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(54) **NEW INTEGRAL PLASTIC RECTANGULAR CAKE FIREWORKS**

(57) The present invention discloses a new kind of integral plastic rectangular cake fireworks which may comprise a rectangular cake fireworks body (7), wherein the rectangular cake fireworks body (7)include a plurality of firework barrels (2) in a matrix arrangement and a frame (1) which encloses outside the plurality of firework barrels (2). Each of firework barrels (2) to the inner side that is not in contact with the outside frame (1) is connected and fixed with a stiffening plate (3). Under the firework barrels (2), preferably four fireworks barrels, which locate in the central part of the rectangular cake fireworks body (7), a fixing plate (8) is provided. On the bottom of the rectangular cake fireworks body (7) is also provided a fuse board (4) which has a "S" shape and is in turn connected to the bottom end of the firework barrels (2). On the bottom of each firework barrel (2), two ignition holes (5) are provided along the extending direction of the fuse board (4). An ignition slot (6), whose one end is connected to an ignition hole (5) of a firework barrel (2) and the other end of the ignition slot (6) is connected to an ignition hole (5) of the other firework barrel (2), is provided between two neighboring firework barrels (2) on the fuse board (4).

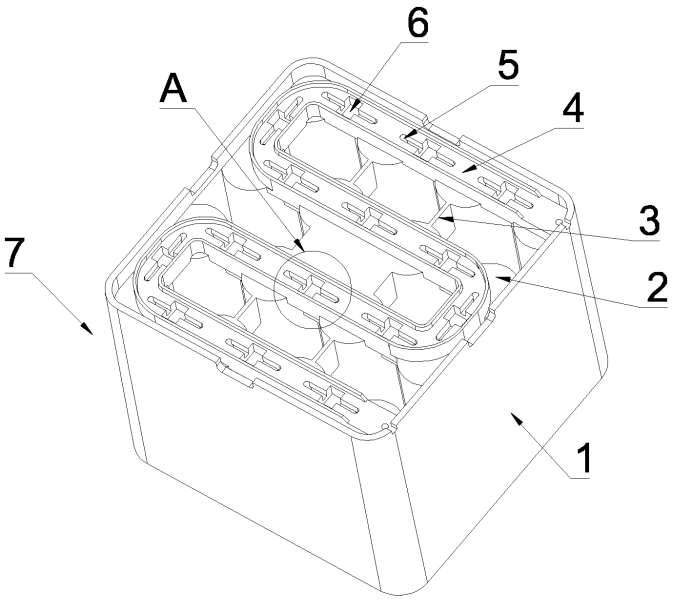

Fig. 1

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Description

TECHNOLOGY FIELD:

[0001] The present invention relates to the technical field of firework manufacturing, especially relates to a new integral rectangular plastic cake fireworks.

BACKGROUND TECHNOLOGY:

[0002] There are rectangular cake fireworks made of different materials commercially available nowadays, comprising primarily gypsum and plastic one. The rectangular cake fireworks made of gypsum are mostly integrated-type ones, which means the firework barrels are connected to the base of rectangular cake fireworks. For this kind of fireworks, in case one of the firework barrels explodes, the other barrels will be affected, which is not satisfactory with regard to safety.

[0003] With respect to the rectangular cake fireworks made of plastic, the firework barrel and the rectangular cake fireworks base are usually separated. No matter how the plastic rectangular cake fireworks are designed, the separation of the firework barrel and the rectangular cake fireworks base can not compromise the stability of the fireworks, especially for a long distance transportation, which may cause the problem such as the incorrect ignition connection, and affect the effect of fireworks. In addition, the heat radiation capacity of the present fireworks is not good enough and, from time to time, something like misconnection of ignition may occur. Consequently a new kind of plastic rectangular cake fireworks is an urgent need to overcome the deficiencies detected in the current use.

DETAILED DESCRIPTION OF THE PRESENT INVENTION:

[0004] The present invention aims to provide a new integral plastic rectangular cake fireworks capable of solving the problems proposed in the background.

[0005] To realize the above goal, the present invention provides the following technical solution:

A new integral, plastic, rectangular, cake fireworks that comprise a rectangular cake fireworks body that may include a plurality of firework barrels in a matrix arrangement and a frame which encloses outside several of said plurality of firework barrels. Each of the firework barrels to the inner side of the rectangular cake fireworks body that may not contact with the outside frame is connected and fixed with a stiffening plate.

[0006] Under the firework barrels located in the central part of the rectangular cake fireworks body, a fixing plate is provided. Preferably, there are four firework barrels in the central part of the rectangular cake fireworks body.

[0007] On the bottom of the rectangular cake fireworks body, a fuse board which shows an "S" shape that is in turn connected to the bottom end of the firework barrels is also provided.

[0008] At the bottom of each firework barrel, two ignition holes are provided along the extending direction of the fuse board. An ignition slot is situated on the fuse board, between all two neighboring firework barrels, whose one end is connected to an ignition hole of a firework barrel and the other end of the ignition slot is connected to an ignition hole of the other firework barrel.

[0009] Furthermore, to front and rear sides of the fixing plate is provided a connecting plate whose end is connected to the stiffening plate.

[0010] Further, the frame, the firework barrels, the stiffening plate, the fuse board, the fixing plate and the connecting plate are manufactured by integrated molding.

[0011] Furthermore, the ignition slot may comprise a square groove and two bar grooves positioned to both sides of the square groove.

[0012] Furthermore, both the diameter of the ignition hole and the width of the bar groove are 2.8 mm.

[0013] Furthermore, the connection part between the ignition hole and the bar grooves is filleted.

[0014] Furthermore, the rectangular cake fireworks body is made of plastic material and, looking at it from a top view, the rectangular cake fireworks body has a square or rectangular shape.

[0015] Furthermore, in another embodiment, the ignition slot comprises two transversal ribs, perpendicular to a longitudinal direction of the ignition slot, positioned between each bar grooves and the square groove.

[0016] Furthermore, in another embodiment, the ignition slot comprises two transversal ribs perpendicular to a longitudinal direction of the ignition slot (6), which divide said slot into three parts.

[0017] Compared with the prior art, the beneficial effects of the present invention are shown as follow: the way to fix the fuse has been changed from parallel to a serial connection, in the new integral plastic rectangular cake fireworks; and there are two ignition holes designed on every firework barrel. Heat radiation is greatly facilitated and enough time is allowed for burning the fuse with the ignition slot wide opening, to prevent the ignition misconnection.

[0018] Experiments show that the present design could basically solve the problem of the ignition misconnection. The rectangular cake fireworks is more stable, much smoother outside and it is much easier to manufacture the outer package when it is enclosed with the frame from outside. The design of the rectangular cake fireworks base with holes improves the heat dissipation and the material costs could be saved with better environmental and economic effects. In addition, the base holes also enable that the rectangular cake fireworks don't deform easily because of the expansibility of plastics. Furthermore, if one of the firework barrels explodes, the other firework barrels would not be affected as they are made from plastic, however, it is likely that the entire firework explode when any one firework barrel does if they are made of gypsum. In this regard, the design of

the present invention is much safer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

- Figure 1 shows a ISO diagram of the structure of the present invention from a bottom side.
- Figure 2 shows a ISO diagram of the structure of the present invention from a top side.
- Figure 3a shows an enlarge view of an embodiment of the A part of Figure 1.
- Figure 3b shows an enlarge view of another embodiment of the A part of Figure 1, wherein the ignition slot comprises two transversal ribs, perpendicular to the longitudinal direction of the ignition slot, positioned between each bar grooves and the square groove .
- Figure 3c shows an enlarge view of another embodiment of the A part of Figure 1, wherein the ignition slot comprises two transversal ribs perpendicular to a longitudinal direction of the ignition slot (6), which divide said slot into three parts.
- Figure 4a shows a front section view of the ignition slot of an embodiment of the present invention.
- Figure 4b shows a front section view of the ignition slot of another embodiment of the present invention, wherein the ignition slot comprises two transversal ribs, perpendicular to the longitudinal direction of the ignition slot, positioned between each bar grooves and the square groove.
- Figure 4c shows a front section view of the ignition slot of another embodiment of the present invention, wherein the ignition slot comprises two transversal ribs perpendicular to a longitudinal direction of the ignition slot (6), which divide said slot into three parts.
- Figure 5 is a top view of the invention.

[0020] All various elements in the figures are shown as follows:

1. Frame,
2. firework barrel,
3. stiffening plate,
4. fuse board,
5. ignition hole,
6. ignition slot,
    61. Bar groove,
    62. Square groove,
    63. Two transversal ribs
7. Rectangular cake fireworks body,
8. Fixing plate,
9. Connecting plate.

PREFERRED DESCRIPTION OF THE INVENTION

[0021] A clear and complete description will be given to the technical scheme of the present invention with reference to the accompanying figures. Obviously, the embodiments described here are only several embodiments of the present invention, not an exhaustive list of them. Based on the embodiments described here, all other embodiments that a skilled in the art can obtain without creative work shall fall within the scope of protection of the present invention.

[0022] As is shown in the figures 1- to 5, in one embodiment of the present invention, the new integral plastic rectangular cake fireworks may comprise a rectangular cake fireworks body (7). The shape of the rectangular cake fireworks body (7) can be rectangular or square, viewed from a top view, and the corners cake fireworks body are smoothed, viewed from top side. The rectangular cake fireworks body (7) is made of plastic and may comprise plurality of firework barrels (2), in a matrix arrangement, and a frame (1) which encloses the outside firework barrels (2). The inner firework barrels (2) that do not contact with the frame (1), are fixed and connected by a stiffening plate (3) to avoid the shaking of the firework barrels during burning. As is shown infigure 5, under the four firework barrels (2) which are situated in the center part of the rectangular cake fireworks body (7), a fixing plate (8) is provided. Things may be put on the center part of the rectangular cake fireworks body (7) when the ground is uneven, to make it heavier so the center of gravity is more stable. A plurality of connecting plates (9) are provided to the front and rear sides of the fixing plate (8), whereas the other ends of said fixing plate (8) are connected to the stiffening plate (3), in this way, stability of the present structure is further improved. On the bottom of the rectangular cake fireworks body (7) a fuse board (4) is also provided. The frame (1), the firework barrels (2) and the fuse board (4) are machined and molded integrally. The fuse board (4) has a "S" shape and is in turn connected to the bottom end of the firework barrels (2). Two ignition holes are provided at the bottom of the firework barrels (2), along the extending direction of the fuse board (4), and the diameter of the ignition hole (5) is 2.8 mm. Fuses may not be uniform when they are manufactured, so that it may be difficult to plug into a 2.5 mm hole, and it may be even difficult as the fuse is not always round. An ignition slot (6) may be provided between the two firework barrels (2) on the fuse board (4). In one embodiment, the ignition slot (6) may include a square groove (62) and a bar grooves (61) which are positioned on both sides of the square groove (62) and wherein the width of the bar groove (61) is also 2.8 mm. One end of the ignition slot (6) is connected to one ignition hole (5) of the firework barrels (2) and the other end of the ignition slot (6) is connected to the other ignition hole (5) of the firework barrels (2). In practical use, if the ignition hole (5) is vertically provided on the bar groove (61), it is not easy to plug in the fuse, and after plugging in the fuse

will turn not submissive and tend to float. As is shown in fig. 4a, the connection part of the ignition hole (5) and the bar grooves (61) is smoothed, consequently, the round angle will serve the translation of the fuse well and the fuse can be close to the ignition hole (6).

[0023] In another embodiment, the ignition slot (6) may include two transversal ribs (63) perpendicular to the longitudinal direction of the ignition slot (6), positioned between each bar grooves (61) and the square groove (62), and in another embodiment, the ignition slot (6) may not include the bar grooves (61) and the ignition slot (6) may comprises three different parts or areas, separated by two ribs (63).

[0024] The beneficial effects of the present invention are shown as follows:

(1) The plastic material is light and easy to transport. Especially for the fireworks export companies and small sized fireworks, so that plastic works perfectly for transportation and economic purpose.
(2) The integrated design of the rectangular cake fireworks is different from the existing rectangular cake fireworks present in the market. No matter how the cake fireworks are designed, existing cake fireworks with separate base and firework barrel cannot address the problem of security during transportation, and possibly the burning effect of entire fireworks is affected.
(3) The plastic rectangular cake fireworks is more environment-friendly and it is possible to reuse them.
(4) Plastic material doesn't deform easily.
(5) Fuse connection method of the present integral rectangular cake fireworks has been changed from parallel connection to serial connection, and there are two ignition holes (5) on every firework barrel (2).
(6) With the wide opening design ignition slot (6), heat radiation is greatly facilitated and enough time is allowed for burning the fuse, to prevent misconnection of ignition. Experiments show that the present design could basically solve the problem of misconnection of ignition.
(7) The rectangular cake fireworks is more stable, much smoother outside and it is much easier to manufacture the outer package enclosed with the frame from outside.
(8) The design of the rectangular cake fireworks base with holes enables to dissipate heat and the material costs could be saved with better environmental and economic effects. In addition, holes in the base could also promise the rectangular cake fireworks don't deform easily because of the expansibility of plastics.
(9) In case one of the firework barrels exploded, the other firework barrels would not be affected as they are made from plastic, however, it is likely that the entire firework will explode when any one firework barrel does if it is made of gypsum. In this regard, the design of the present invention is much safer.

[0025] The descriptions above are just preferred implement ways of the invention, it should be noted that the improvements and the embellishments within the scope of the tenets of the invention shall be within the protection range of the invention to the technical personnel in this field.

Claims

1. The integral plastic rectangular cake fireworks that comprise a rectangular cake fireworks body (7), **wherein:**

    - the rectangular cake fireworks body (7) comprises:

        - a plurality of firework barrels (2) in a matrix arrangement; and
        - a frame (1) which encloses outside several of said firework barrels (2);

    wherein each of the firework barrels (2) to an inner side of the rectangular cake fireworks body (7) that do not contact with the frame (1), is connected and fixed with a stiffening plate (3); and
    wherein the integral plastic rectangular cake fireworks comprises:

    - a fixing plate (8) under the firework barrels (2), preferably four fireworks barrels (2), situated in a central part of the rectangular cake fireworks body (7);
    - a fuse board (4) which comprises an "S" shape, situated on the bottom of the rectangular cake fireworks body (7), that is in turn connected to a bottom end of the firework barrels (2);

    wherein two ignition holes (5) are situated along an extending direction of the fuse board (4), on the bottom of each firework barrel (2); and
    wherein an ignition slot (6) is situated on the fuse board (4) between all two neighboring firework barrels (2), whose one end is connected to an ignition hole (5) of a firework barrel (2) and the other end of the ignition slot (6) is connected to an ignition hole (5) of the other firework barrel (2).

2. The integral plastic rectangular cake fireworks according to claim 1, **wherein** to front and rear sides of the fixing plate (8) is provided a connecting plate (9) whose an end is connected to the stiffening plate (3).

3. The integral plastic rectangular cake fireworks according to any of claims 1 or 2, **wherein** the frame (1), the firework barrels (2), the stiffening plate (3), the fuse board (4), the fixing plate (8) and the con-

necting plate (9) are manufactured by integrated molding.

4. The integral plastic rectangular cake fireworks according to claim 1, **wherein** the ignition slot (6) comprise a square groove (62) and two bar grooves (61) positioned to both sides of the square groove (62).

5. The integral plastic rectangular cake fireworks according to claim 4, **wherein** both the diameter of the ignition hole (5) and the width of the bar groove (61) are 2.8 mm.

6. The integral plastic rectangular cake fireworks, according to claim 5, **wherein** the connection part between the ignition hole (5) and the bar grooves (61) is filleted.

7. The integral plastic rectangular cake fireworks according to claim 1, **wherein** the rectangular cake fireworks body (7) is made of plastic material and, looking at it from a top view, the rectangular cake fireworks body (7) have a square or rectangular shape.

8. The integral plastic rectangular cake fireworks, according to any of the claims 4 to 6, **wherein** the ignition slot (6) comprises two transversal ribs (63) perpendicular to a longitudinal direction of the ignition slot (6), positioned between each bar grooves (61) and the square groove (62).

9. The integral plastic rectangular cake fireworks, according to claim 1, **wherein** the ignition slot (6) comprises two transversal ribs (63) perpendicular to a longitudinal direction of the ignition slot (6), which divide said slot (6) into three parts.

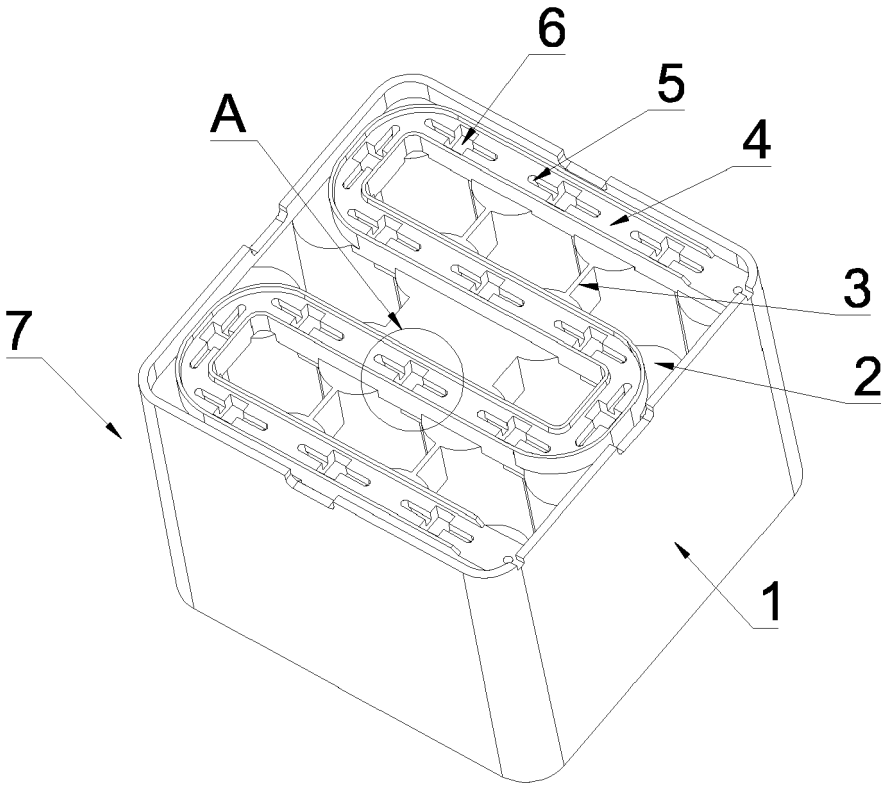

Fig. 1

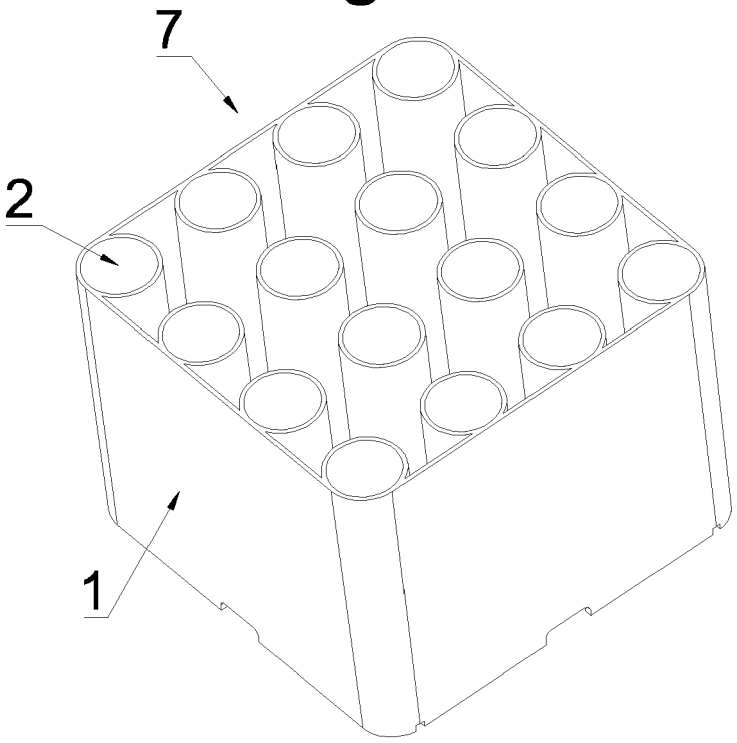

Fig. 2

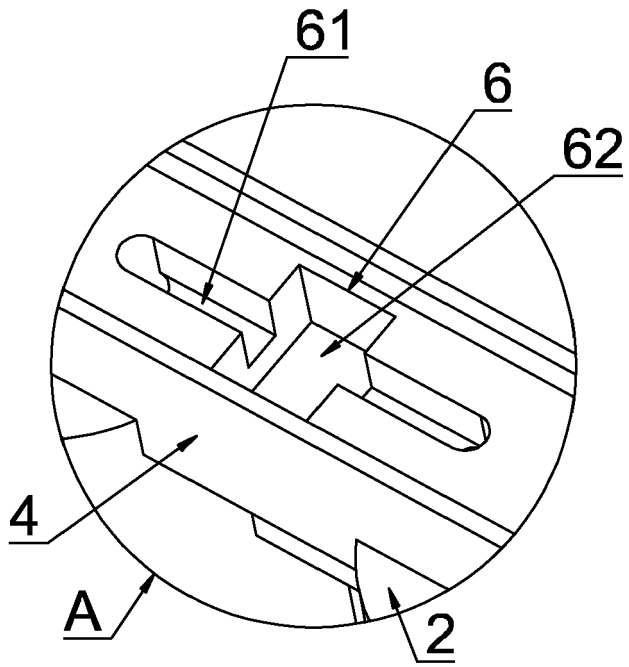

Fig. 3a

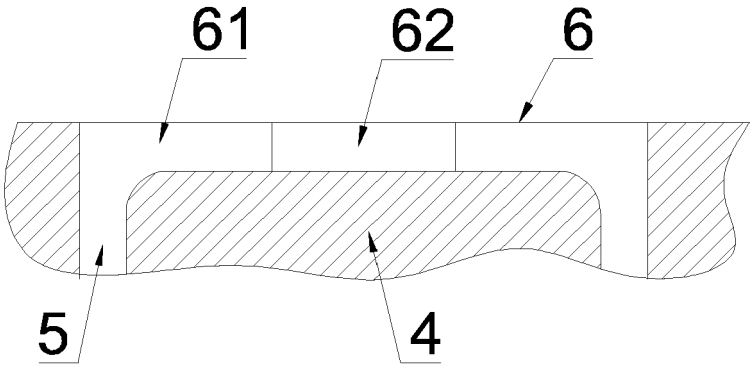

Fig. 4a

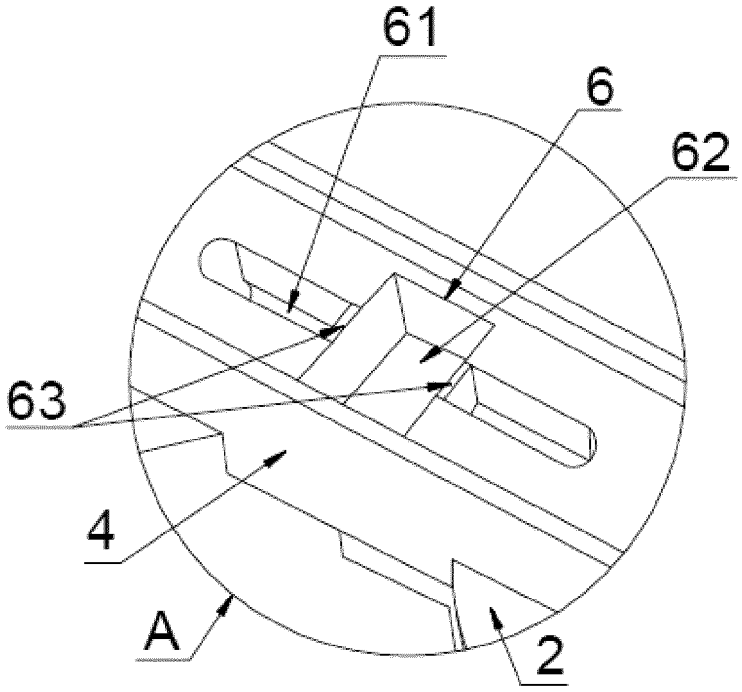

Fig. 3b

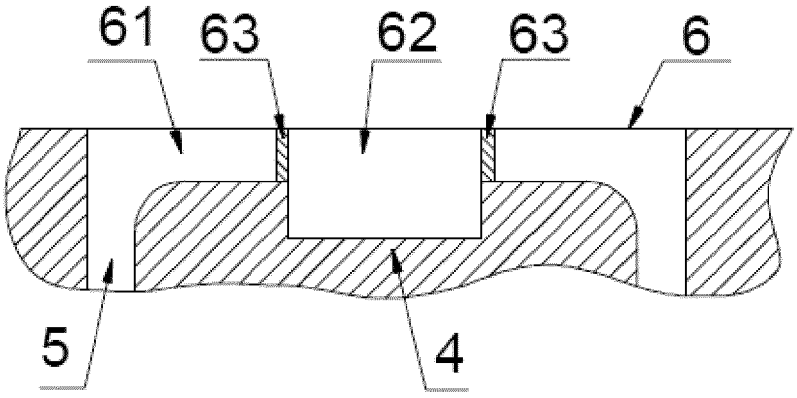

Fig. 4b

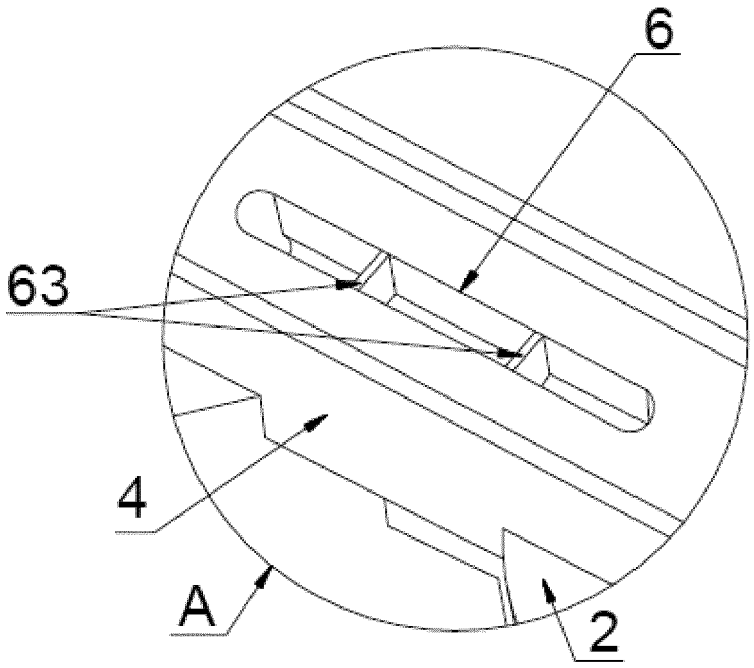

Fig. 3c

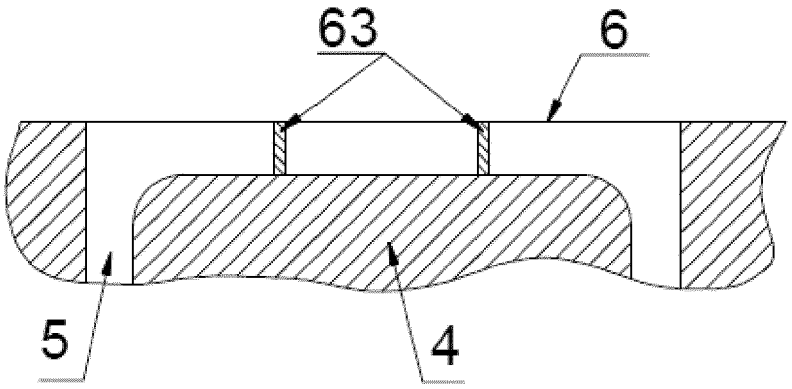

Fig. 4c

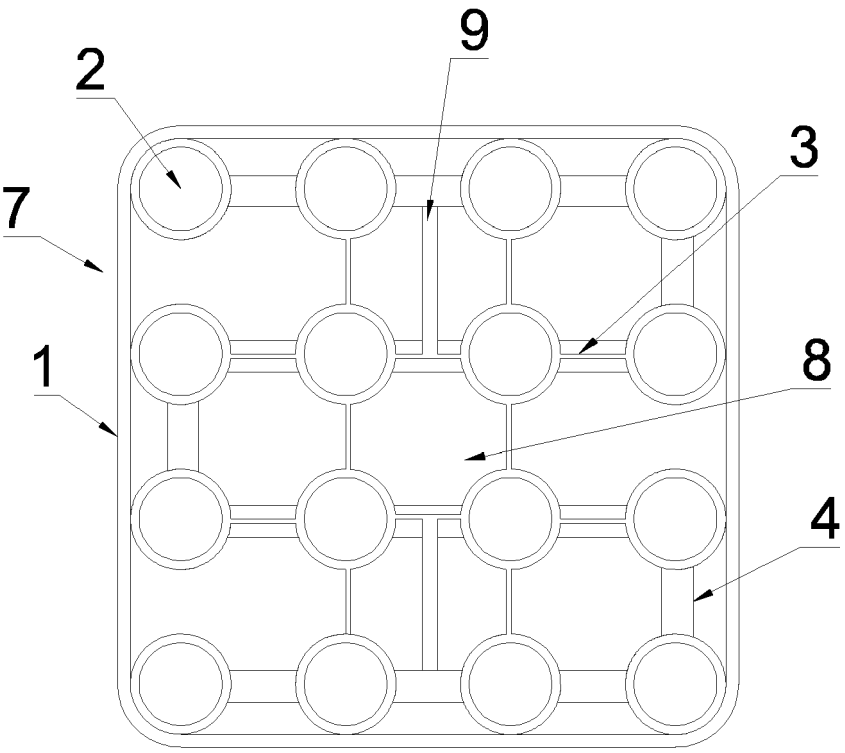

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 19 18 7043

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 2 781 877 A1 (LIUYANG YIHELONG FIREWORKS GROUP CO LTD [CN]) 24 September 2014 (2014-09-24) * paragraphs [0020] - [0022]; figures 4-6 * -----	1-9	INV. F42B4/24 F42B4/20
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A	CN 207 501 792 U (SHEN SI) 15 June 2018 (2018-06-15) * paragraphs [0028] - [0041]; figures 1-4 * -----	1-9	
			TECHNICAL FIELDS SEARCHED (IPC) F42B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	5 December 2019	Kasten, Klaus

CATEGORY OF CITED DOCUMENTS

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05-12-2019

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