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## (54) Device for checking delivery of fluid or semifluid products.

(57) The device checks whether a spray apparatus for fluid or semifluid products, for example abrasive pastes, paints or lubricants, emits or does not emit product spray. The check is made by a radiation beam disposed to intersect the jet. To prevent any soiling by sprayed product being able to falsify the check and thus impair the device, pneumatic means are provided for preventing such soiling.

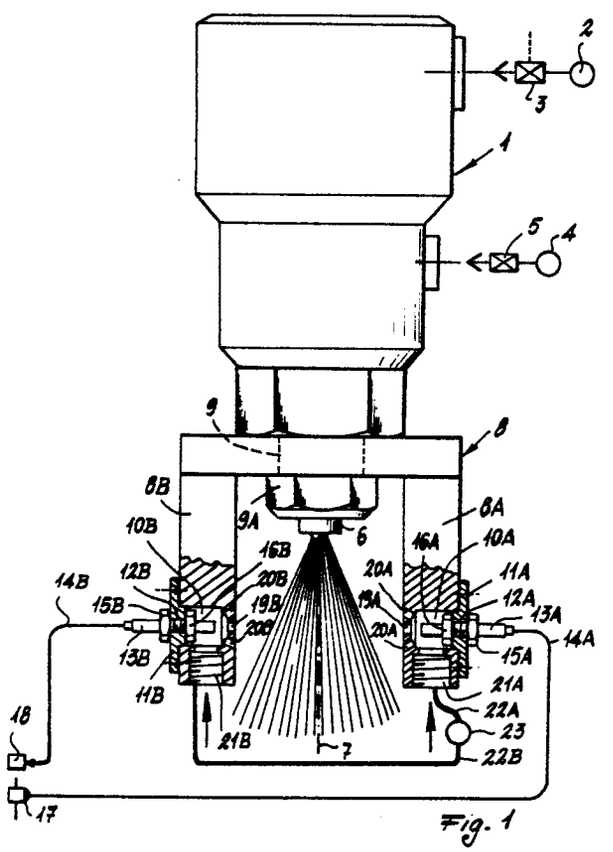


Fig. 1

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# DEVICE FOR CHECKING DELIVERY OF FLUID OR SEMIFLUID PRODUCTS

This invention relates to a device for checking if a conventional spray apparatus for fluid or semifluid products, such as abrasive pastes, paints or lubricants, regularly emits product spray.

With particular but not exclusive reference to those manufacturing fields which use abrasive paste for the surface finishing (for example polishing) of articles such as saucepans and other metal receptacles in apparatuses which operate on such articles by means of rotary tools such as discs or brushes, such apparatuses are known to comprise at least one spray gun which at predetermined intervals sprays given quantities of abrasive paste into the working zone. The discs or brushes act on the article by way of the abrasive paste, so polishing it. The apparatuses in question generally form part of a complex plant comprising several working positions, often located in highly automated anti-pollution cabins.

Any failure in the delivery of the abrasive paste leads not only to the production of unsuitable articles which have to be again passed through the working cycle, but in certain cases also to the irreversible deformation of the article by heat and in particular to the combustion of the discs or brushes (in this respect it should be noted that the abrasive paste also acts as a lubricant and coolant).

There is therefore a requirement to ensure that the aforesaid serious drawbacks do not arise during its absence.

In other fields, such as spray painting or lubrication, the absence of the spray when required is a source of inconvenience, such as the scrapping of an inadequately painted piece or damage to inadequately lubricated parts.

The main object of the present invention is therefore to provide a device able to sense the more or less protracted absence of the jet or spray, so as to enable adequate measures to be adopted in order to remedy the situation deriving from the absence of the product jet or spray.

This and further objects will be more apparent from the detailed description given hereinafter are attained by a device characterised essentially in that the direction of the jet or spray interferes with that of a radiation beam which extends between emitter and receiver means, these means being kept clean pneumatically.

According to a preferred embodiment of the invention, the emitter and receiver means comprise optical fibres associated with light radiation generators and optoelectronic transducers for converting the light energy into an electrical signal. Those terminations of the optical fibres which face the jet are kept clean pneumatically by an air stream which prevents the product or dirt in general from reaching said terminations.

Further characteristics and advantages of the invention will be apparent from the detailed description of a preferred embodiment thereof given herinafter by way of non-limiting example with reference to the accompanying drawing, in which:

Figure 1 is a partly side view and partly sectional view of a conventional abrasive paste spray gun or head with which the device of the invention is associated;

Figure 2 is a diagrammatic view of the device with its control circuit; and

Figures 3 and 4 are two diagrams relative to the operation of that shown in Figure 2.

In the figures, the reference numeral 1 indicates a conventional head or gun for spraying quantities of abrasive paste towards a user point represented for example by a known apparatus for the polishing or other surface-working of an article, such as a saucepan, by means of a pair of rotary discs or brushes acting on the article. The gun or head is operated by compressed air supplied by a source 2 through a solenoid valve 3. The abrasive paste is fed to the gun under pressure from a tank 4 through a controlled valve 5. The gun is supported vertically in known manner above the machine working zone by support means, also of known type, and comprises a nozzle 6 the vertical spray axis of which is indicated by 7 in Figure 1.

On the lower end of the gun there is mounted an inverted-U bracket 8, provided for this purpose with a central hole 9 and retained on the gun by a nut 9A.

In each arm 8A, 8B of the bracket 8, in proximity to its lower end, there is provided a cavity 10A, B of horizontal axis, closed by a cover 11A, B on the outer side of the arm. The two cavities are coaxial. The covers 11A, B are fixed to the relative arms by screws, not shown, and are provided centrally with a through bore 12A, B. Through this through bore there extends a metal sheath or sleeve 13A, B, threaded over at least a central part, and supporting the end of an optical fibre 14A, B. The sheath and the termination of the optical fibre finish in the relative cavity 10A, B. The optical fibre terminations face each other and are coaxial. Two nuts 15A, B; 16A, B secure each sleeve 13A, B and thus the terminations of the optical fibres of the relative covers 11A, B, and are used to set them coaxial. For this purpose, the sheath diameter is less than the diameter of the cover bore.

The other terminations of the optical fibres 14A, B finish at a luminous radiation source 17 (for example an LED) and at a photoelectronic transducer 18 (for example a photoelectric cell).

On the inner side of the bracket 8, the cavities 10A, B are closed by a wall provided with a central bore 19A, B, coaxial to the terminations of the optical fibres 14A, B. These bores are also mutually coaxial. Around these bores there are also provided other bores 20A, B which preferably mutually diverge from the inside towards the outside of the cavities.

In the lower ends of the arms 8A, B of the bracket 8 there are provided threaded bores 21A, B to which pipes 22A, B connected to a compressed air source 23 are connected by threaded connectors, not shown.

Before describing the operation of the device, it should be noted that the operations involved in loading the abrasive paste into the gun 1, ie the control of the feed valve 5, are well known and therefore require no description. For the understanding of the description given hereinafter it need only be noted that after each spray emission the valve 5 is opened to allow the abrasive paste to fill a chamber of predetermined volume in the head 1, from which it is then sprayed through the nozzle 6.

It is assumed that the head 1 forms part of an automated machine or plant for polishing articles such as saucepans. Before and after the actual polishing operation, a sequence of operations are effected in accordance with an assigned programme set on a programmer device (for example a microprocessor), these including for example the loading and unloading of the article. At the commencement and during the course of polishing, a quantity of abrasive paste has to be sprayed into the machine working zone at a frequency determined by the programme. The programme operates in the indicative example of Figure 2 by determining for each required spray emission the temporary closure of the contact 30, thus opening the solenoid valve 3 which feeds the operating air to the head 1 and the energisation of the relay 31 which closes and opens the relative contact 32 pulse-wise. A pulse is fed to a counter 33 which counts the pulse.

When the spray discharges from the nozzle 6, optical connection between the light source 17 and photoelectric cell 18 is interrupted, so that the relay 34 connected thereto becomes de-energised and its rest contact 35 passes from the position indicated by dashed lines to the rest position indicated by full lines. In this latter position, the contact 35 zeroes the counter 33. With the subsequent closures of the contact 30, the succession of events is repeated identically until a spray is detected.

If however no spray is detected, the relay 34 does not become temporarily de-energised, so that no zeroing signal reaches the counter 33, with the result that this latter still indicates "1". If spray is produced with the next closure, the counter which has now counted "2"is zeroed. If the spray is again not produced, the counter remains at "2". If the counter is set to emit a signal to the output line 40 should three consecutive spray discharges fail to emerge, a signal appears in the line 40 on the fourth activation of the valve 3, ie when the counter reaches "4". The signal in the line 40 can be used in various ways to stop the machine or plant and/or to emit an alarm or warning signal.

The counter can be adjusted so as to vary the count level at which the signal is emitted to the line 40.

The diagrams of Figures 3 and 4 clarify the operation of the described circuit. It should however be noted that the circuit is only one of the possible circuits which can be used. Thus for example the circuit can be in the form of discrete electronic components or can be based on a microprocessor, and moreover the method of operation can also be different.

In Figures 3 and 4 the abscissae indicate time and the ordinates indicate the counting and zeroing pulses. Figure 3 relates to the case in which spraying takes place regularly. The pulse is transmitted to the counter 33 by way of the contact 32 at times t'1, 2, 3, n, and the zeroing pulse is transmitted to the counter by way of the contact 35 at times t'1, 1, 3, n by virtue of the fact that spraying takes place regularly. The time intervals t'1-t1, t'2-t2 etc. represent the delay between the two events.

Figure 4 shows the case in which the spray does not appear on three consecutive occasions, so that on the fourth closure of the contact 32 a signal appears at the output 40 of the counter 33. The counter receives a pulse at time t1. Because the spray does not appear, ie because the contact 35 does not close, zeroing does not take place. The counter therefore counts "1". At time t2 the counter 33 received a further pulse, but as there is no spray the counter counts "2". At time t3 the counter likewise counts "3". At time t4, assuming that the counter 33 has been set to emit a signal to the line 40 after three spray failures, a signal appears in this line. When the trouble has been overcome, the operator zeroes the counter 33 before starting the machine or plant. Zeroing is done by pressing a pushbutton 41.

## Claims

1. A device for checking spray or jet delivery of sprayable products, such as abrasive pastes, paints or lubricants, through a spray apparatus, characterised in that the direction of the jet or spray interferes with that of a radiation beam which extends between emitter and receiver means (14A, B), these means being kept clean pneumatically.

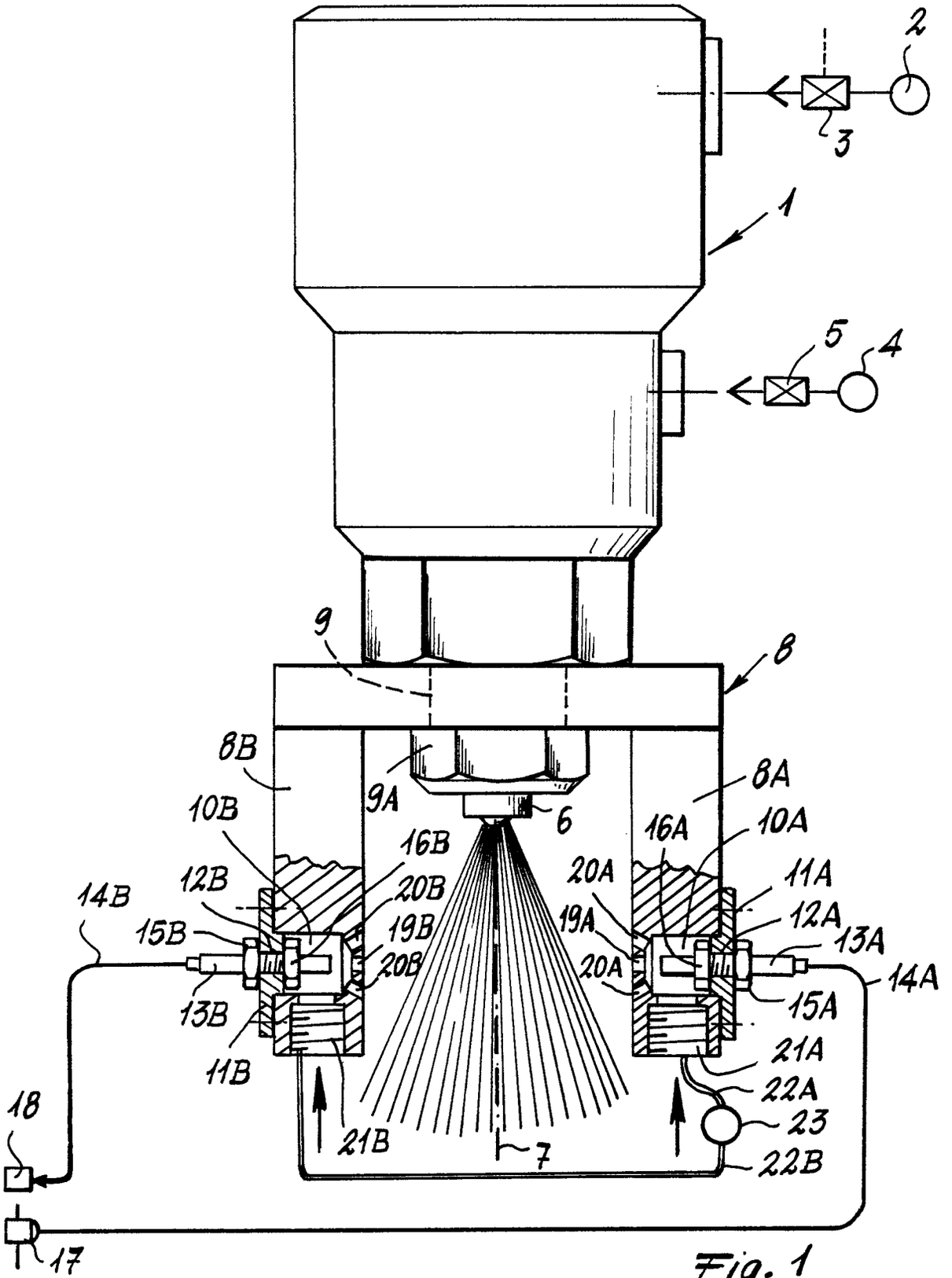
2. A device as claimed in claim 1, characterised in that the emitter and receiver means comprise optical fibres (14A, B) associated with light radiation generator means (17) and optoelectronic transducers (18).

3. A device as claimed in claim 1 or claims 1 and 2, characterised in that the pneumatic cleaning is effected by an air stream which passes over at least part of said emitter and receiver means (14A, B), and is then directed in a disintegrated state towards the spray or jet.

4. A device as claimed in claim 2 or claims 2 and 3, characterised in that said emitter and receiver means (14A, B) terminate in a respective chamber (10A, B) provided in a structure (8) associated with the spray apparatus (1), said chambers (10A, B) being traversed by an air stream which emerges from said chambers towards the spray through a series of apertures (19A, 20A; 19B, 20B) provided in said chambers.

5. A device as claimed in claim 4, characterised in that one of the apertures (19A, B) of one chamber (10A, 10B) is aligned with that of the other, the radiation traversing said apertures (19A, B).

6. A device as claimed in one or more of the preceding claims, characterised by comprising a counting circuit to detect the absence of spray or jet and to emit a signal after counting a predetermined number of spray absences.


2
3
1
5
4
9
8
8B
9A
8A
10B
6
16B
16A
10A
12B
20B
20A
11A
14B
19B
19A
12A
15B
20B
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13A
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13B
15A
11B
21A
22A
18
21B
7
23
22B
17

Fig. 1

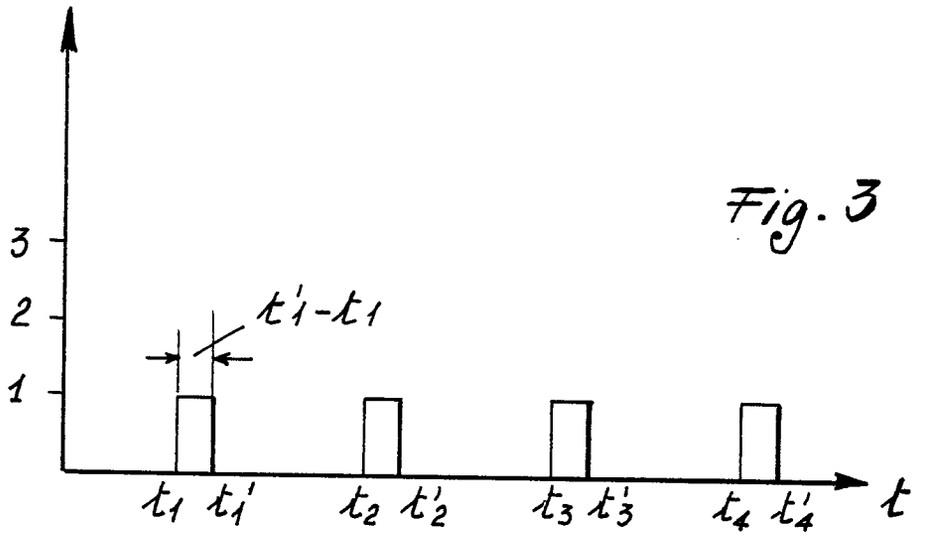


Fig. 3

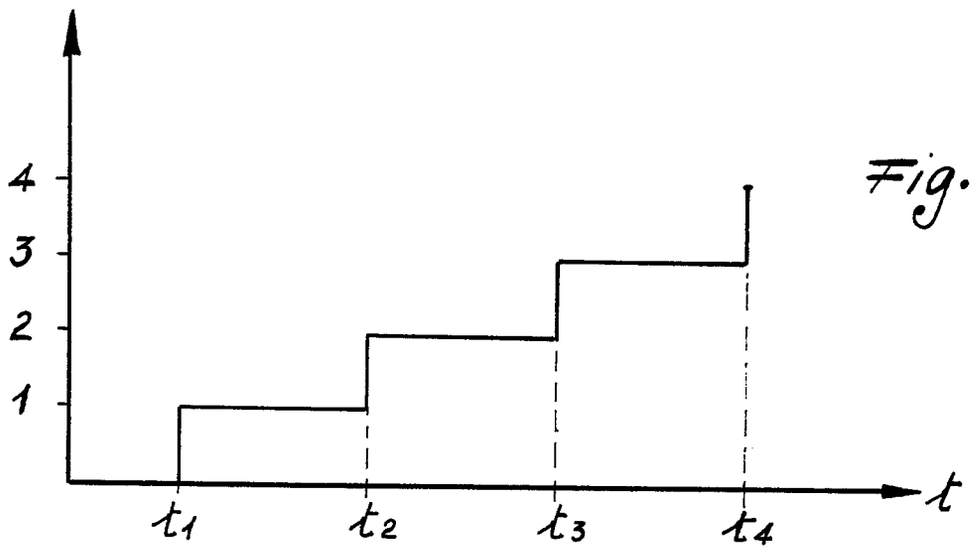


Fig. 4

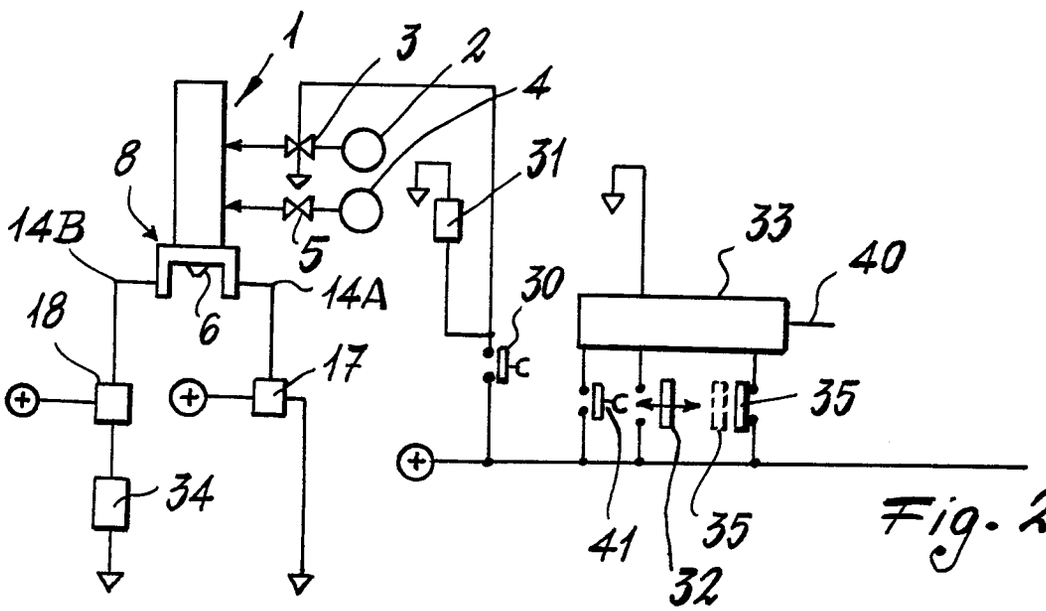


Fig. 2