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(54) **Spray device with a non-circular spray pattern**

Sprühvorrichtung mit einem nicht kreisrunden Sprühmuster

Dispositif de pulvérisation avec une configuration de jet non circulaire

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(73) Proprietor: **Spig S.P.A.**
26041 Arona (IT)

(72) Inventor: **Mosiewicz, Jerzy**
I-28041 Arona (IT)

(74) Representative: **Borsano, Corrado et al**
Notarbartolo & Gervasi S.p.A.
Corso di Porta Vittoria, 9
20122 Milano (IT)

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Description

Field of the invention

[0001] The present invention relates to a sprayer suitable to spray with a liquid and with predetermined uniformity even a non-circular zone of a predetermined surface; a sprayer of this type can be used, for example, in cooling towers with gas/liquid crossflow.

Prior art

[0002] In crossflow or countercurrent cooling towers, heat exchange is known to be obtained between a gaseous medium and a liquid by spraying the liquid - for example water - in droplet form from above onto a body of grids packed together, and by causing an ascending gas current to flow through these packed grids; some examples of these grids are described in the European patents EP 311 794, EP 503 547, EP 1 152 205, EP 931 239, US2003/0183956A1.

[0003] To increase the efficiency of the cooling tower it is necessary to distribute the liquid to be sprayed in the droplet form as uniformly as possible on the packs of grids; for this purpose the liquid can be sprayed with appropriate sprayers, some examples of which are described in the patents EP 654 649 and US 4 111 366.

[0004] These and other sprayers currently known in the art, characterized by the presence of a propeller or impeller made to rotate by the liquid which is directed against it, are able to distribute said liquid in a relatively uniform way over an area of an essentially circular shape below said nozzle, or to spray an area below also with non-uniform distributions, but in any case obtaining distributions with circular symmetry.

[0005] Therefore, when it is necessary to spray a vast area of cooling grids with several sprayers, the circular areas sprayed must be partly overlapped by adjacent sprayers, or these areas must be approximately tangent in some points; in any case, the total area will be sprayed with less uniformity than the single circular areas sprayed by a single sprayer.

[0006] US 4,091,873 relates to fire extinguishing sprinklers to be suspended to create a downwardly directed spray to be directed to the base of the flames. Part of the liquid is diverted by means of a horizontal deflector to diffuse it to the volume above to reduce the oxygen content of the concerned area.

[0007] US 2,005,600 relates to a distributor nozzle having a series of horizontal, circular shaped deflectors to distribute part of the liquid on a wide area.

[0008] None of the above prior art nozzles or sprinklers are suited to evenly spray a surface, in particular an evaporator grid.

[0009] US 3061204 A refers to spray nozzles for use in water coding towers comprising staggened baffle portions to provide a circular spray pattern.

[0010] The object of the present invention is to provide a sprayer with a plurality of which a given area even with a non-circular shape - for example square, rectangular, triangular or polygonal - can be sprayed with greater uniformity compared to prior art sprayers.

Summary of the invention

[0011] This object of the present invention is attained with a sprayer according to claim 1.

[0012] A single sprayer as defined above can spray, relatively uniformly, an area therebelow, even non-circular in shape, such as a square, rectangular, triangular or more generally polygonal area: with a plurality of sprayed areas with these shapes it is possible to cover a larger area with fewer overlapping zones between areas sprayed by two adjacent sprayers, and therefore to spray the total area with greater uniformity. With the same total sprayed surface it is therefore possible to reduce the consumption of sprayed liquid and increase the efficiency of the cooling tower, or of a more general spraying system.

[0013] Further advantages attainable with the present finding will be more apparent to those skilled in the art from the following detailed description of a particular non-limiting embodiment, with reference to the following figures.

List of the figures

[0014]

Figure 1 schematically shows a perspective view of a sprayer according to a preferred embodiment of the present invention;
Figure 2 schematically shows a side view, partly sectioned, of the sprayer in Figure 1;
Figure 3 schematically shows a view of the propeller of the sprayer in Figure 1 according to the direction of the axis of rotation of said propeller;
Figure 4 schematically shows a top view of the approximately square zone sprayed with the sprayer in Figure 1, with predetermined spraying uniformity.

Detailed description

[0015] In the present description the expressions "downstream" and "upstream" refer to the flow of liquid to be sprayed, in the sense that, if a particle of fluid during operation of the nozzle first reaches the element A and then the element B, the element A is said to be upstream of the element B.

[0016] Moreover, in the present description "distribution with circular symmetry" is intended as a distribution, in particular of density of droplets, uniform in the points positioned at the same radial distance from a central point of said distribution.

[0017] The sprayer 1 in Figures 1-3 comprises an upper fixing body 2 which can be connected, by means of the connection 3 - which can for example be a threaded,

bayonet or yet another type of connection - to a suitable supply duct of the liquid to be sprayed, such as water or another liquid; a plurality of sprayers 1 can, for example, be disposed over a mass of trickle grids of a cooling tower, to be sprayed with water or another liquid to be sprayed.

[0018] A jet of liquid to be sprayed - jet referred to as "inlet jet" in the following description - is delivered from the nozzle 4 - referred to in the following description as "upstream nozzle 4" - and is directed against the deflector 5, which comprises a conical part 6 projecting in the direction of impact of the upstream jet against the deflector and facing away from said jet, and a flange 7, located at the base of the conical projecting part 6 and having an external perimeter with an approximately square shape in the plane; preferably, although not necessarily, the flange 7 has a slightly convex upper surface - facing towards the upstream nozzle 4 - in the direction of flow of the liquid to be sprayed thereon; said convex shape promotes concentration by the water to be sprayed at the corners of the flange 7 - i.e. in the four external spraying zones ZE in Figure 4, hatched - and uniform distribution of water on said flange 7.

[0019] In the present embodiment, the deflector 5 is fixed with respect to the rest of the structure of the sprayer.

[0020] Two upper supporting arms 8 are coupled at the centre line of two of the sides of the square flange 7, to connect the deflector 5 to the part of the upstream nozzle 4 and of the threaded connection 3; two dividing crests 9 (Figure 1) are provided at the centre line of the other two sides of the square flange 7, suitable to promote diversion of the flow of liquid to be sprayed which, as will be seen in greater detail hereunder, flows on the external surface of the conical part 6, towards the corners 10 of the square flange 7.

[0021] The upper supporting arms 8 have, at least in the area in which they join the deflector 5, flattened cross sections, hydrodynamic in shape and oriented parallel to the direction of flow of the liquid to be sprayed on the conical projection 6 and, just as the crests 9, also provide means to divide the flow — in the present description also called second flow dividing means - suitable to contribute towards diverting the flow of liquid to be sprayed, which flows on the external surface of the conical part 6, towards the corners 10 of the square flange 7.

[0022] The dividing crests 9 and the flattened coupling zones of the arms 8 on the deflector 5 - i.e. the second flow dividing means 8, 9 - also promote detachment of the water from the surface of the flange 7 and facilitate delivery of the water from the sprayer fragmented in droplets instead of as a jet in sheet form.

[0023] On the top of the conical projection 6 is a hole 11, also called dividing aperture 11, which extends inferiorly, inside the conical projection 6, with a tubular extension 12, or in any case defines a tubular length of duct 12 - in the present description also indicated as "guide duct 12" - the axis of which is substantially parallel to the axis of the inlet jet incident on the deflector 5.

[0024] Positioned under the deflector 5 is a propeller 13, with axis of rotation coaxial with the tubular guide duct 12 and suitable to distribute the liquid with predetermined uniformity over a substantially circular area, which hits said propeller and causes it to rotate.

[0025] The sprayer operates as follows.

[0026] The inlet jet, of water or another liquid to be sprayed, is delivered from the upstream nozzle 4 and is incident against the top of the conical projection 6. The dividing aperture 11 is opposite and coaxial with the upstream nozzle 4 and has a smaller inlet section than the outlet section of the upstream nozzle, so that only part of the flow of liquid incident on the deflector — hereinafter referred to as "first fraction of liquid to be sprayed" - enters the tubular duct 12, while the remaining part - hereinafter referred to as "second fraction of liquid to be sprayed" - flows along the sides of the conical projection 6 and is diverted by the flange 7; for this purpose, the edges 14 of the dividing aperture 11 - in the present description also referred to as dividing crest 14 - preferably have the shape of cutting edges or in any case a tapered hydrodynamic shape, in order to divide the incident flow with greater precision and less turbulence.

[0027] The first fraction of liquid to be sprayed enters the aperture 11 and, after passing through the tubular duct 12, is ejected against the propeller 13, causing it to rotate; among other things, the duct 12 has the function of:

- containing and guiding the flow of liquid to be directed towards the propeller 13, preventing it from dispersion or break-up;
- reducing turbulence inside the jet directed against the propeller 13, compared, for example, to the case of a free jet in the air.

[0028] The rotating propeller 13 distributes part of the liquid supplied to the sprayer 1 with a predetermined distribution uniformity on an area with a square surface - hatched line L1 in Figure 4 - positioned below said sprayer 1.

[0029] The tubular duct 12 has the function of containing, maintaining compact and guiding the flow of the first fraction of liquid to be sprayed, in order to direct it more efficaciously against the propeller 13.

[0030] The second fraction of liquid to be sprayed, after having flowed on the external surface of the conical projection 6, reaches the flange 7 and is thrust by the second dividing means 8, 9 towards the four zones of the corners of the square flange 7, in the following description also referred to as "base extensions 10"; in this way the four base extensions 10 concentrate the flow of sprayed liquid delivered from the flange 7 at the four corners and along the diagonals of said flange 7, giving rise to four projections of the area below sprayed by the sprayer - i.e. in the aforesaid four external spraying zones ZE in Figure 4 - at the corners of the square or rectangular area to be sprayed. In Figure 4 the dash-dot lines L2 indicate the

perimeter of the square area to be sprayed, and the continuous wavy line L3 schematically indicates the boundaries of the zone effectively sprayed by the sprayer in Figure 1 with predetermined degree of uniformity.

[0031] In this way it is possible to obtain relatively uniform distributions of liquid to be sprayed, even with a non-circular shape or circular symmetry; in the present embodiment, the deflector 5 is suitable to spray with predetermined uniformity an area with an approximately square shape - line L3 in Figure 4 - although other embodiments not shown can also spray, with predetermined uniformity, areas of other shapes, such as rectangular, triangular, rhombic, polygonal, star-shaped; sprayed areas with similar shapes can be juxtaposed or partly overlapped with one another, arranging a plurality of sprayers according to the present invention according to a suitable network, in order to spray a wider area - for example the entire filling of a cooling tower - with greater uniformity than obtained by overlapping the circular sprayed areas obtained with prior art sprayers.

[0032] Another important advantage of the sprayer 1 described hereinbefore lies in the fact that the shape and dimensions of the area sprayed with substantial uniformity by the sprayer 1 remains substantially unvaried -approximately square in the example in Figures 1-4 - irrespective of variations in the supply pressure in the interval from 40 to 120 cm of the head of water: in fact, in a prior art sprayer, in which a propeller or impeller sprays water on a substantially circular spraying area, by increasing the head of water the diameter of the spraying area also increases. Instead, in the example of sprayer in Figures 1-3 it has been found that this substantially does not happen, or happens to a much lesser extent, and it is believed that the rotating propeller 13 creates pneumatic depression which tends to close the umbrella-like jet of the water propagating from the flange 7, compensating the increased divarication of said umbrella-like jet caused by an increased supply pressure of the water.

[0033] Preferably, the outlet section of the upstream nozzle 4 and the dividing aperture 11 are opposite and coaxial with each other and - as in the present embodiment, in which both have a circular section - the outlet section of the of the upstream nozzle 4 is approximately 1.3 times greater than the through section of the dividing aperture 11; in other preferred embodiments, the ratio between the outlet section D1 of the upstream nozzle 4 and the through section D2 (Figure 2) of the dividing aperture 11 can vary from 1.2 times to 1.4 times.

[0034] The sprayers described hereinbefore are susceptible to numerous modifications and variations without departing from the scope of the present invention: for example, the propeller 13 can be replace with other types of rotors or revolving bodies made to rotate by the jet of liquid which hits them, or by other types of appropriate circular spraying means, suitable to spray with the sprayed liquid and with a predetermined degree of uniformity, a circular or rounded internal spraying zone; the deflector 5 can be replaced by other peripheral spraying means suitable to spray with water or another sprayed liquid an external spraying zone located around and at least partly external to the aforesaid internal spraying zone; or the deflector 5 can also be hit by several inlet jets, also coming from a plurality of upstream nozzles; the deflector 5 can also be devoid of projecting parts 10, but be suitable to divert and direct the fraction of fluid which flows on the external surface of a conical projection 6 towards one or more spraying areas, on a surface to be sprayed, external to a circular or rounded internal spraying area, in any case giving rise to square, triangular, polygonal or star-shaped sprayed areas. The dividing crest 14 and the upstream nozzle 4 can be replaced by other flow dividing means, suitable to divide the flow of liquid to be sprayed which enters the sprayer in a first and a second fraction, the first fraction sent towards the circular spraying means, the second fraction sent towards the deflector 5.

[0035] In addition to being used in cooling towers, sprayers according to the present invention can be used, for example, in purifying, irrigation or fire extinguishing systems.

Claims

1. Sprayer suitable to spray a predetermined area with a sprayed liquid, said sprayer comprising:

   - circular spraying means (12, 13) suitable to spray, with the sprayed liquid and with a predetermined degree of uniformity, an internal spraying zone (L1) with a substantially circular or rounded shape;
   - peripheral spraying means (5, 6, 9, 10) suitable to spray with the sprayed liquid an external spraying zone (ZE) located around and at least partly externally the internal spraying zone (L1), the peripheral spraying means (5, 6, 9, 10) comprising a deflector (5) suitable to be hit by one or more jets of liquid to be sprayed and to divert and direct at least part of this jet or these jets towards at least part of the external spraying zone (ZE); **characterised in that** said at least part of the external spraying zone (ZE) is substantially contiguous with said internal spraying zone, the internal spray zone (L1) together with the external spray zone (ZE) providing a non-circular spray pattern.

2. Sprayer as claimed in claim 1, **characterized in that** it comprises first flow dividing means (11, 14) suitable to divide the flow of liquid to be sprayed entering said sprayer (1) into at least a first and a second fraction, where at least the first fraction is sent to the circular spraying means (12, 13) and at least the second fraction of the liquid to be sprayed is sent towards the deflector (5) to be sprayed on the at least one

external spraying zone (ZE).

3. Sprayer as claimed in claim 2, **characterized in that** the first dividing means (11, 14) comprise

- at least one dividing crest (14) provided on the deflector and
- at least one upstream nozzle (4) suitable to emit an inlet jet, of liquid to be sprayed, against the at least one dividing crest (14) in order to divide the inlet jet at least into said first and second fraction.

4. Sprayer as claimed in claim 2 or 3, **characterized in that** the first dividing means (11) comprise

- a dividing aperture (11, 14) provided on the deflector (5) and
- at least one upstream nozzle (4) suitable to emit an inlet jet of liquid to be sprayed against the dividing aperture (11) so that said first fraction of liquid to be sprayed enters therein, but the second fraction does not.

5. Sprayer as claimed in claim 4, **characterized in that** the at least one upstream nozzle (4) and the dividing aperture (11) are substantially opposite and the outlet cross section of the at least one upstream nozzle (4) is substantially approximately 1.2 to approximately 1.4 times greater than the cross section of the dividing aperture (11).

6. Sprayer (1) as claimed in claim 3 and/or 4, **characterized in that** the deflector (5) comprises a projecting part (6) which extends in the direction of incidence of the inlet jet, where said dividing aperture (11) and/or said dividing crest (14) are disposed on the top or near the top of the projecting part (6).

7. Sprayer as claimed in one or more of claims 2 to 6, **characterized in that** the deflector (5) comprises, downstream of the first dividing means (11, 14), at least a base extension (10) which extends transverse to the direction of incidence of the upstream jet and is suitable to divert at least part of said second fraction of liquid to be sprayed in order to project it transverse to the direction of the upstream jet and towards at least one of said external spraying zones (ZE) located around and at least partly outside the internal spraying zone (L1).

8. Sprayer as claimed in one or more of claims 2 to 7, **characterized in that** the deflector (5) comprises a flange (7) located at and around the base of the projecting part (6), said flange (7) being suitable to divert at least part of the upstream jet in order to release it transverse to the direction of incidence of said upstream jet against the deflector (5), and towards at least part of the external spraying zone (ZE) located around and at least partly external to the internal spraying zone.

9. Sprayer as claimed in claim 8, **characterized in that** the perimeter of the plane of the flange (7) has a substantially square or rectangular shape.

10. Sprayer as claimed in one or more of claims 7 to 9, **characterized in that** at least in proximity of and/or at the base of the projecting part (6) the deflector (5) comprises second dividing means (8. 9) suitable to promote diversion, towards at least one of the base extensions (10), of the second fraction of liquid to be sprayed.

11. Sprayer as claimed in one or more of claims 1 to 10, **characterized in that** the circular spraying means (12, 13) comprise a rotor (13) suitable to be made to rotate by a jet of liquid to be sprayed which hits it and by rotating is suitable to sprinkle the liquid to be sprayed.

12. Sprayer as claimed in claim 11, **characterized in that** the deflector (5) comprises a guide duct (12) located downstream of the dividing aperture (11) and suitable to contain and guide the first fraction of liquid to be sprayed against the rotor (13), in order to increase the output of the propeller (13).

Patentansprüche

1. Sprüheinrichtung, die zum Sprühen eines vorbestimmten Bereiches mit einer gesprühten Flüssigkeit geeignet ist, wobei die Sprüheinrichtung umfasst:

- ein Kreissprühmittel (12, 13), das zum Sprühen einer inneren Sprühzone (L1) mit einer im Wesentlichen kreisförmigen oder gerundeten Form mit der gesprühten Flüssigkeit und mit einem vorbestimmten Grad an Gleichförmigkeit geeignet ist;
- ein Umfangssprühmittel (5, 6, 9, 10), das zum Sprühen einer äußeren Sprühzone (ZE), die um und zumindest teilweise außerhalb der inneren Sprühzone (L1) angeordnet ist, mit der gesprühten Flüssigkeit geeignet ist,
- wobei das Umfangssprühmittel (5, 6, 9, 10) eine Ablenkeinrichtung (5) umfasst, die dazu geeignet ist, von einem oder mehreren Strahlen der zu sprühenden Flüssigkeit getroffen zu werden und zumindest einen Teil dieses Strahls oder dieser Strahlen zu zumindest einem Teil der äußeren Sprühzone (ZE) umzulenken und zu richten;

dadurch gekennzeichnet, dass zumindest der Teil der äußeren Sprühzone (ZE) im Wesentli-

chen an die innere Sprühzone angrenzt, wobei die innere Sprühzone (L1) zusammen mit der äußeren Sprühzone (ZE) ein nicht kreisförmiges Sprühmuster bereitstellt.

2. Sprüheinrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** sie ein erstes Strömungsteilungsmittel (11, 14) umfasst, dass geeignet ist, die Strömung der zu sprühenden Flüssigkeit, die in die Sprüheinrichtung (1) eintritt, in zumindest einen ersten und einen zweiten Anteil zu teilen, wobei zumindest der erste Anteil an das Kreissprühmittel (12, 13) geliefert wird und zumindest der zweite Anteil der zu sprühenden Flüssigkeit zu der Ablenkeinrichtung (5) geliefert wird, um auf die zumindest eine äußere Sprühzone (ZE) gesprüht zu werden.

3. Sprüheinrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass** das erste Teilungsmittel (11, 14) umfasst:

- zumindest eine Teilungskrone (14), der an der Ablenkeinrichtung vorgesehen ist, und
- zumindest eine stromaufwärtige Düse (4), die zum Ausstoßen eines Einlassstrahles von zu sprühender Flüssigkeit gegen die zumindest eine Teilungskrone (14) geeignet ist, um den Einlassstrahl zumindest in den ersten und zweiten Anteil zu teilen.

4. Sprüheinrichtung nach einem der Ansprüche 2 oder 3, **dadurch gekennzeichnet, dass** das erste Teilungsmittel (11) umfasst:

- eine Teilungsöffnung (11, 14), die an der Ablenkeinrichtung (5) vorgesehen ist, und
- zumindest eine stromaufwärtige Düse (4), die zum Ausstoßen eines Einlassstrahles von zu sprühender Flüssigkeit gegen die Teilungsöffnung (11) geeignet ist, so dass der erste Anteil der zu sprühenden Flüssigkeit darin eintritt, jedoch nicht der zweite Teil.

5. Sprüheinrichtung nach Anspruch 4, **dadurch gekennzeichnet, dass** die zumindest eine stromaufwärtige Düse (4) und die Teilungsöffnung (11) im Wesentlichen gegenüberliegen und der Auslassquerschnitt der zumindest einen stromaufwärtigen Düse (4) im Wesentlichen etwa 1,2 bis etwa 1,4 mal größer als der Querschnitt der Teilungsöffnung (11) ist.

6. Sprüheinrichtung (1) nach einem der Ansprüche 3 und/oder 4, **dadurch gekennzeichnet, dass** die Ablenkeinrichtung (5) ein vorragendes Teil (6) umfasst, das sich in der Einfallsrichtung des Einlassstrahles erstreckt, wobei die Teilungsöffnung (11) und/oder die Teilungskrone (14) an dem oberen Bereich oder nahe dem oberen Bereich des vorragenden Teiles (6) angeordnet sind.

7. Sprüheinrichtung nach einem der Ansprüche 2 bis 6, **dadurch gekennzeichnet, dass** die Ablenkeinrichtung (5) stromabwärts des ersten Teilungsmittels (11, 14) zumindest eine Basisverlängerung (10) umfasst, die sich quer zu der Einfallsrichtung des stromaufwärtigen Strahles erstreckt und zum Umlenken zumindest eines Teils des zweiten Anteils von zu sprühender Flüssigkeit geeignet ist, um diesen quer zu der Richtung des stromaufwärtigen Strahles und zu zumindest einer der äußeren Sprühzonen (ZE) zu projizieren, die um und zumindest teilweise außerhalb der inneren Sprühzone (11) angeordnet sind.

8. Sprüheinrichtung nach einem der Ansprüche 2 bis 7, **dadurch gekennzeichnet, dass** die Ablenkeinrichtung (5) einen Flansch (7) umfasst, der an und um die Basis des vorragenden Teils (6) angeordnet ist, wobei der Flansch (7) dazu geeignet ist, zumindest einen Teil des stromaufwärtigen Strahles umzulenken, um diesen quer zu der Einfallsrichtung des stromaufwärtigen Strahls gegen die Ablenkeinrichtung (5) und zu zumindest einem Teil der äußeren Sprühzone (ZE) freizusetzen, die um und zumindest teilweise außerhalb der inneren Sprühzone angeordnet ist.

9. Sprüheinrichtung nach Anspruch 8, **dadurch gekennzeichnet, dass** der Umfang der Ebene des Flansches (7) eine im Wesentlichen quadratische oder rechtwinklige Form besitzt.

10. Sprüheinrichtung nach einem der Ansprüche 7 bis 9, **dadurch gekennzeichnet, dass** zumindest in der Nähe und/oder an der Basis des vorragenden Teils (6) die Ablenkeinrichtung (5) ein zweites Teilungsmittel (8, 9) umfasst, das dazu geeignet ist, eine Umlenkung des zweiten Anteils von zu sprühender Flüssigkeit zu zumindest einer der Basisverlängerungen (10) zu unterstützen.

11. Sprüheinrichtung nach einem der Ansprüche 1 bis 10, **dadurch gekennzeichnet, dass** das Kreissprühmittel (12, 13) einen Rotor (13) umfasst, der geeignet ist, durch einen Strahl von zu sprühender Flüssigkeit, die auf diesen trifft, in Rotation versetzt zu werden und durch Rotation zum Spritzen der zu sprühenden Flüssigkeit geeignet ist.

12. Sprüheinrichtung nach Anspruch 11, **dadurch gekennzeichnet, dass** die Ablenkeinrichtung (5) einen Führungskanal (12) umfasst, der stromabwärts der Teilungsöffnung (11) angeordnet und dazu geeignet ist, den ersten Anteil von zu sprühender Flüssigkeit zu enthalten und gegen den Rotor (13) zu führen,

um den Ausgang des Propellers (13) zu erhöhen.

Revendications

1. Pulvérisateur approprié pour pulvériser un liquide pulvérisé sur une zone prédéterminée, ledit pulvérisateur comprenant :

   - des moyens de pulvérisation circulaires (12, 13) appropriés pour pulvériser le liquide pulvérisé selon un degré d'uniformité prédéterminé sur une zone de pulvérisation interne (L1) présentant une forme sensiblement circulaire ou arrondie ;
   - des moyens de pulvérisation périphériques (5, 6, 9, 10) appropriés pour pulvériser le liquide pulvérisé sur une zone de pulvérisation externe (ZE) située autour de la zone de pulvérisation interne (L1) et de façon au moins partiellement externe à celle-ci,
   les moyens de pulvérisation périphériques (5, 6, 9, 10) comprenant un déflecteur (5) approprié pour être heurté par un ou plusieurs jets de liquide devant être pulvérisé et pour dévier et diriger au moins une partie de ce jet ou de ces jets en direction d'au moins une partie de la zone de pulvérisation externe (ZE) ; **caractérisé en ce que** ladite au moins une partie de la zone de pulvérisation externe (ZE) est sensiblement contiguë à ladite zone de pulvérisation interne, la zone de pulvérisation interne (L1) fournissant conjointement avec la zone de pulvérisation externe (ZE) une configuration de pulvérisation non circulaire.

2. Pulvérisateur selon la revendication 1, **caractérisé en ce qu'**il comprend des premiers moyens de division d'écoulement (11, 14) appropriés pour diviser l'écoulement de liquide devant être pulvérisé entrant dans ledit pulvérisateur (1) en au moins une première et une seconde fraction, où au moins la première fraction est envoyée vers les moyens de pulvérisation circulaires (12, 13) et au moins la seconde fraction du liquide devant être pulvérisé est envoyée en direction du déflecteur (5) pour être pulvérisée sur la au moins une zone de pulvérisation externe (ZE).

3. Pulvérisateur selon la revendication 2, **caractérisé en ce que** les premiers moyens de division (11, 14) comprennent

   - au moins une crête de division (14) disposée sur le déflecteur et
   - au moins une buse amont (4) appropriée pour émettre un jet d'admission de liquide devant être pulvérisé contre la au moins une crête de division (14) afin de diviser le jet d'admission au moins en lesdites première et seconde fractions.

4. Pulvérisateur selon la revendication 2 ou 3, **caractérisé en ce que** le premier moyen de division (11) comprend

   - une ouverture de division (11, 14) disposée sur le déflecteur (5) et
   - au moins une buse amont (4) appropriée pour émettre un jet d'admission de liquide devant être pulvérisé contre l'ouverture de division (11) de sorte que ladite première fraction de liquide devant être pulvérisé entre à l'intérieur, mais pas la seconde fraction.

5. Pulvérisateur selon la revendication 4, **caractérisé en ce que** la au moins une buse amont (4) et l'ouverture de division (11) sont sensiblement opposées et **en ce que** la section transversale d'évacuation de la au moins une buse amont (4) est sensiblement environ 1,2 ou environ 1,4 fois supérieure à la section transversale de l'ouverture de division (11).

6. Pulvérisateur (1) selon la revendication 3 et/ou la revendication 4, **caractérisé en ce que** le déflecteur (5) comprend une partie faisant saillie (6) qui s'étend dans la direction d'incidence du jet d'admission, où ladite ouverture de division (11) et/ou ladite crête de division (14) sont disposées sur le sommet ou près du sommet de la partie faisant saillie (6).

7. Pulvérisateur selon l'une ou plusieurs des revendications 2 à 6, **caractérisé en ce que** le déflecteur (5) comprend, en aval du premier moyen de division (11, 14), au moins une extension de base (10) qui s'étend transversalement à la direction d'incidence du jet amont et qui est appropriée pour dévier au moins une partie de ladite seconde fraction de liquide devant être pulvérisé afin de projeter celle-ci transversalement à la direction du jet amont et en direction d'au moins l'une desdites zones de pulvérisation externes (ZE) situées autour et au moins partiellement à l'extérieur de la zone de pulvérisation interne (L1).

8. Pulvérisateur selon l'une ou plusieurs des revendications 2 à 7, **caractérisé en ce que** le déflecteur (5) comprend une bride (7) située au niveau et autour de la base de la partie faisant saillie (6), ladite bride (7) étant appropriée pour dévier au mois une partie du jet amont afin de libérer celle-ci transversalement à la direction d'incidence dudit jet amont contre le déflecteur (5), et en direction d'au moins une partie de la zone de pulvérisation externe (ZE) située autour de la zone de pulvérisation interne et de façon au moins partiellement externe à celle-ci.

9. Pulvérisateur selon la revendication 8, **caractérisé en ce que** le périmètre du plan de la bride (7) pré-

sente une forme sensiblement carrée ou rectangulaire.

10. Pulvérisateur selon l'une ou plusieurs des revendications 7 à 9, **caractérisé en ce qu'**au moins à proximité et/ou au niveau de la base de la partie faisant saillie (6), le déflecteur (5) comprend des seconds moyens de division (8, 9) appropriés pour favoriser la déviation, en direction d'au moins une des extensions de base (10), de la seconde fraction de liquide devant être pulvérisé.

11. Pulvérisateur selon l'une ou plusieurs des revendications 1 à 10, **caractérisé en ce que** les moyens de pulvérisation circulaires (12, 13) comprennent un rotor (13) qui est approprié pour être amené en rotation par un jet de liquide devant être pulvérisé qui le heurte et par la rotation est approprié pour asperger le liquide devant être pulvérisé.

12. Pulvérisateur selon la revendication 11, **caractérisé en ce que** le déflecteur (5) comprend une conduite de guidage (12) située en aval de l'ouverture de division (11) et appropriée pour contenir et guider la première fraction de liquide devant être pulvérisé contre le rotor (13), afin d'augmenter le rendement de l'hélice (13).

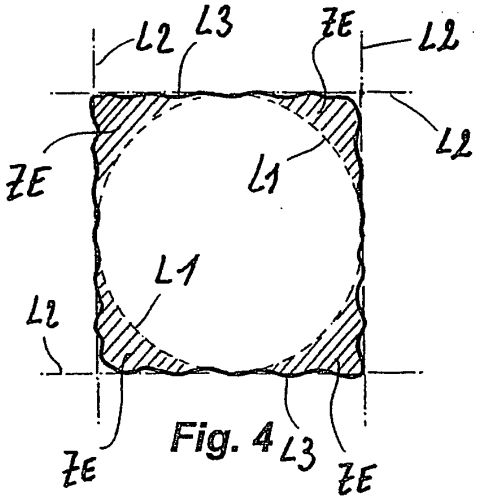


Fig. 4

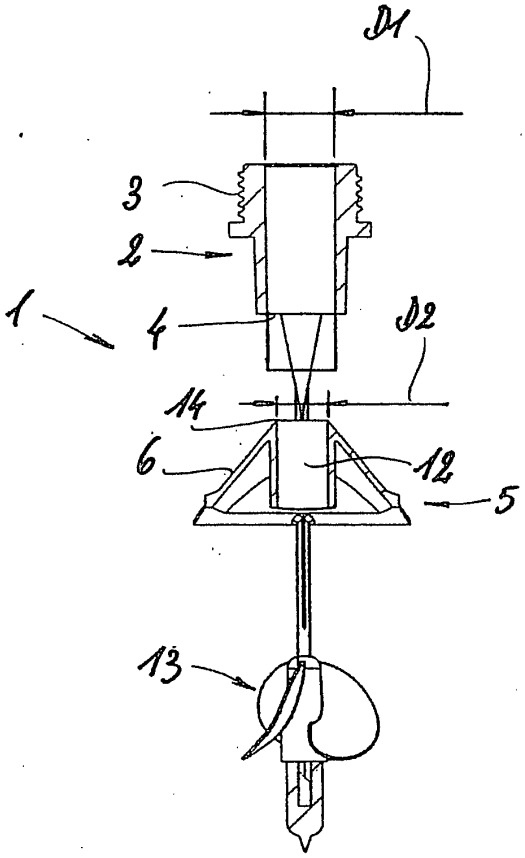


Fig. 2

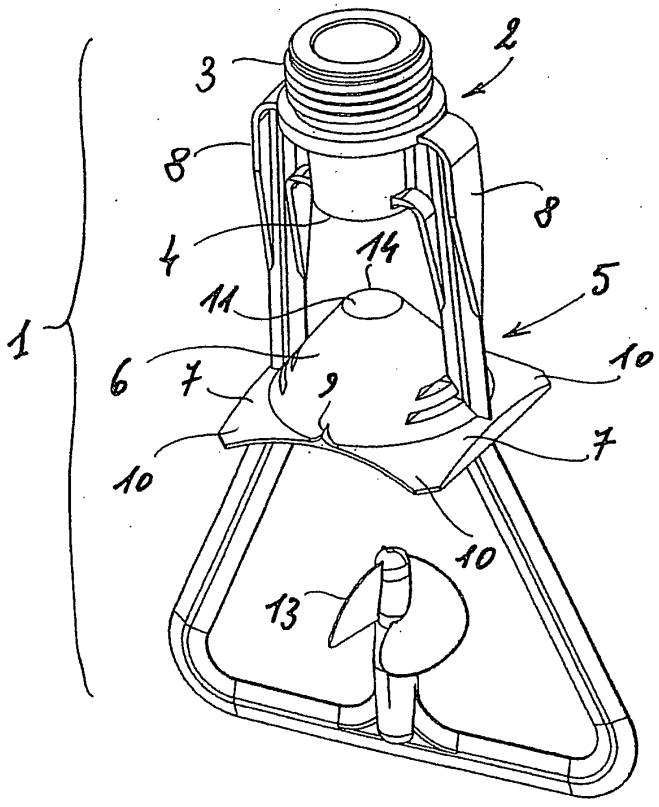


Fig. 1

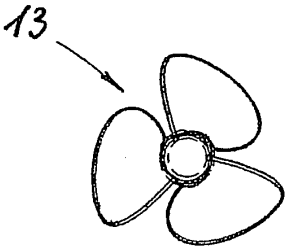


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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