'au moins une charge explosive (16) dans la portion d'une extrémité.

4. Dispositif selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ladite plaque inférieure (9) est munie d'une ouverture (20) occluse par ledit élément d'étranglement. (15)

5. Dispositif selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit élément d'étranglement (15) est mobile d'une première position là où ladite charge explosive (16) n'est pas alignée avec ledit détonateur (11), et au moins une deuxième position là où ladite charge explosive (16) est alignée avec ledit détonateur (11).

6. Dispositif selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit élément d'étranglement (15) est mobile de ladite deuxième position à ladite première position et viceversa par contraste avec et pour l'action d'un temporisateur mécanique (21).

7. Dispositif selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit actionneur est logé dans un récipient (31) là où ladite masse explosive constituée par un explosif à la mine est introduite par fusion.

8. Dispositif selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ladite masse explosive est actionnée par ledit détonateur (11) par ladite charge explosive (16) présente audessus dudit élément d'étranglement (15).

9. Dispositif selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce qu'**il comprend des moyens (40) pour relâcher ledit récipient dans ledit point sélectionné, ledit moyen de relâchement (40) étant apte à actionner ledit temporisateur mécanique (21).

10. Dispositif selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit moyen de relâchement (40) comprend un câble « jetable » (41) dont l'une de ses extrémités est munie d'une goupille fendue (25) pour verrouiller ledit élément d'étranglement (15) et, à proximité de ladite goupille fendue (25), une fente apte à s'emboîter avec un crochet (43) associé audit récipient (31) et mobile par contraste avec, et pour l'action d'un ressort (44).

11. Dispositif selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce qu'**il comprend un moyen anti-roulage pour le récipient sur ledit manteau de neige.

12. Dispositif selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit moyen anti-roulage comprend au moins deux barres (45) insérées au travers de trous (46) respectifs présents sur ledit récipient (31).

13. Dispositif selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit actionneur (4) est muni d'un ultérieur dispositif de sécurité se composant d'une goupille fendue (80) apte à maintenir ledit élément d'étranglement (15) dans ladite première portion.

14. Dispositif selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce qu'**une des extrémités dudit câble de relâchement est munie d'une masse en métal (83), munie à son tour d'un demi-anneau (84) de son côté inférieur ; et, à une certaine distance de cet endroit-là, avec trois crochets de sécurité (85) dont les deux premiers sont reliés aux dits allumeurs (9) de façon à les activer lorsque la charge explosive est déposée sur la neige, au lieu de l'activer à bord de l'hélicoptère ; et **en ce que** le troisième crochet est relié à ladite ultérieure goupille fendue (80) qui est débranchée de son siège pendant la récupération dudit câble et l'actionnement desdits allumeurs.

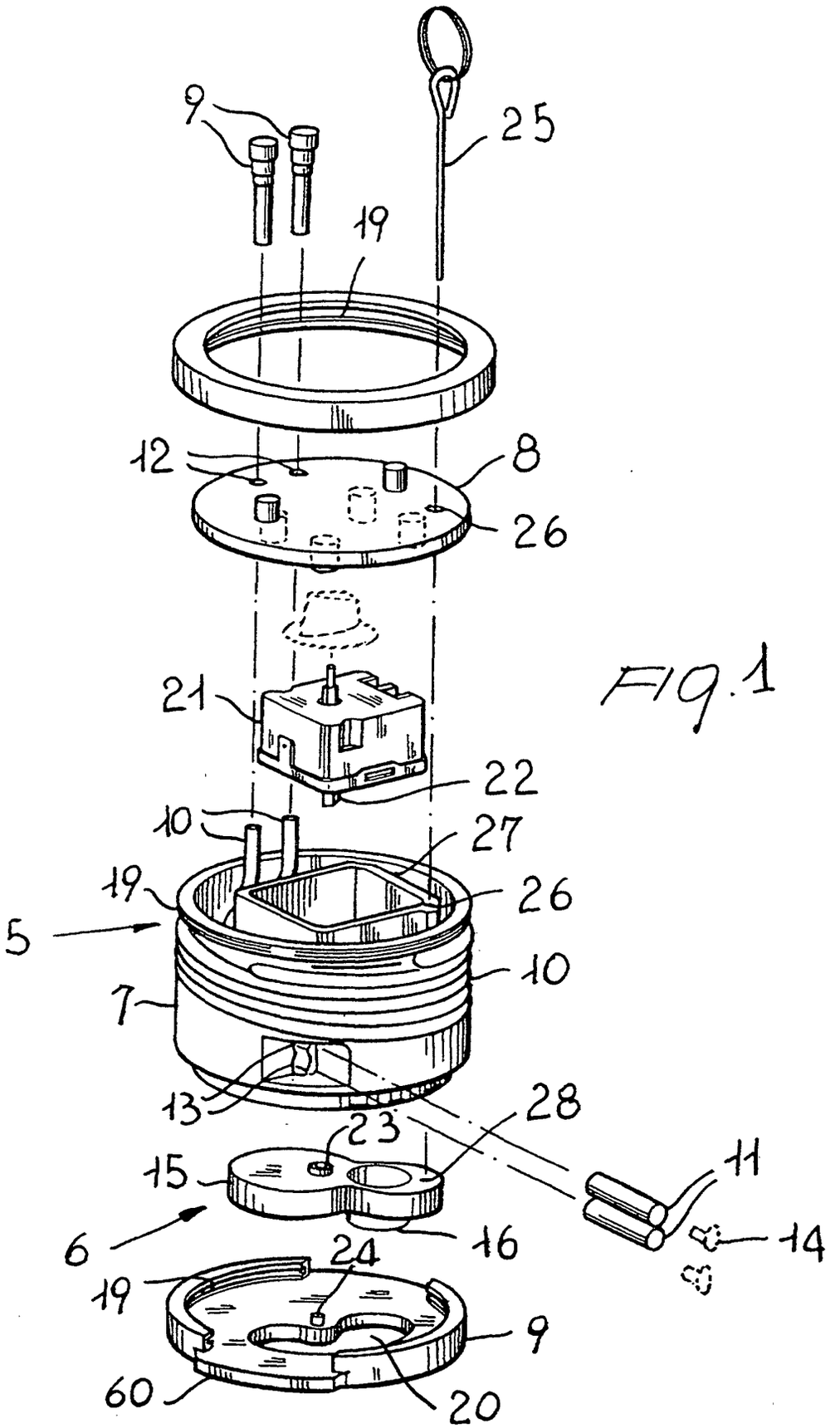

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FIG.1

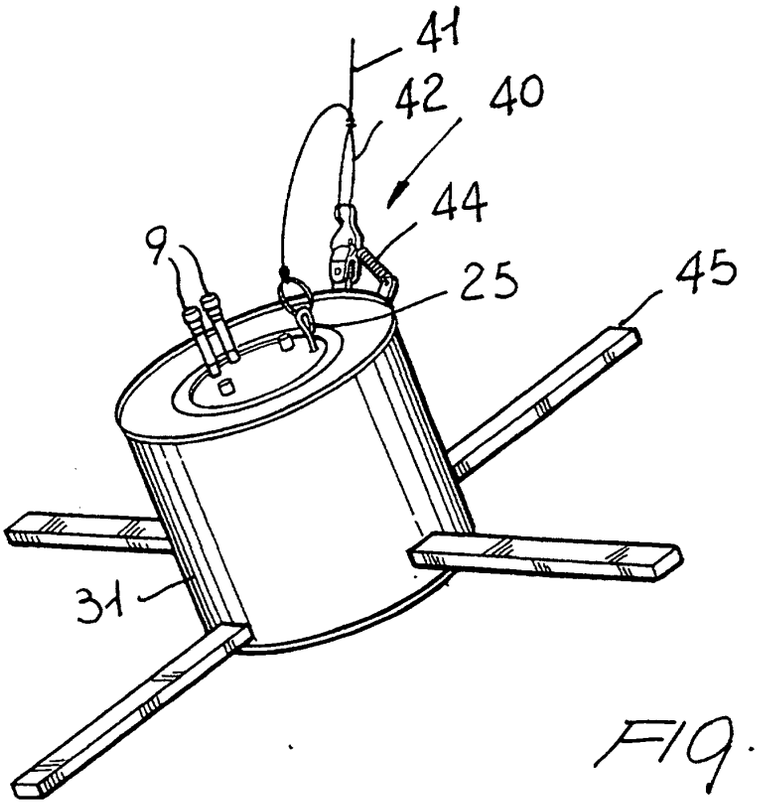


FIG. 4

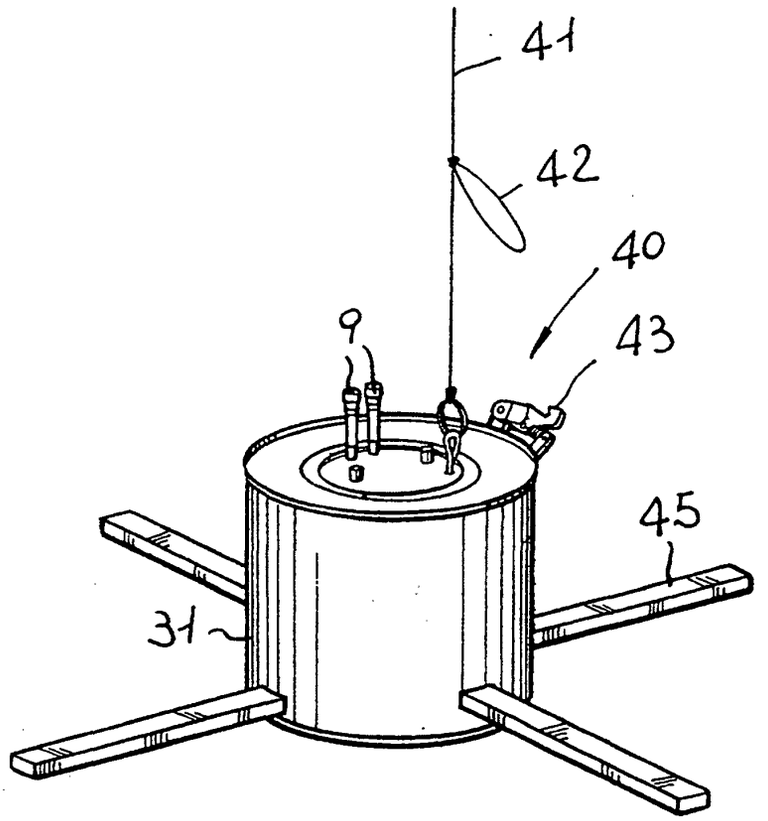


FIG. 5

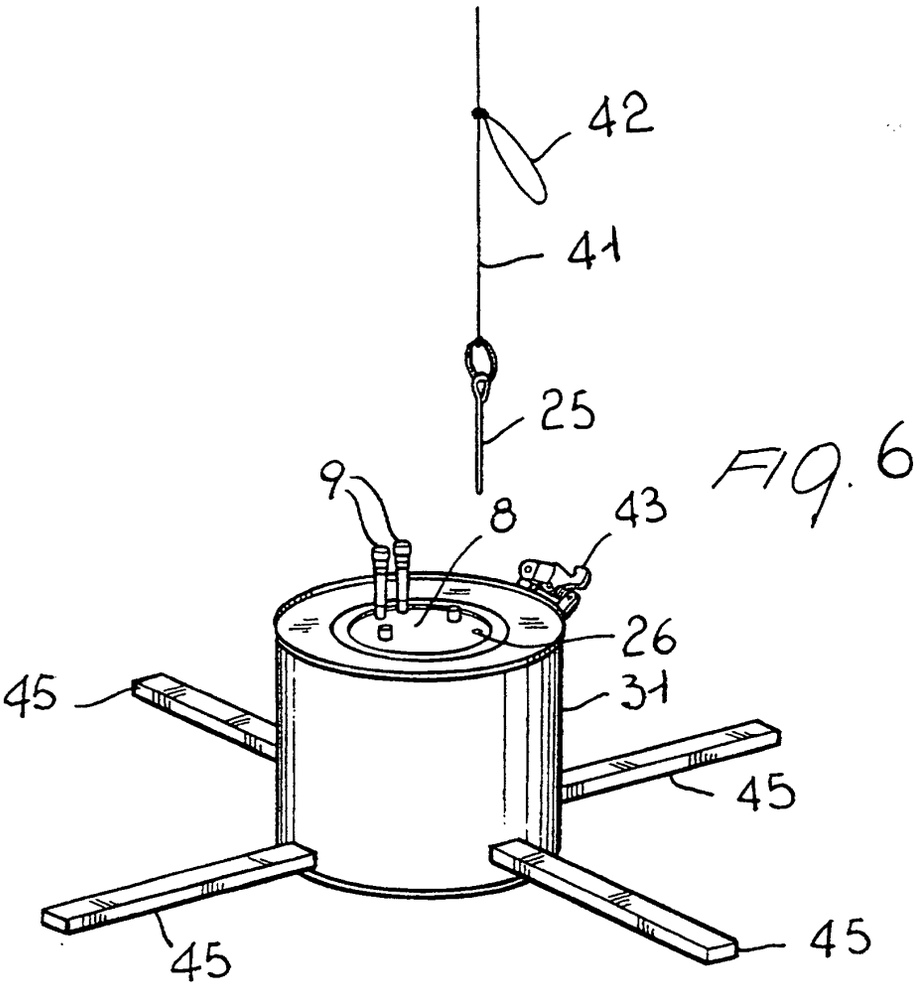


FIG. 6

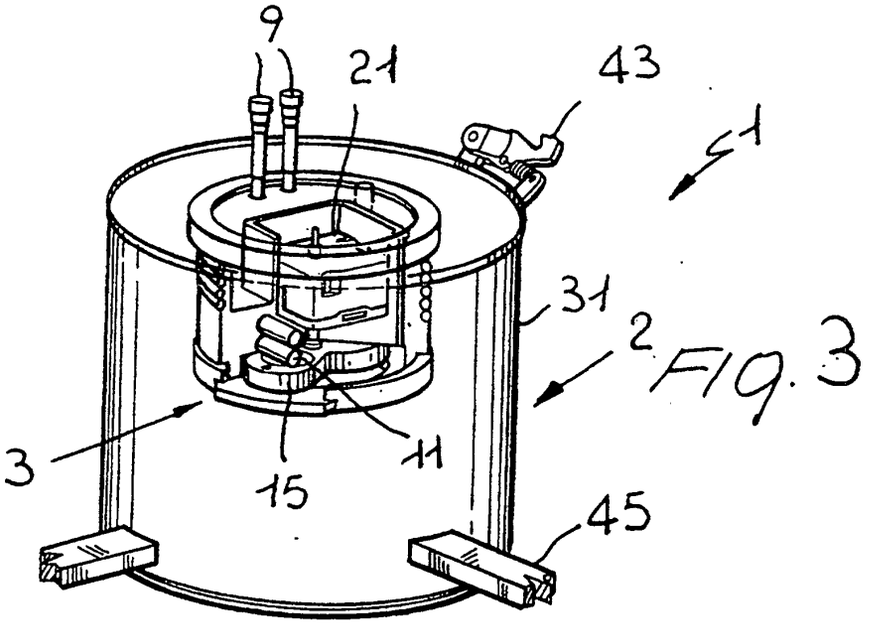


FIG. 3

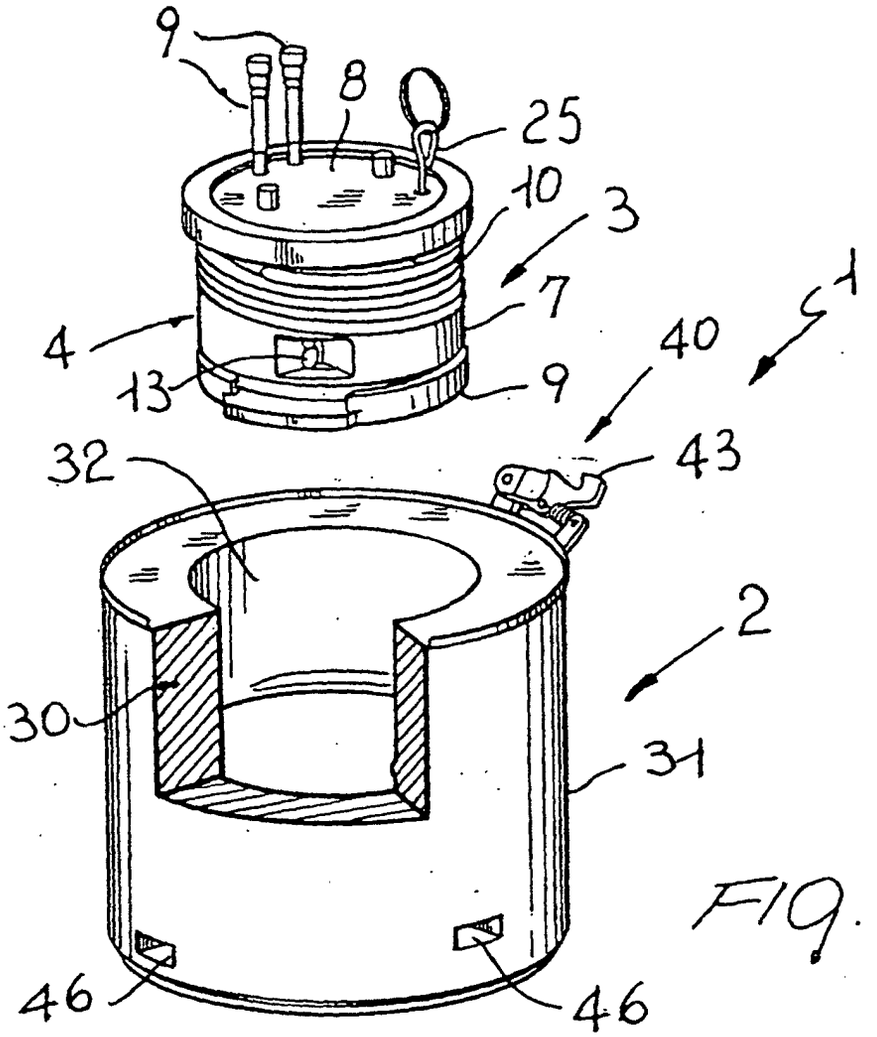


FIG. 2

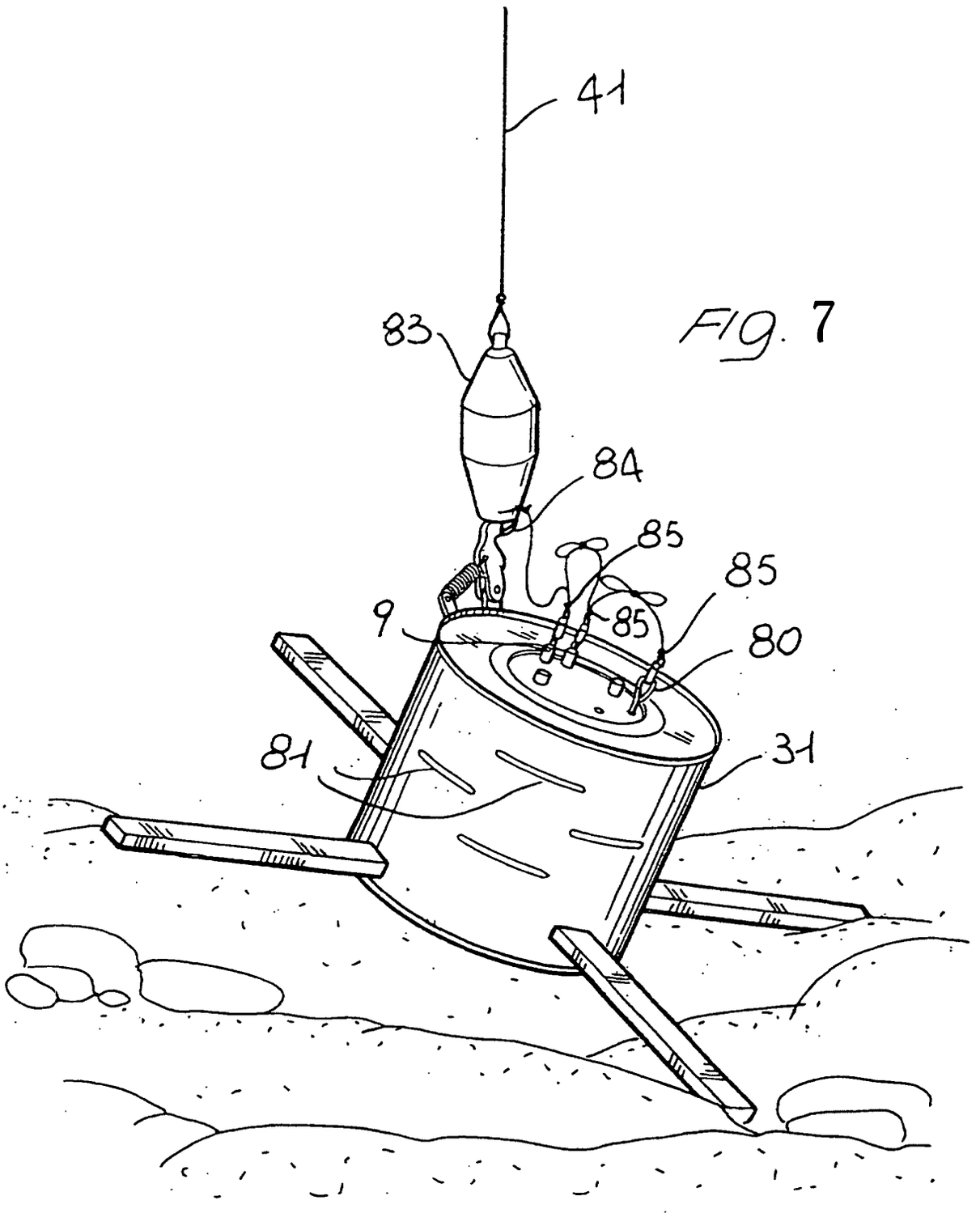


FIG. 7