



(51) International Patent Classification:

B05B 7/00 (2006.01) *B05B 7/08* (2006.01)
A62C 3/02 (2006.01) *B05B 15/652* (2018.01)
B05B 1/20 (2006.01) *B05B 15/68* (2018.01)

(21) International Application Number:

PCT/IB2018/059865

(22) International Filing Date:

11 December 2018 (11.12.2018)

(25) Filing Language:

English

(26) Publication Language:

English

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(81) Designated States (*unless otherwise indicated, for every
 kind of national protection available*): AE, AG, AL, AM,
 AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
 CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO,
 DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,

HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP,
 KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME,
 MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
 OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,
 SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
 TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

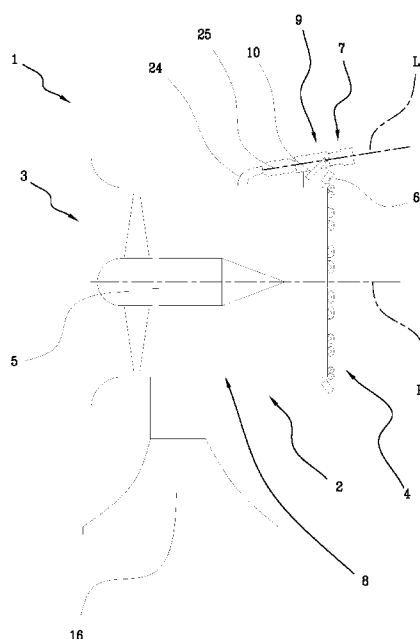
(84) Designated States (*unless otherwise indicated, for every
 kind of regional protection available*): ARIPO (BW, GH,
 GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ,
 UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
 TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
 EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
 MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
 TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
 KM, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- in black and white; the international application as filed
 contained color or greyscale and is available for download
 from PATENTSCOPE

(54) Title: A MACHINE FOR OUTPUTTING AT LEAST ONE JET OF FLUID AND CORRESPONDING METHOD

Fig.1



(57) Abstract: A machine (1) for outputting at least one jet of fluid comprises a tubular body (2), blowing means (5) operatively associated to the tubular body (2) for generating an air flow along a propagation direction (P), and a plurality of atomizing nozzles (6) operatively associated to the tubular body (2) so as to spray at least a first jet of fluid towards the air flow. Additionally, the machine (1) comprises an output mouth (7) positioned at an external surface (8) of said tubular body (2) for spraying a second jet of fluid substantially along a longitudinal direction (L) parallel to said propagation direction (P), and first orientation means (9) for orientating the output mouth (7) so as to vary the inclination of said longitudinal direction (L) of the second jet of fluid with respect to a direction parallel to said propagation direction (P) and passing through said output mouth (7).

A MACHINE FOR OUTPUTTING AT LEAST ONE JET OF FLUID AND CORRESPONDING METHOD

DESCRIPTION

Technical field

The present invention relates to a machine for outputting at least one jet of fluid, preferably a liquid.

Preferably, the machine is a cannon or gun for the emission of at least one
5 jet of fluid.

Particularly, the invention fits into the technical field of machine for dust abatement and/or odors abatement and/or fire mitigation through the emission of at least one jet of fluid, preferably a jet of water possibly added with a substance useful for this purpose.

10 Additionally, the invention relates to a method for outputting at least one jet of fluid in which the above mentioned machine is used.

Background art

Fires that break out at airports are particularly sensitive, as they are
15 closely related to saving lives.

Considering the large quantities of fuel, the potential danger of explosions and/or the development of considerable heat is particularly high. In these cases a useful time of a few minutes (generally two or three) is estimated for the intervention of the rescue vehicles. After this time the danger of
20 explosions increases exponentially and therefore it is preferable to move away.

Generally, the rescue vehicles are trucks equipped with "cannon" shaped devices capable of conveying huge jets of a specific fluid (e.g. water or a mixture of water added with foaming agents) for fire mitigation and/or,
25 possibly, for the abatement of odors and/or dust.

Nowadays, the "cannon" fire-fighting devices used include a tubular body into which an impeller (or blower or turbine) is inserted to create an outlet air flow. Additionally, they comprise a crown of spray nozzles arranged at

the outlet opening of the tubular body.

In this way, the nebulizer nozzles spray liquid into the outlet air flow to obtain a cloud of suspended drops that can help to low the temperature of the fire and they contain the fumes and/or dust produced to prevent them
5 from spreading into the environment.

However, it often happens that the fumes and/or dust produced by the fire propagate in a different direction from the point of origin of the fire. Therefore, the prior art has brought to light drawbacks related to the fact that it is not always possible to direct the cloud exactly and simultaneously
10 on all points of interest. In this case, therefore, it is necessary to use at least two different fire-fighting devices capable of acting independently on two different areas (for example, a cannon for fumes and/or odors and a fire-brigade hose that intervenes directly on the origin of the fire).

However, this means doubling the material required, the overall
15 dimensions, as well as the personnel and also the water supply systems at the fire site.

Disclosure of the invention

In this context, the technical task underlying the present invention is to
20 propose a machine for outputting a jet of fluid that overcomes the drawbacks of the prior art mentioned above.

In particular, it is an object of the present invention to provide a machine for outputting a jet of fluid that is able to reduce the intervention time to extinguish a fire or to eliminate dust and/or odors.

25 Another object of the present invention is to provide a machine for outputting a jet of fluid that is able to optimize the directionality of the jet of fluid with respect to the different areas of interest of a fire and/or those of interest for the propagation of dust.

In detail, a purpose of this invention is to provide a machine for outputting
30 a jet of fluid that is able to act simultaneously on two different areas of interest, providing better performance and reducing the use of devices.

Another purpose of this invention is to provide a machine for outputting a jet of fluid that is fully remotely controlled, for example via wireless technology, to reduce the risk to operators.

A further purpose of this invention is to provide a method for outputting at
5 least one flow of liquid applicable to the previously introduced machine.

The specified technical task and specified purposes are substantially achieved by a machine for outputting a jet of fluid and by a method for outputting at least one jet of fluid, which include the technical characteristics set out in the independent claims. The dependent claims
10 correspond to further advantageous aspects of the invention.

It should be noted that this summary introduces a selection of concepts in simplified form, which will be further developed in the detailed description below.

The invention is directed to a machine for outputting at least one jet of
15 fluid. In detail, the machine comprises a tubular body (which provides the characteristic cannon shape), blowing means, a plurality of atomizing nozzles, an output mouth and first orientation means.

The tubular body extends between an air inlet opening thereof and an air outlet opening thereof and blowing means are operatively associated to
20 the tubular body for generating an air flow along a propagation direction of the air, which one goes from the inlet opening towards the outlet opening. The plurality of atomizing nozzles are operatively associated to the outlet opening of the tubular body so as to spray at least a first jet of fluid towards the air flow generated along the propagation direction by the
25 blowing means. The output mouth is positioned at an external surface of the tubular body for spraying a second jet of fluid substantially along a longitudinal direction, which is parallel to the propagation direction of the air flow. Advantageously, the machine also comprises the first orientation means for orientating the output mouth so as to vary the inclination of the
30 longitudinal direction of the second jet of fluid with respect to a direction which is parallel to the propagation direction and it pass through the output

mouth. Additionally, the first orientation means comprise one or more actuating members commandable to regulate the orientation of the output mouth.

5 In other words, the output mouth defines a sort of "monitor" for the emission of a jet of fluid along the longitudinal direction. While the atomizing nozzles define a crown for the realization of a cloud of suspended liquid particles that are pushed forward the propagation direction by the airflow.

10 In this way, the machine is equipped to handle at least two different jets of fluid. The first jet of fluid is emitted by the atomizing nozzles towards the air flow in such a way that the latter transports the suspended drops towards the area of interest, forming a cloud such as to circumscribe any fire and/or the fumes and/or odors present.

15 The second jet of fluid, on the other hand, is emitted from the orientable output mouth (positioned outside the tubular body) by orientation means comprising at least one actuating element. Specifically, the actuating element manages the orientation means to orient the output mouth and so to adjust the inclination of the latter to orient, and eventually to modify in use and over time according to the need, the exit direction of the first flow
20 of fluid.

Preferably, the first orientation means are configured to vary the inclination of the longitudinal direction on a horizontal plane parallel to the propagation direction, or on a vertical plane incident to the propagation direction, or on a combination between the horizontal plane and the
25 vertical plane.

In this way, the variation of inclination can advantageously take place both with respect to a vertical direction and/or with respect to a horizontal direction to vary the range and the displacement of the second jet of fluid.

30 Preferably, the output mouth is positioned substantially on a top portion of the external surface of the tubular body with respect to a vertical direction, so as to output the second jet of fluid substantially above with respect to

the tubular body.

Advantageously, this positioning of the output mouth makes it more visible and accessible to an operator during the adjustment or maintenance phase.

5 According to an aspect of the invention, the machine comprises a control unit connected at least to the orientation means. The control unit is configured to send a movement signal to the actuating members so as to vary the inclination of the longitudinal direction of the second jet of fluid with respect to the direction parallel to the propagation direction.

10 Advantageously, the control unit allows an operator to manage indirectly the actuating elements in order to reduce risks and to be able to change the orientation even during the use of the machine. Even more advantageously, the control unit is configured to manage additional parameters during machine operation in addition to switching the machine
15 on or off.

Preferably, the control unit comprises a receiving module configured to receive a remote command signal and to send the latter to the control unit itself so as to vary, remotely, the inclination of the longitudinal direction of the second jet of fluid with respect to the direction parallel to the
20 propagation direction.

In this way, an operator is advantageously able to control the machine remotely such as through a tablet or a special electronic device, for example via wireless technology.

According to another aspect of the invention, the output mouth is arranged
25 at the outlet opening of the tubular body and, additionally, it projects over a lying plane of the outlet opening itself along the longitudinal direction.

Advantageously, this positioning of the output mouth allows to avoid any interference between the first and the second jet of fluid emitted, respectively, by the atomizing nozzles and by the output mouth.

30 According to a further aspect of the invention, the plurality of atomizing nozzles are arranged in a crown fashion around the outlet opening of the

tubular body. In detail, the output mouth is positioned externally of the plurality of atomizing nozzles with respect to a radial direction of the tubular body.

According to an aspect of the invention, the first orientation means
5 comprises a fixed portion and a movable portion associated to the fixed portion. The fixed portion is connected to a fluid supply conduit, while the movable portion is connected to the output mouth. Additionally, the movable portion comprises a swivel joint configured to vary the inclination of the longitudinal direction of the second jet of fluid with respect to the
10 direction parallel to the propagation direction.

Advantageously, the use of a swivel joint, such as a ball joint, to connect the output mouth to a supply duct allows to orient the second jet of fluid along any inclined direction with respect to the direction parallel to the propagation direction. The variation of inclination can therefore easily take
15 place both with respect to a vertical direction and/or with respect to a horizontal direction to vary the range and the displacement of the second jet of fluid.

Preferably, the actuating member comprises at least one hydraulic piston externally associated to the swivel joint in order to regulate and maintain
20 the inclination of the longitudinal direction of the second jet of fluid with respect to the direction parallel to the propagation direction. Each hydraulic piston included in the orientation means is operatively interposed between the fixed portion and the movable portion.

Advantageously, the hydraulic piston is configured to move the movable
25 portion of the orientation means relative to the fixed portion connected to a feed line of fluid. In addition, the hydraulic piston is shaped to maintain a certain position of the mobile portion with respect to the fixed portion, so as to maintain the inclination of the second jet of fluid unchanged for a predetermined time.

30 According to an aspect of the invention, the machine comprises a valve for controlling a pressure or a flow rate of the fluid. In detail, the valve is

interposed between the fixed portion of the orientation means and the fluid supply conduit.

Preferably, the valve comprises a regulation organ configured to vary the flow rate of the fluid between a maximum value, substantially equal to the
5 maximum flow rate of the fluid, and a minimum value, substantially comprised between 10% and 80% of the maximum flow rate of the fluid.

Advantageously, the valve is configured to vary its flow rate between its inlet and outlet portion so as to regulate the flow rate of the second jet of fluid. Preferably, this adjustment is done remotely depending on the water
10 supply required and established by an operator.

According to another aspect of the invention, the machine comprises a first conduit for transporting a fluid and a second conduit for transporting a fluid. The first conduit extends between an inlet portion thereof associated to a fluid source and an outlet portion thereof connected to the plurality of
15 atomizing nozzles. While the second conduit extends between an inlet portion thereof associated to a respective fluid source, and an outlet portion thereof connected to the output mouth.

In this way, the machine is configured to manage the supply of the output mouth and the atomizing nozzles independently of each other. In addition,
20 the machine is advantageously configured to activate or deactivate the emission of one of the two jets of fluid as required.

Preferably, the second conduit comprises a pair of auxiliary conduits which branch from the inlet portion towards two corresponding attachments of the outlet portion of the second conduit itself.

25 In this way, the output mouth receives a balanced fluid supply from two preferably opposite feed lines.

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According to an aspect of the invention, the machine comprises at least one light source connected to the output mouth to project a cone of light
30 substantially along the longitudinal direction.

Advantageously, the light source allows an operator to operate easily in

the area of interest even in the case of poor visibility.

According to another aspect of the invention, the machine comprises at least a camera associated to the tubular body. In detail, the camera is configured to take a picture or a video along the longitudinal direction or the propagation direction.

Advantageously, an operator is able to remotely manage the machine for the fire mitigation, even if a direct view of the place of interest is not available, for example due to a dense smoke bank.

According to a further aspect of the invention, the machine comprises movement means associated to the tubular body for moving the machine. In detail, the movement means comprise rubber-covered wheels, or tracks and/or railway wheels.

The use of handling equipment allows an operator, preferably remotely, to bring the machine as close as possible to the area of interest and to correct its positioning according to the needs and how they evolve over time.

A method for outputting at least one jet of fluid, comprises the following operating steps of:

- predisposing the machine above described for outputting at least one jet of fluid;
- activating the blowing means for generating the air flow along the propagation direction from the inlet opening towards the outlet opening;
- regulating the inclination of the output mouth with respect to the direction parallel to the propagation direction and which passes through the output mouth;
- spraying at least a first jet of fluid from the plurality of atomizing nozzles;
- spraying the second jet of fluid from the output mouth.

Preferably, the step of spraying at least a first jet of fluid from the plurality of atomizing nozzles takes place subsequently to the step of spraying the second jet of fluid from the output mouth.

According to an aspect of the invention, the step of regulating the inclination of the output mouth takes place simultaneously with the step of spraying the second jet of fluid from the output mouth.

Thus, in this way an operator is capable to manage the orientation of the
5 second jet of fluid during machine operation.

According to another aspect of the invention, the method comprises further operating steps of:

- regulating the inclination of the central mouth with respect to the propagation direction;
- 10 - spraying the third jet of fluid from the central mouth.

Preferably, the step of regulating the inclination of the output mouth takes place independently of the step of regulating the inclination of the central mouth.

Advantageously, the first jet, the second jet and the third jet of fluid can
15 cover three different areas to improve the fire mitigation reducing the intervention time.

Therefore, an operator is advantageously able to remotely manage the orientation of the first jet of fluid during the operation of the machine and also during the operation of the output mouth itself.

20

Brief description of drawings

Additional features and advantages of the present invention will become more evident from the approximate and thus non-limiting description of a preferred but non-exclusive embodiment of a machine for outputting at
25 least one jet of fluid, as illustrated in the appended drawings, in which:

- Figure 1 illustrates a side view of the machine for outputting at least one jet of fluid;
- Figure 2 illustrates a front view of the machine;
- Figure 3 illustrates a top view of the output mouth positioned on the
30 machine to underline its movement with respect to a horizontal plane;

- Figure 4 illustrates a side view of the output mouth positioned on the machine to underline its movement with respect to a vertical plane;
 - Figure 5 illustrates a perspective view of the machine arranged on the roof of a rescue vehicle to show the different orientation between the first jet of fluid and the second jet of fluid;
 - Figure 6 illustrates a top view of the machine arranged on a rescue vehicle to show the different orientation between the first jet of fluid and the second jet of fluid toward an airplane.
- With reference to the drawings, they serve solely to illustrate embodiments of the invention with the aim of better clarifying, in combination with the description, the inventive principles of the invention.

Detailed description of preferred embodiments of the invention

The present invention refers to a machine for outputting at least one jet of fluid, which is preferably capable to reduce the time necessary to extinguish a fire.

In the following of this description, reference will be made mainly to the fire-fighting sector as the preferred, but not exclusive, field of application of the invention.

With reference to the figures, a machine for outputting at least one jet of fluid has been generically denoted with the number 1.

The other numerical references refer to technical features of the invention which, except for various indications or evident structural incompatibilities, the person skilled in the art will know how to apply to all the variant embodiments described.

As shown in figure 1, in accordance with the invention, the machine 1 for outputting at least one jet of fluid comprises a tubular body 2 extending between an air inlet opening 3 thereof and an air outlet opening 4 thereof.

The particular shape of the tubular body 2 gives the machine 1 its characteristic "cannon" or gun shape. In addition, the tubular body 2 is

operationally combined with blowing means 5 to generate a flow of air along a direction of propagation P of the air from the inlet opening 3 to the outlet opening 4. The blowing means 5 include an impeller (or rotor or turbine) placed at least partially inside the tubular body 2 at the inlet opening 3.

Additionally, the machine 1 comprises a plurality of atomizing nozzles 6 operatively associated to the outlet opening 4 of the tubular body 2 so as to spray at least a first jet of fluid towards the air flow along the propagation direction P. In detail, the plurality of atomizing nozzles 6 are arranged in a crown fashion around the outlet opening 4 of the tubular body 2. Advantageously, the first jet of fluid is emitted towards the air flow in such a way that the latter transports the suspended drops of fluid towards the area of interest, forming a cloud such as to circumscribe any fire and/or the fumes and/or odors present.

Therefore, the machine 1 comprises an output mouth 7 positioned at an external surface 8 of the tubular body 2 for spraying a second jet of fluid substantially along a longitudinal direction L parallel to the propagation direction P. In detail, the output mouth 7 is disposed along the extension of the tubular body, externally to the latter, so that the second jet of fluid is emitted along the longitudinal direction L towards a point substantially frontal to the outlet opening 4 of the tubular body 2.

According to an aspect of the invention, as shown in the attached figures, the output mouth 7 is preferably positioned substantially at a top portion of the external surface 8 of the tubular body 2 with respect to a vertical direction, so as to output the second jet of fluid substantially above with respect to the tubular body 2 itself. Preferably, the output mouth 7 is positioned externally of the plurality of atomizing nozzles 6 with respect to a radial direction of the tubular body 2, and more precisely with respect to a radial direction of the outlet opening 4. Even more preferably, as shown in Figure 1, the output mouth 7 arranged at the outlet opening 4 of the tubular body 2 projects over a lying plane of the outside of the tubular

body 2 along the longitudinal direction L.

In practice, the output mouth 7 is a "monitor" for the emission of the liquid jet. In any case, the output mouth 7 emits a second jet of liquid with a higher flow rate than the first jet of liquid emitted by the plurality of atomizing nozzle 6, for example a value of about 5000 liters/minute or more. Alternatively, if machine 1 is used for dust abatement, the output mouth 7 is configured to emit a jet of liquid with a flow rate lower than the value indicated above.

Advantageously, the machine 1 is configured to spray two different jets of fluid independently of each other. The first jet of fluid propagates like a cloud of nebulized liquid under the action of the flow of air generated by the blowing means 5 and therefore substantially along the direction of propagation P of the air. The second jet of fluid, instead, propagates along an emission direction (the orientable longitudinal direction L) variable in time according to the need, which can be parallel (FIGs 1-4) or inclined (FIGs 5 and 6) with respect to the direction parallel to the propagation direction P of the air, or, more precisely, in the first case, the directions of the fluid flows extend along the same vertical plane parallel to the propagation direction P, while in the second case they extend along two different vertical planes that intercept each other.

Advantageously, therefore, the machine 1 is configured to direct the second flow of fluid to the place of interest (for example, the place of origin of the fire or where there is an excess of dust to be felled) and the cloud in a different critical area, where there may be smoke and/or odors, to circumscribe and flare them. In other words, the two jets of fluid are independent for the orientation and, in particular, the second jet of fluid is adjustable with respect to the first, so that it can be directed differently depending on the needs.

According to the aspect above described, the machine 1 comprises first orientation means 9 for orientating the output mouth 7 so as to vary the inclination of the longitudinal direction L of the second jet of fluid with

respect to a direction parallel to the propagation direction P which also passes through the output mouth 7 itself. For this purpose, the first orientation means comprise one or more actuating members 10 commandable to regulate the orientation of the output mouth 7.

- 5 In other words, the first orientation means 9 are configured to manage the position of the output mouth 7 to vary its orientation with respect of the propagation direction P. In more detail, the first orientation means are able to tilt the output mouth 7 in different orientations on a horizontal plane parallel to the propagation direction P, or on a vertical plane incident to the
10 propagation direction P, or on a combination between the horizontal plane and the vertical plane.

According to an aspect of the invention, as better shown in Figure 3 and Figure 4, the first orientation means 9 comprises a fixed portion 11 and a movable portion 12 associated to the fixed portion 11. The fixed portion 11
15 is connected to a fluid supply conduit 19, while the movable portion 12 is connected to the output mouth 7. In other words, the first orientation means 9 interconnects the output mouth 7 with the relative fluid supply conduit 19 and, additionally, it is configured to vary the orientation of the output mouth 7 and therefore of the second jet of fluid.

- 20 Advantageously, the first orientation means 9 comprises a swivel joint 14 (e.g. "knee" joint) configured to vary the inclination of the longitudinal direction L of the second jet of fluid with respect to the direction parallel to the propagation direction P. The swivel joint 14 includes a rotating head (the movable portion 12) and a rotation seat (the fixed portion 11).
25 Preferably, the rotating head has a spherical or cylindrical shape, while the rotating seat has a pair of appendages arranged cantilevered with respect to a main body, which are parallel to each other and between which the rotating head can be housed so that it is able to rotate around its own fulcrum to allow the variation of the inclination of the first jet of fluid with
30 respect to the direction of propagation P. In other words, the articulated joint is mechanically rigid.

According to one aspect of the invention, better shown in Figure 3 and in Figure 4, a pin 15 is placed between the rotating head and the rotation seat, or more generally between the fixed portion 11 and the movable portion 12, to keep the components together and allow the rotation of the output mouth 7 on the horizontal plane parallel to the propagation direction P, or on the vertical plane incident to the propagation direction P, or on a combination between the horizontal plane and the vertical plane. According to this aspect, a possible adjustment of the range of the second jet of fluid can be made by varying the inclination of the entire tubular body 2 with respect to a support frame 16 to which it is connected in a swivel way by a pair of lateral supports.

Advantageously, in order to regulate and maintain the inclination of the longitudinal direction L of the second jet of fluid with respect to the direction parallel to the propagation direction P, the actuating member 10 connected to the first orientation means 9 comprises at least one hydraulic piston 17 externally associated to the swivel joint 14. As shown in Figure 3 and Figure 4, each hydraulic piston 17 is operatively interposed between the fixed portion 11 and the movable portion 12.

The hydraulic piston 17 is configured in such a way that in one of its resting positions the output mouth 7 defines the longitudinal direction L parallel to the propagation direction P, while the sliding of the piston with respect to the corresponding cylinder, both in extension and in contraction, involves the movement of the rotating head of the swivel joint around the respective pin 15.

Preferably, the first orientation means 9 comprise two different hydraulic piston 17, each of which is capable of orienting the output mouth 7 with respect to a vertical or horizontal plane with respect to the ground. The implementation of both hydraulic pistons 17 allows advantageously to orient the output mouth 7 in multiple ways to define a wide cone of action of the second jet of fluid.

According to an aspect of the invention, the machine 1 comprises a first

conduit and a second conduit 19 for transporting a fluid. The first conduit extends between an inlet portion thereof associated to a fluid source, and an outlet portion thereof connected to the plurality of atomizing nozzles 6. While, the second conduit 19 extends between an inlet portion 22 thereof
5 associated to a respective fluid source, and an outlet portion 23 thereof connected to the output mouth 7.

Additionally, the second conduit 19 comprises a pair of auxiliary conduits 24 which branch from the inlet portion 22 towards two corresponding attachments of the outlet portion 23 of the second conduit 19 itself.

10 Therefore, each auxiliary conduit 24 extends externally to the tubular body 2 to feed the emission port 6 in a balanced way.

As show in Figures 1, 3, 4, the machine 1 comprises a valve 25 for controlling a pressure or flow rate of the fluid. The valve 25 is interposed between the fixed portion 11 and the fluid supply conduit 19.

15 Preferably, the valve 25 comprises a regulation organ configured to vary the flow rate of the fluid between a maximum value, substantially equal to the maximum flow rate of the fluid, and a minimum value, substantially comprised between 10% and 80% of the maximum flow rate of the fluid.

More precisely, the valve 25 is configured to manage the quantity of fluid
20 that must reach the output mouth 7. During the extinguishing of a fire or during the abatement of dust, in fact, the flow rate of the relative liquid sprayed decreases over time to avoid that excessive pressure causes a displacement of the fire or the dust cloud, rather than its extinction or abatement.

25 Thus, this valve 25 is preferably a valve for reducing the pressure and flow of the fluid. Therefore, the valve 25 has a feedback circuit capable of varying the amount of fluid passing between its inlet section (connected to the fluid supply conduit) and its outlet section (connected to the output mouth 7), between a zero value of 0% and a maximum value of 100%.

30 Additionally, the machine 1 could comprises a central mouth connected to the tubular body 2 for spraying a third jet of fluid substantially along the

propagation direction P. The central mouth is arranged substantially along an extension axis A of the tubular body 2 internally of the air flow so as to output the third jet of fluid substantially centrally with respect to the tubular body 2 itself.

- 5 The central mouth is positioned centrally with respect of the crown of atomizing nozzles 6, and therefore centrally with respect of the outlet opening 4, supported by a multitude of radial supports.

In this way, the central mouth is arranged along the extension axis A of the tubular body 2 and partially outside the latter so that its movement cone
10 with respect to the propagation direction P is the maximum possible. Thus, there is no interference between the third jet of fluid and the tubular body 2 of the machine 1, as well as with the first jet of fluid produced by the atomizing nozzles 6.

Preferably, the central mouth is also orientable and therefore the machine
15 1 comprises second orientation means for orientating the central mouth itself so as to vary the inclination of the third jet of fluid with respect to the propagation direction P.

Even more preferably, the first orientation means 9 and the second orientation means are configured to orient, respectively, the output mouth
20 7 and the central mouth independently of each other.

According to an aspect of the invention, the machine 1 comprises a control unit connected at least to its main components, i.e. the first orientation means 9, the output mouth 7 and the plurality of atomizing nozzle 6. The control unit is configured to send a movement signal to the actuating
25 members so as to vary the inclination of the longitudinal direction L of the second jet of fluid with respect to the direction parallel to the propagation direction P.

More precisely, the control unit comprises a receiving module configured to receive a remote command signal and to send the latter to the control
30 unit itself so as to vary, remotely, the inclination of the longitudinal direction L of the second jet of fluid with respect to the direction parallel to

the propagation direction P.

Where the machine 1 includes the central mouth 26, the control unit is connected to the central mouth 26 and to the second orientation means 27 to manage its orientation remotely and independently from the first orientation means 9, from the output mouth 7 and from the plurality of atomizing g nozzle 6.

As better shown in Figure 2, the machine 1 comprises a plurality of light sources 28 connected to the output mouth 7 and the tubular body 2 to project a cone of light substantially along the longitudinal direction L and the propagation direction P.

Additionally, the machine 1 comprises a plurality of camera 29 associated to the external surface 8 of the tubular body 2. The camera is configured to take a picture or a video along the longitudinal direction L or along the propagation direction P transmissible in real time to an operator.

Therefore, in a safe way, the operator is able to move the machine 1 remotely even if the visibility of the fire is poor or zero.

For this purpose, the machine 1 can be installed on a roof of a rescue vehicle, as shown in Figure 5 and in Figure 6, or it can comprise movement means associated to the tubular body 2 for moving the machine 1 itself. Preferably, the movement means comprising rubber-covered wheels, or tracks and/or railway wheels.

An example of machine 1 operation is derived directly from the above description and is recalled below.

An operator is able to place the machine 1 described above close to the fire, either personally or remotely, thanks to the movement means and the control unit installed on the machine 1 itself.

Therefore, in this situation the operator activates blowing means 5 for outputting at least one jet of fluid along a propagation direction P.

Then, in any order that depends on the need and type of fire, the operator activates the output mouth 7, the plurality of atomizing nozzle 6 and, if installed, the central mouth 26.

Depending on the extent of the fire, the operator shall regulate the orientation of the output mouth 7, of the tubular body 2 (so the plurality of the atomizing nozzle 6) and the central mouth 26, if installed on the machine 1.

- 5 Advantageously, the operator can regulate all the flow rate via the valve 25 connected at fluid conduit.

Even more advantageously, the orientation of the output mouth 7 takes place simultaneously with the spraying the second jet of fluid, because the operator is able to control the machine 1 remotely.

10

CLAIMS

1. A machine (1) for outputting at least one jet of fluid, comprising:
- a tubular body (2) extending between an air inlet opening (3) thereof and an air outlet opening (4) thereof;
 - 5 - blowing means (5) operatively associated to said tubular body (2) for generating an air flow along a propagation direction (P) of the air that goes from the inlet opening (3) towards the outlet opening (4);
 - a plurality of atomizing nozzles (6) operatively associated to said outlet opening (4) of said tubular body (2) so as to spray at least a first jet
10 of fluid towards the air flow;
- characterized in that it comprises
- an output mouth (7) positioned at an external surface (8) of said tubular body (2) for spraying a second jet of fluid substantially along a longitudinal direction (L) parallel to said propagation direction (P);
 - 15 - first orientation means (9) for orientating the output mouth (7) so as to vary the inclination of said longitudinal direction (L) of the second jet of fluid with respect to a direction parallel to said propagation direction (P) and passing through said output mouth (7); said first orientation means (9) comprising one or more actuating members (10) commandable to regulate
20 the orientation of said output mouth (7).
2. A machine (1) according to claim 1, wherein said first orientation means (9) are configured to vary the inclination of said longitudinal direction (L) on a horizontal plane parallel to said propagation direction (P), or on a vertical plane incident to said propagation direction (P), or on a
25 combination between said horizontal plane and said vertical plane.
3. A machine (1) according to claim 1 or 2, wherein said output mouth (7) is positioned substantially at a top portion of said external surface (8) of said tubular body (2) with respect to a vertical direction, so as to output the second jet of fluid substantially above with respect to said tubular body (2).
- 30 4. A machine (1) according to any one preceding claim, comprising a control unit connected at least to said first orientation means (9); said

control unit being configured to send a movement signal to said actuating members (10) so as to vary the inclination of said longitudinal direction (L) of the second jet of fluid with respect to said direction parallel to the propagation direction (P).

5 **5.** A machine (1) according to claim 4, wherein said control unit comprises a receiving module configured to receive a remote command signal and to send the latter to said control unit so as to vary, remotely, the inclination of said longitudinal direction (L) of the second jet of fluid with respect to said direction parallel to the propagation direction (P).

10 **6.** A machine (1) according to any one preceding claim, wherein said output mouth (7) is arranged at said outlet opening (4) and projects over a lying plane of the outside of said tubular body (2) along said longitudinal direction (L).

7. A machine (1) according to any one preceding claim, wherein said
15 plurality of atomizing nozzles (6) are arranged in a crown fashion around the outlet opening (4) of the tubular body (2); said output mouth (7) is positioned externally of said plurality of atomizing nozzles (6) with respect to a radial direction of the tubular body (2).

8. A machine (1) according to any one preceding claim, wherein said
20 first orientation means (9) comprises a fixed portion (11) and a movable portion (12) associated to said fixed portion (11); said fixed portion (11) being connected to a fluid supply conduit (22); said movable portion (12) being connected to said output mouth (7); said movable portion (12) comprising a swivel joint (14) configured to vary the inclination of said
25 longitudinal direction (L) of the second jet of fluid with respect to said direction parallel to the propagation direction (P).

9. A machine (1) according to claim 8, wherein said actuating member
(10) comprises at least one hydraulic piston (17) externally associated to
said swivel joint (14) in order to regulate and maintain the inclination of
30 said longitudinal direction (L) of the second jet of fluid with respect to said direction parallel to the propagation direction (P); the at least one hydraulic

piston (17) being operatively interposed between said fixed portion (11) and said movable portion (12).

10. A machine (1) according to claim 8 or 9, comprising a valve (25) for controlling a pressure or flow rate of the fluid interposed between said
5 fixed portion (11) and said fluid supply conduit (22).

11. A machine (1) according to claim 10, wherein said valve (25) comprises a regulation organ configured to vary the flow rate of the fluid between a maximum value, substantially equal to the maximum flow rate of the fluid, and a minimum value, substantially comprised between 10%
10 and 80% of the maximum flow rate of the fluid.

12. A machine (1) according to any one preceding claim, comprising:

- a first conduit for transporting a fluid extending between an inlet portion thereof associated to a fluid source, and an outlet portion thereof connected to said plurality of atomizing nozzles (6);
- 15 - a second conduit (19) for transporting a fluid extending between an inlet portion (22) thereof associated to a respective fluid source, and an outlet portion (23) thereof connected to said output mouth (7).

13. A machine (1) according to claim 12, wherein said second conduit (19) comprises a pair of auxiliary conduits (24) which branch from said
20 inlet portion (22) towards two corresponding attachments of said outlet portion (23) of said second conduit (19).

14. A machine (1) according to any one preceding claim, comprising at least one light source (28) connected to said output mouth (7) to project a cone of light substantially along said longitudinal direction (L).

25 15. A machine (1) according to any one preceding claim, comprising at least a camera (29) associated to said tubular body (2); said camera (29) being configured to take a picture or a video along said longitudinal direction (L) or said propagation direction (P).

16. A machine (1) according to any one preceding claim, comprising
30 movement means associated to said tubular body for moving said machine; said movement means comprising rubber-covered wheels, or

tracks and/or railway wheels.

17. A method for outputting at least one jet of fluid, comprising the operating steps of:

- predisposing a machine (1) for outputting at least one jet of fluid,
5 according to any one of claims 1 to 16;
- activating said blowing means (5) for generating the air flow along said propagation direction (P) from said inlet opening (3) towards said outlet opening (4);
- regulating the inclination of said output mouth (7) with respect to
10 said direction parallel to the propagation direction (P) and passing through said output mouth (7);
- spraying at least a first jet of fluid from said plurality of atomizing nozzles (6);
- spraying the second jet of fluid from said output mouth (7).

15 **18.** The method according to claim 17, wherein said step of spraying at least a first jet of fluid from said plurality of atomizing nozzles (6) takes place subsequently to said step of spraying the second jet of fluid from said output mouth (7).

20 **19.** The method according to claim 17 or 18, wherein said step of regulating the inclination of said output mouth (7) takes place simultaneously with said step of spraying the second jet of fluid from said output mouth (7).

20. The method according to any one preceding claim from 17 to 19 when dependent on claim 13, comprising further operating steps of:

- 25 - regulating the inclination of said central mouth (26) with respect to said propagation direction (P);
- spraying the third jet of fluid from said central mouth (7).

21. The method according to claim 20, wherein said step of regulating the inclination of said output takes place independently of said step of
30 regulating the inclination of said central mouth (7).

Fig.1

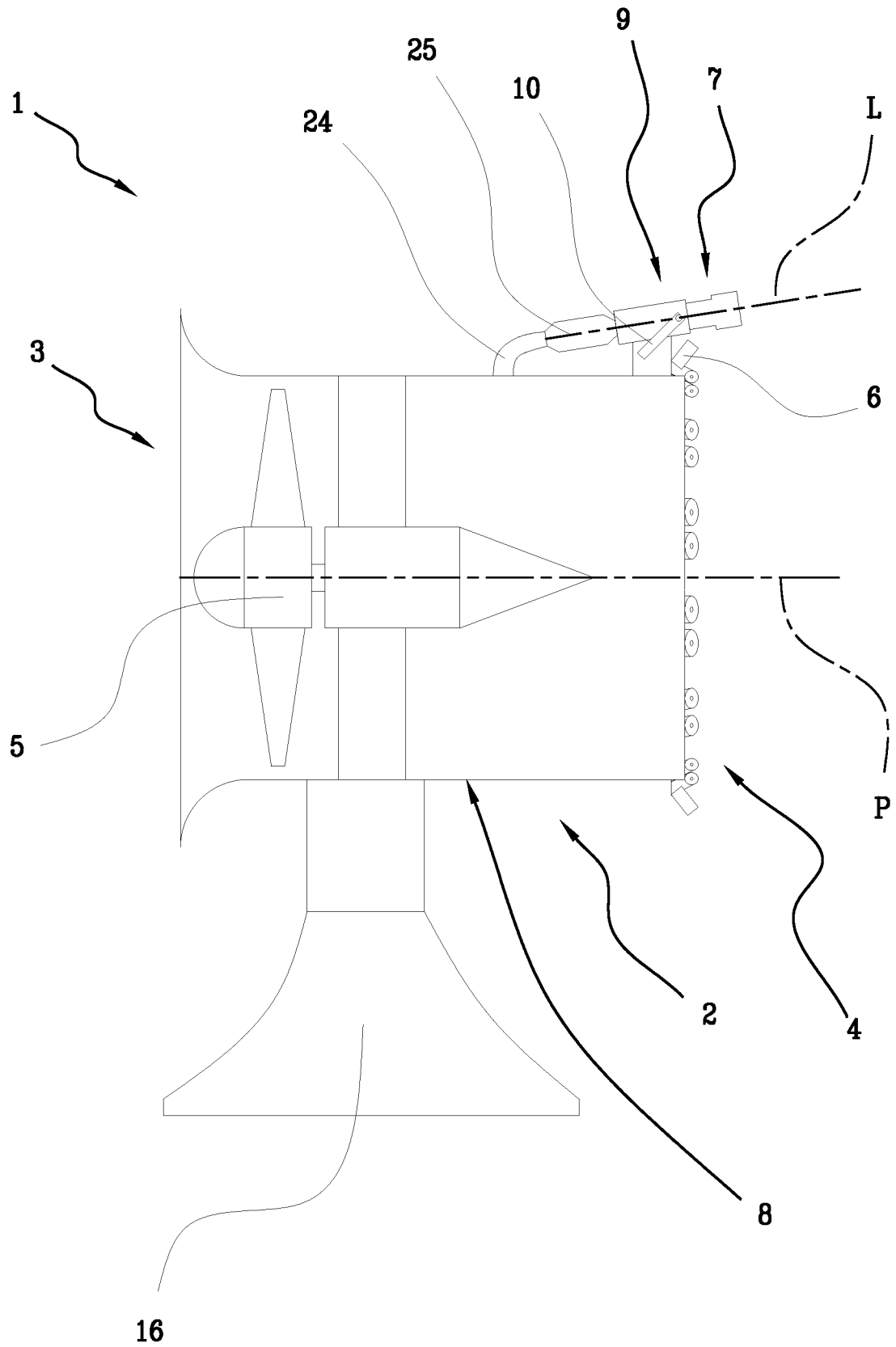


Fig.2

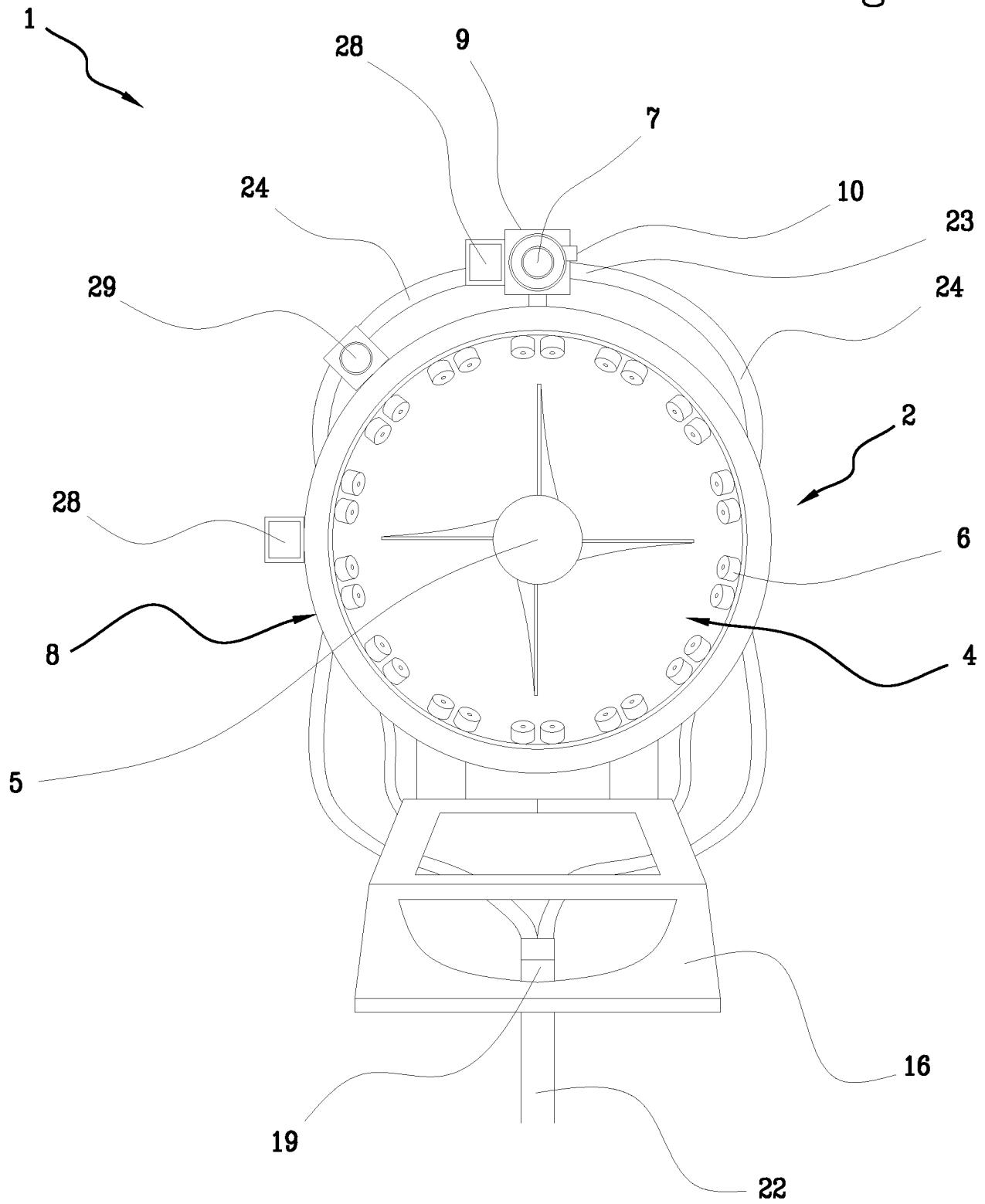


FIG. 3

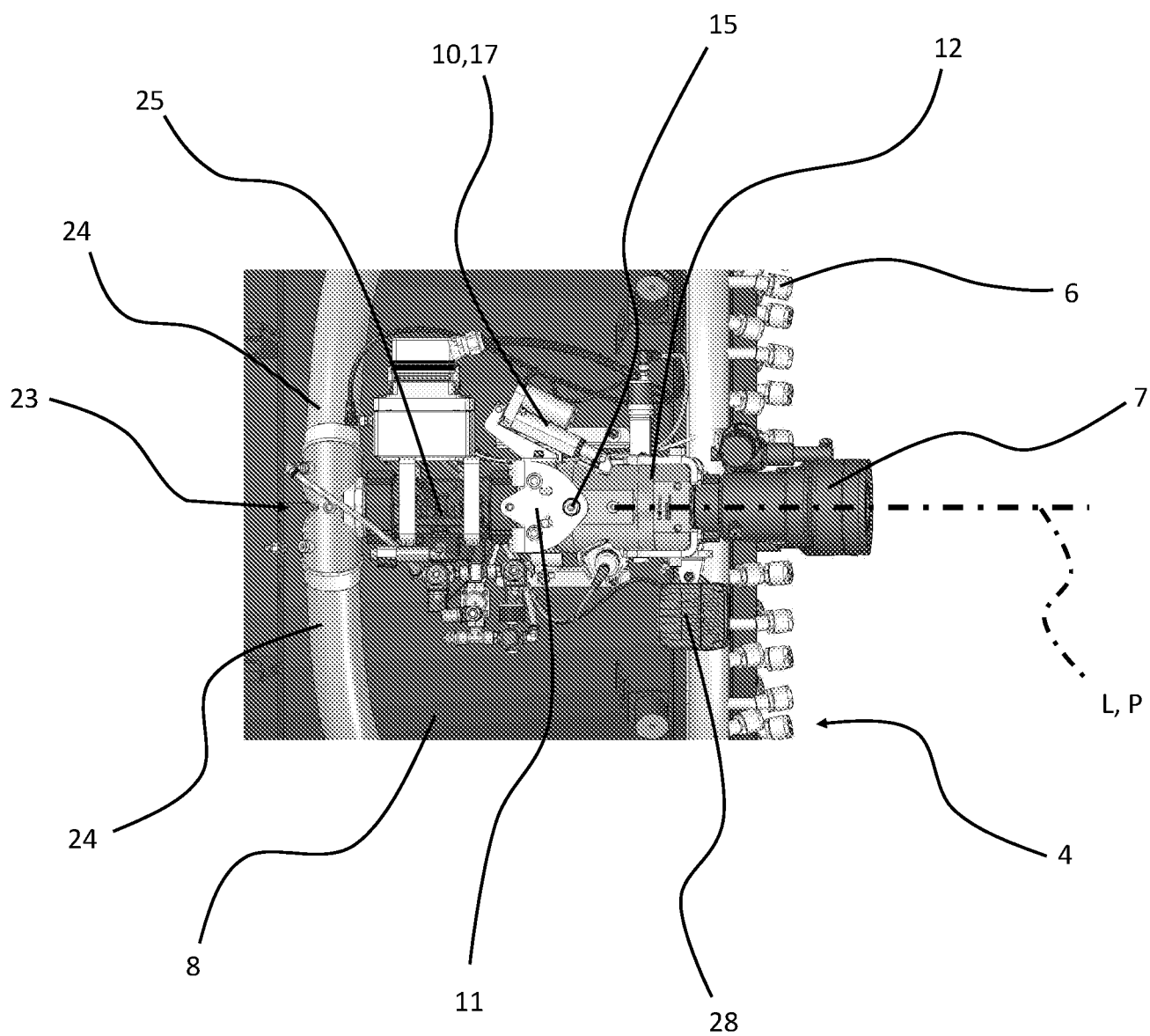


FIG. 4

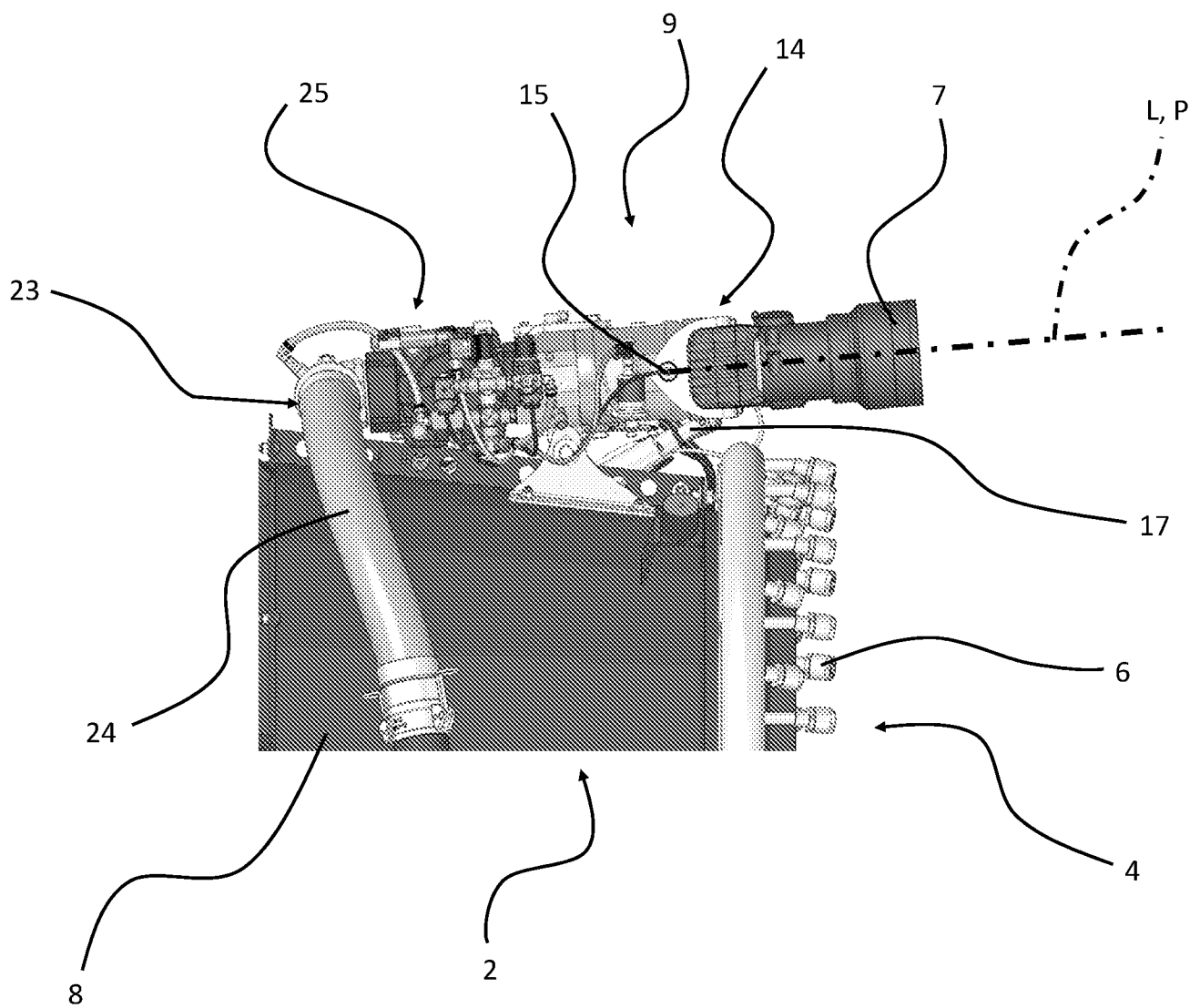


FIG. 5

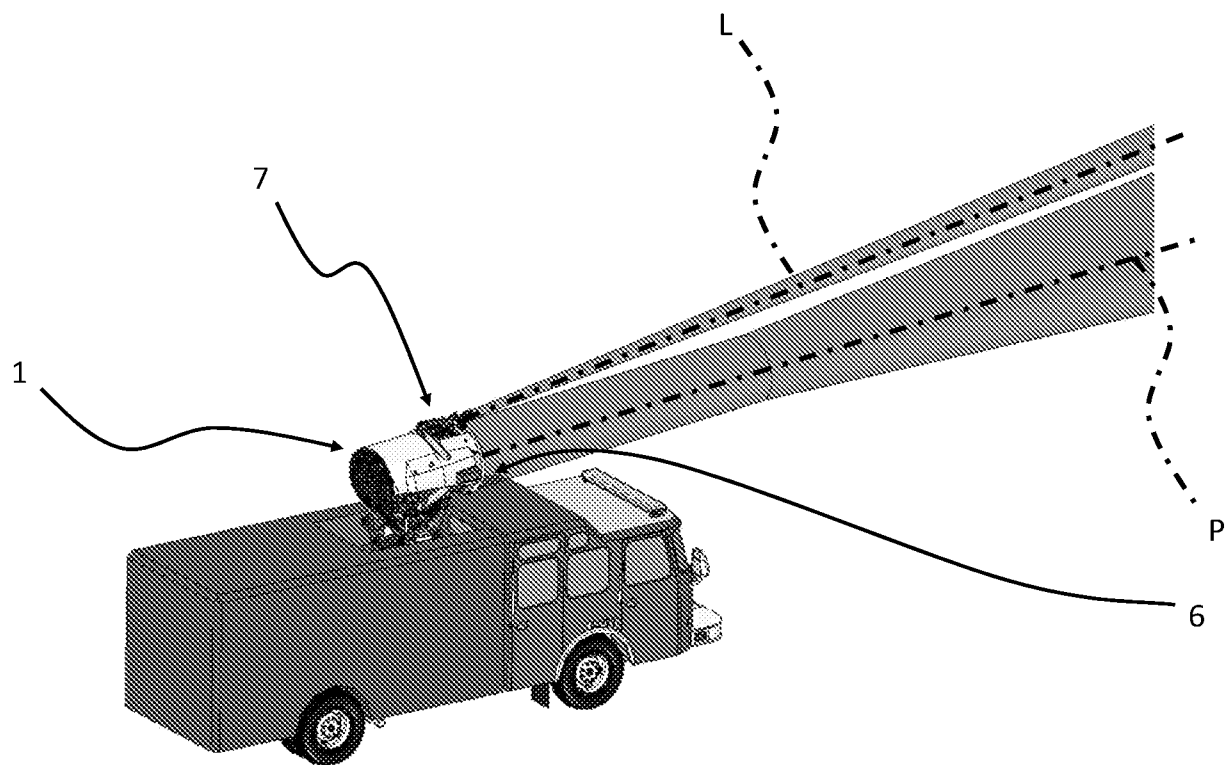
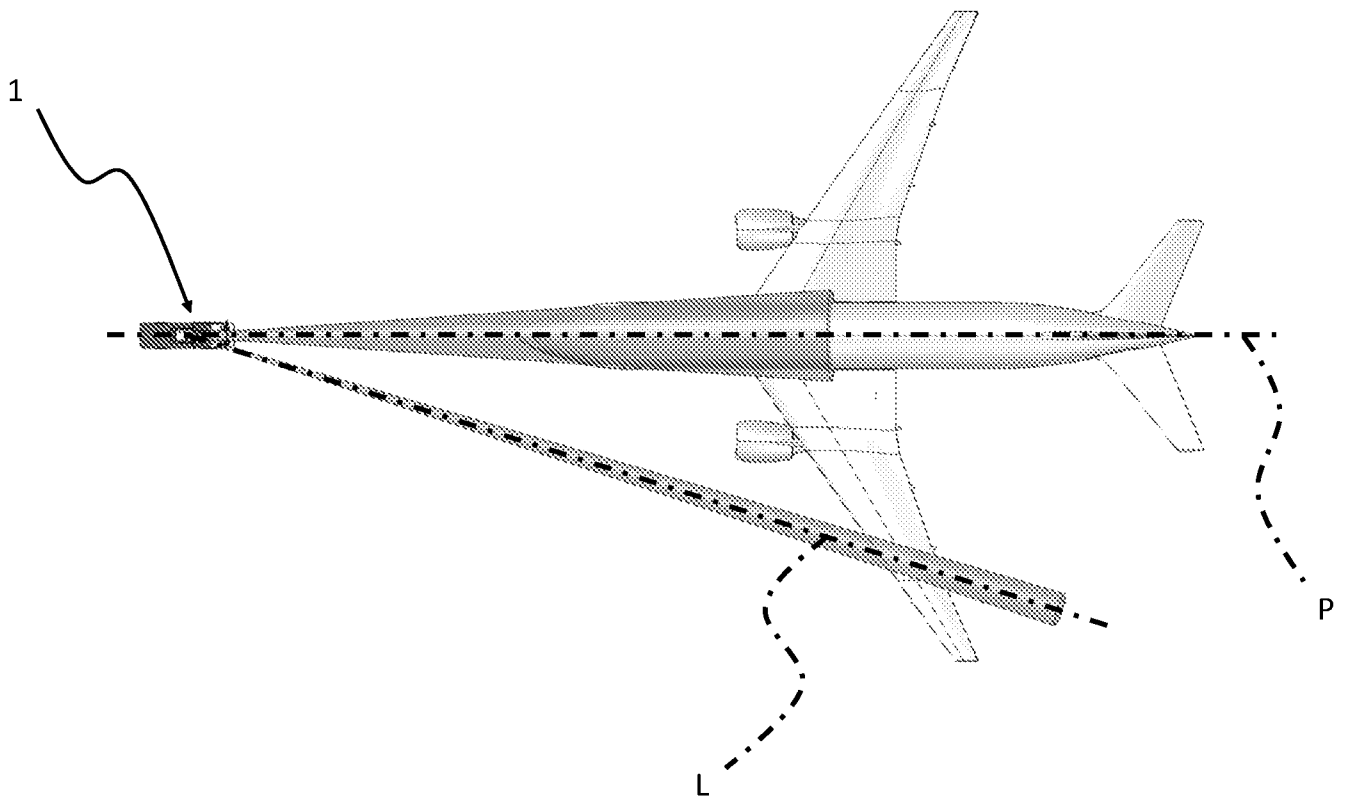


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2018/059865

A. CLASSIFICATION OF SUBJECT MATTER

INV. B05B7/00 A62C3/02 B05B1/20 B05B7/08 B05B15/652
B05B15/68

ADD.

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)

B05B A62C

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)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	US 5 836 513 A (SMITH WARREN C [US] ET AL) 17 November 1998 (1998-11-17)	1-21
Y	column 5, line 31 - column 9, line 30; figures 1-7	14
Y	----- FR 3 011 623 A1 (PEUGEOT CITROEN AUTOMOBILES SA [FR]) 10 April 2015 (2015-04-10) figure 1	14
X	----- US 4 105 161 A (KIRCHER EVERETT F ET AL) 8 August 1978 (1978-08-08)	1,3-7, 9-21
Y	column 2, line 1 - column 5, line 20;	14
A	figures 1-5	2,8
A	----- WO 2015/010160 A1 (FLINDERS PORTS PTY LTD [AU]) 29 January 2015 (2015-01-29) figures 2,3	1-21
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Further documents are listed in the continuation of Box C.



See patent family annex.

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

23 August 2019

Date of mailing of the international search report

02/09/2019

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2018/059865

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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International application No

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