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(54) **LIGHTWEIGHT EMERGENCY DISPOSAL SYSTEM FOR EXPLOSIVES/UNEXPLODED ORDNANCES**

(57) The present disclosure relates to an emergency disposal system for dangerous goods, and belongs to the technical field of protection equipment. A lightweight emergency disposal system for an explosive/unexploded ordnance includes a protection device, a grabbing device, a composite explosion-proof drum and a mobile device, wherein the protection device is used for protecting explosive ordnance disposal personnel; the grabbing device is used for grabbing the explosive/unexploded ordnance; the composite explosion-proof drum is used for temporarily storing the explosive/unexploded ordnance; and a mobile base is used for longer-distance movement of the emergency disposal system. The emergency disposal system integrates various functions such as explosive ordnance disposal protection, explosive grabbing and temporary explosive storage and can implement explosion safety protection for the whole process, thereby avoiding personal injuries caused by accidental explosion during disposal.

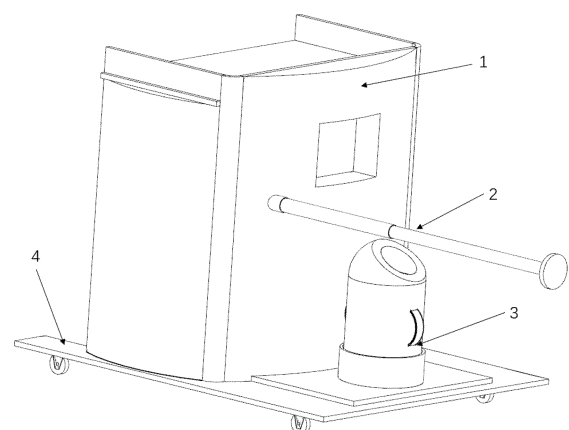


Fig. 1

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a lightweight emergency disposal system for an explosive/unexploded ordnance, and belongs to a protection equipment technology.

BACKGROUND

[0002] As the most lethal way in current terrorist attacks, an explosive terrorist attack always threatens the safety of people's lives and properties. At the same time, with the acceleration of the actual combat of an army, live ammunition exercise has been strengthened in the army. During exercise, some unexploded ordnances, such as grenades, small-caliber grenades and cluster bombs, often appear, and they need to be disposed in time, otherwise, the loss of personnel and equipment may be caused.

[0003] When an explosive/unexploded ordnance appears, there are mainly the following two disposal ways:

(1) professional explosive ordnance disposal personnel operate a robot or use an explosive ordnance disposal rod to transfer the explosive to an explosion-proof ball, an explosion-proof tank or an explosion-proof drum. Each of common explosion-proof balls and explosion-proof tanks is generally made of high-strength steel, has a weight of about 300-1500 kg and is generally fixed in a certain place so as to be unable to move on site in case of emergency; and when it is not suitable for the explosive ordnance disposal robot to pass through an on-site terrain, the explosive ordnance disposal personnel need to use the explosive ordnance disposal rod to clamp the explosive to be placed into the explosion-proof tank. During clamping, the explosive ordnance disposal personnel wear an explosive ordnance disposal suit to directly face the explosive in the whole process, and the explosive ordnance disposal suit is very heavy which is generally 30-35 kg, which will greatly affect the operational flexibility of the explosive ordnance disposal personnel. At the same time, it is highly possible that the head and neck of the explosive ordnance disposal personnel are injured even if he wears the explosive ordnance disposal suit due to direct facing to explosion shock waves. In addition, the explosive ordnance disposal suit and the explosive ordnance disposal robot are generally expensive, relatively complex in system structure and cumbersome in maintenance; and

(2) an explosion-proof carpet is adopted for disposal, which requires to be lifted by two persons to cover the explosive. When the explosive is covered, firstly, an inner fence is lifted for covering, then, an outer fence is lifted to cover the inner fence, and finally,

the explosion-proof carpet covers the fences. In such way, the explosive is not touched by adopting non-contact disposal; however, due to longer operation time, there are many ways to detonate the explosive, and it is possible that the disposal personnel are injured in a process of lifting explosion-proof equipment due to the detonation of the explosive during disposal.

[0004] At present, there have been mainly riot shields on the current market. These shields are generally made of transparent PC (Polycarbonate) materials, are mainly used for anti-throwing, sticks and other functions, and are unable to prevent explosion and fragmentation. At present, there have been explosion-proof shields with steel structures on the market, and such structures are larger in weight, inflexible in use and small in protection area.

[0005] How to achieve safety protection as well as efficient and flexible disposal throughout the process during emergency disposal for explosives is a problem in the fields of explosive ordnance disposal prevention and disposal.

SUMMARY

[0006] An objective of the present disclosure is to provide a lightweight emergency disposal system for an explosive/unexploded ordnance with specific to defects in the prior art.

[0007] A technical solution of the present disclosure is that: provided is a lightweight emergency disposal system for an explosive/unexploded ordnance, including a protection device, a grabbing device and a composite explosion-proof drum;

the protection device including an explosive ordnance disposal fence main body, a top protection plate, lateral buffer plates and a front buffer plate; the explosive ordnance disposal fence main body being provided with a front protection plate as well as left and right lateral protection plates; the top protection plate being disposed in a top opening of the explosive ordnance disposal fence main body to realize top protection; the lateral buffer plates be additionally disposed outside the left and right lateral protection plates to form lateral buffer layers; the front buffer plate being additionally disposed outside the front protection plate to form a front buffer layer; the explosive ordnance disposal fence main body being provided with a viewing window, and the viewing window being equipped with bullet-proof glass; the grabbing device being used for grabbing the explosive/unexploded ordnance and including a grabbing head, an electric push rod, a power source and a control unit; one end of the electric push rod being mounted on the protection device, and the other end thereof being connected to the grabbing head; the

power source being used for supplying power to the electric push rod and the grabbing head; and the control unit being used for controlling the electric push rod to stretch and contract and the grabbing head to grab/release the explosive/unexploded ordnance; and the composite explosion-proof drum being used for temporarily storing the explosive/unexploded ordnance released after being grabbed by the grabbing device.

[0008] On the basis of the above-mentioned solution, further, the lightweight emergency disposal system further includes a mobile device used for moving the protection device, the grabbing device and the composite explosion-proof drum as a whole.

[0009] On the basis of the above-mentioned solution, further, a bottom of an outer surface of the front protection plate of the explosive ordnance disposal fence main body is connected to a front end support plate; and the front end support plate is used for bearing the composite explosion-proof drum.

[0010] On the basis of the above-mentioned solution, further, a composite explosion-proof drum protection seat is disposed in a center of the front end support plate, and the composite explosion-proof drum protection seat is used for positioning the composite explosion-proof drum.

[0011] On the basis of the above-mentioned solution, further, a bottom of an inner surface of the explosive ordnance disposal fence main body is connected to a rear end support plate.

[0012] On the basis of the above-mentioned solution, further, the composite explosion-proof drum includes an explosion-proof drum main body, an explosion-proof drum top ring and an explosion-proof drum top cover;

the explosion-proof drum top ring is of a semi-spherical structure and is mounted in a top opening of the explosion-proof drum main body, and a top of the explosion-proof drum top ring is provided with an inclined opening for changing propagation directions of shock waves; and

the explosion-proof drum top cover is used for closing the inclined opening in the top of the explosion-proof drum top ring.

[0013] On the basis of the above-mentioned solution, further, the explosion-proof drum main body includes a bottom and an annular part; each of the bottom and the annular part is of a multilayer structure;

the bottom is sequentially provided with a bottom bullet-proof layer, a bottom explosion-proof liquid layer and a bottom support layer from outside to inside; wherein each of the bottom bullet-proof layer and the bottom explosion-proof liquid layer is a circular plate, and the bottom support layer is of an

annular structure with a central trapezoidal blind hole; and

the annular part is sequentially provided with a fiber bullet-proof layer, a foam buffer layer and a lateral explosion-proof liquid protection layer from outside to inside.

[0014] On the basis of the above-mentioned solution, further, the grabbing head is an electromagnetic chuck used for adsorbing the explosive/unexploded ordnance; and after the electromagnetic chuck adsorbs the explosive/unexploded ordnance, the electric push rod contracts to enable the electromagnetic chuck to be located above a bung hole of the composite explosion-proof drum, then, the control unit controls the electromagnetic chuck to be powered off, and at the moment, the explosive/unexploded ordnance will be placed into the composite explosion-proof drum.

[0015] On the basis of the above-mentioned solution, further, the grabbing head is a clamping jaw hook connected to the electric push rod by the electromagnetic chuck, and the control unit controls the connection or disconnection between the electromagnetic chuck and the electric push rod by controlling the power on or off of the electromagnetic chuck; and after the explosive/unexploded ordnance is hooked by the clamping jaw hook, the electric push rod contracts to enable the clamping jaw hook to be located above the bung hole of the composite explosion-proof drum, then, the control unit controls the electromagnetic chuck to be powered off, and at the moment, the clamping jaw hook and the explosive/unexploded ordnance will be placed into the composite explosion-proof drum at the same time.

[0016] On the basis of the above-mentioned solution, further, the electric push rod is mounted in the protection device by a universal bearing, and the universal bearing is used for adjusting a direction of the electric push rod.

[0017] On the basis of the above-mentioned solution, further, a connection position between the front protection plate and each of the left and right lateral protection plates of the explosive ordnance disposal fence main body is foldable.

[0018] On the basis of the above-mentioned solution, further, the explosive ordnance disposal fence main body is laminated in a segmented way, that is, during pressing formation, the explosive ordnance disposal fence main body is divided into three segments which are respectively used as the front protection plate as well as the left and right lateral protection plates, a spacing reserved between the front protection plate and each of the left and right lateral protection plates is used as a welt seam, during pressing, the front protection plate as well as the left and right lateral protection plates are respectively pressed, and a folding position is not pressed.

[0019] Beneficial effects:

(1) the emergency disposal system integrates various functions such as explosive ordnance disposal

protection, explosive grabbing and temporary explosive storage and can implement explosion safety protection for the whole process, thereby avoiding personal injuries caused by accidental explosion during disposal;

(2) the emergency disposal system adopts a lightweight composite structure and can protect an explosive equivalent to about 200 g of TNT; inconvenience in actions of explosive ordnance disposal personnel due to a heavy explosive ordnance disposal suit is avoided, and the personnel can wear a simple explosive ordnance disposal search suit or a conventional protection suit to perform disposal; and

(3) a main laminated plate is pressed by adopting a segmented lamination technology, and this pressing method not only has good bullet-proof performance, but also has a good protection effect on a folding position, and at the same time, the main laminated plate can also be folded.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

Fig. 1 is a schematic composition diagram of a lightweight emergency disposal system for an explosive/unexploded ordnance in the present disclosure; Fig. 2 is a schematic structural diagram of a protection device;

Fig. 3 and Fig. 4 are schematic structural diagrams of an explosive ordnance disposal fence main body; Fig. 5 is a schematic composition diagram of a grabbing device;

Fig. 6 is a schematic composition diagram of a composite explosion-proof drum;

Fig. 7 is a schematic structural diagram of a composite explosion-proof drum body;

Fig. 8 is a schematic structural diagram of a composite explosion-proof drum top cover; and

Fig. 9 is a schematic diagram of segmented pressing.

[0021] In which: 1-protection device, 2-grabbing device, 3-composite explosion-proof drum, and 4-mobile base;

1.1-explosive ordnance disposal fence main body (1.1), 1.2-top protection plate, 1.3-lateral buffer plate, 1.4-universal bearing seat, 1.5-front buffer plate, and 1.6-viewing window;

1.1.1-main laminated plate, 1.1.2-front end right-angle hinge, 1.1.3-front end support plate, 1.1.4-composite explosion-proof drum protection seat, 1.1.5-folding handle, 1.1.6-rear end right-angle hinge, and 1.1.7-rear end support plate;

2.1-grabbing head, 2.2-electric push rod, 2.3-universal bearing, 2.4-power source, and 2.5-control unit; 3.1-composite explosion-proof drum body, 3.2-com-

posite explosion-proof drum lifting handle, 3.3-composite explosion-proof drum top ring; and 3.2-composite explosion-proof drum top cover;

3.1.1-bottom bullet-proof layer, 3.1.2-bottom explosion-proof liquid layer, 3.1.3-bottom support layer, 3.1.4-lateral explosion-proof liquid protection layer, 3.1.5-foam buffer layer, and 3.1.6-fiber bullet-proof layer;

3.4.1-magnetic stripe, and 3.4.2-top cover main body;

A-front protection plate, B-folding position, C-pressing machine, and D-lateral protection plate.

DETAILED DESCRIPTION

[0022] The present disclosure will be further described in detail below with reference to the accompanying drawings and embodiments.

20 Embodiment 1:

[0023] The present embodiment provides a lightweight emergency disposal system for an explosive/unexploded ordnance, which can achieve safety protection as well as efficient and flexible disposal throughout the process during emergency disposal for explosives.

[0024] As shown in Fig. 1, the emergency disposal system includes a protection device 1, a grabbing device 2, a composite explosion-proof drum 3 and a mobile device 4.

[0025] The protection device 1 is used for protecting operating personnel. As shown in Fig. 2, the protection device 1 includes an explosive ordnance disposal fence main body 1.1, a top protection plate 1.2, lateral buffer plates 1.3 and a front buffer plate 1.5.

[0026] The explosive ordnance disposal fence main body 1.1 is provided with a front protection plate as well as left and right lateral protection plates; and the top protection plate 1.2 is disposed in a top opening of the explosive ordnance disposal fence main body 1.1 to realize top protection; and the top protection plate 1.2 is a bullet-proof laminated plate and is a PE plate, aramid plate or PE and aramid mixed protection plate with a thickness of 6 mm to 10 mm. The top protection plate 1.2 is inserted into the explosive ordnance disposal fence main body 1.1 by a slot to play a role in enhancing protection, thereby avoiding more protection weakness on a top.

[0027] The lateral buffer plates 1.3 are additionally disposed outside the left and right lateral protection plates to form lateral buffer layers; and the front buffer plate is additionally disposed outside the front protection plate to form a front buffer layer. The lateral buffer plates 1.3 and the front buffer plate are made of a flame-retardant and low-density foam material of which the density is 20 kg/m³ to 100 kg/m³, outer surfaces thereof are waterproof and flame-retardant cloth, the lateral buffer plates 1.3 are pasted to the explosive ordnance disposal fence main

body 1.1 by using a hook-and-loop fastener, and the lateral buffer plates 1.3 and the front buffer plate adopt arc-shaped surfaces by which waveforms of shock waves can be changed, and actions of the shock waves to the inside of a structure can be reduced.

[0028] A through window is formed in the front buffer plate 1.5 and the front protection plate to form a viewing window 1.6, and the viewing window 1.6 is equipped with bullet-proof glass or a transparent PC material with a thickness of 20 mm to 30 mm. A position of the explosive can be determined by the viewing window, and people cannot be injured by fragments caused by explosion.

[0029] At the same time, the front buffer plate 1.5 is provided with a universal bearing seat 1.4 for mounting the grabbing device 2. An inner surface of the explosive ordnance disposal fence main body 1.1 is provided with a handle. The protection device 1 may be placed on the mobile device 4 to move for a longer distance; and when close to the explosive, the protection device 1 may be moved for a short distance by operating personnel by virtue of the rear handle.

[0030] As shown in Fig. 5, the grabbing device 2 includes a grabbing head 2.1, an electric push rod (i.e. electric telescopic rod) 2.2, a power source 2.4 and a control unit 2.5.

[0031] There are two kinds of grabbing heads 2.1. One of them is an electromagnetic chuck having an electromagnetic attraction greater than or equal to 1500 g and mainly used for an explosive with a steel shell, such as a grenade and a small grenade; the explosive is adsorbed by the electromagnetic chuck, and then, the control unit controls the electric push rod 2.2 to contract to a position near the composite explosion-proof drum 3, so that the electromagnetic chuck is located above a bung hole of the composite explosion-proof drum 3; and then, the control unit 2.5 controls the electromagnetic chuck to be powered off, then, an adsorption force of the electromagnetic chuck is eliminated, and at the moment, the explosive will be placed in the composite explosion-proof drum 3. The other one is a clamping jaw hook used for an explosive with an external package, such as an explosive placed in a schoolbag, and the explosive can be placed into the composite explosion-proof drum 3 after being hooked by the clamping jaw hook, wherein the clamping jaw hook is also connected to the electric push rod 2.2 by the electromagnetic chuck; and after the explosive is hooked by the clamping jaw hook, the electric push rod 2.2 contracts to enable the clamping jaw hook to be located above the bung hole of the composite explosion-proof drum 3, then, the control unit 2.5 controls the electromagnetic chuck to be powered off, then, an adsorption force of the electromagnetic chuck is eliminated, and at the moment, the clamping jaw hook and the explosive will be placed into the composite explosion-proof drum 3 at the same time. At the same time, the electromagnetic chuck is capable of adsorbing a composite explosion-proof drum top cover 3.4, so that the composite explosion-proof drum top cover 3.4 covers the composite ex-

plosion-proof drum 3 or is removed from the composite explosion-proof drum 3.

[0032] A telescopic distance of the electric push rod 2.2 should be greater than or equal to 1.5 m, an overall bearing capacity thereof should be greater than or equal to 2 kg, and an overall material thereof is an aluminum alloy material; and

the electric push rod 2.2 is mounted on the universal bearing seat 1.4 on the protection device 1 by a universal bearing 2.3 (wherein the universal bearing 2.3 is mounted on the universal bearing seat 1.4 by using a bolt), and thus, the grabbing device 2 is mounted on the protection device 1; and the universal bearing 2.3 is used for adjusting a direction of the electric push rod 2.2.

[0033] The power source 2.4 is a lithium battery power source, is used for supplying power to the electric push rod 2.2 and the electromagnetic chuck, and is capable of continuously working for 30 min or longer.

[0034] The control unit 2.5 is used for controlling the electric push rod 2.2 to stretch and contract and the electromagnetic chuck to contract or release.

[0035] The composite explosion-proof drum 3 is used for temporarily storing the explosive. As shown in Fig. 6, the composite explosion-proof drum 3 includes an explosion-proof drum main body 3.1, explosion-proof drum lifting handles 3.2, an explosion-proof drum top ring 3.3 and an explosion-proof drum top cover 3.4.

[0036] The explosion-proof drum main body 3.1 is of a drum-shaped structure with a top opening; and the explosion-proof drum lifting handles 3.2 are mounted on two opposite sides of an outer circumference of the explosion-proof drum main body 3.1 to facilitate lifting the explosion-proof drum, and at the same time, the explosion-proof drum main body 3.1 may cooperate with a common explosive ordnance disposal rod to transfer the composite explosion-proof drum 3 to a safety position.

[0037] The explosion-proof drum top ring 3.3 is of a semi-spherical structure and mainly plays a role in changing propagation directions of shock waves to a direction where a human body is not injured by the shock waves; and at the same time, energy from the shock waves can be absorbed, so that injuries are reduced. A main material of the explosion-proof drum top ring 3.3 is flame-retardant foam; and a top of the explosion-proof drum top ring 3.3 is provided with an inclined opening forming an angle of 15-45° with a horizontal direction to guide the shock waves to the other side where the human body is not injured by the shock waves.

[0038] The explosion-proof drum top ring 3.3 is mounted in the top opening of the explosion-proof drum main body 3.1 in a way that: a die is used to perform die sinking on the explosion-proof drum top ring 3.3 according to a design size, the explosion-proof drum top ring 3.3 and the explosion-proof drum main body 3.1 are cemented by using epoxy resin, and 1-2 polyurea is sprayed for shaping; then, inner and outer surfaces are wrapped with 1-2 layers of silica glass fiber cloth for flame retardance; a surface of the silica glass fiber cloth is sprayed with an

anti-corrosion paint for preventing strong acid and alkali corrosion; and finally, polyurea is sprayed on the surface.

[0039] A rubber magnetic stripe is pasted to the upside of the inclined opening of the explosion-proof drum top ring 3.3 to facilitate pasting the explosion-proof drum top cover 3.4. The explosion-proof drum top cover 3.4 is supported by foam and mainly plays roles in absorbing part of energy from the shock waves, reducing psychological harm to personnel at the same time, and avoiding the situation that personnel feel feared when looking straight at the explosive; and the explosion-proof drum top cover 3.4 may be adsorbed by the electromagnetic chuck.

[0040] As shown in Fig. 8, the explosion-proof drum top cover 3.4 includes a top cover main body 3.4.2 and a columnar convex part, wherein the columnar convex part is used to cooperate with the inclined opening of the explosion-proof drum top ring 3.3 to close the inclined opening (thereby avoiding other personnel from looking straight at the explosive), at the moment, the top cover main body 3.4.2 is fitted to a surface of the inclined opening of the explosion-proof drum top ring 3.3, and two fitting surfaces are respectively provided with rubber magnetic stripes to guarantee the reliable connection between the explosion-proof drum top cover 3.4 and the explosion-proof drum top ring 3.3. At the same time, each of an upper surface and a ring part of the top cover main body 3.4.2 is pasted with one rubber magnetic stripe (the rubber magnetic stripe on the upper surface of the top cover main body 3.4.2 is a top magnetic stripe 3.4.1 shown in Fig. 8); by adopting the rubber magnetic stripe, a grabbing tool is favorably cooperated to open or close the explosion-proof drum; and at the same time, the rubber magnetic stripe is of a soft structure, thereby causing less damage to the human body and surroundings thereof after explosion.

[0041] The mobile base 4 is used for longer-distance movement of the emergency disposal system. When longer-distance movement is required, the composite explosion-proof drum 3 and the protection device 1 provided with the grabbing device 2 are placed on the mobile base 4; the mobile base 4 is made of a lightweight plate such as a carbon fiber plate, a glass fiber plate, a wood plate and a PC plate; and the mobile base 4 is provided with castors or tracked wheels, thereby facilitating movement.

Embodiment 2:

[0042] The explosive ordnance disposal fence main body 1.1 will be further described in detail on the basis of the above-mentioned embodiment 1.

[0043] As shown in Fig. 3 and Fig. 4, the explosive ordnance disposal fence main body 1.1 includes a main laminated plate 1.1.1, a front end support plate 1.1.3, a composite explosion-proof drum protection seat 1.1.4 and a rear end support plate 1.1.7.

[0044] The main laminated plate 1.1.1 is provided with a front protection plate as well as left and right lateral

protection plates, and a connection position between the front protection plate and each of the left and right lateral protection plates is foldable, thereby facilitating the storage of an overall structure.

[0045] A bottom of an outer surface of the front protection plate of the main laminated plate 1.1.1 is connected to the front end support plate 1.1.3 by two front end right-angle hinges 1.1.2, and a bottom of an inner surface is connected to the rear end support plate 1.1.7 by two rear end right-angle hinges 1.1.6; the right-angle hinges are adopted for connection, and the hinges are opened during use; and during storage, the hinges may be closed to play a role in folding the front end support plate 1.1.3 and the rear end support plate 1.1.7.

[0046] The front end support plate 1.1.3 is a non-metal plate with low density and high rigidity, such as one or a mixture of a glass fiber plate, a carbon fiber plate, a PE plate and a PC plate, mainly plays a role in bearing the composite explosion-proof drum 3, and is required to have connection reliability and no great deformation after being connected to the main laminated plate 1.1.1 by the hinges. At the same time, the non-metal plate is adopted, so that the weight is reduced, and secondary injuries are reduced.

[0047] A composite explosion-proof drum protection seat 1.1.4 is disposed in a center of the front end support plate 1.1.3, the composite explosion-proof drum protection seat 1.1.4 is used for positioning the composite explosion-proof drum 3, a height of the composite explosion-proof drum protection seat 1.1.4 is 1/4 to 1/3 of a height of a drum body of the composite explosion-proof drum 3, the composite explosion-proof drum protection seat 1.1.4 may be shaped after being filled with an aramid or PE material to effectively reduce the risk that fragments fly out of a bottom of a temporary storage device, and the composite explosion-proof drum protection seat 1.1.4 is pasted to the front end support plate 1.1.3 by glue.

[0048] The rear end support plate 1.1.7 adopts a non-metal plate with low density; during use, one of explosive ordnance disposal personnel firstly lifts the explosive ordnance disposal fence main body 1.1, at the moment, the rear end support plate 1.1.7 is in a closed state to be prevented from interfering with the advancing of the explosive ordnance disposal personnel; and after reaching a position near the explosive, the explosive ordnance disposal personnel put down the rear end support plate 1.1.7 and step on the rear end support plate 1.1.7 to avoid the overall structure from being blown up by the shock waves after explosion, thereby avoiding injuries of personnel at the rear.

[0049] The handle on the inner surface of the explosive ordnance disposal fence main body 1.1 adopts a folding handle 1.1.5 which may bear overall weight; when not used, the handle may be folded to be stored, so that excessive space occupation is avoided; and when used, the handle can be used for lifting the overall structure.

[0050] The top protection plate 1.2 is inserted into the main laminated plate 1.1.1 by a slot, so that the situation

that an upper-layer plate of the main laminated plate 1.1.1 falls off due to gravity can be avoided.

[0051] The emergency disposal system is used in a way that:

after finding the explosive/unexploded ordnance, the explosive ordnance disposal personnel rapidly unfold the explosive ordnance disposal fence main body 1.1 in a folded state and paste the lateral buffer plates 1.3 and the front buffer plate 1.5 to the front and sides of the explosive ordnance disposal fence main body 1.1 by using the hook-and-loop fastener; and then, the composite explosion-proof drum 3 is placed in the composite explosion-proof drum protection seat 1.1.4. The top protection plate 1.2 is inserted into the explosive ordnance disposal fence main body 1.1, and the grabbing device 2 is mounted on the protection device 1 by using the universal bearing 1.4. The explosive ordnance disposal personnel lift the folding handle 1.1.5 behind the protection device 1 to place the overall equipment on the mobile base 4 and then push the mobile base 4 to a position near the explosive/unexploded ordnance. Then, the rear end support plate 1.1.7 is put down, and the explosive ordnance disposal personnel half squat behind the explosive ordnance disposal fence main body 1.1 to remove protection structures (including the protection device 1, the grabbing device 2 and the composite explosion-proof drum 3) from the mobile base 4 and place them on a plane; after being stabilized, the explosion-proof drum top cover 3.4 is adsorbed to be opened by operating the electric push rod 2.2 and placed at a position; and then, the electric push rod 2.2 is operated to be close to the explosive/unexploded ordnance, the electromagnetic chuck is started to adsorb the explosive/unexploded ordnance, then, the electric push rod 2.2 contracts back to the opening of the composite explosion-proof drum 3, the electromagnetic chuck is shut down, the explosive/unexploded ordnance will be placed in the composite explosion-proof drum 3, then, the electric push rod 2.2 is operated to place the explosion-proof drum top cover 3.4 in the opening of the composite explosion-proof drum 3 again, and thus, an operation is completed. In this process, the explosive ordnance disposal personnel operate behind the protection device 1 in the whole process, and therefore, high safety is achieved. The adopted chuck way is high in reliability as well as simple and flexible in operation.

Embodiment 3:

[0052] A segmented lamination technology is adopted for the main laminated plate 1.1.1 on the basis of the above-mentioned embodiment 2.

[0053] The segmented lamination technology for the main laminated plate 1.1.1 is described as follows:

according to a design, the explosive ordnance disposal fence main body 1.1 has a length of 1.6 m and a width of 1.4 m and is cut from 100-layer PE cloth so as to meet a requirement on a design size. Firstly, fiber cloth is sewed by using a high-strength sewing thread which

adopts an aramid thread, wherein a sewing size is the design size. This step mainly aims at preliminarily fixing a plurality of pieces of fiber cloth, thereby avoiding a situation of offset or disorder in the pressing process of a pressing machine. A gap with a thickness being 3-5 times as large as that of the plate is generally reserved in a folding part according to a thickness requirement, and a 50 mm non-pressed part is reserved at the folding position; and then, the sewed fiber cloth is laminated in a segmented way, that is, the sewed fiber cloth is divided into three segments which are respectively used as the front protection plate A and the two lateral protection plates D, and a 50 mm spacing is reserved as a welt seam between the front protection plate A and each of the left and right lateral protection plates D. As shown in Fig. 9, when the main laminated plate 1.1.1 is pressed by the pressing machine C, only the front protection plate A and the two lateral protection plates D are pressed, but the folding part B is not pressed.

Embodiment 4:

[0054] The composite explosion-proof drum main body 3.1 will be further described in detail on the basis of the above-mentioned embodiment 1.

[0055] As shown in Fig. 7, the explosion-proof drum main body 3.1 includes a bottom and an annular part; and each of the bottom and the annular part is of a multilayer structure; and

specifically, the bottom is sequentially provided with a bottom bullet-proof layer 3.1.1, a bottom explosion-proof liquid layer 3.1.2 and a bottom support layer 3.1.3 from outside to inside; wherein each of the bottom bullet-proof layer 3.1.1 and the bottom explosion-proof liquid layer 3.1.2 is a circular plate, and the bottom support layer 3.1.3 is of an annular structure with a central trapezoidal blind hole. The bottom bullet-proof layer 3.1.1 is made by pressing multi-layer fiber or a fiber plate; the bottom explosion-proof liquid layer 3.1.2 consists of water, an anti-freeze liquid, a porous nanopowder and gel; and a main body of the bottom support layer 3.1.3 is made of low-density foam of which the density is 20 to 50 kg/m³. By adopting the foam, the energy from the shock waves can be absorbed, and at the same time, the structure can be kept light; and by adopting the annular structure, it can be ensured that equipment placed in the drum is at a central position of the drum, and at the same time, triangular structures at two sides are raised, which can change the waveforms of the explosion shock waves, so that the shock waves can overlap each other to neutralize the corresponding energy after collision.

[0056] The annular part is sequentially provided with a fiber bullet-proof layer 3.1.6, a foam buffer layer 3.1.5 and a lateral explosion-proof liquid protection layer 3.1.4 from outside to inside; the fiber bullet-proof layer 3.1.6 is mainly formed by winding the multi-layer fiber or pressing an annular plate in a hot isostatic pressing way; the fiber bullet-proof layer 3.1.6 is preferably formed by winding

PE cloth for 120 layers. By adopting such method, the processing period is shorter than that of the hot isostatic pressing way and is low in cost. The design that the bullet-proof layer is formed by winding the 120-layer PE cloth is based on a plurality of previous tests under the condition that a certain redundancy is considered. The lateral explosion-proof liquid protection layer 3.1.4 is used for attenuating lateral shock waves; and the foam buffer layer 3.1.5 is used for attenuating lateral shock waves.

[0057] Although the present disclosure has been described in detail with general description and specific embodiments as above, some modifications or improvements can be made on the basis of the present disclosure, which is apparent for those skilled in the art. Therefore, these modifications or improvements made without departing from the spirit of the present disclosure fall within a scope of protection of the present disclosure.

Claims

1. A lightweight emergency disposal system for an explosive/unexploded ordnance, **characterized by** comprising a protection device (1), a grabbing device (2) and a composite explosion-proof drum (3);

the protection device (1) comprising an explosive ordnance disposal fence main body (1.1), a top protection plate (1.2), lateral buffer plates (1.3) and a front buffer plate (1.5); the explosive ordnance disposal fence main body (1.1) being provided with a front protection plate as well as left and right lateral protection plates; the top protection plate (1.2) being disposed in a top opening of the explosive ordnance disposal fence main body (1.1) to realize top protection; the lateral buffer plates (1.3) be additionally disposed outside the left and right lateral protection plates to form lateral buffer layers; the front buffer plate (1.5) being additionally disposed outside the front protection plate to form a front buffer layer; the explosive ordnance disposal fence main body (1.1) being provided with a viewing window (1.6), and the viewing window (1.6) being equipped with bullet-proof glass;

the grabbing device (2) being used for grabbing the explosive/unexploded ordnance and comprising a grabbing head (2.1), an electric push rod (2.2), a power source (2.4) and a control unit (2.5); one end of the electric push rod (2.2) being mounted on the protection device (1), and the other end thereof being connected to the grabbing head (2.1); the power source (2.4) being used for supplying power to the electric push rod (2.2) and the grabbing head (2.1); and the control unit (2.5) being used for controlling the electric push rod (2.2) to stretch and contract and the grabbing head (2.1) to grab/release the ex-

plosive/unexploded ordnance; and the composite explosion-proof drum (3) being used for temporarily storing the explosive/unexploded ordnance released after being grabbed by the grabbing device (2).

2. The lightweight emergency disposal system for the explosive/unexploded ordnance of claim 1, **characterized by** further comprising a mobile device (4) used for moving the protection device (1), the grabbing device (2) and the composite explosion-proof drum (3) as a whole.
3. The lightweight emergency disposal system for the explosive/unexploded ordnance of claim 1 or 2, **characterized in that** a bottom of an outer surface of the front protection plate of the explosive ordnance disposal fence main body (1.1) is connected to a front end support plate (1.1.3); and the front end support plate (1.1.3) is used for bearing the composite explosion-proof drum (3).
4. The lightweight emergency disposal system for the explosive/unexploded ordnance of claim 3, **characterized in that** a composite explosion-proof drum protection seat (1.1.4) is disposed in a center of the front end support plate (1.1.3), and the composite explosion-proof drum protection seat (1.1.4) is used for positioning the composite explosion-proof drum (3).
5. The lightweight emergency disposal system for the explosive/unexploded ordnance of claim 1 or 2, **characterized in that** a bottom of an inner surface of the explosive ordnance disposal fence main body (1.1) is connected to a rear end support plate (1.1.7).
6. The lightweight emergency disposal system for the explosive/unexploded ordnance of claim 1 or 2, **characterized in that** the composite explosion-proof drum (3) comprises an explosion-proof drum main body (3.1), an explosion-proof drum top ring (3.3) and an explosion-proof drum top cover (3.4);
the explosion-proof drum top ring (3.3) is of a semi-spherical structure and is mounted in a top opening of the explosion-proof drum main body (3.1), and a top of the explosion-proof drum top ring (3.3) is provided with an inclined opening for changing propagation directions of shock waves; and the explosion-proof drum top cover (3.4) is used for closing the inclined opening in the top of the explosion-proof drum top ring (3.3).
7. The lightweight emergency disposal system for the explosive/unexploded ordnance of claim 6, **characterized in that** the explosion-proof drum main body

(3.1) comprises a bottom and an annular part; each of the bottom and the annular part is of a multilayer structure;

the bottom is sequentially provided with a bottom bullet-proof layer (3.1.1), a bottom explosion-proof liquid layer (3.1.2) and a bottom support layer (3.1.3) from outside to inside; wherein each of the bottom bullet-proof layer (3.1.1) and the bottom explosion-proof liquid layer (3.1.2) is a circular plate, and the bottom support layer (3.1.3) is of an annular structure with a central trapezoidal blind hole; and

the annular part is sequentially provided with a fiber bullet-proof layer (3.1.6), a foam buffer layer (3.1.5) and a lateral explosion-proof liquid protection layer (3.1.4) from outside to inside.

8. The lightweight emergency disposal system for the explosive/unexploded ordnance of claim 1 or 2, **characterized in that** the grabbing head (2.1) is an electromagnetic chuck used for adsorbing the explosive/unexploded ordnance; and after the electromagnetic chuck adsorbs the explosive/unexploded ordnance, the electric push rod (2.2) contracts to enable the electromagnetic chuck to be located above a bung hole of the composite explosion-proof drum (3), then, the control unit (2.5) controls the electromagnetic chuck to be powered off, and at the moment, the explosive/unexploded ordnance will be placed into the composite explosion-proof drum (3).
9. The lightweight emergency disposal system for the explosive/unexploded ordnance of claim 1 or 2, **characterized in that** the grabbing head (2.1) is a clamping jaw hook connected to the electric push rod (2.2) by the electromagnetic chuck, and the control unit (2.5) controls the connection or disconnection between the electromagnetic chuck and the electric push rod (2.2) by controlling the power on or off of the electromagnetic chuck; and after the explosive/unexploded ordnance is hooked by the clamping jaw hook, the electric push rod (2.2) contracts to enable the clamping jaw hook to be located above the bung hole of the composite explosion-proof drum (3), then, the control unit (2.5) controls the electromagnetic chuck to be powered off, and at the moment, the clamping jaw hook and the explosive/unexploded ordnance will be placed into the composite explosion-proof drum (3) at the same time.
10. The lightweight emergency disposal system for the explosive/unexploded ordnance of claim 1 or 2, **characterized in that** the electric push rod (2.2) is mounted in the protection device (1) by a universal bearing (2.3), and the universal bearing (2.3) is used

for adjusting a direction of the electric push rod (2.2).

11. The lightweight emergency disposal system for the explosive/unexploded ordnance of claim 1 or 2, **characterized in that** a connection position between the front protection plate and each of the left and right lateral protection plates of the explosive ordnance disposal fence main body (1.1) is foldable.
12. The lightweight emergency disposal system for the explosive/unexploded ordnance of claim 11, **characterized in that** the explosive ordnance disposal fence main body (1.1) is laminated in a segmented way, that is, during pressing formation, the explosive ordnance disposal fence main body (1.1) is divided into three segments which are respectively used as the front protection plate as well as the left and right lateral protection plates, a spacing reserved between the front protection plate and each of the left and right lateral protection plates is used as a welt seam, during pressing, the front protection plate as well as the left and right lateral protection plates are respectively pressed, and a folding position is not pressed.

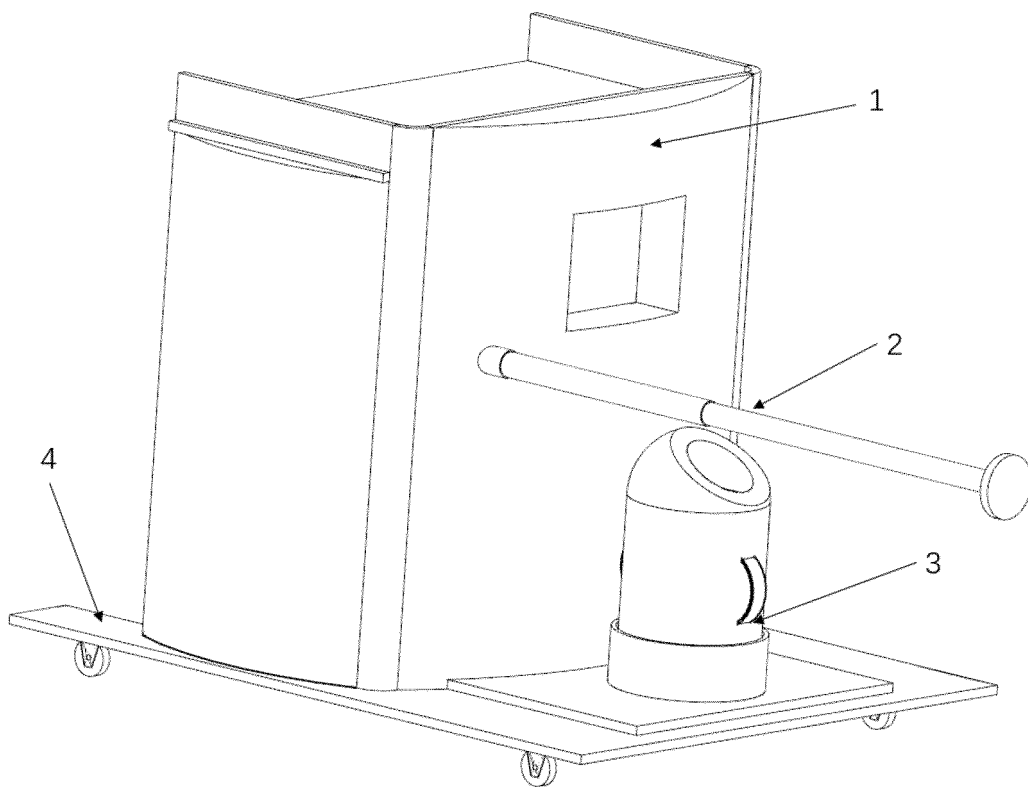


Fig. 1

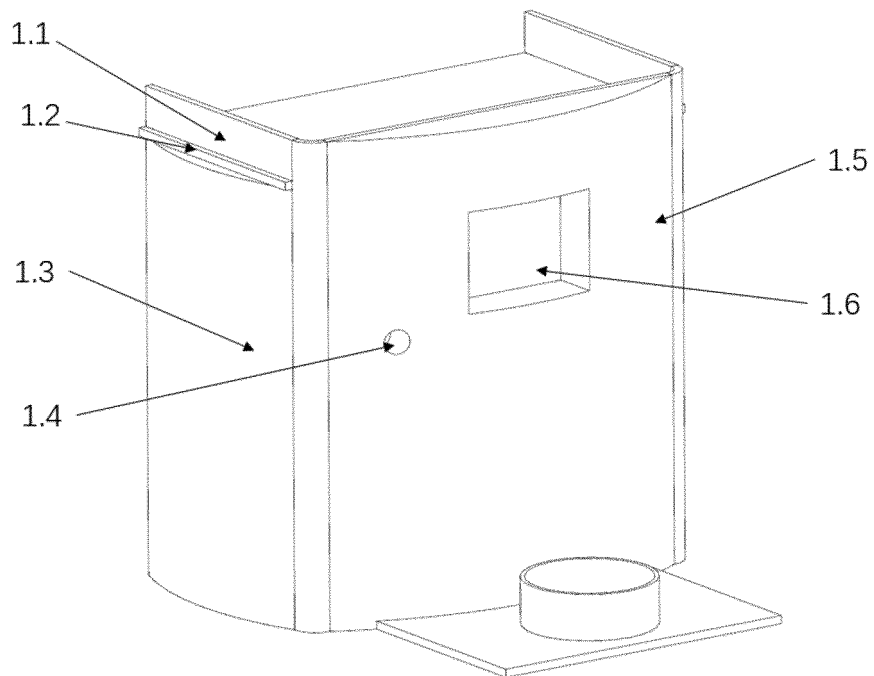


Fig. 2

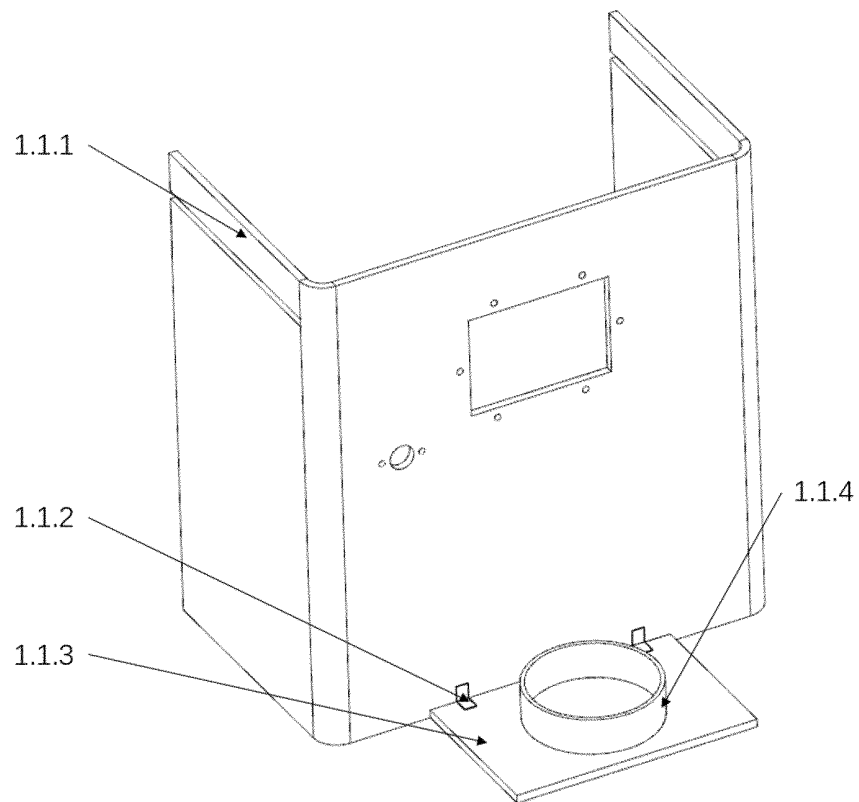


Fig. 3

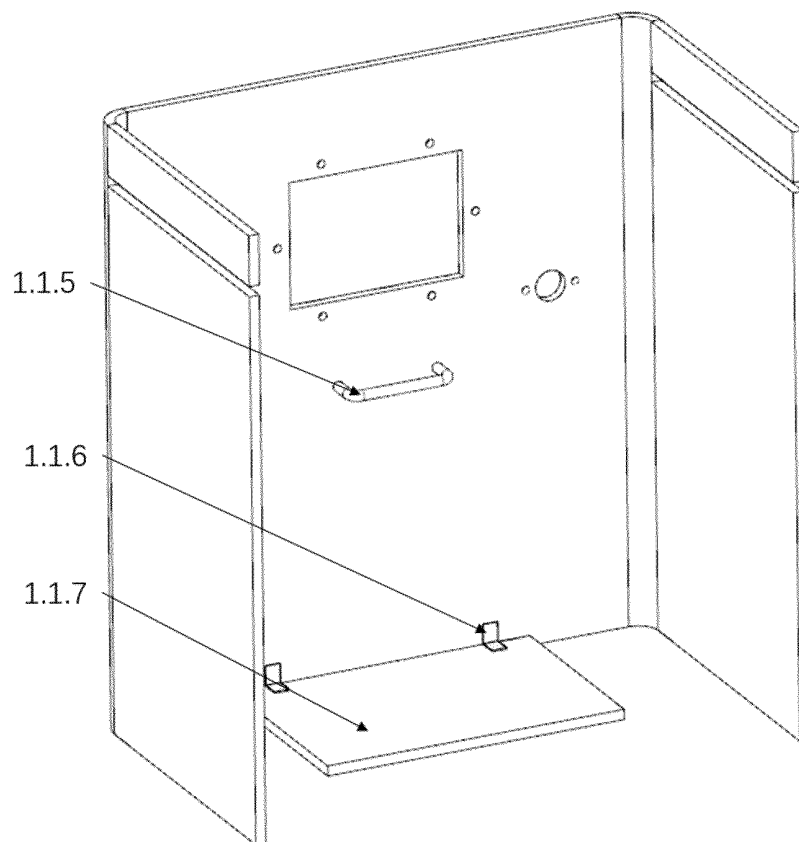


Fig. 4

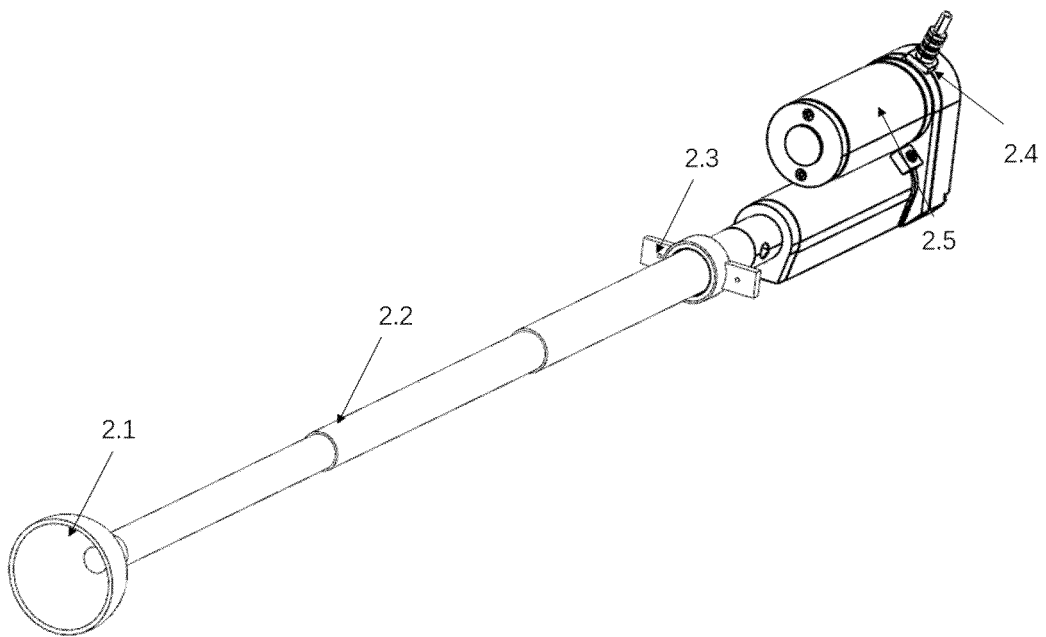


Fig. 5

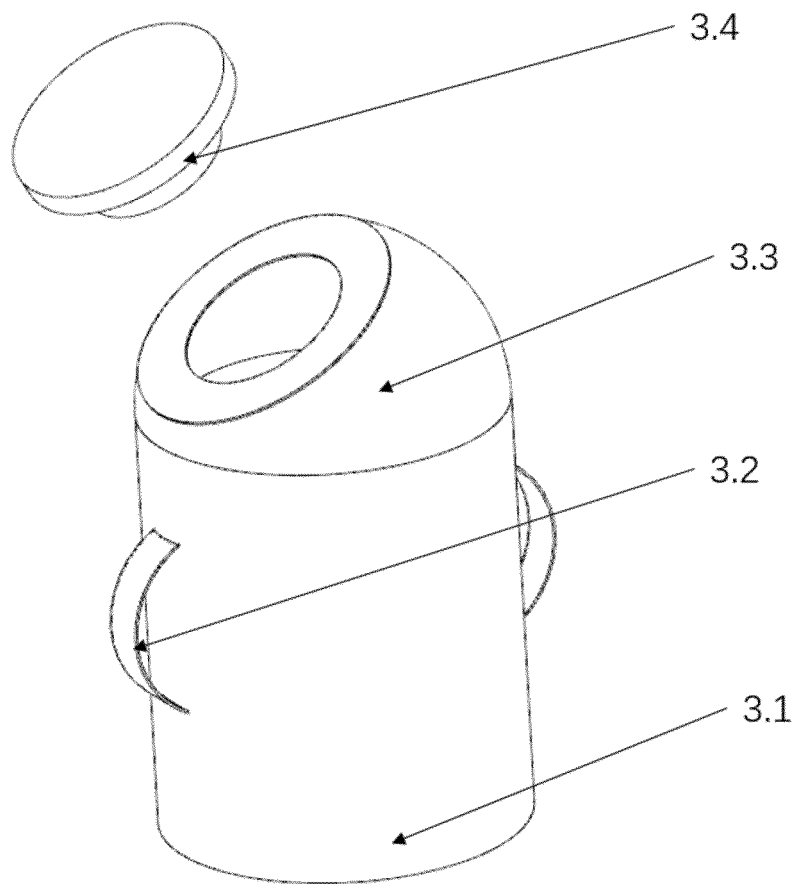


Fig. 6

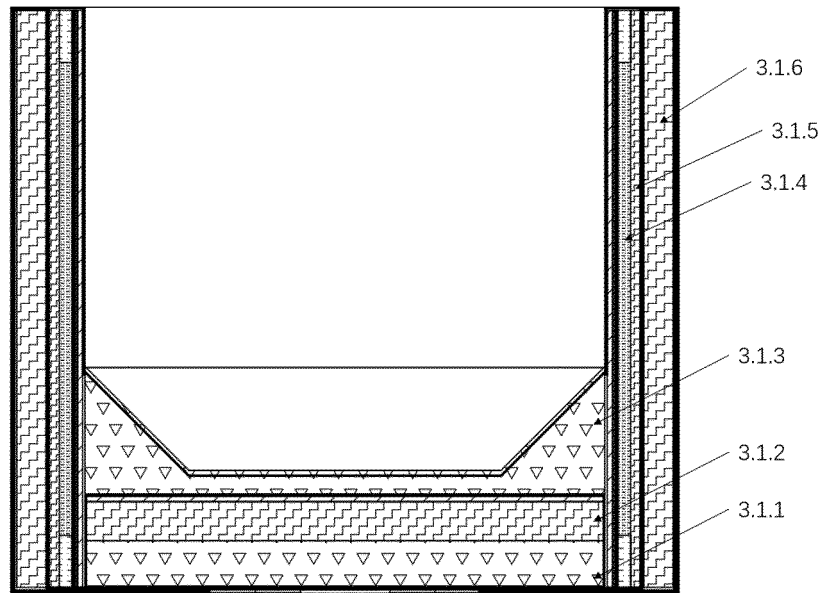


Fig. 7

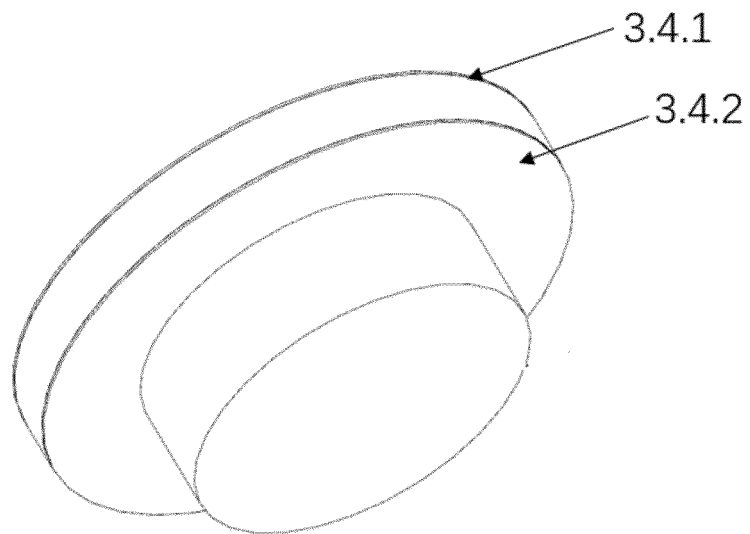


Fig. 8

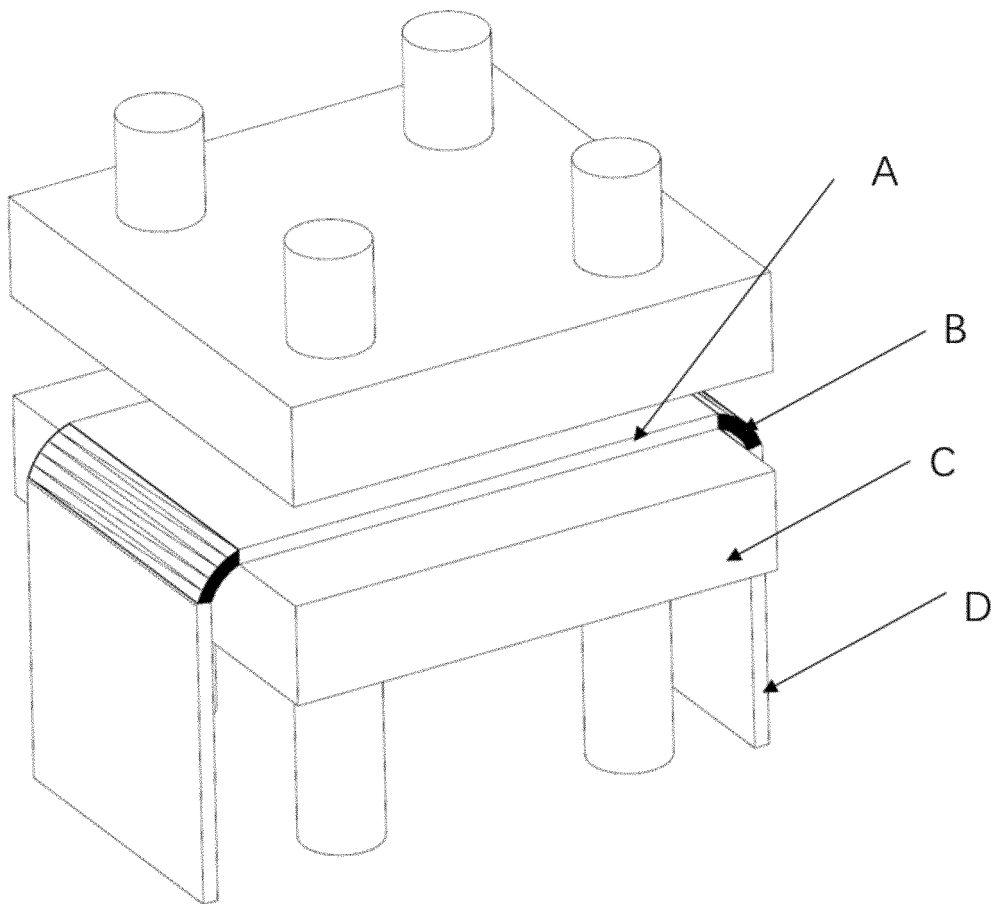


Fig. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2022/083497

A. CLASSIFICATION OF SUBJECT MATTER F42D 5/04(2006.01)i; F42D 5/045(2006.01)i According to International Patent Classification (IPC) or to both national classification and IPC																					
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) F42D Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNKI, CNABS, CNTXT, ENTXT, WPABS: 爆, 危险, 处置, 防护; explosion, danger, disposal, protect																					
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>PX</td> <td>CN 113237400 A (BEIJING INSTITUTE OF TECHNOLOGY) 10 August 2021 (2021-08-10) claims 1-12</td> <td>1-12</td> </tr> <tr> <td>Y</td> <td>CN 111854557 A (XI'AN WUHUA JUNENG BLASTING EQUIPMENT CO., LTD.) 30 October 2020 (2020-10-30) description, paragraphs 18-61, and figure 1</td> <td>1-12</td> </tr> <tr> <td>Y</td> <td>CN 205909744 U (LI RENFU) 25 January 2017 (2017-01-25) description, paragraphs 16-25</td> <td>1-12</td> </tr> <tr> <td>Y</td> <td>CN 209820303 U (AI CHUNLING) 20 December 2019 (2019-12-20) description, paragraphs [0019]-[0026]</td> <td>1-12</td> </tr> <tr> <td>Y</td> <td>CN 111637808 A (HUNAN AIR DEFENSE TECHNOLOGY CO., LTD.; BEIJING INSTITUTE TECHNOLOGY) 08 September 2020 (2020-09-08) description, paragraphs 31-61</td> <td>6-7</td> </tr> <tr> <td>A</td> <td>EP 0725260 A1 (AKZO NOBEL NV) 07 August 1996 (1996-08-07) entire document</td> <td>1-12</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	PX	CN 113237400 A (BEIJING INSTITUTE OF TECHNOLOGY) 10 August 2021 (2021-08-10) claims 1-12	1-12	Y	CN 111854557 A (XI'AN WUHUA JUNENG BLASTING EQUIPMENT CO., LTD.) 30 October 2020 (2020-10-30) description, paragraphs 18-61, and figure 1	1-12	Y	CN 205909744 U (LI RENFU) 25 January 2017 (2017-01-25) description, paragraphs 16-25	1-12	Y	CN 209820303 U (AI CHUNLING) 20 December 2019 (2019-12-20) description, paragraphs [0019]-[0026]	1-12	Y	CN 111637808 A (HUNAN AIR DEFENSE TECHNOLOGY CO., LTD.; BEIJING INSTITUTE TECHNOLOGY) 08 September 2020 (2020-09-08) description, paragraphs 31-61	6-7	A	EP 0725260 A1 (AKZO NOBEL NV) 07 August 1996 (1996-08-07) entire document	1-12
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Date of the actual completion of the international search 08 June 2020	Date of mailing of the international search report 23 June 2022																				
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China Facsimile No. (86-10)62019451	Authorized officer Telephone No.																				

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/083497

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CN	205909744	U	25 January 2017	None			
CN	209820303	U	20 December 2019	None			
CN	111637808	A	08 September 2020	None			
EP	0725260	A1	07 August 1996	DE	59600607	D1	05 November 1998
				ES	2122727	T3	16 December 1998
				AT	171779	T	15 October 1998