Foam producing antirobbery device for armoured trucks carrying valuables and the like.

Foam producing antirobbery device for armoured trucks carrying valuables and the like comprising a tank (7, 31a) containing one component of a two-component resin, a second tank (8, 31b) containing the second component of the same resin and a mixer (9, 54) of the two components to form a foaming product which is discharged on the material to be protected.

Said components are supplied to said mixer (9, 54) on command under the thrust of an inert gas which is let into the two containers at the time of use.
FOAM PRODUCING ANTIROBBERY DEVICE FOR ARMoured TRUCKS CARRYING VALUABLES AND THE LIKE

Prior Art

Antirobbery devices used at present for armoured trucks carrying valuables, armoured vaults of banks, etc. are generally based on more or less sophisticated alarm systems which have various shortcomings among which is particularly serious the possibility of being neutralized. In addition they require intervention by the security services and intervention times are often such that the robbery cannot be thwarted.

There has also been proposed the use of foam producing devices which mix the two components of a two component resin contained in bottles under constant pressure of an inert gas.

These devices have never been applied because they do not have the necessary assurance of reliability, practicality and safety. The difficulties encountered heretofore in the embodiment of these devices are many.

Firstly, the component substances of the two component resin decay with time and thus make essential periodic replacement thereof and this is made difficult and costly by the use of pressurized bottles.

It should be noted that a safety device must ensure long term reliability even if there is no occasion for its use.

In the proposed solutions said replacement implies either disassembly of the device with replacement and recharging in the laboratory or an on-site intervention with costly equipment and skilled personnel.

A further complication is created by the bottle heating system.

In addition the known system makes the insertion of double protective circuits problematical.

Finally, for the use of said devices to be effective, the two mixed components must be chemically reacted together and foam in optimal manner and extent so as to fill the spaces to be protected.

To achieve this the two components must be heated and kept at predetermined temperatures, adequately mixed at the time of activation and expelled rapidly from their containers.

Summary of the Invention

We have invented a foam producing antirobbery device for armoured trucks carrying valuables and the like which overcomes the shortcomings of the known art.

Said device comprises a first tank containing one component of the two-component resin, a second tank containing the second component of the same resin and a mixer of the two components to form a foamed product which is discharged on the material to be protected, said components being fed to the mixer on command by means of the thrust exerted by an inert gas which is let into the two tanks at the time of use of the device.

Detailed description of the invention

The characteristics and advantages of the antirobbery device in accordance with the present invention are made clear by the following description and the annexed FIGS. 1, 2, 3, 4 and 5.

FIG. 1 shows a pneumatic unit for the supply of inert gas;

FIG. 2 shows a hydraulic circuit supplied by the pneumatic unit, the tanks containing the components of the resin and the mixer for mixing said components;

FIG. 3 shows the device complete with its cabinet, heating system and electrical control system; and

FIGS. 4 and 5 show variants of the device shown in FIGS. 1 and 3.

The pneumatic unit for supply of the inert gas comprises two electromagnets 1, two bottles 2 containing the inert gas under pressure and connected in parallel, a pressure reducer 3 and a 3-way valve 4. At the outlet of each of the two bottles there is inserted a pressure switch 5 which indicates any loss of pressure of the gas.

The double design of this equipment gives the circuit maximum reliability because the gas charged in each of the two bottles is calculated in such a manner as to ensure sufficient pressure for complete operation of the device.

In case of loss of pressure in the bottles, the gas is discharged to the atmosphere by the valve 4, which diverts toward the hydraulic circuit only during programmed feeding.

To supply the inert gas the electromagnet 1 is energized and by means of the pin 6 the closing ball valve of the bottle 2 is opened. The gas flows through the manifold 2a to the pressure reducer 3 where its pressure is reduced to 3 = 10kg/cm² and it is fed to the downstream circuit through the valve 4.

The device comprises a tank 7 containing one component of a two component resin, a tank 8 containing the second component of said resin, a
- static mixer 9 for the two components, and a circuit for feeding the inert gas to said containers. Said circuit comprises the valve 4, the pistons 10 and 11, a distributor 12 and two valves 13 and 14 from which the gas is let into the tanks 7 and 8.

The circuit operates as follows.

The inert gas from the valve 4 at a pressure of $3 \times 10$ kg/cm^2 operates the piston 10 which opens the non-return valve 15 so that the component in the tank 8 can flow through the duct 16 to the mixer 9.

When the piston 10 reaches the end of its stroke the passage 17 is freed and the gas passes to the piston 11 and opens the non-return valve 18 so that the components in the tank 7 can flow through the duct 19 to the mixer 9.

When the piston 11 reaches the end of its stroke the passage 20 is freed and the gas passes through the distributor 12 and the valves 13 and 14 to the tanks 7 and 8 where it exerts thrust on the two respective components which are pushed toward the mixer 9 through the outlet valves 15 and 18.

The device is completed by heating means, consisting of armoured electrical resistances supplied by battery, for the two components.

Said components are two monomers which when appropriately mixed give rise to a reaction and form a foamed resin.

One of the two components consists preferably of an isocyanate of the type commonly used in packaging technology.

The other component consists preferably of a polyol of the type commonly used in packaging technology.

The reaction of the polyol with the isocyanate gives rise to the formation of very rapidly solidifying polyurethane foam.

Substances used as components for the present invention are for example A 300/B RECTICEL, A/300 RECTICEL, 600.3.10/A PLASCOFOAM and 600.3.10/B PLASCOFOAM (Montedison).

The gas used can be any of the inert gases and preferably nitrogen and its pressure in the bottles 2 goes from 50 to 200 kg/cm^2.

In the case of application for trucks carrying valuables, bottles having a volume of less than 500 ml, which have advantages for certification and space occupation, are preferred.

The temperature of the components in their respective containers is kept between 40 °C and 50 °C so as to achieve high reaction speed.

Variants of the equipment described can be made while remaining within the scope of the invention.

In a preferred embodiment, as shown in FIG. 3, the tanks 7 and 8 are parallelepiped in form and made of aluminium.

They are mounted with extreme ease in a box-like insulated cabinet 21, from which they are removed for periodic replacement with equal ease.

In the dividing partition of said cabinet there are provided the outlet valves 15 and 18 and the inert gas supply valves 13 and 14, not shown, for connection of the containers 7 and 8 with the inert gas circuit and the mixer 9.

In the compartment 23 of the cabinet are mounted the pneumatic unit of FIG. 1, the hydraulic circuit of FIG. 2 and the electric control circuit.

In the floor of said cabinet there are provided two electric resistances for heating the tanks.

The cabinet is equipped with electrical connections, an event recorder and a control panel with audio and visual trouble signaling.

It is designed for fixing with bolts to the floor of a truck and is closed by lock and key from the front door 22.

The device in accordance with the present invention operates as follows, in case of an attempt of robbery:

- by means of relays the electromagnets 1 are energized, so that the valves 15 and 18 are opened through the circuits described;
- the two components contained in the tanks 7 and 8, pushed by the inert gas into the static mixer 9, mix together and are discharged in a few seconds; and
- in the following 30 seconds the foam formed by the reaction expands and solidifies, filling the volume of the room to be protected and covering all the valuables guarded.

In addition the solidified foam exerts pressure on the door of the room and prevents opening thereof.

In the expansion phase it is not possible to stop the process and it is only possible to remove the resin mechanically, which takes a long time, not available to the robber. Any attempt to burn the product would cause the production of toxic gases.

The description given above shows clearly how the device in accordance with the invention constitutes a safe and always reliable means of thwarting the robbing of valuables. It is applicable to armoured trucks carrying valuables, in luggage compartments for carrying jewels, armoured vaults of banks, etc. In particular, in the case of application in motor vehicles, it can be embodied as a third seat.

In the device shown in FIG. 4 reference number 30 indicates two pressurized gas bottles and reference numbers 31a and 31b indicate the tanks containing the two components of a two component resin, installed in a container 32 and equipped with insulating walls 33.

The tanks 31a and 31b are equipped with
ducts 34, hermetic plugs 35 and safety valves 36. Inside them are placed heating resistances 37 and probes 38 operationally connected to thermostats 39 for control of the temperature of the resin components.

The bottles 30 are equipped with unions 40 with a hermetically sealing membrane, and with means of activation consisting of pyrotechnic cartridges 41 operated by sparking by means of the operating pushbutton 43.

The unions 40 are connected by means of the ducts 44 to the manifold 45 from which depart pairs of ducts 46, connected by means of the pressure reducers 47 and non-return valves 48, to the tanks 31a and 31b and pairs of ducts 49 connected to the cylinders of the pistons 50 equipped with punches 51, capable of cutting the plugs 35 of the tanks 31a, 31b.

The outlet ducts 52 of the tanks 31a, 31b are connected by means of non-return valves 53 to the static mixer 54.

When the starting command has been given with the pushbutton 43 a spark activates the pyrotechnic cartridges 41 which control opening of the bottles 30 and delivery of the gas contained therein to the manifold 45, whence it is distributed through the reducers 47 and the non-return valves 48 to the tanks 31a, 31b and the pistons 50 which, pushed to the end of stroke, break the plugs 35.

The gas entering the tanks 31a, 31b pushes the resin components through the ducts 34 and upon the opening of the plugs 35, to the outlet ducts 52, to be mixed in the static mixer 54.

The components, previously heated by means of the resistances 37, are converted in a few seconds into a very rapidly solidifying polyurethane foam as described for the device shown in FIGS. 1-3.

The device shown in FIG. 5 is similar to the one shown in FIG. 4, but in this case the tanks 31a and 31b of the two components are insulated separately by insulating layers 33a and 33b and the ducts 60 feed gas under pressure through the reducers 47 to the cylinders of the pistons 50 and the ducts 61, which are connected to the tanks 31a and 31b, when said pistons 50 are at their end of stroke.

For the rest, the device of FIG. 5 is similar to and operates like that of FIG. 4.

Claims

1. Foam producing antirobbery device for armoured trucks carrying valuables and the like characterized in that it comprises a tank (7, 31a) containing one component of a two-component resin, a tank (8, 31b) containing the second component of said resin, and a mixer (9, 53) of the two components to form a foamed product which is discharged on the material to be protected, said components being supplied to the mixer (9, 54) on command by the thrust exerted by an inert gas which is let into said tanks at the time of use of the device.

2. Device in accordance with claim 1, characterized in that said inert gas is let into said tanks through a pneumatic unit comprising two bottles (2) containing the pressurized inert gas, a pressure reducer (3) and a 3-way valve (4) and a circuit comprising the pistons (10) and (11), a distributor (12) and two valves (13) and (14).

3. Device in accordance with claim 2, characterized in that said bottles (2) contain said inert gas at a pressure between 50 and 200kg/cm².

4. Device in accordance with claim 2, characterized in that said pressure reducer (3) reduces the pressure of said inert gas to values comprised between 3 and 10kg/cm².

5. Device in accordance with claim 2, characterized in that said pistons (10) and (11) open the valves (15) and (18) through which the components flow from the tanks (8) and (7) to the mixer (9).

6. Device in accordance with claim 1, characterized in that said tanks (7) and (8) are parallelepiped in form and made of aluminium.

7. Device in accordance with claim 1, characterized in that said mixer (9) is static.

8. Device in accordance with claim 1, characterized in that it is mounted in a boxlike insulated cabinet (21) comprising two electrical resistances for heating said tanks, an event recorder and a control panel with audio and visual trouble signalling.

9. Device in accordance with claim 1, characterized in that said inert gas is nitrogen.

10. Device in accordance with claim 1, characterized in that said components are two monomers which react to form a foamed resin.

11. Device in accordance with claim 10, characterized in that said components are respectively an isocyanate and a polyol of the type commonly used in packaging technology.

12. Device in accordance with claims 1 and 2, characterized in that said bottles (30) are connected operationally to activating means consisting of pyrotechnic cartridges (41) operated by a spark by means of an activating pushbutton (43).

13. Device in accordance with claim 1, characterized in that said tanks (31a, 31b) have insulated walls (33, 33a, 33b).

14. Device in accordance with claim 1, characterized in that said tanks (31a, 31b) have heating resistances (37) and probes (38) connected operationally to thermostats (39) for control of the temperature of said components.
fig 2
## DOCUMENTS CONSIDERED TO BE RELEVANT

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<tr>
<th>Category</th>
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<th>Relevant to claim</th>
<th>CLASSIFICATION OF THE APPLICATION (Int. Cl.5)</th>
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## TECHNICAL FIELDS SEARCHED (Int. Cl.5)

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The present search report has been drawn up for all claims.

Place of search: THE HAGUE  
Date of completion of the search: 24-07-1990

Examiner: KISING A.J.

### CATEGORY OF CITED DOCUMENTS

- X: particularly relevant if taken alone
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