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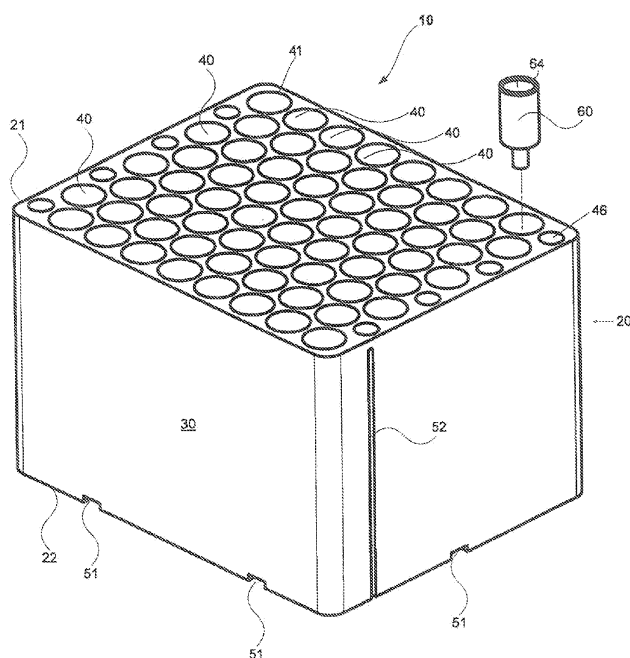
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(54) **A multiple firing firework device with insert assembly and a multiple shot device**

(57) A multiple firing firework device with insert assembly (10), comprising: a block (20), a plurality of the tubular apertures (40) being defined in the block (20) extends from top surface (21) to the surface corresponding to the top surface (21) i.e. bottom surface (22). The tubular apertures (40) have open top ends (41) on the top surface (21) and open bottom ends (42) on the bottom surface (22). The device also comprises a plurality of holders (60) for receiving pyrotechnic composition and each holder (60) is separately placed within a tubular

aperture (40) of the block. By using a holder (60), the pyrotechnic composition is injected into the holder (60) beforehand instead of being in direct contact with the tubular aperture (40). The block (20) can then be completely dissolved in water for environmentally friendly disposal. In addition, there is a bottom plate (70) covering the bottom surface (22) of the device to avoid exposure of the ignition fuse (81). Safety is enhanced and the international safety regulations are met. This invention also comprises a multiple shot device.

Figure 1



Description

Technical Field

[0001] The invention concerns a device for fireworks, especially a multiple firing device with insert assembly and a multiple shot device.

Background of the Invention

[0002] Conventionally, among all the multiple shot devices having a variety of colors and patterns, the device which is placed on the ground to launch the pyrotechnic composition is called a multiple firing device. A multiple firing device comprises a series of tubular apertures. The pyrotechnic composition is injected into each tubular aperture. Each tubular aperture is connected together by a high-speed fuse to make a long lasting display with one ignition.

[0003] Typically, a multiple shot device will resemble from the outside a simple cube or rectangular, circular, star or other covered shapes. For a traditional multiple shot device, a large number of cardboard tubes (the candles) form the tubular apertures. Tubular apertures are made by hand and are therefore susceptible to human error, which may lead to dangerous consequences when the fireworks are ignited. For example, if the tubes are not of equal size, more or less powder may be filled in. The tube may burst from too much pressure if there is too much powder. Some powder may not be burned and remain in the tube but may later re-ignite and the entire device may catch on fire. The stability of the device is not ensured in this case.

Summary of the Invention

[0004] In order to cope with the above mentioned or other technical problems, there a multiple firing device with insert assembly and a multiple shot device are provided. By using a separate holder, the pyrotechnic composition is injected into the holder beforehand instead of being in direct contact with the tubular aperture. The block can then be completely dissolved in the water for environmentally friendly disposal. In addition, there is a bottom plate covering the bottom surface of the device to avoid exposure of the ignition fuse. Safety is enhanced and the international safety regulations are met.

[0005] In a first preferred aspect, there is provided a multiple firing device with insert assembly, comprising: a block, having a plurality of tubular apertures which extends from top surface to the surface corresponding to the top surface i.e. bottom surface. The tubular apertures have open top ends on the top surface, open bottom ends on the bottom surface and a plurality of holders for receiving a pyrotechnic composition and being placed within the tubular aperture.

[0006] The device may further comprise a bottom plate for attaching to the bottom surface of the block after the

connection of an ignition fuse to the pyrotechnic composition of a holder, wherein the bottom plate prevents exposure of the ignition fuse at the bottom surface of the block.

[0007] Each holder has a fuse which projects out of the bottom and is connected to a main fuse for ignition. The main fuse is connected to the bottom plate and then pressed into connection with the holder fuses.

[0008] The block may be made from a paper material mixed with an adhesive, and the mixture is cooked to form a rigid solid block. The paper material also contains fire retardants. The block may be made by molding the hot paper mixture and then cooling.

[0009] The block has a longitudinal slit extending from bottom surface (almost) to the top surface defined on at least one of the sidewalls to receive a portion of the ignition fuse.

[0010] The block further comprises a cut-out portion defined at a bottom portion of the solid peripheral sidewall to enable the ignition fuse to pass through without affecting the stability of the device.

[0011] The tubular apertures are oriented perpendicular or at an angle relative to the bottom surface of the block.

[0012] The top surface of the bottom plate has a continuous path which corresponds with the open bottom ends of the tubular apertures. The path holds the ignition fuses extending from open bottom ends, which stem from the holders. The path also guides the main ignition fuse eventually to the exterior of the block through any of the cut-out portions defined in the sidewalls of the block. In other words there is a main fuse and each holder has its own separate fuse extending from the bottom of the aperture which in turn is connected to the main fuse. The separate fuses of the holders will be connected to the main fuse after insertion of the holders into the apertures. The main fuse will be placed into the groove (path) in the bottom plate and the bottom plate is then attached to the block. In this way the main fuse and the separate fuses are in touch, i.e. connected to each other.

[0013] The holder comprises: an upper section, which has a longer diameter and is placed near the top surface; a lower section, which has a shorter diameter and is placed near the bottom surface; and a narrowing conical portion, which joins the upper section and lower section.

[0014] In a second aspect, there is provided a multiple shot device, comprising: a multiple firing device with an insert assembly; a pyrotechnic composition contained in a holder; and an ignition fuse extending from pyrotechnic composition to the open bottom end. In other words, an arrangement of the block with a holder in each aperture; wherein each holder has a fuse extending from the bottom of the aperture and connected to the main fuse in the bottom plate, is provided.

[0015] The pyrotechnic composition comprises lifting a charge, a breaking charge and an effect charge and a cover covering the lifting charge, breaking charge and effect charge.

[0016] The present embodiments of the invention pertain to a multiple firing device with an insert assembly and a multiple shot device. By using a separate holder, the pyrotechnic composition is inserted into the holder beforehand instead of being in direct contact with the tubular aperture. The block can then be completely dissolved in the water for environmentally friendly disposal. In addition, there is a bottom plate covering the bottom surface of the device to avoid exposure of the ignition fuse. Safety is enhanced and the international safety regulations are met.

Brief Description of the Drawings

[0017] To ensure the purposes, features and advantages of the invention can be easily understood, an example of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a perspective view from above of a multiple firing device with an insert assembly in accordance with an embodiment of the present invention; Figure 2 is a top plan view of the device of Figure 1; Figure 3 is a top plan view of a bottom plate for attachment with a block of the device in accordance with an embodiment of the present invention; Figure 4 is a rear plan view of the device of Figure 1; Figure 5 is a front plan view of the device of Figure 1; Figure 6 is a right side plan view of the device of Figure 1; Figure 7 is a left side plan view of the device of Figure 1; Figure 8 is a perspective view from below of the device of Figure 1 as the bottom plate is being attached to a bottom surface of the block; Figure 9 is schematic perspective view of a holder shown in Figure 1; and Figure 10 is a side sectional view of the holder positioned in a tubular aperture of the device and connected to an ignition fuse.

Detailed Description of the Drawings

[0018] Although the embodiments in the description and the drawings can fully illustrate the invention, persons skilled in the art can make numerous variations and/or modifications without departing from the scope or spirit of the invention. Therefore, the invention is broadly described and not limited to the present embodiments.

[0019] Referring to Figures 1 and 2, a multiple firing device with an insert assembly 10 having a variety of colours and patterns is provided. It comprises: a block 20 having solid peripheral sidewalls 30, a plurality of tubular apertures 40 which each extend from top surface 21 to the surface corresponding to the top surface i.e. bottom surface 22, the tubular apertures 40 have open top ends 41 on the top surface and open bottom ends 42 on the bottom surface, a plurality of holders 60 for receiv-

ing a pyrotechnic composition and being placed within the tubular apertures 40. Referring to Figure 10, a pyrotechnic composition comprises of fireworks projectiles 80A and effect charge 80. The pyrotechnic composition can further comprise a lifting charge, a breaking charge and an effect charge and a cover 82 attached to the top opening 64 of the holder 60 covering the lifting charge, breaking charge and effect charge. The cover can be made from paper and any other suitable materials.

[0020] Referring to Figure 8, a multiple shot device 100 is provided. It comprises device 10, the pyrotechnic composition contained in a holder 60 and the ignition fuse 81 extending from pyrotechnic composition to the open bottom end 42.

[0021] A holder 60 is a completed unit and can be manufactured separately from the block 20 and placed within each tubular aperture 40. The tubular aperture 40 is used for protection and serves an auxiliary function to launch the fireworks of the holder 60. The tubular apertures 40 are separated from each other by the same material as the block 20 which is integral with the solid peripheral sidewall 30. Fixing holes 46 are provided in the margin of the block 20, extending from top surface 21 to bottom surface 22. Fixing holes 46 are generally smaller in diameter than the tubular apertures 40. The fixing holes 46 enable the position of the block 20 to be fixed relative to another object and ensure stability and accuracy during the launching of fireworks.

[0022] The tubular aperture 40 may have any cross section, for example, circular, square, and rectangular. The length, size and shape of the tubular aperture 40 are dependent on its application and the fireworks effects desired. A plurality of cut-out portions 51 is defined at the margin, i.e. the bottom of the sidewall of the block 20, to enable an ignition fuse 81 to pass through from an area beneath the tubular apertures 40 to the exterior of the block 20. This avoids affecting the stability of the device 10 because the device 10 does not have to rest on any part of the ignition fuse 81 or compromise its integrity.

[0023] Referring to Figures 5 and 7, the block 20 has longitudinal slits 52 extending from bottom surface 22 to top surface 21 defined on peripheral side walls 30, such as the exterior surface of a front surface and a left surface of the block 20, to receive a portion of the ignition fuse 81. This minimizes any loose ignition fuse 81 and enhances safety. The ignition fuse 81 coming from the bottom surface 22 of the block 20 can pass through the cut-out portions 51 and kept within the slits 52. The longitudinal slits 52 and cut-out portions 51 can be arranged on other surfaces of block 20.

[0024] The block 20 is made from a paper material mixed with an adhesive, and the mixture is cooked, molded and then cooled to form a rigid solid block. The paper material may be a composition of craft paper, flour glue and graphite powder and also include fire retardants. To make the paper material, the craft paper is mixed with the flour glue and graphite powder. The mixture is cooked, and then the cooked mixture is injected into a

mold to create the block 20. The advantages of this paper material are that everything can be completely dissolved, it is easy to dispose of after use, environmentally friendly and it is a natural material as it is chemical-free. The material for the block 20 also has the benefit of fire prevention.

[0025] Preferably, the holder 60 is made from plastic. The holder 60 may be manufactured using plastic injection molding techniques. However, other suitable materials may be used. Each of the tubular apertures 40 can receive a holder 60. The holder 60 is sized so that it has a close fit within the tubular aperture 40.

[0026] Turning to Figure 9, the holder 60 is a hollow piece and generally cylindrical in shape. The holder 60 generally has three sections: an upper section 61, a lower section 63 and a narrowing conical portion 62. The upper section 61 includes the top opening 64 of the holder 60. The diameter of the upper section is 25mm. The upper section 61 contains the pyrotechnic composition. The lower section 63 has a diameter of 11 mm and is joined to the upper section 61 via a narrowing conical portion 62 to gradually reduce the diameter from the upper section 61 to the narrower lower section 63 of the holder 60. The bottom opening 65 of the holder 60 is defined at the bottom surface of the lower section 63. The bottom opening 65 has a diameter of 6mm. The total height of the holder 60 is 50mm. The upper section 61 has a length of 34mm. The lower section 63 has a length of 13mm. The narrowing conical portion 62 has a length of 3mm. Within the holder 60, at the bottom of the narrowing conical portion 62, a rectangular slit is defined having the same length as the diameter of the bottom opening 65 and is about 1 mm in width. The slit enables the fuse only to pass through to ignite the fireworks projectiles 80A and effect charge 80. The holder 60 is placed at the bottom of tubular aperture 40 so that the bottom opening 65 of the holder 60 and the bottom surface 22 of the block 20 are at the same level. Therefore, the entire pressure is directed upwards rather than downwards to launch the fireworks from the device 10. Although specific lengths have been described, it is envisaged other lengths for the various sections are possible depending on specific applications.

[0027] The holder 60 is dropped into a tubular aperture 40 with the lower section 63 entering the tubular aperture 40 first. The fireworks projectiles 80A and effect charge 80 after ignition leaves the holder 60 via the cover 82 and leaves the upper section 61 and tubular aperture 40. It is envisaged that a machine or tool may be used to drop multiple holders 60 into multiple tubular apertures 40 at the same time. This enables faster completion of the device 10 rather than individually dropping a holder 60 into a tubular aperture 40 sequentially.

[0028] Using the holder 60 avoids generating a chemical reaction which causes some of the pyrotechnic composition to attach to the tubular aperture 40. If the pyrotechnic composition attaches to the tubular aperture 40, the device 10 cannot be dissolved and therefore it is not

environmentally friendly. By using a holder 60, the pyrotechnic composition is injected into the holder 60 beforehand instead of being in direct contact with the tubular aperture 40. The holder 60 does not launch from the block 20 together with the pyrotechnic composition. After the fireworks are launched from the holder 60 and away from the device 10, the holder 60 will remain at the bottom of the tubular aperture 40 in the block 20. After the fireworks are launched, the holder 60 can be removed from the device 10 and the device 10 can then be completely dissolved in the water for safe disposal. Preferably, the block 20 is rectangular in shape with rounded corners. This facilitates efficient storage and transport. However, the block 20 may be any shape or size and is dependent on its application and the fireworks effects desired, such as a simple cube or rectangular, circular, star or other covered shapes.

[0029] Turning to Figures 3 and 8, there is provided a bottom plate 70 that is attached to the bottom surface 22 of the block 20 after the ignition fuse 81 has been connected to the holders 60 so that the ignition fuse 81 is not exposed. The peripheral sidewall 30 of the block 20 has a raised edge 31, the bottom plate 70 has a shape which fits tightly with the bottom surface 22 of the block 20. Glue/adhesive is used to firmly attach the bottom plate 70 to the bottom surface 22 of the block 20. By attaching the bottom plate 70 to the raised edge 31, the bottom plate 70 covers the entire bottom surface 22 of the block 20 while the bottom plate 70 and the raised edge 31 are at the same level, providing a major planar bottom surface. Preferably, the bottom plate 70 is made of the same material as the block 20. However, any other suitable material may be used, such as plastic and paper.

[0030] Referring to Figure 3, the top surface of the bottom plate 70 has a continuous path 71 which corresponds with the open bottom ends 42 of the tubular apertures 40. The path 71 holds the ignition fuses 81 extending from open bottom ends 42. A path 71 is used for guiding the ignition fuse 81 for connection each holder 60 in each tubular aperture 40. In other words there is a main fuse 81 and each holder has its own separate fuse 81 extending from the bottom of the aperture 40 which in turn is connected to the main fuse 81. The separate fuses 81a of the holders 60 will be connected to the main fuse 81 after insertion of the holders into the apertures. The main fuse will be placed into the groove (path) 71 in the bottom plate 70 and the bottom plate is then attached to the block, thereby bringing the fuses into connection (touch) with each other at connection point 100. The path 71 also guides the ignition fuse 81 eventually to the exterior of the block 20 through any of the cut-out portions 51 defined in the sidewalls of the block 20. The bottom surface of the bottom plate 70 is a solid surface so that the ignition fuse 81 is not exposed which ensures safety. After the ignition fuse 81 is connected to the holder 60, the bottom plate 70 is attached to the bottom surface of the block 20. Referring to Figure 8, there is a raised edge 31 on the bottom surface of the block 20. Glue/adhesive

is used to firmly attach the raised edge 31 of the bottom plate 70 to the bottom surface 22 so that the bottom surface 22 of the block 20 and the raised edge 31 are at the same level. The block 20 in use substantially rests on the bottom plate 70 and the bottom plate 70 covers the ignition fuse 81 entirely and increases stability of the device 10 by providing a major planar bottom surface. By attaching the bottom plate 70 to cover ignition fuse 81 in the device 100, international safety regulations requiring that all connecting ignition fuses should be covered are complied with by covering the ignition fuse 81 using the bottom plate 70. The bottom plate 70 is also made using the same process as making the block 20 by using a mold for the bottom plate 70.

[0031] A 3 mm ignition fuse 81 can be used to ensure accurate timing and the high probability of ignition of the fireworks. This can minimize the possibility of failed ignition of the fireworks occurring midway through the ignition process and which may stop the ignition process in between the tubular apertures 40 of the device 10.

[0032] The block may be made from a paper material mixed with an adhesive and the mixture is cooked, formed and cooled to form a rigid solid block. The rigid solid block is machined (molded) to form the tubular apertures 40, the fixing holes 46, cut-out portions 51 and the longitudinal slits 52. Machining a rigid solid block maintains the integrity and strength of the device 10 as the end product is formed from a one-piece unitary construction. After the device 10 has been used, it may be recycled. The tubular aperture 40 may have any cross section, for example, circular, square, and rectangular. The length, size and shape of the tubular aperture 40 are dependent on its application and the fireworks effects desired.

[0033] The holders 60 can be mass manufactured with the pyrotechnic composition (lifting charge, breaking charge, effect charge and a cover 82) and effects provided in an automated production line. This enables convenience and safety as after manufacture, the holder 60 is a completed unit and can be transported separately from the block 20. Since holders 60 are produced separately of the device 10, the process of managing the pyrotechnic composition can be simplified and the spaces required in the block 20 can be minimized in the automatic production line. In the automatic production line, the division of operation can be more secure and the management of safety is easier. Also, any waste resulting from manufacturing the holder and the block can be minimized.

[0034] It will be appreciated by persons skilled in the art that numerous variations and/or modifications may be made to the invention as shown in the specific embodiments without departing from the scope or spirit of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects illustrative and not restrictive.

Claims

1. A multiple firing firework device with insert assembly (10), comprising:

a block (20), having a plurality of tubular apertures (40) which extend from top surface (21) to the surface corresponding to the top surface i.e. bottom surface (22), wherein the tubular apertures have open top ends (41) on the top surface and open bottom ends (42) on the bottom surface, and
a plurality of holders (60) for receiving a pyrotechnic composition and being placed within the tubular apertures.

2. The device according to claim 1, further comprising a bottom plate (70) for attaching to the bottom surface of the block after the connection of an ignition fuse (81) to the pyrotechnic composition of a holder, wherein the bottom plate prevents exposure of the ignition fuse at the bottom surface of the block.

3. The device according to claims 1 or 2, wherein the block may be made from a paper material mixed with an adhesive and the mixture is cooked to form a rigid solid block.

4. The device according to claim 2, wherein the block has a longitudinal slit (52) extending from bottom surface to the top surface defined on at least one of the sidewalls to receive a portion of the ignition fuse.

5. The device according to claim 2, further comprising a cut-out portion (51) defined at a bottom portion of the solid peripheral sidewall to enable the ignition fuse to pass through without affecting the stability of the device.

6. The device according to any one of the preceding claims, wherein the tubular apertures are oriented perpendicular or at an angle relative to the bottom surface of the block.

7. The device according to claim 5, wherein the top surface of the bottom plate has a continuous path which corresponds with the open bottom ends of the tubular apertures, wherein the path holds the ignition fuses extending from open bottom ends and the path also guides the ignition fuse eventually to the exterior of the block through any of the cut-out portions (51) defined in the sidewalls of the block.

8. The device according to any one of the preceding claims, the holder comprises:

an upper section (61), which has a longer diameter and is placed near the top surface;

a lower section (63), which has a shorter diameter and is placed near the bottom surface; and a narrowing conical portion (62), which joins the upper section and lower section.

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9. A multiple shot device (100), comprising:

a multiple firing firework device with insert assembly (10) according to the preceding claims 1-8;

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a pyrotechnic composition contained in a holder (60); and

an ignition fuse extending from pyrotechnic composition to the open bottom end.

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10. The multiple shot device according to claim 9, wherein the pyrotechnic composition comprises a lifting charge, a breaking charge and an effect charge and a cover (82) covering the lifting charge, breaking charge and effect charge.

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Figure 1

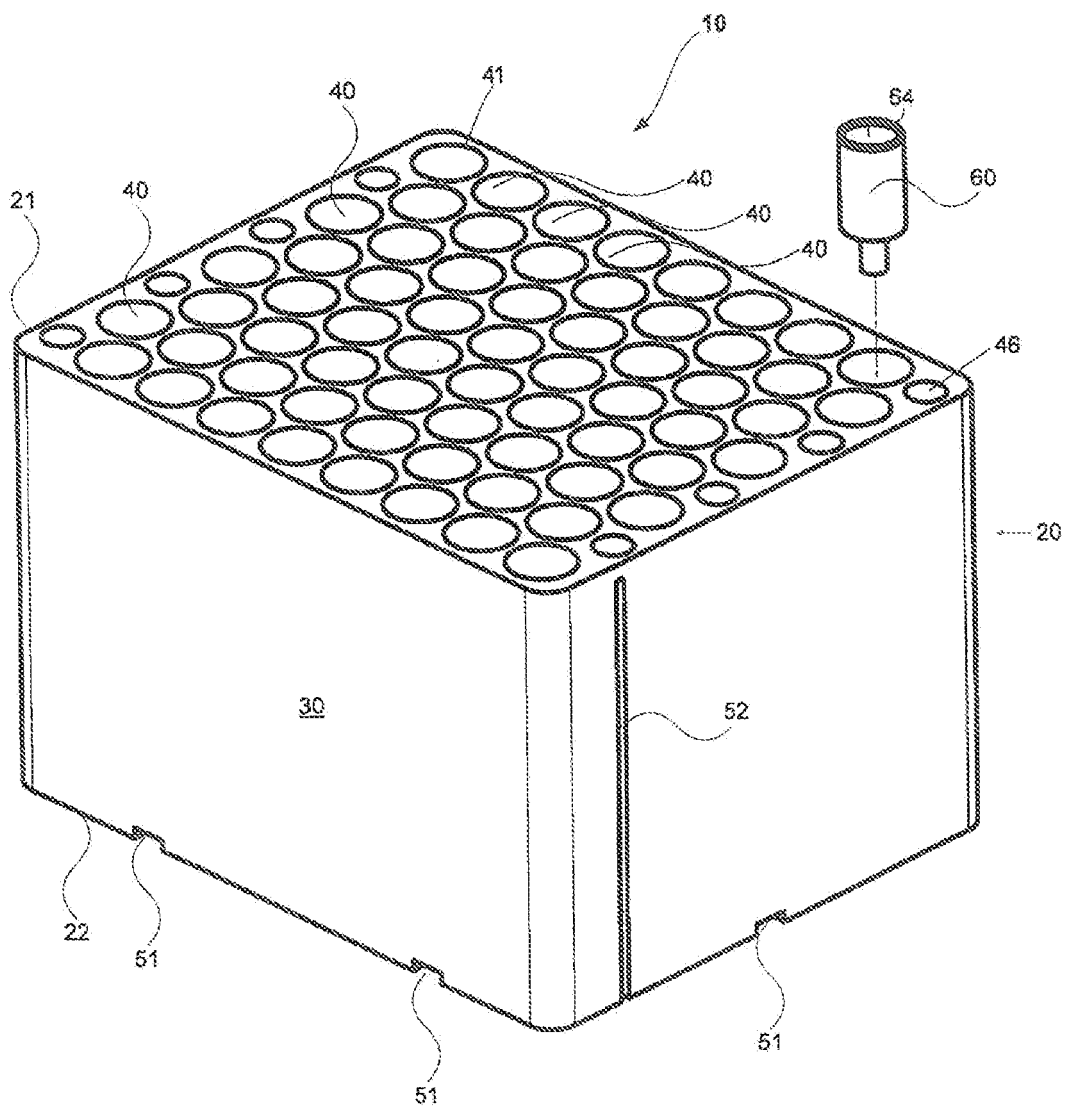


Figure 2

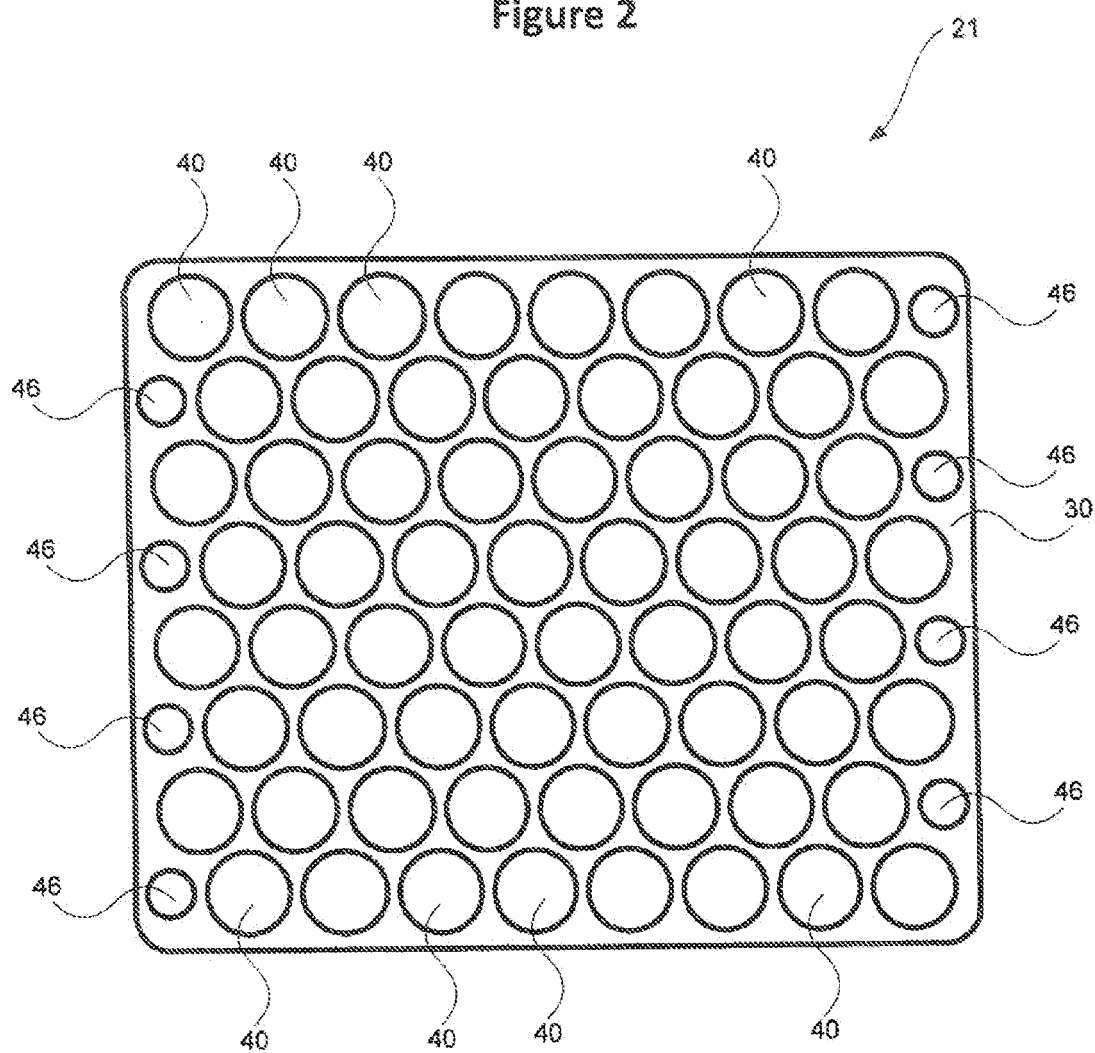


Figure 3

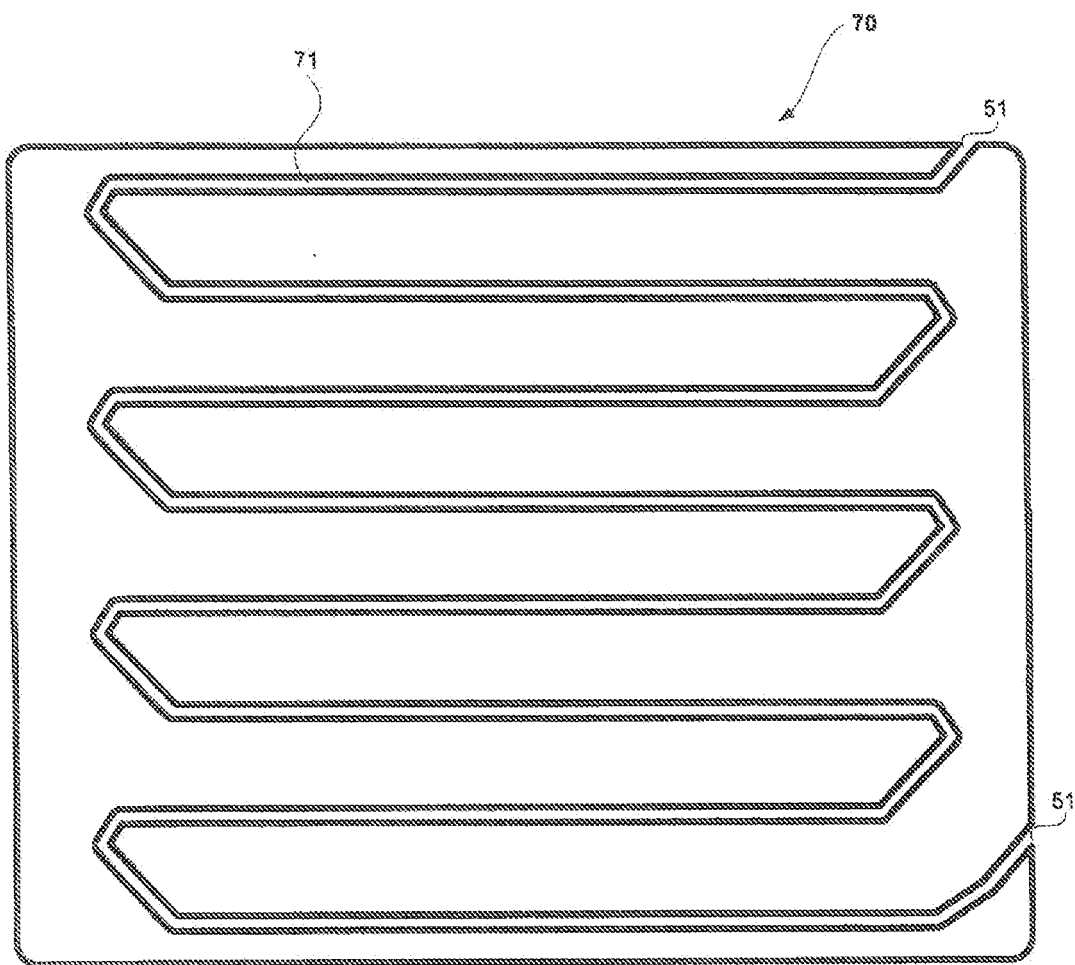


Figure 4

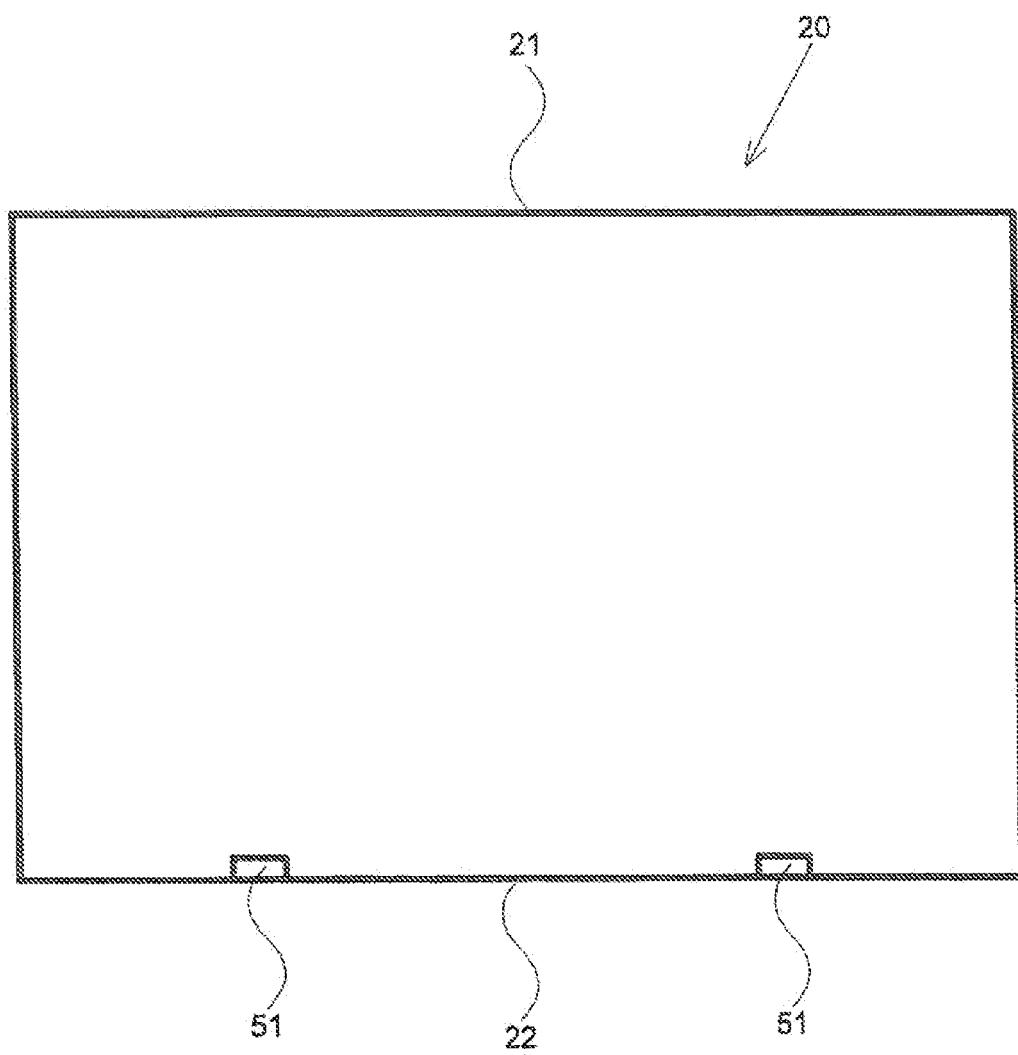


Figure 5

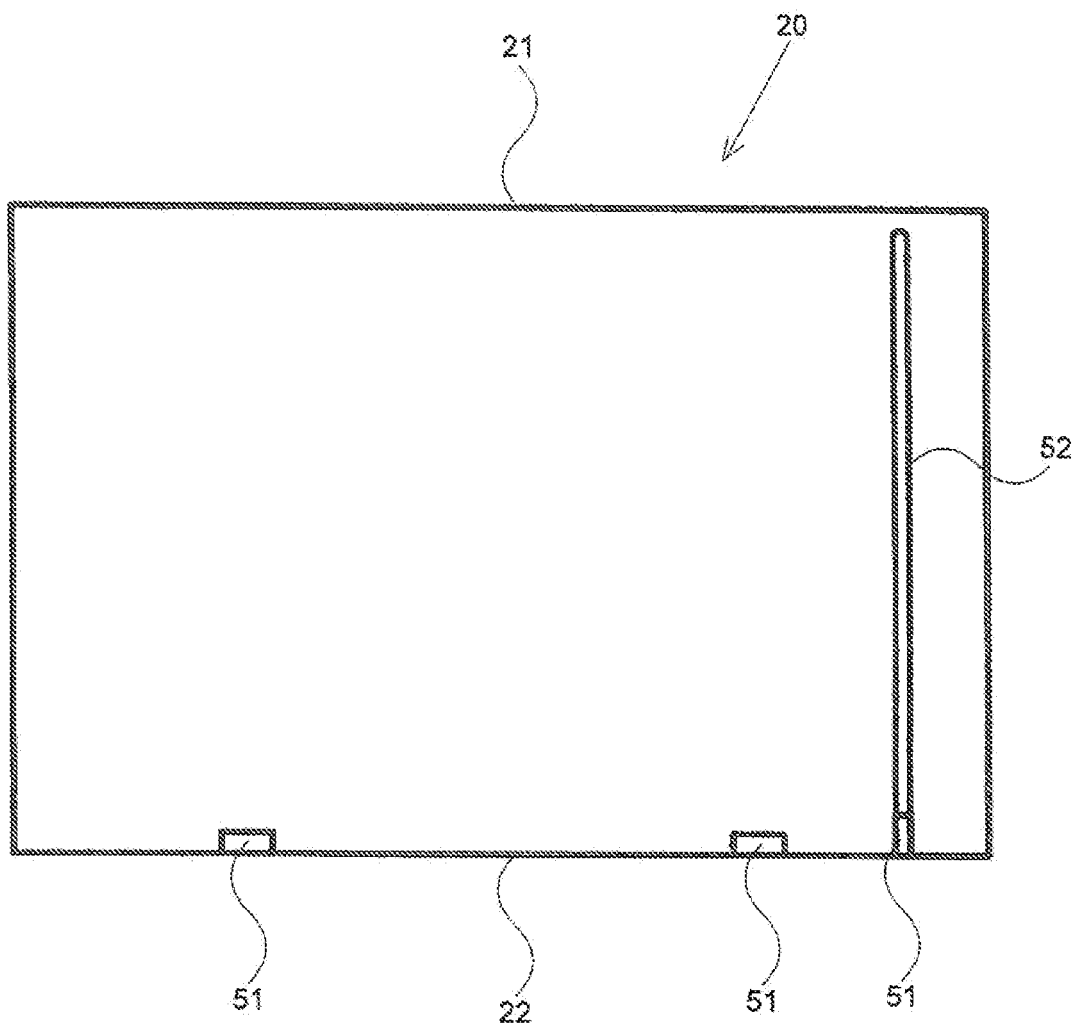


Figure 6

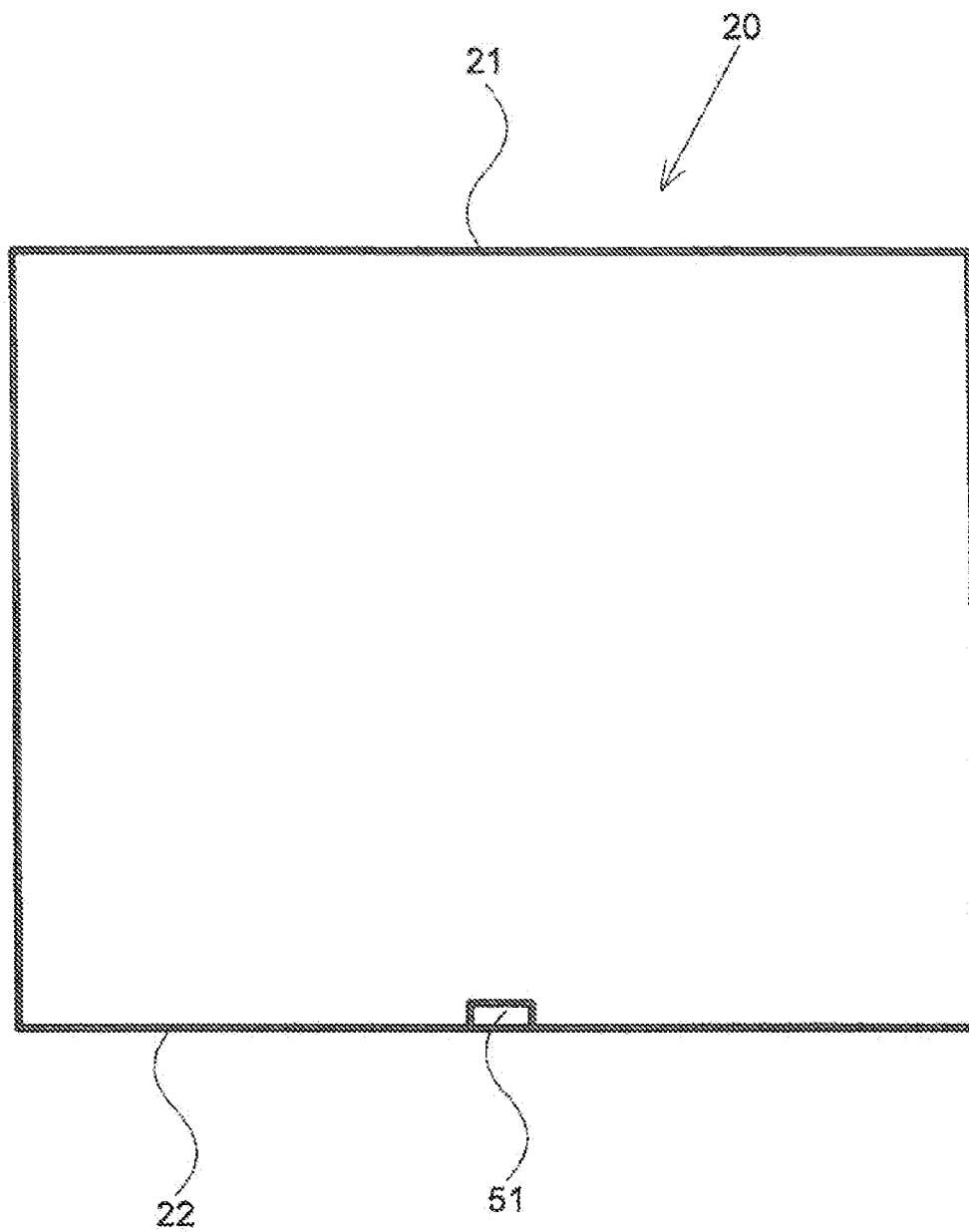


Figure 7

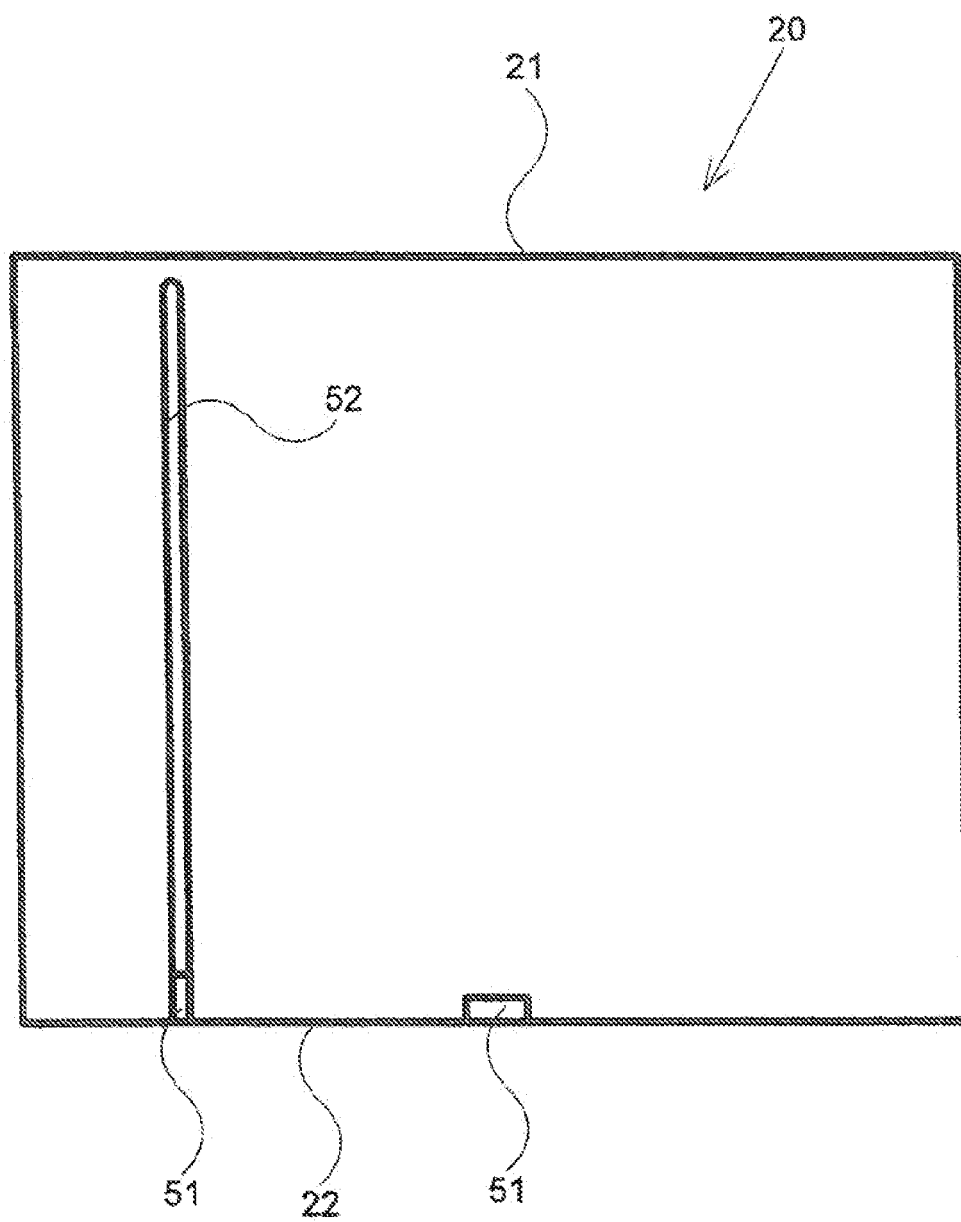


Figure 8

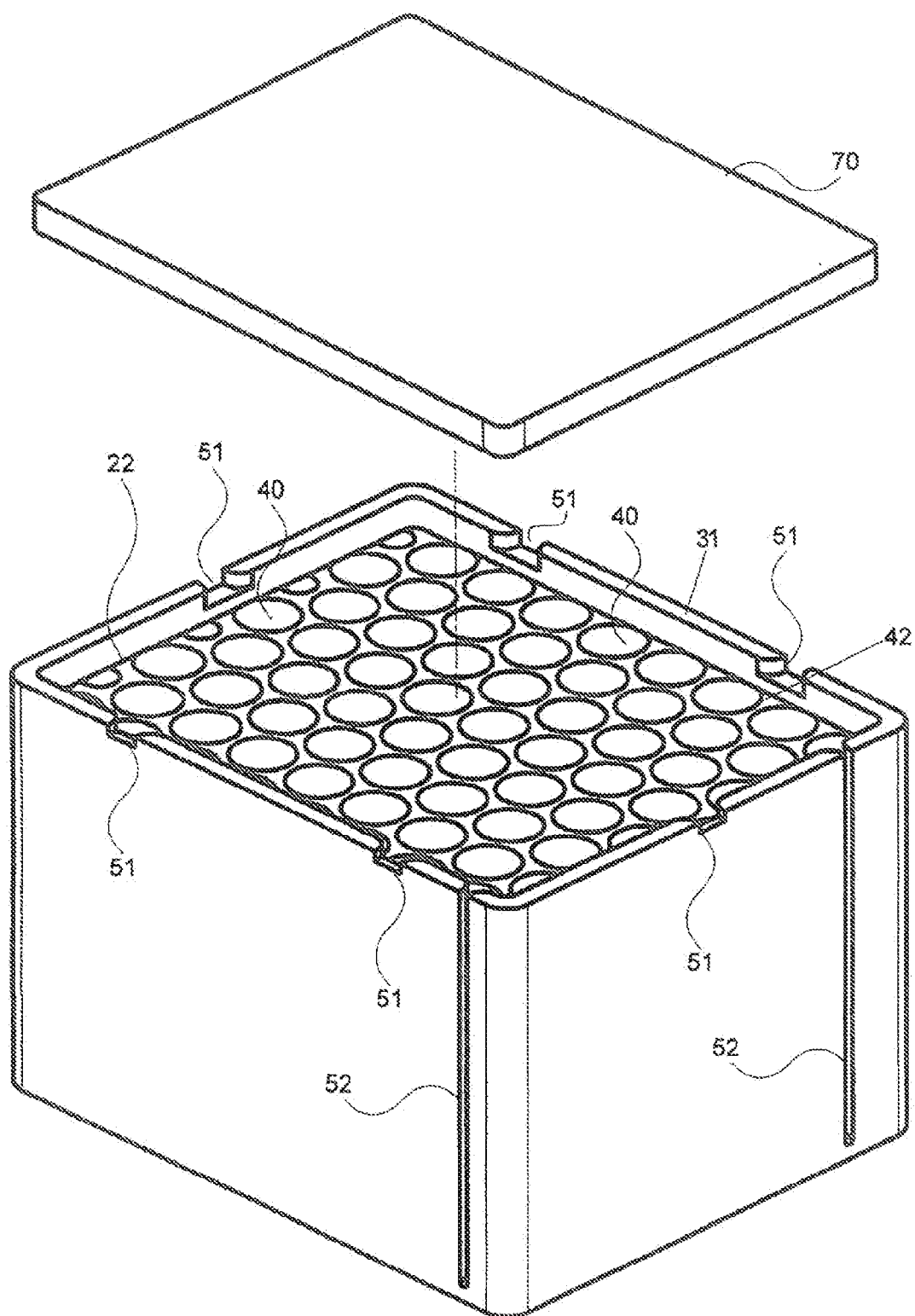


Figure 9

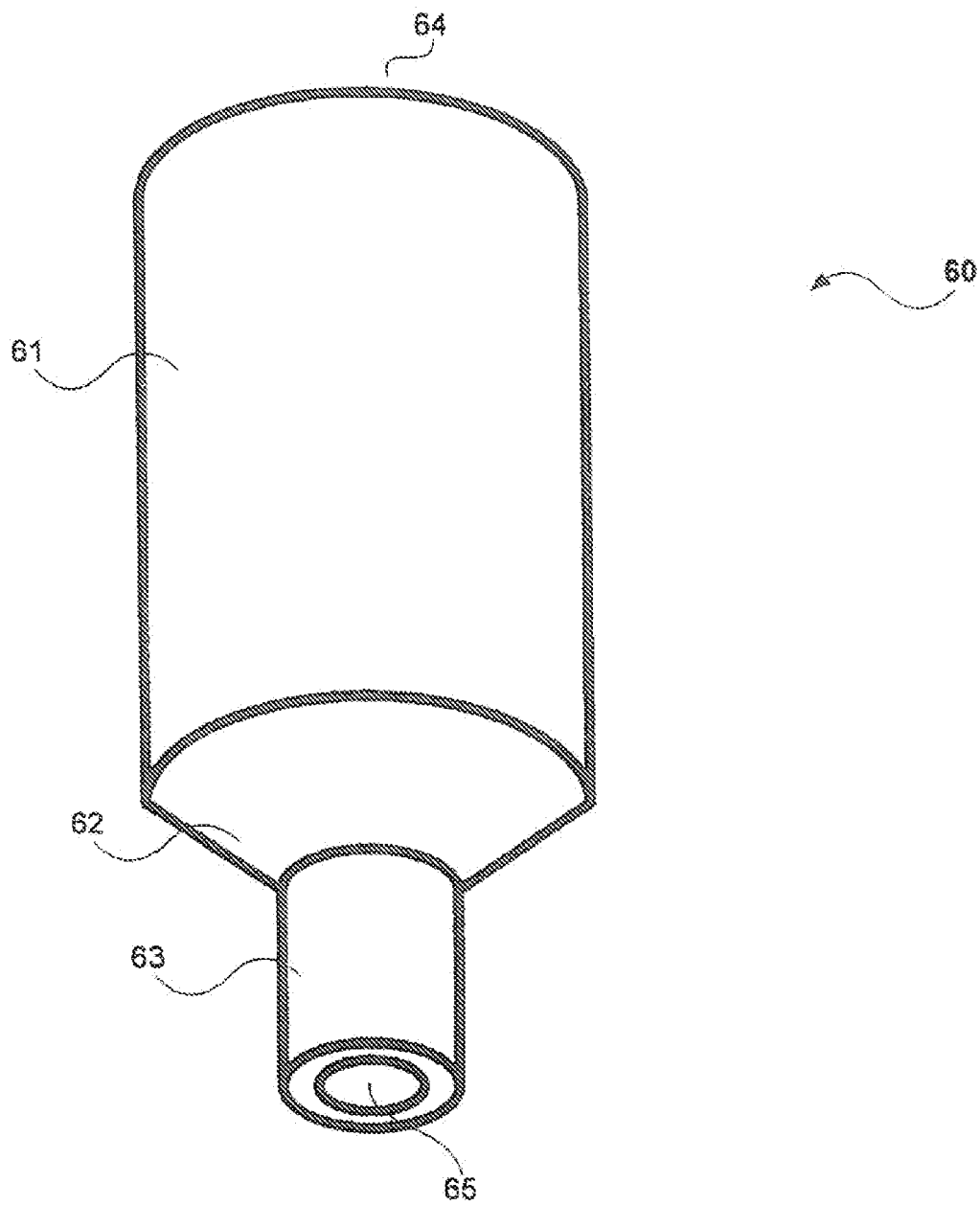


Figure 10

