



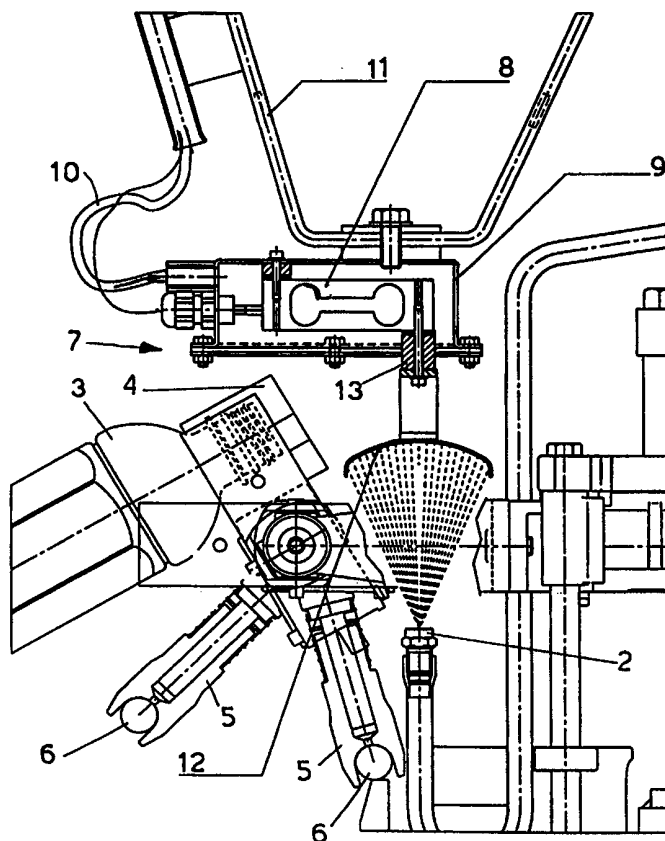
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : B05B 12/08, G01P 13/00	A1	(11) International Publication Number: WO 99/28043 (43) International Publication Date: 10 June 1999 (10.06.99)
(21) International Application Number: PCT/IT98/00322 (22) International Filing Date: 16 November 1998 (16.11.98) (30) Priority Data: PR97A000073 28 November 1997 (28.11.97) IT (71) Applicant (for all designated States except US): PROCOMAC S.P.A. [IT/IT]; Via Fedolfi, 29, I-43038 Sala Baganza (IT). (72) Inventor; and (75) Inventor/Applicant (for US only): LE BRUN, Renato [IT/IT]; Via Duca Alessandro, 22, I-43100 Parma (IT). (74) Agent: GOTRA, Stefano; Bugnion S.p.A., Via Garibaldi, 22, I-43100 Parma (IT).		(81) Designated States: JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report.

(54) Title: METHOD AND DEVICE FOR CHECKING THE OPERATION OF NOZZLES

(57) Abstract

In the bottling sector a device for checking the operation of nozzles (2) comprises a fluid sensing element (12) which is formed so as to receive the fluid flow of one or more nozzles (2) so as to actuate means for detecting a flow parameter, which activate an alarm procedure when said parameter is below a predefined threshold. Said means comprise a load cell (8) associated with the sensing element (12) so as to detect the force exerted by the flow on the sensing element (12) or comprise a position sensor which detects the displacement of a movable sensing element (12) produced by the fluid flow. A method for checking the nozzles involves the steps of flushing a fluid through the nozzles and determining the efficiency of said flushing flow by recording the force which it exerts on a surface of predefined dimensions.



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METHOD AND DEVICE FOR CHECKING THE OPERATION OF NOZZLES

TECHNICAL FIELD AND BACKGROUND ART.

- 5 The present invention relates to a method and a device for checking nozzles, in particular spraying nozzles of rotary rinsing machines in bottling plants.

In bottling plants the containers which are to undergo washing and sterilisation operations prior to filling are conveyed to rotary rinsing machines provided with a plurality of peripheral heads with gripping devices designed to grip the containers and overturn them
10 onto spraying nozzles which spray flushing fluids upwards inside the overturned containers.

In rinsing machines the chemical efficiency of flushing of the containers, in view of the type of sterilising agents, is associated with a mechanical efficiency determined by the flow rate of the flushing fluid.

- 15 One of the drawbacks of these machines consists in the possibility of blockage of the nozzles, with consequent lack of washing of the containers treated by the head which has the blocked nozzle.

In order to overcome this drawback a visual check by a human operator or a telecamera has been adopted, but these represent costly and unreliable solutions.

- 20 Another solution consists in checking the individual nozzles using a flowmeter. However, the cost of a flowmeter is fairly high (hundreds of US\$) and therefore, in rotary machines equipped with more than one hundred operating heads, each of which has its own nozzle (or two concentric nozzles), the cost of checking the output efficiency of the nozzles becomes uneconomical.

DISCLOSURE OF INVENTION.

The object of the present invention is that of eliminating the abovementioned drawbacks and providing a method and an apparatus for checking the nozzles which ensure a high degree of reliability and efficiency together with a low installation and operating cost.

5 Said objects are fully achieved by the method according to the present invention, which is characterized by the contents of the claims indicated below and in particular by the fact that it involves the following steps:

- flushing of fluid through the nozzles;
 - determining the efficiency of said flushing flow by recording the force which it exerts
- 10 on a surface of predefined dimensions or recording the displacement of a movable surface struck by said flushing flow.

It is envisaged expelling, where necessary, the containers which have not undergone efficient treatment, namely containers where the nozzle intended for treatment by means of fluid flushing has exerted a force on said surface which is less than a predefined

15 threshold value or has moved the movable surface by an insufficient amount.

The present invention also relates to a device which is characterized by the contents of the claims indicated below and in particular by the fact that it comprises a load cell provided with a sensing element formed so as to fully receive the fluid spray of one or more nozzles in order to actuate the load cell in such a way that, upon recording of a spray parameter

20 which is below a predefined threshold, an alarm procedure signalling incorrect operation of the nozzles is activated.

Said parameter consists in the force with which the spray acts on the flow sensing element.

Preferably a single load cell, which is contained inside a pressurised casing and supported,

25 via said casing, by a fixed frame of the machine, is provided.

BRIEF DESCRIPTION OF DRAWINGS.

These and other characteristic features will emerge more clearly from the following description of a preferred embodiment illustrated, purely by way of non-limiting example, in the accompanying plates of drawings, in which:

- 5 - Figures 1 and 2 show respectively a side view and a plan view of the device;
- Figure 3 shows a front view of the device.

BEST MODE FOR CARRYING OUT THE INVENTION.

With reference to the figures, 1 schematically denotes a fixed frame of a rotary machine, in the specific case a rotary rinsing machine provided with a plurality of peripheral
10 nozzles rotating together with a movable platform of the rinsing machine, each of which nozzles is intended to spray upwards a flushing fluid inside containers 3 which reach each nozzle in the overturned position, in accordance with a known technique.

The containers 3, which are supplied in an erect position by a transportation device, not shown, are in fact gripped by grippers 4 of the known type associated with fork members
15 5 able to slide and rotate along a cam 6 consisting of a round bar which surrounds perimetrally the rinsing machine and which, along the initial section of the rinsing machine, shown in Figure 2 and referred to as the "overturning twist", performs overturning of the containers.

7 denotes the original device according to the invention, which comprises a load cell 8
20 enclosed and fixed inside a stainless-steel casing 9 internally pressurised by means of a duct 10 which supplies pressurisation air. The casing 9 is fixed by means of a support 11 to the fixed frame 1 of the rinsing machine. 12 denotes a sensing element which is intended to be struck by the fluid sprayed by the nozzles which pass underneath said element. Interception of the fluid by the sensing element produces on the latter a force
25 in accordance with the principle of variation of the momentum.

The sensing element 12, which is outside the casing 9, is connected to the load cell by means of a connector 13, as illustrated in Figure 1, in such a way that the casing 9 is kept pressurised, so as to allow operation of the load cell even under particular conditions of use, for example in corrosive environments.

- 5 The sensing element 12 preferably consists of a metal plate which is folded at the ends with dimensions such that its surface receives fully the spray jets of the nozzles which pass underneath it.

It is possible to design the plate with dimensions such that it is struck by the spray of a single nozzle or by the spray of several nozzles.

- 10 The device 7, which is only one for the whole rinsing machine, is positioned along the initial section of the rinsing machine or in the zone where there are no containers located over the nozzles and the spraying area is free from obstacles.

As regards the original method for checking operation of the nozzles, shown in Figure 3, when the nozzle arrives in the vicinity of the zone underneath the sensing element,
15 emission of the flushing fluid is actuated for the whole of the time during which the nozzle, travelling along its circumferential trajectory, remains within the zone of the sensing element, acting over the whole length of said sensing element. The nozzle may continue to spray until the container is present or the flow may be temporarily interrupted until the container is present, being overturned with its mouth over the nozzle.

- 20 The same occurs for the following nozzles so that the sensing element always has underneath it a constant number of nozzles, i.e. one or more, which spray at the same time, or in any case so that there is a substantially constant throughput of fluid. In the example illustrated in Figure 3, in fact, the sensing element is acted on by the spray of three nozzles (two of which are partial) and during subsequent steps is acted on by the
25 entire spray of two nozzles. The flow rate remains constant, however, equal to the full

throughput of two nozzles.

Activation of emission of the flushing fluid when the nozzle is located underneath the sensing element may be performed with a rotating central header and a fixed synchronised distributor or with a fixed cam which actuates distribution valves associated with each
5 nozzle or by means of solenoid valves managed by a PLC.

The force of the fluid spray is transmitted by means of the sensing element to the load cell which reads this information in the form of an analog signal, sending it to an electronic circuit, not shown, which compares it with a preset alarm threshold.

If the value read is greater than the preset threshold, operation is optimal since it means
10 that the nozzles are functioning correctly and the fluid strikes the amplifying element in an adequate quantity and with sufficient force.

If, on the other hand, the value falls below the threshold, the rinsing machine is stopped and checking of the possible causes of the malfunction is performed.

These causes may consist in blockage of one or more nozzles or damage to the supply
15 valve of the nozzles or lowering of the pressure of the treatment fluid.

Once the malfunction situation has terminated and correct operation above the threshold has been restored, the rinsing machine starts to function again.

Basically, by flushing a fluid (typically water, air or flushing fluid) through a nozzle at a known pressure, striking a load cell, a force is obtained (according to the principle of
20 momentum), which, converted into an electric signal, diminishes with a lessening in the throughput of the nozzle (for example, following a reduction in pressure or cross-section) until it reaches an alarm threshold below which the container does not undergo a correct washing treatment.

The present method and device have been specifically described applied to a rotary
25 rinsing machine, but may be applied, more generally, to checking the operation of nozzles

in operating machines of any kind.

Within the sector of bottling plants said method and device may be applied, for example, to blowing machines for checking blowing nozzles.

With the present invention efficient and reliable checking of the operation of the nozzles
5 is obtained in an extremely simple and low-cost manner and with the use of a single device for each machine, even if the latter is provided with several operating heads, each of which has a nozzle.

It is also envisaged that the containers which do not undergo correct treatment (on account of a blocked nozzle) are eliminated by means of activation of a mechanical expulsion
10 device of a known type, for example a lateral thruster.

According to a variation of embodiment not shown, it is envisaged, in particular in the case of slow machines, using a movable sensing element which is intended to perform a certain displacement (linear, or angular if pivotably mounted) when it intercepts the fluid flow and is subsequently recalled into the rest position by a spring or a counterweight, the
15 operating force of which is adjustable in accordance with known techniques.

Basically, the force is converted into movement, i.e. the parameter "displacement" rather than the parameter "force" is detected.

The load cell 8 and the position sensor form means for detecting a parameter relating to the fluid spray.

20 If the displacement of the sensing element, detected by a position sensor, is insufficient, i.e. less than a predefined threshold, an alarm situation arises because the nozzle is not operating correctly.

CLAIMS

1. Device for checking nozzles, in particular spraying nozzles in a rinsing machine, characterized in that it comprises a fluid sensing element (12) formed so as to receive the fluid flow of one or more nozzles (2) in order to actuate means (8) for detecting a flow parameter, which activate an alarm procedure signalling incorrect operation of the nozzles when said parameter is below a predefined threshold.
2. Device according to Claim 1, in which said means comprise a load cell (8) associated with a sensing element (12) in the form of a metal plate so as to detect as a parameter the force exerted by the flow on the sensing element (12).
3. Device according to Claim 1, in which said means comprise a position sensor which detects as a parameter the displacement of the sensing element (12) produced by the fluid flow, said sensing element (12) being a movable element or strip comprising recall means.
4. Device according to Claim 3, in which said means for recalling the sensing element (12) comprise at least one spring or at least one counterweight.
5. Device according to Claim 2, in which there is a single load cell (8) contained inside a pressurised casing (9) and supported, via said casing (9), by a fixed frame (1) of the machine.
6. Method for checking the operation of nozzles in machines for treating containers, in particular spraying nozzles in a rotary rinsing machine, characterized in that it involves the following steps:
 - flushing a fluid through the nozzles;
 - determining the efficiency of said flushing flow by recording the force which it exerts on a surface of predefined dimensions.
7. Method according to Claim 6, in which the value recorded for the force is converted into a value recording a displacement performed by a sensing element movable as a result of

interception of the fluid flow.

8. Method according to Claim 6, in which it is envisaged expelling, where necessary, the containers which have not undergone efficient treatment, i.e. containers where the nozzle intended for treatment by means of fluid flushing has exerted a force on said surface lower than a predefined threshold value.
9. Machine for rinsing containers, characterized in that it comprises a device according to any one of Claims 1 to 5.
10. Blowing machine for containers, characterized in that it comprises a device according to any one of Claims 1 to 5.

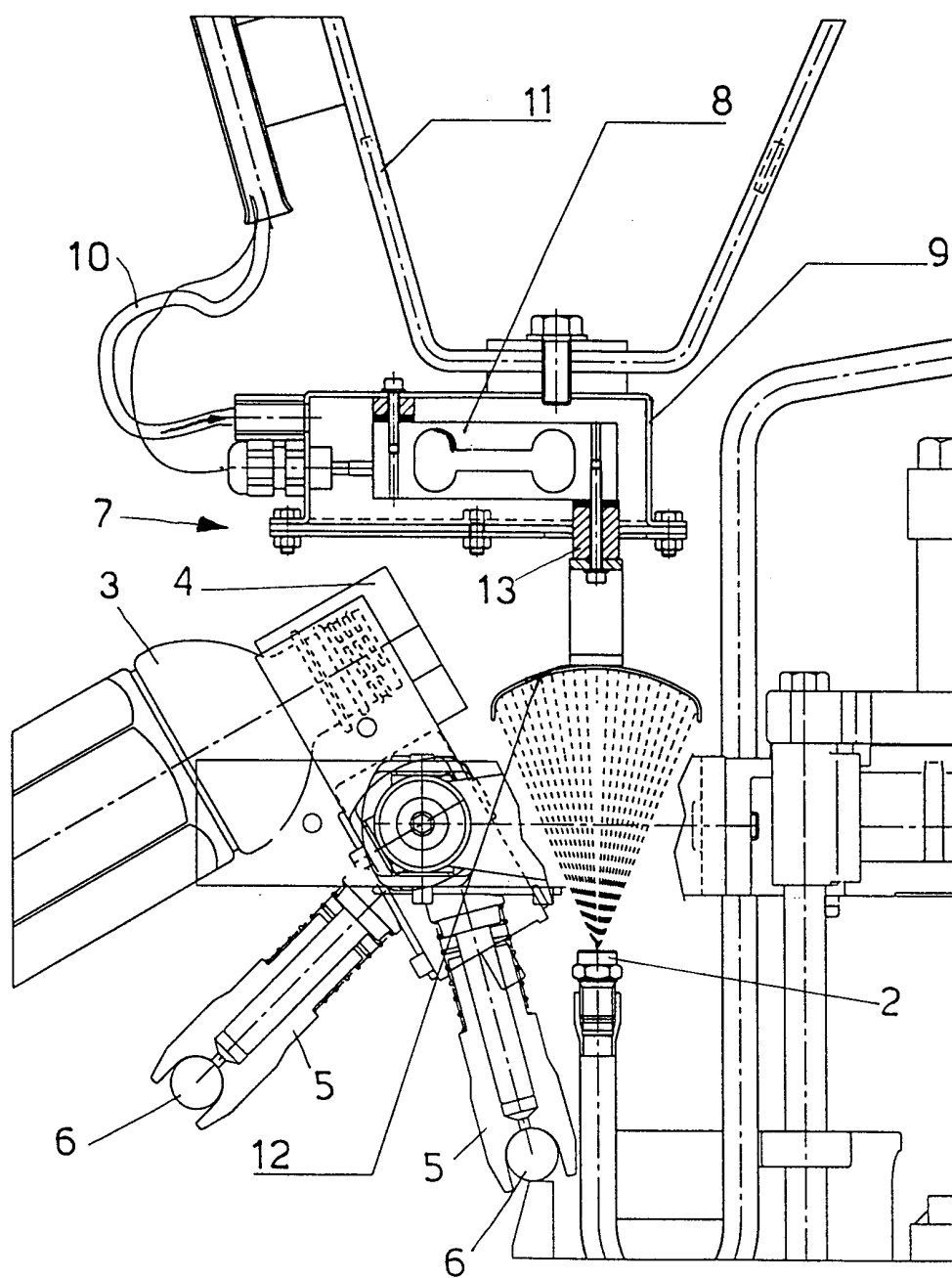


FIG.1

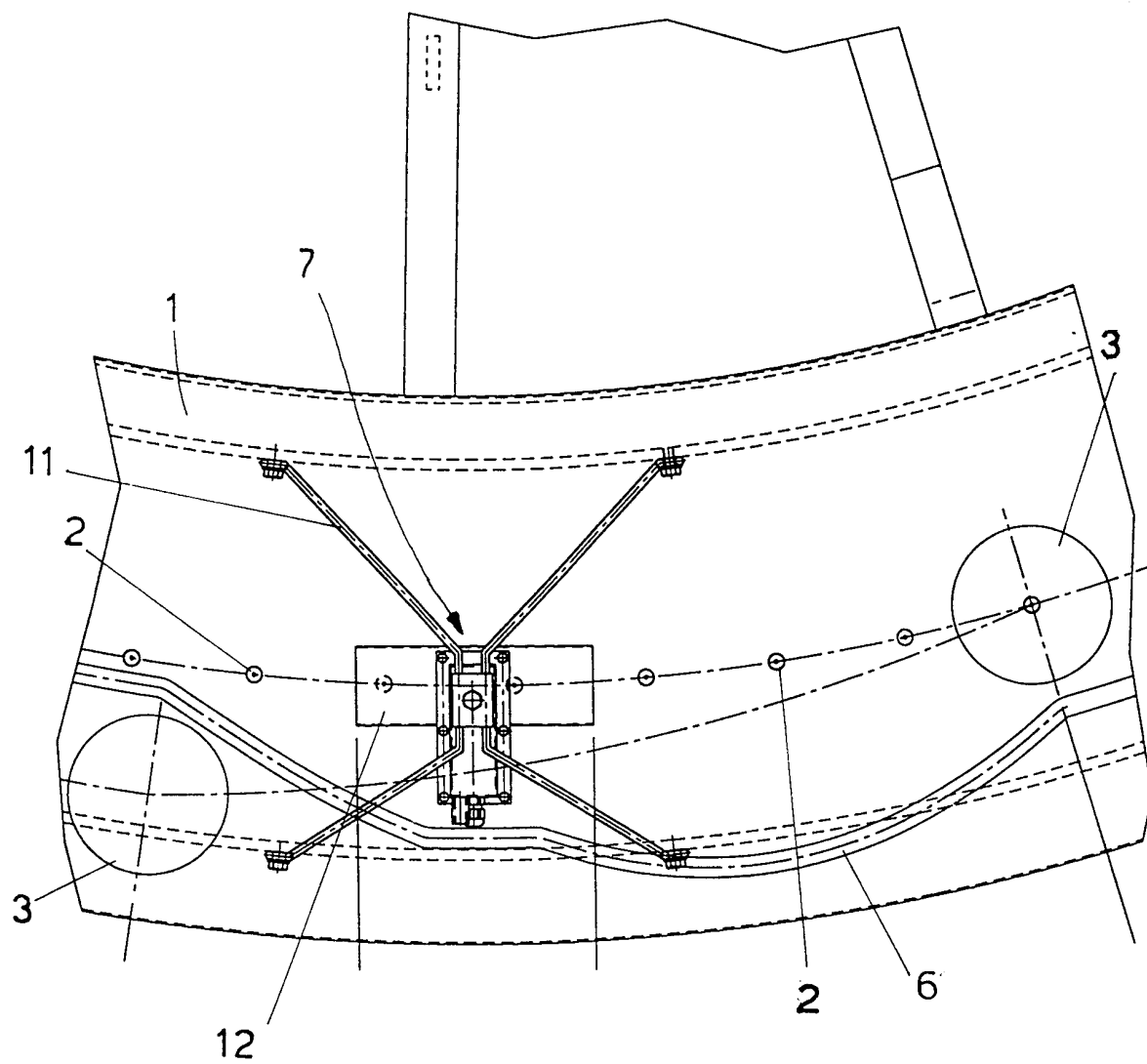
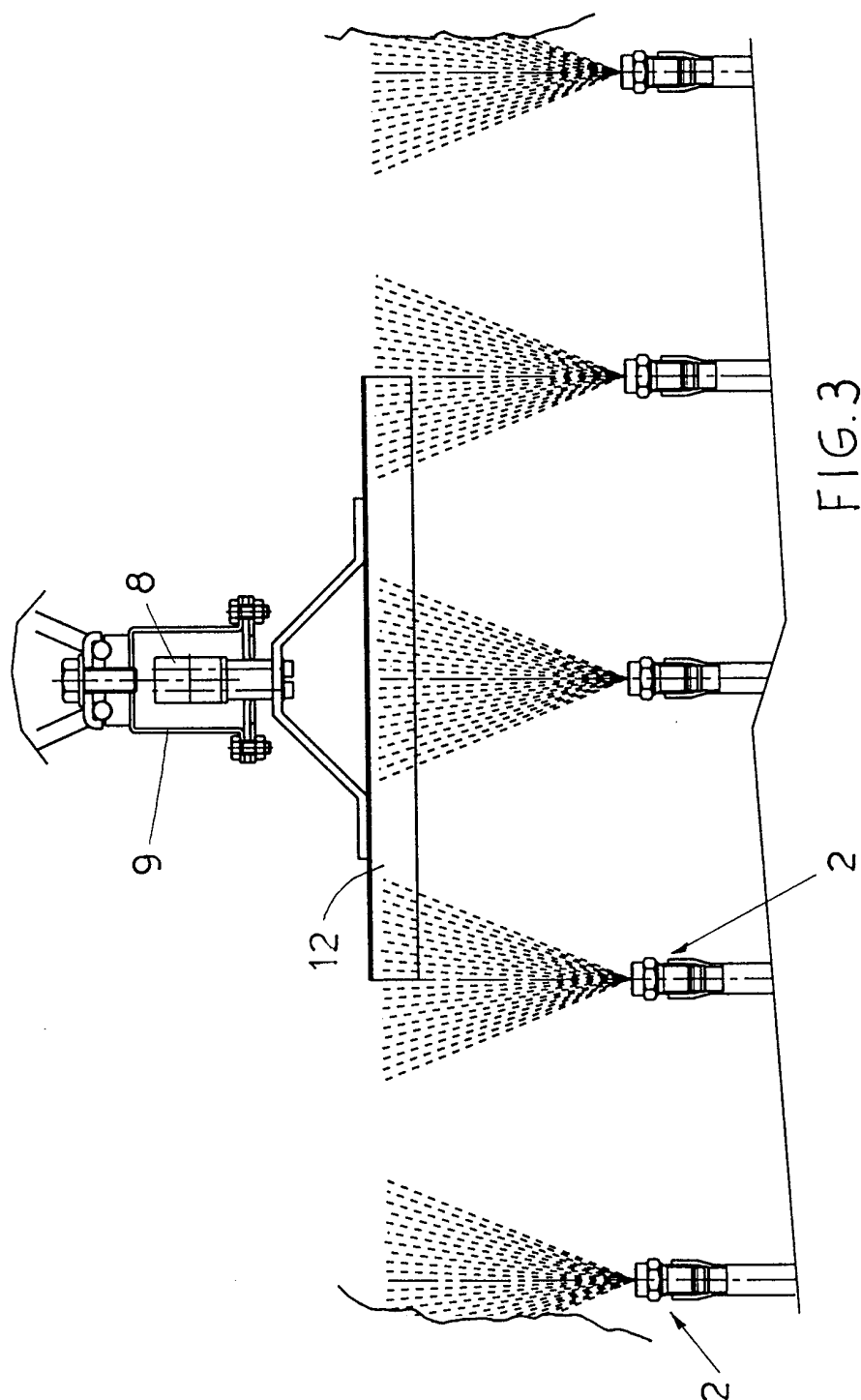


FIG. 2



INTERNATIONAL SEARCH REPORT

In tional Application No
PCT/IT 98/00322

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B05B12/08 G01P13/00

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)
IPC 6 B05B G01P A01M B08B

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 practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	PATENT ABSTRACTS OF JAPAN vol. 095, no. 002, 31 March 1995 & JP 06 315660 A (KOBE STEEL LTD), 15 November 1994 see abstract ---	1-7
Y	US 4 193 356 A (BERG, PIETER VAN DEN ET AL) 18 March 1980 see column 4, line 21-39; figures 3,4 ---	1,2,5,6
Y	US 4 246 576 A (GRIEVE, DONALD F. ET AL) 20 January 1981 see column 6, line 64 - column 7, line 40; figures 7,8 --- -/--	3,4,7

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

10 March 1999

Date of mailing of the international search report

18/03/1999

Name and mailing address of the ISA

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NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
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Authorized officer

Innecken, A

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Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

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