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(54) **Device for removing explosive material from soil.**

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EP-A- 0 183 915
DE-A- 3 335 464
DE-C- 604 623
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US-A- 3 813 125

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Description

The present invention relates to a device for removing explosive material such as old ammunition and the like from soil according to the preamble of claim 1.

Such a device is known from DE-A 3 335 464 in which by means of the spray lances liquid jets are directed to explosive materials such as mines. The object of said known device is to push the mines out of the roadway by liquid jets in such a manner that in case of an explosion there will be no or little damage. Said known device is not suitable for removing explosives from soil in case said explosives cannot be detected by sight and have for example been in the ground since the last world war.

The object of the invention is to provide a device by means of which these explosives can be efficiently separated from the soil, and with which optimum safety for the operating personnel is ensured.

This object is achieved according to the invention by means of the features of the characterizing part of claim 1.

The soil is emptied into the collection bin of the device by means of a conventional excavator which is armoured against possible explosions. A powerful jet of water is then directed on the soil with the spray lance, so that sand and mud are taken through the perforated plates to the collection tank situated underneath the collection bin. Larger pieces and possible explosive objects remain behind in the collection bin and can be removed from it. Explosive objects can be recognized as such and rendered harmless. During the flushing away of the soil, the personnel are in the armoured cab of the machine and run practically no risk in the process, while still being able to have a good view of the work.

It has to be noticed that from US-A 3 395 798 a collection bin is known for separating materials. In this known collection bin the materials are vibrated and washed in order to separate the larger materials from the smaller materials. In the device according to the invention it is important that the explosive materials can be recognized as such and therefore the mud and soil is sprayed away by means of the liquid jets, the soil being discharged from said device by means of a pump.

It is preferable to have disposed along the side of the walls of the collection bin a spray pipe, which is connected by means of a valve to the water supply pipe of the spray lance. This spray pipe is for flushing the grid and the collection bin clean.

In a preferred embodiment of the invention, one or more spray nozzles are disposed in the collection tank, and are connected to the water supply pipe of the spray lance. These spray nozzles are for the purpose of maintaining water circulation when the spray lance and the spray pipe are not in operation. This prevents the discharge pump accommodated in the discharge pipe from running dry.

The spray nozzles are preferably connected to the water supply pipe by means of an excess pressure valve.

When the spray lance and the spray pipe are not in operation, the pressure in the water supply pipe

will increase, and this rise in pressure causes the valve to the spray nozzles to open, so that a water supply to the discharge pump is automatically ensured.

The walls of the collection bin are preferably clad on the inside with wood, so that if an explosion takes place, ricocheting of shell splinters and the like against the walls is avoided. The wood also provides effective protection for the walls. Since the perforated plates forming the bottom of the collection bin are detachable, they can easily be replaced if damaged by any explosion.

The invention is explained with reference to the appended drawing, in which:

Fig. 1 shows a schematic cross section of the device according to the invention; and

Fig. 2 shows a top view of the device of Fig. 1.

As can be seen in particular from Fig. 1, the device according to the invention comprises a mobile frame which is provided with caterpillar tracks 1, a control cab 2, and a collection bin 3. The cab 2 is provided with panels 4 of armour-plated glass, and is designed in such a way that operating personnel in it are virtually fully protected against a possible explosion.

The collection bin 3 is rectangular in top view, with upright walls 5, which are clad with wood on the inside, preferably with deal about 2.5 cm thick. The wood cladding provides effective protection of the upright walls, on the one hand, while the ricocheting of shell splinters against the walls is avoided, on the other. The bottom of the collection bin 3 consists of a grid 6, which is formed by a number of perforated plates which are disposed detachably and can thus easily be replaced in the event of damage. Under the collection bin 3 is a collection tank 7, which is trough-shaped with downward-sloping side walls. Near the bottom of the collection tank 7 is a discharge pipe 8, in which a discharge pump is accommodated, suitable for pumping a water and soil mixture, and driven by a hydraulic motor 10. The discharge pipe 8 extends to the rear side of the device and a discharge pipe (not shown) can be connected to it. If the water and soil mixture has to be transported over a distance of more than 1 km, extra pumps of the same type as pump 9 will have to be disposed in the discharge pipe.

The device is also provided with a water supply pipe 11 which extends forwards from the rear side thereof and divides near the front of the cab 2 into a pipe 12 which leads to a spray lance 13, disposed above the collection bin 3, and an essentially through pipe 14. The spray lance 13, which can be controlled from the cab, is of a known type and need not be described in detail here. Connected to the pipe 12 is a branch pipe 15, which extends along the inside of the walls 5 of the collection bin 3 and is provided at regular intervals with openings. The pipe 15 thus forms a spray pipe for flushing away the material through the grid 6.

The through pipe 14 leads to a spray nozzle 16, which is provided inside the collection tank 7 under the grid 6, and the object of which will be clear in the

description of the working of the device. Disposed in the pipes 12, 15 and 14 are valves 17, 18 and 19 respectively. Connected to the pipe 12 is another pipe 20 for feeding a screen washer for the windscreen of the cab.

The vehicle is driven by a diesel engine 21, which also drives the hydraulic motor 10 and hydraulic pumps 22 for placing the water supplied by the pipe 11 under pressure.

The device according to the invention works as follows:

Ground in which possibly explosive objects could be present is excavated using a conventional excavator, which is provided with suitable safety facilities, and is emptied into the collection bin 3. By means of the spray lance 13, a powerful jet of water is directed onto the soil in the bin 3, so that sand and mud and other small particles are flushed away through the grid 6 to the collection tank 7. The large parts and possibly explosive objects remain sprayed clean on the grid 6. Any explosives can be recognized as such and rendered harmless. The collection bin 3 is then emptied, and a new load of soil is emptied into the collection bin 3. During the examination for explosives left behind on the grid 6 and the removal thereof, the spray lance 13 is stopped by means of the valve 17, and the spray pipe 15 by means of the valve 18. This gives rise to the danger that the pump 9 for discharge of the soil and water mixture will run dry, which could lead to damage to it. However, the shutting off of the spray lance 13 and the spray pipe 15 gives rise to an increase in the pressure in the water supply pipe 11. If the valve 19 is designed as an excess pressure valve, this increase in pressure results in the valve 19 opening and water being fed through the spray nozzle 16 into the collection tank 7. In this way the water circulation is maintained when the spray lance 13 and the spray pipe 15 are out of action, and damage to the pump 9 is avoided.

Claims

1. A device for removing explosive material such as old ammunition and the like from soil, comprising a mobile frame containing an armoured control cab (2), a spray lance (13) which is controllable from the cab and is connected to a water supply pipe (11, 12), characterized in that the mobile frame contains a collection bin (3) for the soil said collecting bin being provided with a bottom consisting of perforated plates (6), the spray lance (13) is disposed above the collection bin, and a collection tank (7) is disposed under the perforated plates of the collection bin, said tank near the bottom being provided with a discharge pipe (8) in which a discharge pump (9) is accommodated.

2. A device according to Claim 1, characterized in that disposed along the inside of the walls (5) of the collection bin is a spray pipe (15), which is connected by means of a valve (18) to the water supply pipe (12) of the spray lance.

3. A device according to Claim 1 or 2, characterized in that disposed in the collection tank are one or more spray nozzles (6) which are connected to

the water supply pipe (11) of the spray lance.

4. A device according to Claim 3, characterized in that the spray nozzles are connected to the water supply pipe by means of an excess pressure valve (19).

5. A device according to one or more of the preceding claims, characterized in that the walls (5) of the collection bin are clad with wood on the inside.

6. A device according to one or more of the preceding claims, characterized in that the perforated plates (6) forming the bottom of the collection bin are detachable.

7. A device according to one or more of the preceding claims, characterized in that the armoured cab (2) is provided with a screen washer, which is connected to the water supply pipe (12) of the spray lance by a pipe (20).

Patentansprüche

1. Vorrichtung zum Räumen von im Boden liegenden explosiven Gegenständen, wie alte Munition, bestehend aus einem fahrbaren Gestell, mit einer gepanzerten Bedienungskabine (2) und einer Sprühlanze (13), die von der Kabine (2) aus bedienbar ist und die mit einem Wasserversorgungsrohr (11, 12) verbunden ist, dadurch gekennzeichnet, daß das fahrbare Gestell einen Sammelbehälter (3) für die Erde aufweist, wobei der Sammelbehälter (3) mit einem Boden versehen ist, der aus perforierten Platten (6) besteht, daß die Sprühlanze (13) oberhalb des Sammelbehälters (3) angeordnet ist, und daß sich unter den perforierten Platten des Sammelbehälters (3) ein Sammelbehälter (7) befindet, wobei der Sammelbehälter (7) nahe dem Boden ein Rohr (8) mit einer Pumpe (9) zum Entsorgen des Sammelbehälters (7) aufweist.

2. Vorrichtung nach Anspruch 1 dadurch gekennzeichnet, daß innerhalb der Wände (5) des Sammelbehälters ein Sprührohr (15) angeordnet ist, das durch ein Ventil (18) mit dem Wasserversorgungsrohr (12) der Sprühlanze verbunden ist.

3. Vorrichtung nach Anspruch 1 und 2 dadurch gekennzeichnet, daß innerhalb des Sammelbehälters ein oder mehrere Sprühdüsen (16) angeordnet sind, die mit dem Wasserversorgungsrohr (11) der Sprühlanze verbunden sind.

4. Vorrichtung nach Anspruch 3 dadurch gekennzeichnet, daß die Sprühdüsen mit dem Wasserversorgungsrohr (11) durch ein Überdruckventil (19) verbunden sind.

5. Vorrichtung nach einem oder mehreren voranstehenden Ansprüche dadurch gekennzeichnet, daß die Wände (5) des Sammelbehälters an der Innenseite mit Holz ausgekleidet sind.

6. Vorrichtung nach einem oder mehreren der voranstehenden Ansprüche dadurch gekennzeichnet, daß die den Boden des Sammelbehälters bildenden perforierten Platten (6) auswechselbar sind.

7. Vorrichtung nach einem oder mehreren der voranstehenden Ansprüche dadurch gekennzeichnet, daß die gepanzerte Kabine (2) einen Scheibenwischer aufweist, der mit dem Wasserversorgungsrohr (12) der Sprühlanze durch ein Rohr (20) verbunden ist.

Revendications

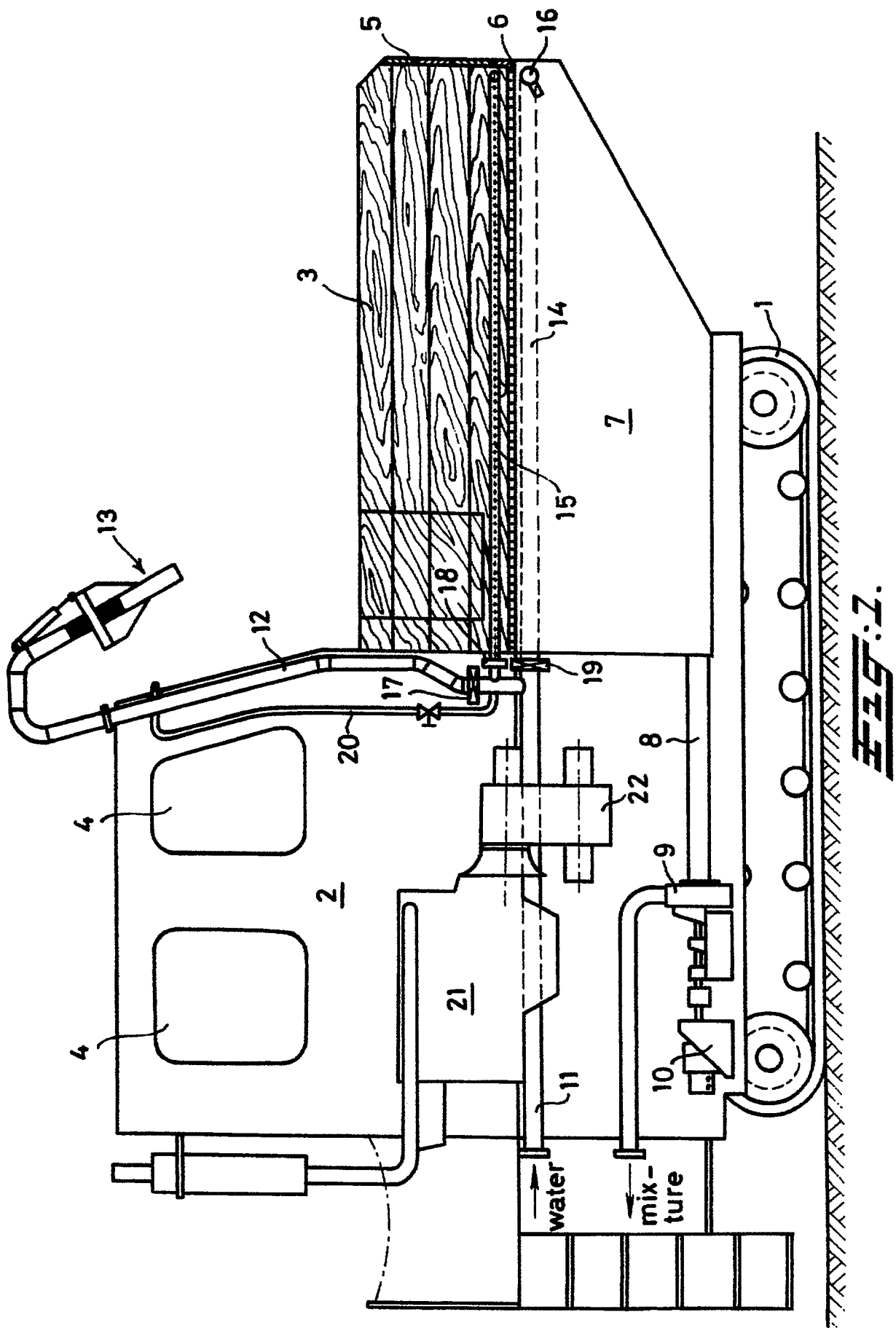
1. Dispositif pour retirer du sol un explosif comme par exemple une ancienne munition et analogue, comprenant un cadre mobile contenant une cabine de commande blindée (2), une lance de pulvérisation (13), qui peut être commandée à partir de la cabine et est raccordée à une canalisation d'alimentation en eau (11, 12), caractérisé en ce que le cadre mobile contient une trémie de collecte (3) destinée à recevoir le sol, ladite trémie de collecte comportant un fond constitué par des plaques perforées (6), en ce que la lance de pulvérisation (13) est disposée au-dessus de la trémie de collecte, et en ce qu'une cuve de collecte (7) est disposée au-dessous des plaques perforées de la trémie de collecte, ladite cuve comportant, à proximité du fond, une canalisation d'évacuation (8), dans laquelle est montée une pompe de refoulement (9). 5
2. Dispositif selon la revendication 1, caractérisé en ce qu'une canalisation de pulvérisation (15), qui est raccordée au moyen d'une vanne (18) à la canalisation d'alimentation en eau (12) de la lance de pulvérisation, est disposée le long de la face intérieure des parois (5) de la trémie de collecte. 10
3. Dispositif selon la revendication 1 ou 2, caractérisé en ce qu'une ou plusieurs buses de pulvérisation (6), qui sont raccordées à la canalisation d'alimentation en eau (11) de la lance de pulvérisation, sont disposées dans la cuve de collecte. 15
4. Dispositif selon la revendication 3, caractérisé en ce que les buses de pulvérisation sont raccordées à la canalisation d'alimentation en eau au moyen d'un limiteur de pression (19). 20
5. Dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce que les parois (5) de la trémie de collecte sont recouvertes intérieurement de bois. 25
6. Dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce que les plaques perforées (6) constituant le fond de la trémie de collecte sont amovibles. 30
7. Dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce que la cabine blindée (2) comporte un lave-glace, qui est raccordé à la canalisation d'alimentation en eau (12) de la lance de pulvérisation par un tuyau (20). 35

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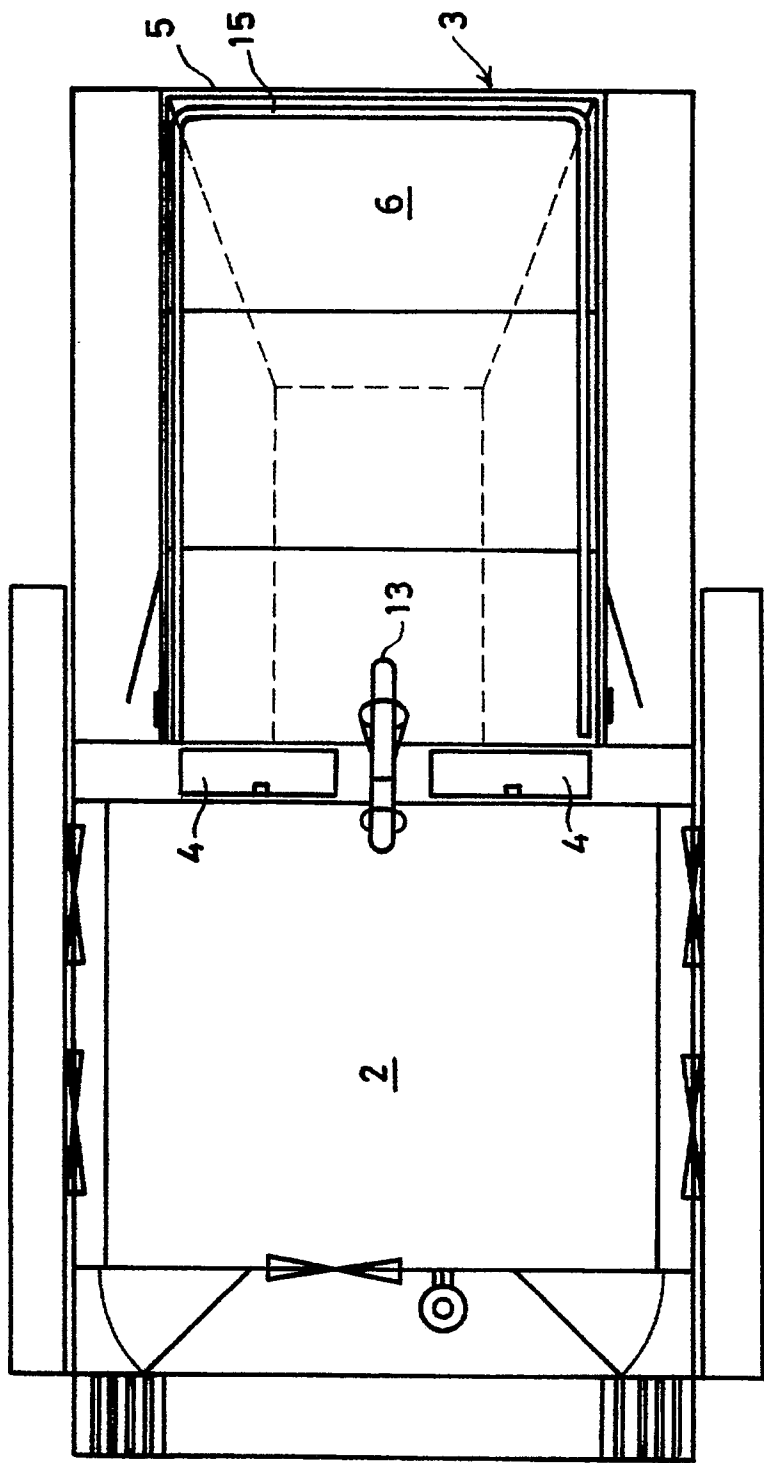


Fig. 2.