Claim No. IP – 2015 - 000158

IN THE HIGH COURT OF JUSTICE
CHANCERY DIVISION
INTELLECTUAL PROPERTY ENTERPRISE COURT

ANGUS FIRE LIMITED

Claimant

- and -

COLD CUT SYSTEMS SVENSKA AB
(a company incorporated under the laws of Sweden)

Defendant

ANNEX I

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(54) METHOD AND EQUIPMENT FOR USE IN RESCUE SERVICE

VERFAHREN UND AUSRÜSTUNG FÜR RETTUNGSDIENSTE

PROCEDE ET EQUIPEMENT DESTINES A ETRE UTILISES PAR UN SERVICE DE SAUVETAGE

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(73) Proprietor: Cold Cut Systems Svenska AB
400 70 Göteborg (SE)

(72) Inventors:
- LARSSON, Lars, G.
S-429 44 Särö (SE)
- LARSSON, Arne
S-417 43 Göteborg (SE)

(74) Representative: Franzén, Lars Hjalmar et al
AWAPATENT AB
P.O. Box 11394
404 28 Göteborg (SE)

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Description

[0001] The present invention relates to a method and to equipment for use in rescue service operations generally, for making at least one hole in structures, such as buildings of various kinds, cisterns, tanks and containers designed for various purposes, vehicles, trains and ships, etcetera, in case of accidents or other emergency situations to allow evacuation of gases and liquids and to rescue lives and property, etcetera, and for making holes in roofs, walls, etcetera in fighting fires in structures of the kind outlined above, for the purpose of venting combustion gases and particularly for fire-extinguishing purposes.

[0002] Briefly speaking, combustion-gas venting involves controlling, in the case of fires, the extension and development of the fire by affecting the gases that generate during the fire. In practical terms this means cooling the combustion gases and discharging them into the ambient atmosphere via holes that are being made for that purpose, or via hatches, windows, lanterns, skylights and the like. The purpose of combustion-gas venting is, primarily, to allow safe evacuation of humans and livestock and to improve the possibilities of saving lives and property, to offer the rescue personnel increased extinguishing and penetration possibilities and to contain the fire and reduce excess pressures and temperatures, and so on.

[0003] Hole-making for fire venting and fire fighting purposes is at present effected essentially by means of such hand-held implements as axes, crowbars and break-up iron bars, angular grinding and/or cutting machines, etcetera. More recent equipment and methods use explosive frames, whereby holes are made with the aid of explosions. Explosive frames for this purpose are, however, comparatively expensive and contain explosives, with ensuing strict requirements on above all storage and handling conditions.

[0004] Irrespective of whether hand-operated implements and/or explosive frames or the like are used, working with this kind of equipment is very dangerous, both because the rescue personnel need to walk on for instance large flat or more or less steeply inclined roofs on the building on fire in order to make the holes, and because the very handling of the implements and the explosive frames is hazardous, involving risks that the individuals be thrown or clamped and, when explosive frames are used, risks of premature detonation.

[0005] GB-A-2019213 relates to a method of extinguishing fire in an aircraft fuselage including the steps of firing a high pressure water jet at the fuselage, to cut a hole therein, and supplying fire extinguishing fluid through the hole. The assembly for carrying out the method comprises an annular boss having a central passage for supplying low pressure fire extinguishing fluid and a high pressure bore in its wall terminating in a jet nozzle to produce the water jet to cut the hole. Thus, two separate means, the nozzle for the high pressure water and the central passage for the low pressure fluid, are necessary to carry out the cutting and extinguishing tasks.

[0006] The main object of the present invention is to eliminate as far as possible the above referred-to hazards and disadvantages and to suggest a novel, efficient and safe method and equipment for use in rescue service operations for making holes in structures of the kind outlined in the introduction hereto.

[0007] With respect to the method, this main object is achieved in that the hole or holes are produced by means of cutting, using a pressurised liquid which while cutting is sprayed into the structure in question in the shape of a jet for allowing evacuation of gases and liquids and saving of lives and property.

[0008] With respect to the equipment, this main object is achieved by the provision of a source of pressurised medium having an outlet for a pressurised liquid, of a conduit, and of a nozzle having an inlet and an outlet, said conduit being connected at one of its ends to the outlet of the source of pressurised medium and at its opposite end to the inlet of the nozzle for supply of pressurised fluid from the source of pressurised medium to the outlet of the nozzle, from which the liquid in the form of a jet is caused to be discharged and to be directed towards the structure in question, in order to cut through said structure to form said number of holes, and in connection with said cut-through to be sprayed into the structure in the form of a jet to evacuate gases and liquid and to rescue lives and property.

[0009] A further object of the method is to suggest a method and equipment as defined above for making at least one hole in the roof, walls, etcetera for fighting fires in structures of the kind outlined in the afore-going for venting combustion gases and to extinguish fires.

[0010] With respect to the method, this further object is achieved in that the hole or holes are produced by means of cutting, using a pressurised liquid which while cutting is sprayed into the space on fire in the shape of a jet which rapidly evaporates and in doing so contributes to extinguishing the fire, the combustion gases being vented through the cut hole or holes.

[0011] The equipment for achieving this further object includes a source of pressurised medium having an outlet for a pressurised liquid, a conduit, and a nozzle having an inlet and outlet, said conduit being connected at one of its ends to the outlet of the source of pressurised medium and at its opposite end to the inlet of the nozzle, for supply of pressurised fluid from the source of pressurised medium to the outlet of the nozzle, from which the liquid in the form of a jet is caused to be discharged and to be directed towards the roof, the wall, etcetera, in order to cut through said roof, wall, etcetera to form said at least one hole, and in connection with said cut-through to be sprayed into the structure in question on fire in order to assist in extinguishing the fire.

[0012] In accordance with the teachings of the invention a very rapid, efficient and above all safe method and

equipment are provided for use in rescue service operations for making holes in structures of the kind defined in the introduction, particularly for making holes in structures on fire of the kind defined above.

[0013] Experiments show that conventionally structured roof comprising e.g. external roofing sheets, insulation and internal roofing sheets having a total thickness of 20-30 cm was cut through in only a few seconds, and in the case of the most difficult experiment, the cutting speed amounted to 1 m/min. The considerable safety offered by the method and the equipment is related to the fact that contrary to the case when cutting tools, explosive frames and similar equipment are used, the inventive method and equipment do not in themselves generate heat and/or sparks.

[0014] The invention will be described in closer detail in the following with reference to the accompanying drawings wherein is illustrated an at presently particularly preferred embodiment among several possible ones. In the drawings:

Fig 1 is a schematic perspective view as seen obliquely from the front, of a fire-brigade vehicle in position of transport, in the subject case a vehicle including elevating equipment in the form of an hydraulic platform on which the equipment in accordance with the invention is mounted,

Fig 2 is a similar perspective view of the same vehicle as in Fig 1 but showing the vehicle and the equipment in one of several possible fire-fighting positions,

Fig 3 is a lateral view of the upper part of the vehicle which supports an operator's cage, parts of the equipment in accordance with the invention assuming the roof hole-making position, and

Fig 4 is a view from above of the operator's cage and the equipment of Fig. 3.

[0015] In accordance with the inventive method for making holes in a roof 1, see Fig. 4, walls, doors, etcetera of a building or the like, not shown in more detail, in the case of a fire 2, for the purpose of allowing venting of combustion gases and fire extinction, the hole is produced by cutting, using a pressurised liquid 3 which while cutting is sprayed into a space 4 on fire in the building, etcetera on fire in the shape of a jet 5 which rapidly evaporates and in doing so contributes to extinguishing the fire 2, the combustion gases 6 being vented through the cut hole.

[0016] Normally, the liquid is ordinary water but as a rule one or several liquids and/or particulate additives are added thereto in order to enhance the hole-making and/or extinguishing properties. One such additive is an abrasive 14, such as a blasting medium which contains sand or other abrasive substances that increase the cutting speed for penetration of the roof 1 , etcetera. Another additive may be a foaming agent or the like which, when the liquid 3 is being sprayed into the burning space 4, generates foam for the purpose of jointly with the vapour that forms simultaneously, rapidly lowering the temperature in the fire 2, thus further contributing to efficient fire-extinction. Prior to being vapourised, the jet 5 of liquid is converted into a mist 30 of finely divided liquid in order to additionally contribute to efficient fire-extinction.

[0017] The equipment generally designated in the drawing figures by numeral reference 7 for application of the above method comprises the following main components, viz. a source 8 of pressurised medium having an outlet 9 for the pressurised liquid 3, a conduit 10, and a nozzle 11 having an inlet 12 and and outlet 13. The conduit 10 is connected at one of its ends to the outlet 9 of the source 8 of pressurised medium and at its opposite end to the inlet 12 of the nozzle 11 for supply of the pressurised fluid from the source 8 of pressurised medium to the outlet 13 of the nozzle 11. The pressurised liquid 3 in the form of the above-mentioned jet 5 is caused to be discharged and be directed towards the roof 1, the wall, etcetera, so as to cut through said roof, wall, etcetera, thus forming a hole, and in connection with said cut-through to be sprayed into the space 4 on fire in order thus to assist in extinguishing the fire 2.

[0018] The above-described equipment 7 likewise comprises a vessel 15 containing the above defined abrasive 14. The vessel 15 is connected to the conduit 10 at a point intermediate the source 8 of pressurised medium and the nozzle 11 for adjustable addition of the abrasive 14 to the liquid 3 in order to enhance the hole-making and cutting efficiency as mentioned above.

[0019] In the shown and preferred embodiment described above, the source 8 of pressurised medium preferably is formed by a high-pressure pump 17 which is driven by a motor 16. As is the case in the shown embodiment, the motor may be a hydraulic motor, in turn being driven by a pump or an engine, not shown, for instance an internal combustion engine. The motor 16 as well as the high-pressure pump 17 are of a more or less conventional design. The capacity of the high-pressure pump 17 is such that the pump may deliver pressurised liquid 3 at a pressure in the order of 100-300 bar, preferably about 200 bar, and at a flow rate in the order of 20-60 l/min, preferably about 40 l/min. In some applications the pressure may exceed the values above and amount to say 400 bars or more, and also the flow rate may exceed that mentioned above and amount to say 100 l/min or more.

[0020] The nozzle 11 forming part of the equipment 7 is supported at the outer free end of an arm 18. This arm is mounted for movement in all directions when actuated by an actuation means 19, preferably an hydraulic piston-and-cylinder unit. A bracket 20 is connected to the arm 18 at the outer free end thereof and supports a power-operated rotator 21, which preferably is driven by hydraulic means. On the rotator is mounted an essentially circular cylindrical holder 23 which is rotatable about a centre axis 22 and which is formed at its end remote

from the rotator 21 with a support 24 positioned in the centre axis 22. Preferably, the support is configured as a more or less pointed stud designed for supporting abutment against the roof 1, wall, etcetera.

[0021] The nozzle 11 is connected to the holder 23 and is positioned essentially in parallel with the centre axis 22 in spaced relationship thereto such that said nozzle 11, upon rotation of the holder by means of the rotator 21, is caused to orbit the centre axis and in doing so cut an essentially circular hole 25 in the roof 1, wall, etcetera.

[0022] By pivoting the movable arm 18 by means of the actuating means 19, see Fig. 4, at least one hole 25 may be made adjacent one another and so as to partly overlap, see Fig. 4, thus allowing a larger hole 26 (the hatched area in Fig. 4) to be produced for additionally efficient combustion-gas venting and fire extinction.

[0023] Depending on the size and mass of the components incorporated in the equipment described so far, the entire equipment or parts thereof may be carried by hand/hand-held. It is, however, preferred to install the entire equipment on a vehicle 27, preferably a fire-brigade motor vehicle, a trailer hauled by such a vehicle or, most preferable, on such an elevating mechanism as the hydraulic platform illustrated in the drawing figures. The mechanism is equipped with an operator's cage 28 and at its end remote from the nozzle 11 the arm 18 is movably connected to the operator's cage. In this case the conduit 10 extends between the operator's cage 28 and the chassis 29 of the fire-brigade vehicle 27 or the like on which the motor 16, the high-pressure pump 17, and the vessel 15 containing the abrasive 14 are mounted together with ancillary operating equipment and accessories.

[0024] To obviate the need for the rescue personnel to walk on the roof 1, etcetera of the building on fire, and to thus further enhance safety, the equipment, at least the arm 18 and the nozzle 11, are telecontrolled via the actuating means 19 and/or the rotator 21 from the operator's cage 28 and/or from some other place spaced from the area immediately adjacent the hole-making area.

[0025] It is to be understood that the invention should not be regarded as restricted to the embodiment as described and illustrated but that it could be modified optionally in many ways within the scope of the protection as defined in the appended claims.

Claims

1. A rescue service method for making at least one hole in roofs (1), walls, etcetera, in case of fire (2) in spaces (4) in structures such as buildings of various kinds, cisterns, tanks and containers designed for various purposes, vehicles, trains and ships, etcetera, for the purpose of combustion-gas venting and fire extinction, wherein said at least one hole is produced by cutting, using a pressurised liquid (3) which while cutting is sprayed into the space (4) on fire in the shape of a jet (5) which is transformed into a mist of atomised liquid (30) and rapidly evaporates and in doing so contributes to extinguishing the fire (2), the combustion gases (6) being vented through the cut hole or holes (25), said pressurised liquid (3) containing an abrasive (14) or an abrasive (14) being added thereto.

2. Equipment for rescue service operations for making at least one hole in roofs (1), walls, etcetera, in case of fire (2) in spaces (4) in structures such as buildings of various kinds, cisterns, tanks and containers designed for various purposes, vehicles, trains and ships, etcetera, for the purpose of combustion-gas venting and fire extinction, comprising a source of pressurised medium (8) having an outlet (9) for a pressurised liquid (3), a conduit (10), a nozzle (11) having an inlet (12) and outlet (13), said conduit being connected at one of its ends to the outlet (9) of the source of pressurised medium (8) and at its opposite end to the inlet (12) of the nozzle (11) for supply of the pressurised liquid (3) from the source (8) of pressurised medium to the outlet (13) of the nozzle (11), from which the pressurised liquid (3) in the form of a jet (5) is caused to be discharged and to be directed towards the roof (1), the wall, etcetera, in order to cut through said roof, wall, etcetera to form said at least one hole, and in connection with said cut-through to be sprayed into the space (4) on fire in order to assist in extinguishing the fire (2), and at least one vessel (15), which contains an abrasive (14) and is connected to the conduit (10) at a point intermediate the source (8) of pressurised medium and the nozzle (11) for adjustable addition of the abrasive (14) to the pressurised liquid (3) to reinforce the cutting efficiency, said nozzle (11) being disposed at the outer free end of an arm (18) which is movable in all directions.

Replace with Amended Claims 2 to 2G attached

3. Equipment as claimed in claim 2, wherein the arm (18) is movable in all directions by means of an actuating means (19), wherein a bracket (20) is connected to the arm (18) at the outer free end thereof so as to support a power-operated rotator (21) on which a holder (23) is mounted for rotation about a centre axis (22), said holder (22) presenting at its end remote from the rotator (21) a support (24) arranged to supportingly abut against the roof (1), wall, etcetera, and wherein the nozzle (11) is connected to the holder (23) and is positioned in parallel with the centre axis (22) in spaced relationship thereto such that said nozzle (11), upon rotation of the holder (23) by means of the rotator (21), is caused to orbit the centre axis and in doing so cut an essentially circular hole (25) in the roof (1), wall, etcetera.

4. Equipment as claimed in claim 2 or 3, wherein it is installed in a fire-brigade motor vehicle, preferably a motor vehicle including elevating equipment comprising an operator's cage (28), said arm (18) being movably attached to the cage (28) at its end remote from the nozzle (11), said conduit (10) extending between the operator's cage and the chassis (29) or the like of the fire-brigade vehicle (27) on which the source (8) of pressurised medium, the vessel (15) containing the abrasive as well as ancillary equipment are mounted.

5. Equipment as claimed in any one of claims 2-4, wherein at least the arm (18) and the nozzle (11) are telecontrolled via the actuating means (19) and/or the rotator (21) from the operator's cage (28) and/or from some other place spaced from the area immediately adjacent the hole-making area.

Patentansprüche

1. Verfahren für Rettungsdienste, um zum Zweck der Abführung von Brandgasen und des Löschens von Bränden bei Brand (2) in Räumen (4) von Strukturen wie Gebäuden verschiedener Art, Zisternen, Tanks und Behältern, die für verschiedene Zwecke ausgelegt sind, Fahrzeugen, Zügen und Schiffen usw. zumindest ein Loch in Dächern (1), Wänden usw. zu machen, dadurch gekennzeichnet, dass das zumindest eine Loch durch Schneiden unter Einsatz eines unter Druck stehenden Flüssigkeit (3) erzeugt wird, die während des Schneidens in Gestalt eines Strahls (5), der in einen Nebel zerstäubter Flüssigkeit (30) umgewandelt wird, rasch verdampft und dabei zum Löschen des Feuers (2) beiträgt, in den brennenden Raum (4) eingesprüht wird, wobei die Brandgase (6) durch das geschnittene Loch bzw. die geschnittenen Löcher (25) abgeführt werden und die unter Druck stehende Flüssigkeit (3) ein Schleifmittel (14) enthält oder ihr ein Schleifmittel (14) hinzugefügt wird.

2. Ausrüstung für Rettungsdienste, um zum Zweck der Abführung von Brandgasen und des Löschens von Bränden bei Brand (2) in Räumen (4) von Strukturen wie Gebäuden verschiedener Art, Zisternen, Tanks und Behältern, die für verschiedene Zwecke ausgelegt sind, Fahrzeugen, Zügen und Schiffen usw. zumindest ein Loch in Dächern (1), Wänden usw. zu machen, eine Quelle für ein unter Druck stehendes Medium (8) umfassend, die eine Austrittsöffnung (9) für eine unter Druck stehende Flüssigkeit (3), einen Kanal (10) und eine Düse (11) mit einer Eintrittsöffnung (12) und einer Austrittsöffnung (13) besitzt, wobei der Kanal an einem seiner Enden mit der Austrittsöffnung (9) der Quelle des unter Druck stehenden Mediums (8) verbunden ist, an seinem entgegengesetzten Ende aber mit der Eintrittsöffnung (12) der Düse (11) für die Zufuhr der unter Druck stehenden Flüssigkeit (3) aus der Quelle (8) des unter Druck stehenden Mediums zur Austrittsöffnung (13) der Düse (11), aus der die unter Druck stehende Flüssigkeit (3) in Gestalt eines Strahles (5) entlassen und gegen das Dach (1), die Wand usw. gerichtet wird, um zumindest ein Loch durch das Dach, die Wand usw. zu schneiden, sowie in Verbindung mit der geschnittenen Öffnung in den brennenden Raum (4) gesprüht wird, um beim Löschen des Feuers (2) zu helfen, sowie zumindest ein Gefäss (15), das ein Schleifmittel (14) enthält und zur regulierbaren Zugabe des Schleifmittels (14) zu der unter Druck stehenden Flüssigkeit (3) an einem Punkt zwischen der Quelle (8) des unter Druck stehenden Mediums und der Düse (11) mit dem Kanal (10) verbunden ist, um die Schneidleistung zu verbessern, wobei die Düse (11) am äusseren freien Ende eines Armes (18) angeordnet ist, der in allen Richtungen bewegt werden kann.

3. Ausrüstung, wie in Anspruch 2 beansprucht, dadurch gekennzeichnet, dass der Arm (18) durch ein Betätigungsorgan (19) in allen Richtungen bewegt werden kann, wobei ein Bügel (20) so am äusseren freien Ende des Armes (18) angebracht ist, dass er einen motorgetriebenen Rotor (21) stützt, an dem ein Halter (23) zur Drehung um eine zentrale Achse (22) montiert ist, wobei der Halter (22) an seinem vom Rotor (21) abgewandten Ende einen Träger (24) aufweist, der so ausgelegt ist, dass er als Stütze auf dem Dach (1), der Wand usw. aufliegt, und wobei die Düse (11) so mit dem Halter (23) verbunden und mit Abstand parallel zur zentralen Achse (11) angeordnet ist, dass die Düse (11) bei Drehung des Halters (23) durch den Rotor (21) veranlasst wird, um die zentrale Achse zu kreisen und dabei ein im Wesentlichen kreisrundes Loch (25) in das Dach (1), die Wand usw. zu schneiden.

4. Ausrüstung, wie in Anspruch 2 oder 3 beansprucht, dadurch gekennzeichnet, dass es in einem Feuerlösch-Motorfahrzeug und bevorzugt in einem Motorfahrzeug installiert ist, das eine Hebeausrüstung mit einer Führerkabine (28) umfasst, wobei der Arm (18) mit seinem der Düse (11) abgewandten Ende beweglich an der Kabine (28) angebracht ist, der Kanal (10) sich zwischen der Führerkabine und dem Untergestell (29) oder dergleichen des Feuerwehrfahrzeugs (27) erstreckt, auf dem die Quelle (8) des unter Druck stehenden Mediums, das das Schleifmittel enthaltende Gefäss (15) sowie Hilfsausrüstungen montiert sind.

5. Ausrüstung wie in einem der Ansprüche 2 bis 4 beansprucht, dadurch gekennzeichnet, dass zumindest der Arm (18) und die Düse (11) über da

Betätigungsorgan (19) und/oder den Rotor von der Führerkabine (28) und/oder von einem anderen, von der unmittelbaren Umgebung des Ortes des zu brechenden Loches beabstandeten Ort aus ferngesteuert werden.

Revendications

1. Procédé pour service de sauvetage destiné à réaliser au moins un trou dans des toits (1), des murs, etc., dans le cas d'un incendie (2) à l'intérieur d'espaces (4) dans des structures telles que des bâtiments de divers types, des citernes, des cuves et des conteneurs conçus à diverses fins, des véhicules, des trains et des bateaux, etc., afin d'évacuer les gaz de combustion et d'éteindre l'incendie, dans lequel ledit au moins un trou est réalisé par découpage, en utilisant un liquide sous pression (3) qui, lors du découpage, est pulvérisé à l'intérieur de l'espace (4) en feu sous la forme d'un jet (5) qui se transforme en un brouillard de liquide atomisé (30) et qui s'évapore rapidement et de cette manière contribue à éteindre l'incendie (2), les gaz de combustion (6) étant évacués par le trou ou les trous (25) découpés, ledit liquide sous pression (3) contenant un agent abrasif (14) ou un agent abrasif (14) étant ajouté à celui-ci.

2. Equipement destiné à des opérations de service de sauvetage destiné à réaliser au moins un trou dans des toits (1), des murs, etc. dans le cas d'un incendie (2) à l'intérieur d'espaces (4) dans des structures telles que des bâtiments de divers types, des citernes, des cuves et des conteneurs conçus à diverses fins, des véhicules, des trains et des bateaux, etc., afin d'évacuer les gaz de combustion et d'éteindre l'incendie, comprenant une source de milieu sous pression (8) comportant une sortie (9) pour un liquide sous pression (3), un tuyau (10), un bec de lance (11) comportant une entrée (12) et une sortie (13), ledit tuyau étant relié à l'une de ses extrémités à la sortie (9) de la source du milieu sous pression (8) et à son extrémité opposée à l'entrée (12) du bec de lance (11) pour une alimentation du liquide sous pression (3) depuis la source (8) du milieu sous pression vers la sortie (13) du bec de lance (11), à partir duquel le liquide sous pression (3) sous la forme d'un jet (5) est amené à être évacué et à être dirigé en direction du toit (1), du mur, etc., de manière à réaliser un découpage à travers ledit toit, ledit mur, etc. pour former ledit au moins un trou, et en association avec ledit découpage, à être pulvérisé à l'intérieur de l'espace (4) en feu de manière à contribuer à l'extinction de l'incendie (2), et au moins un récipient (15) qui contient un agent abrasif (14) et est relié au tuyau (10) à un endroit entre la source (8) du milieu sous pression et le bec de lance (11) pour un ajout ajustable de l'agent abrasif (14) au liquide sous pression (3) afin de renforcer l'efficacité du découpage, ledit bec de lance (11) étant disposé à l'extrémité libre extérieure d'un bras (18) qui est mobile dans toutes les directions.

3. Equipement selon la revendication 2, dans lequel le bras (18) est mobile dans toutes les directions au moyen d'un moyen d'actionnement (19), dans lequel une patte (20) est reliée au bras (18) à son extrémité libre extérieure de façon à supporter un dispositif de rotation commandé par moteur (21) sur lequel un support (23) est monté pour une rotation autour d'un axe central (22), ledit support (22) présentant à son extrémité distante du dispositif de rotation (21) un élément d'appui (24) agencé pour venir en butée avec appui contre le toit (1), le mur, etc., et où le bec de lance (11) est relié au support (23) et est positionné de façon parallèle à l'axe central (22) suivant une relation espacée par rapport à celui-ci de sorte que ledit bec de lance (11), lors de la rotation du support (23) au moyen du dispositif de rotation (21), est amené à tourner en orbite autour de l'axe central et de cette manière à découper un trou pratiquement circulaire (25) dans le toit (1), le mur, etc.

4. Equipement selon la revendication 2 ou 3, dans lequel il est installé dans un véhicule à moteur de pompier, de préférence un véhicule à moteur comprenant un équipement d'élévation ayant une nacelle d'utilisateur (28), ledit bras (18) étant fixé de façon mobile à la nacelle (28) à son extrémité distante du bec de lance (11), ledit tuyau (10) s'étendant entre la nacelle de l'utilisateur et le châssis (25) ou autre du véhicule de pompier (27) sur lequel la source (8) du milieu sous pression, le récipient (15) contenant l'agent abrasif de même qu'un équipement auxiliaire sont montés.

5. Equipement selon l'une quelconque des revendications 2 à 4, dans lequel au moins le bras (18) et le bec de lance (11) sont télécommandés par l'intermédiaire du moyen d'actionnement (19) et/ou du dispositif de rotation (21) depuis la nacelle de l'utilisateur (28) et/ou depuis un autre endroit distant de la zone immédiatement adjacente à la zone où on réalise le trou.

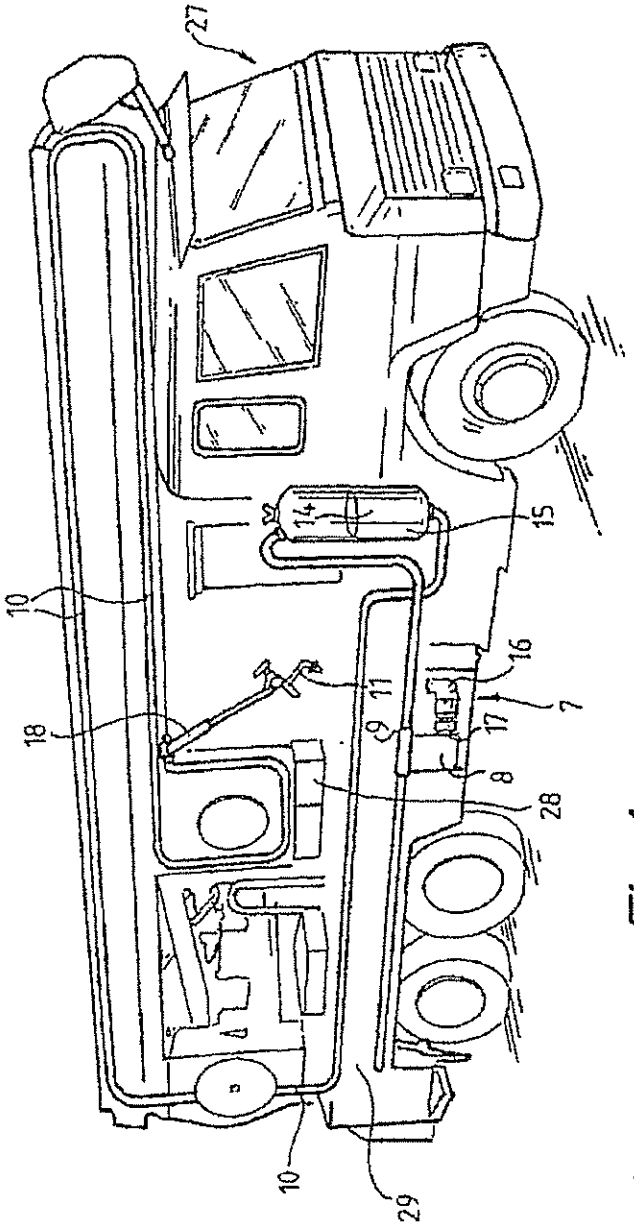

Fig. 1

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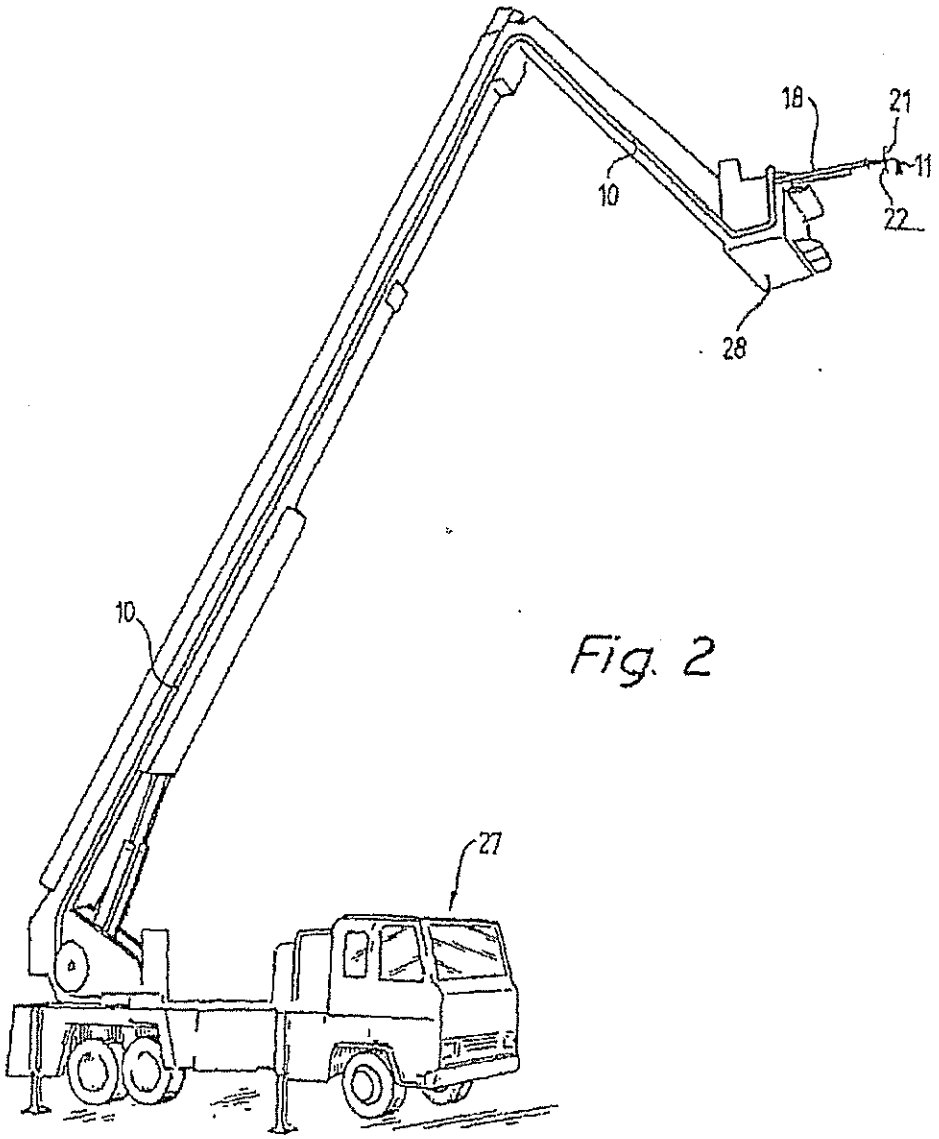

Fig. 2

8

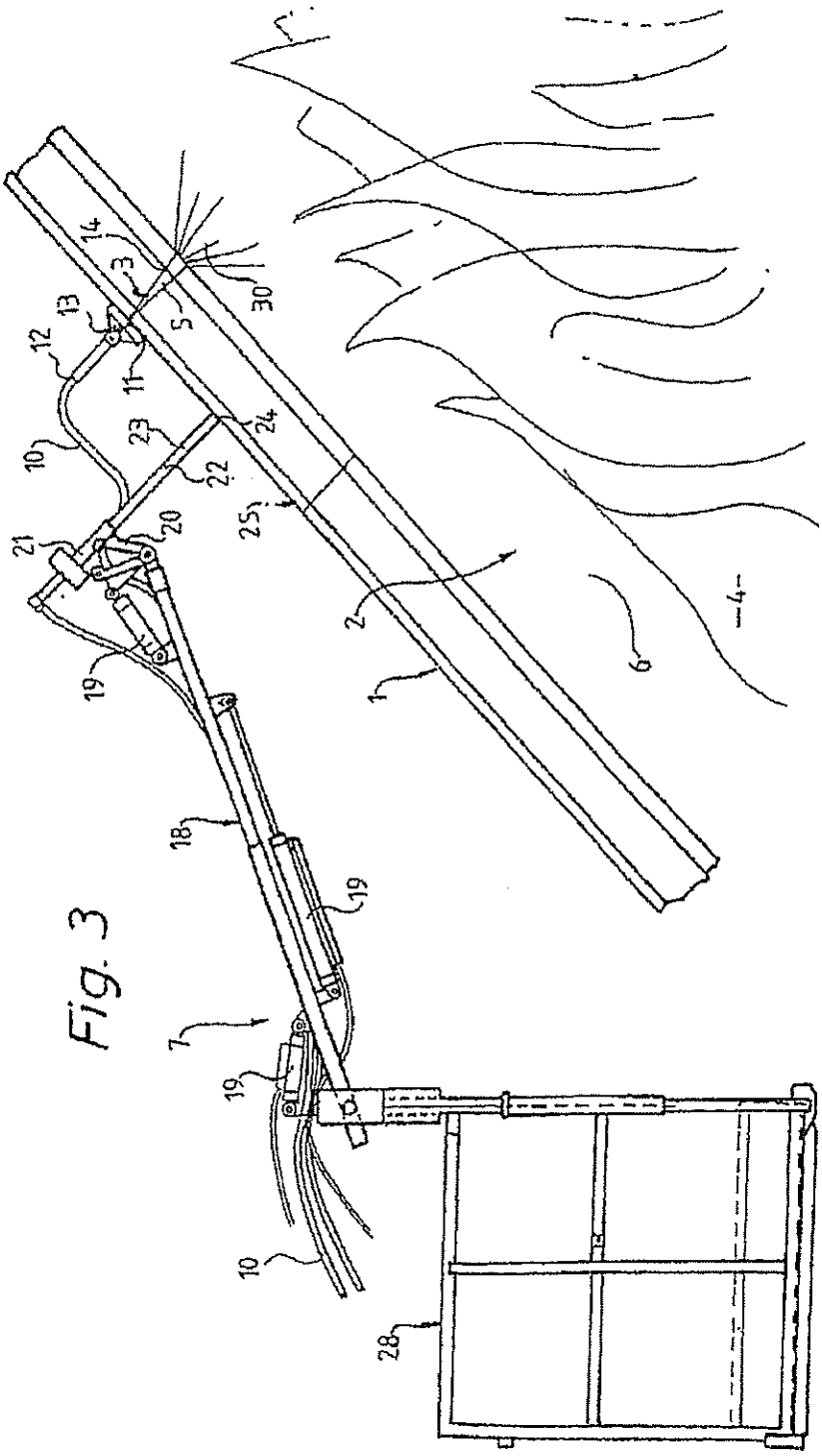

Fig. 3

9

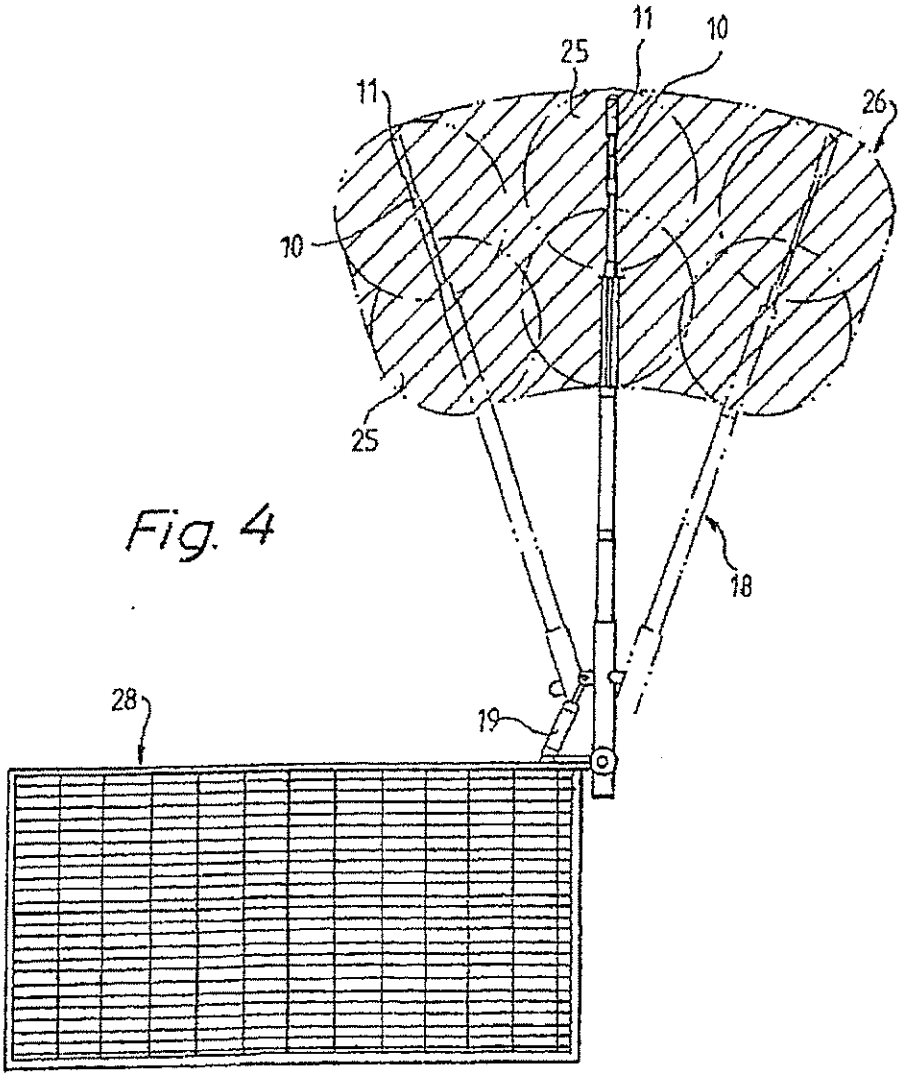

Fig. 4

Annex I

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2. Equipment for rescue service operations for making at least one hole in roofs (1), walls, etcetera, in case of fire (2) in spaces (4) in structures such as buildings of various kinds, cisterns, tanks and containers designed for various purposes, vehicles, trains and ships, etcetera, for the purpose of combustion-gas venting and fire extinction, comprising a source of pressurised medium (8) having an outlet (9) for a pressurised liquid (3), a conduit (10), a nozzle (11) having an inlet (12) and outlet (13), said conduit being connected at one of its ends to the outlet (9) of the source of pressurised medium (8) and at its opposite end to the inlet (12) of the nozzle (11) for supply of the pressurised liquid (3) from the source (8) of pressurised medium to the outlet (13) of the nozzle (11), from which the pressurised liquid (3) in the form of a jet (5) is caused to be discharged and to be directed towards the roof (1), the wall, etcetera, in order to cut through said roof, wall, etcetera to form said at least one hole, and in connection with said cut-through to be sprayed into the space (4) on fire in order to assist in extinguishing the fire (2) **and transformed into a mist of atomised liquid (30) which rapidly evaporates and in doing so contributes to extinguishing the fire (2)**, and at least one vessel (15), which contains an abrasive (14) and is connected to the conduit (10) at a point intermediate the source (8) of pressurised medium and the nozzle (11) for adjustable addition of the abrasive (14) to the pressurised liquid (3) to reinforce the cutting efficiency, said nozzle (11) being disposed at the outer free end of an arm (18) which is movable in all directions.

2A. Equipment for rescue service operations for making at least one hole in roofs (1), walls, etcetera, in case of fire (2) in spaces (4) in structures such as buildings of various kinds, cisterns, tanks and containers designed for various purposes, vehicles, trains and ships, etcetera, for the purpose of combustion-gas venting and fire extinction, comprising a source of pressurised medium (8) having an outlet (9) for a pressurised liquid (3), a conduit (10), a nozzle (11) having an inlet (12) and outlet (13), **wherein the source of pressurised medium (8) is for delivery of liquid (3) at a pressure of 100 bar or more,** said conduit being connected at one of its ends to the outlet (9) of the source of pressurised medium (8) and at its opposite end to the inlet (12) of the nozzle (11) for supply of the pressurised liquid (3) from the source (8) of pressurised medium to the outlet (13) of the nozzle (11), from which the pressurised liquid (3) in the form of a jet (5) is caused to be discharged and to be directed towards the roof (1), the wall, etcetera, in order to cut through said roof, wall, etcetera to form said at least one hole, and in connection with said cut-through to be sprayed into the space (4) on fire in order to assist in extinguishing the fire (2), and at least one vessel (15), which contains an abrasive (14) and is connected to the conduit (10) at a point intermediate the source (8) of pressurised medium and the nozzle (11) for adjustable addition of the abrasive (14) to the pressurised liquid (3) to reinforce the cutting efficiency, said nozzle (11) being disposed at the outer free end of an arm (18) which is movable in all directions.

2B. Equipment for rescue service operations for making at least one hole in roofs (1), walls, etcetera, in case of fire (2) in spaces (4) in structures such as buildings of various kinds, cisterns, tanks and containers designed for various purposes, vehicles, trains and ships, etcetera, for the purpose of combustion-gas venting and fire extinction, comprising a source of pressurised medium (8) having an outlet (9) for a pressurised liquid (3), a conduit (10), a nozzle (11) having an inlet (12) and outlet (13), **wherein the source of pressurised medium (8) is for delivery of liquid (3) at a flow rate of 20 l/min or more,** said conduit being connected at one of its ends to the outlet (9) of the source of pressurised medium (8) and at its opposite end to the inlet (12) of the nozzle (11) for supply of the pressurised liquid (3) from the source (8) of pressurised medium to the outlet (13) of the nozzle (11), from which the pressurised liquid (3) in the form of a jet (5) is caused to be discharged and to be directed towards the roof (1), the wall, etcetera, in order to cut through said roof, wall, etcetera to form said at least one hole, and in connection with said cut-through to be sprayed into the space (4) on fire in order to assist in extinguishing the fire (2) and at least one vessel (15), which contains an abrasive (14) and is connected to the conduit (10) at a point intermediate the source (8) of pressurised medium and the nozzle (11) for adjustable addition of the abrasive (14) to the pressurised liquid (3) to reinforce the cutting efficiency, said nozzle (11) being disposed at the outer free end of an arm (18) which is movable in all directions.

2C. Equipment for rescue service operations for making at least one hole in roofs (1), walls, etcetera, in case of fire (2) in spaces (4) in structures such as buildings of various kinds, cisterns, tanks and containers designed for various purposes, vehicles, trains and ships, etcetera, for the purpose of combustion-gas venting and fire extinction, comprising a source of pressurised medium (8) having an outlet (9) for a pressurised liquid (3), a conduit (10), a nozzle (11) having an inlet (12) and outlet (13), **wherein the source of pressurised medium (8) is for delivery of liquid (3) at a pressure of 100 bar or more and at a flow rate of 20 l/min or more,** said conduit being connected at one of its ends to the outlet (9) of the source of pressurised medium (8) and at its opposite end to the inlet (12) of the nozzle (11) for supply of the pressurised liquid (3) from the source (8) of pressurised medium to the outlet (13) of the nozzle (11), from which the pressurised liquid (3) in the form of a jet (5) is caused to be discharged and to be directed towards the roof (1), the wall, etcetera, in order to cut through said roof, wall, etcetera to form said at least one hole, and in connection with said cut-through to be sprayed into the space (4) on fire in order to assist in extinguishing the fire (2) and at least one vessel (15), which contains an abrasive (14) and is connected to the conduit (10) at a point intermediate the source (8) of pressurised medium and the nozzle (11) for adjustable addition of the abrasive (14) to the pressurised liquid (3) to reinforce the cutting efficiency, said nozzle (11) being disposed at the outer free end of an arm (18) which is movable in all directions.

2D. Equipment for rescue service operations for making at least one hole in roofs (1), walls, etcetera, in case of fire (2) in spaces (4) in structures such as buildings of various kinds, cisterns, tanks and containers designed for various purposes, vehicles, trains and ships, etcetera, for the purpose of combustion-gas venting and fire extinction, comprising a source of pressurised medium (8) having an outlet (9) for a pressurised liquid (3), a conduit (10), a nozzle (11) having an inlet (12) and outlet (13), **wherein the source of pressurised medium (8) is for delivery of liquid (3) at a pressure of 100 bar or more and at a flow rate of 20 l/min or more,** said conduit being connected at one of its ends to the outlet (9) of the source of pressurised medium (8) and at its opposite end to the inlet (12) of the nozzle (11) for supply of the pressurised liquid (3) from the source (8) of pressurised medium to the outlet (13) of the nozzle (11), from which the pressurised liquid (3) in the form of a jet (5) is caused to be discharged and to be directed towards the roof (1), the wall, etcetera, in order to cut through said roof, wall, etcetera to form said at least one hole, and in connection with said cut-through to be sprayed into the space (4) on fire in order to assist in extinguishing the fire (2) **and transformed into a mist of atomised liquid (30) which rapidly evaporates and in doing so contributes to extinguishing the fire (2),** and at least one vessel (15), which contains an abrasive (14) and is connected to the conduit (10) at a point intermediate the source (8) of pressurised medium and the nozzle (11) for adjustable addition of the abrasive (14) to the pressurised liquid (3) to reinforce the cutting efficiency, said nozzle (11) being disposed at the outer free end of an arm (18) which is movable in all directions.

2E. Equipment as claimed in claims 2A to 2C, wherein the jet (5) is transformed into a mist of atomised liquid (30) and rapidly evaporates and in doing so contributes to extinguishing the fire (2).

2F. Equipment as claimed in claims 2, 2B or 2E (when dependent on claim 2B), wherein the source of pressurised medium (8) is for delivery of liquid (3) at a pressure of 100 bar or more.

2G. Equipment as claimed in claims 2, 2A or 2F (when dependent on claim 2) wherein the source of pressurised medium (8) is for delivery of liquid (3) at a flow rate of 20 l/min or more.

Notes:

1. These notes and the bold and underlined formatting are for the purpose of clarity and are not to be included in the final proposed amendment.
2. The bold underlining highlights integers which are to be added to old claim 2.
3. It may be preferable to renumber the claims when the court grants permission to amend.