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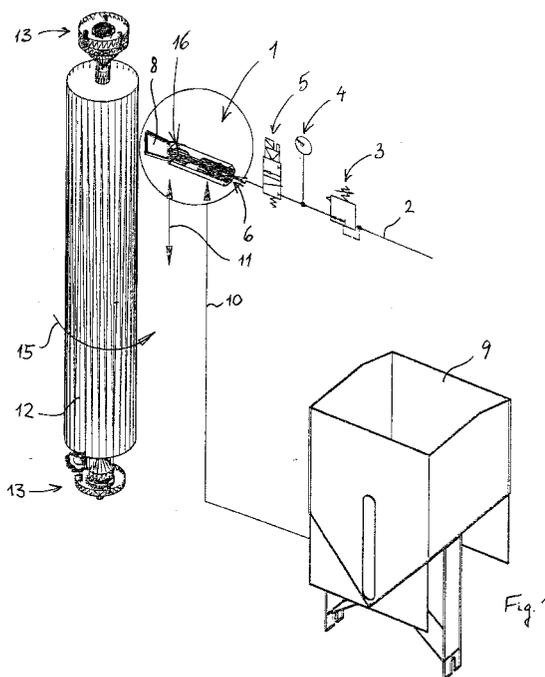
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(54) **Blast cleaning apparatus for printing machines**

(57) The present invention discloses a cleaning apparatus for cleaning of graphic equipment, in particular removing ink residues and the like from the surfaces of anilox rolls, inking rolls or the like, comprising blast cleaning means including an injector (1) for continuous supplying a portion of blast powder material into a pressurised carrier airflow, said injector comprising an inlet (6) with means for connecting the injector to a pneumatic air supply (2) providing the pressurised carrier airflow, a nozzle head for dispensing the blast powder material towards a surface of an item (12) to be cleaned, and a flow channel (7) connecting the inlet to the nozzle outlet (8), and into said flow channel blast powder material can be inserted into the pressurised airflow of the passage, wherein a sliding member (22) having an air flow passage (7b) is provided in the flow channel creating at the downstream end of the sliding member a gap (26) between a thereby created vacuum chamber (24) into which blast powder material is to be fed from a preferably unpressurised blast powder material supply (9), said sliding member being shiftable in a first part of the flow channel whereby the size of the gap can be regulated according to a predetermined dosage of blast powder material into the air flow of through the injector. By the present invention, an apparatus for cleaning of graphic equipment is provided where the proportionality between the amount of blast powder material in the carrier airflow can be altered irrespective of the pressure of the pneumatic air supplied into the injector of the blast cleaning means. This in turn means that the blast pressure can be reduced offering a significantly more gentle or softer cleaning of the surface making the apparatus suitable for cleaning fragile surfaces of rolls in the printing industry, such as inking rolls, anilox rolls and the like.



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Description

[0001] The present invention relates to a cleaning apparatus for graphic equipment in the printing industry, in particular removing ink residues and the like from the surfaces of anilox rolls, inking rolls or the like, comprising blast cleaning means including an injector for continuous supplying a portion of blast powder material into a pressurised carrier airflow, said injector comprising an inlet with means for connecting the injector to a pneumatic air supply providing the pressurised airflow, a nozzle head for dispensing the blast powder material towards a surface of an item to be cleaned, and a flow channel connecting the inlet to the nozzle outlet, and into said flow channel blast powder material can be inserted into the pressurised air flow of the passage.

[0002] Blast cleaning is efficient in cleaning surfaces, e.g. stripping a surface for paint. The process is very cost effective and quick. Moreover no chemical solutions are needed making the process an environmentally friendly cleaning process. This process is usual carried out as a sandblasting, using sand is the blast medium. However, the sandblasting is rough on the surface and leaving sand on or around the surface after it has been stripped of its top layer.

[0003] For more delicate or fragile surface structures, it is known to use sodium bicarbonate as the blast medium. Sodium bicarbonate has an extremely fine grinding effect and is used in various polishing processes of surfaces. Moreover, the process is gentle and effective leaving no harmful substances since this blast medium is biodegradable.

[0004] For cleaning of graphic equipment within e.g. the flexographic and intaglio printing industries, an apparatus of the initially mentioned kind is known. In the graphic industries equipment such as printing rolls, anilox rolls, inking rolls or the like ink residues must regularly be cleaned. For this purpose, blast cleaning with sodium bicarbonate has proven an outstanding alternative to the usual cleaning under use of chemical solutions and substances, in particular with respect to removing ink based on water solutions. The blast cleaning process has proven both more cost efficient, quicker and considerably more environmentally friendly than the chemical cleaning processes since the blast medium dissolves in water and can be collected and lead directly into the public drainage system without polluting the environment. This avoids considerable costs of the disposal of the aggressive chemicals. Likewise, no special requirements for the storage facilities of the blast medium are needed.

[0005] Furthermore, the advantage of this "soft blast cleaning" process is that the structure of the surface itself is not effected making this cleaning particularly attractive in relation to cleaning of rolls having very fine surface structures such as e.g. anilox rolls.

[0006] In the known solutions, the blast medium is inserted into a flow of pressurised air by using a differential

pressure system, where a difference in pressure is created between the air flow of carrier air and in the storage container, placed just above the injector whereby the blast powder is supplied through an opening into the injector.

[0007] However, this known type of dosage system does only prove reliable when the pressurised air of the carrier air is above a certain level. Underneath a certain pressure level, the risk of pulsation is present due to an insufficient pressure in the supply tank. In particular in relation to the performance of a gentle surface cleaning the minimum required pressure constitutes a limitation, as the blast cleaning can be performed more gentle the less pressure of the air flow. In addition, the sodium bicarbonate powder is particularly compressed at the outlet and thus might congest and even clog the outlet. The size of the outlet can be increased in order to reduce this problem, but by increasing the size of the outlet the concentration of blast powder material in the air stream is also increased.

[0008] The object of the invention is to provide an apparatus for blast cleaning of graphic equipment where the above-identified drawbacks are overcome and the injector is adjustable according to the type of job is to be done.

[0009] By the present invention this object is achieved by a cleaning apparatus of the initially mentioned kind wherein a sliding member having a air flow passage is provided in the flow channel creating at the downstream end of the sliding member a gap between a thereby created vacuum chamber into which blast powder material is to be fed from a preferably unpressurised blast powder material supply, said sliding member being shiftable in a first part of the flow channel whereby the size of the gap can be regulated according to a predetermined dosage of blast powder material into the air flow of through the injector.

[0010] By the present invention, a cleaning apparatus for the cleaning of graphic equipment is provided where the proportionality between the concentration of blast powder material in the carrier air stream can be adjusted irrespective of the pressure of the pneumatic air supplied into the injector of the blast cleaning means.

[0011] This in turn means that the blast pressure can be reduced offering a significantly more gentle or softer cleaning of the surface making the apparatus suitable for cleaning fragile surfaces of rolls in the printing industry, such as inking rolls, anilox rolls and the like, since the pressure can be significantly reduced by an apparatus according to the invention just as the concentration or dosage of blast powder material in the air stream can be adjusted according to the actual cleaning task.

[0012] The injector according to the invention is designed in such a way that air flow in the main flow channel of the injector creates at least a partial vacuum in the vacuum chamber whereby the blast powder material is sucked into the chamber from the supply line connected to the chamber. Due to the difference in pressure and

the consequent direction of the air flow, the blast-powder particles flows into the main air stream and blasted on-wards through the nozzle head and onto the surface to be cleaned.

[0013] In the preferred embodiment of the invention the blast powder material is sodium bicarbonate. This is an extremely gentle polishing medium and ensures a smooth surface cleaning. However another blast powder media could alternatively be used in the event the conditions favours such other material.

[0014] In a preferred embodiment of the injector of the apparatus according to the invention, the gap and the reception chamber being an annular chamber are concentrically arranged with the flow channel. Hereby an even distribution of the injection of the blast powder into the flow channel is provided.

[0015] In another preferred embodiment fastening means are provided for maintaining the sliding member in a determined position in the flow channel, preferably an adjustment screw that tightens the sliding member in the housing of the injector. The upstream end of the sliding member could further constitute the inlet of the flow channel.

[0016] In a preferred embodiment, the blast cleaning means further comprises a reduction valve, a shutter valve and preferably also a manometer inserted in the pneumatic air supply line to the injector. Hereby, the apparatus according to the invention can be connected to a pneumatic supply of a clean and dry air under a high pressure, e.g. up to 10 bar. By the reduction valve this pressure can be decreased to the desired blasting pressure level of e.g. 2-3 bar. The blasting pressure can then be read on the manometer.

[0017] In another preferred embodiment of the invention, the apparatus is provided with water spraying means. By spraying water onto the surface prior to the blast impact with the sodium bicarbonate particles this softens the impact of the blast cleaning making the cleaning process even more gentle. The water creates a protective film on the surface and prevent dust from occurring, just as the water has a rinsing effect by dissolving the sodium bicarbonate particles and removing the particles from the item to be cleaned. The water spaying means does at least include a water spray nozzle on the injector for spraying directly onto the surface immediately prior to the impact of the blast powder material. In addition hereto a sprinkling system could be arranged for rinsing a greater part or the whole of the roll or the like to be cleaned.

[0018] In the preferred embodiment of an apparatus according to the invention, the blasting means are mounted on a traversing carriage being driven by traversing means in a traversing movement in a direction parallel with a graphic roller or the like to be cleaned. The traversing of the blasting means ensures a uniform cleaning of the entire length of the roller or the like item to be cleaned.

[0019] The blast powder material is being fed to the

injector through a flexible supply conduit. This facilitates feeding the injector with blast-powder particles during the traversing movement.

[0020] The roll, such as an anilox roll, to be cleaned is in the preferred embodiment placed in holding means in a vertical position, said holding means preferably also comprising driving means for rotating the accommodated roll. The holding means is moreover preferably designed to accommodate rolls of different lengths, such as roll lengths of up to 650 mm or more, and the holding means, the blasting means and the water spraying means are arranged in a cabin, said means being commanded by process control means. Hereby a compact apparatus is provided that is particular suitable for the printing industry as an efficient and environmentally friendly cleaning of e.g. anilox rolls can be carried out. The cabin is preferably completely casing the holding means, water spray means and the blasting means and is provided with a transparent front door for inspection during the process and for rigging and de-rigging the apparatus.

[0021] In the preferred embodiment of the cabin according to the invention, it is provided with a drain, if feasible a vacuum exhaust drain. The drain can be connected to a public drainage system via a settling tank, whereby harmful materials, i.e. ink residues are removed from the waste water. This means that environmentally harmful materials are not present in the waste water of the blast cleaning process according to the invention that is lead into the drainage system.

[0022] The invention will be described more detail below with reference to the accompanying drawings, in which

Fig. 1 is a schematic view of an apparatus according to the invention,
 fig. 2 is a detailed cross-sectional view of an injector in the apparatus according to the invention, and
 fig. 3 is a schematic front view of an apparatus according to the preferred embodiment of the invention.

[0023] As illustrated in the figures 1 to 3, an injector 1 is supplied with pressurised air in a pneumatic air supply 2 through a reduction valve 3 reducing the air pressure to the blast pressure, a manometer 4 and a shutter valve 5. The pneumatic air supply can provide air with as much as 10 bar that then can be reduced with as much as 7-8 bar creating a wanted blasting pressure of as less as 2-3 bar. The air flow is entered into the injector 1 by the inlet 6. The air flow passes through a flow channel 7 in the injector 1 to the outlet 8 which is formed as a flat nozzle 8. Sodium bicarbonate blast powder material is sucked from a container 9 through a supply conduit 10 into the flow channel 7 of the injector 1.

[0024] The blasting means is arranged for traversing movement such as indicated by the arrow 11 in fig. 1

and 3. The path of the traversing movement is parallel to the longitudinal axis of the anilox roll 12 mounted in the holding means 13 of the apparatus. The holding means 13 include driving means 14 for rotating the roll 12 inserted in the apparatus for being blast cleaned. The distance from the outlet nozzle 8 and the surface of the roller 12 is adjustable.

[0025] A water spray nozzle 16 is mounted on the injector 1 in such a position that the surface immediately before the line of blast cleaning - seen in the direction of the rotation 15 of the roll 12 - is sprayed with water smoothing the impact of the blast cleaning powder on the surface. The water spray nozzle 16 is connected to a water supply tube 17, such as e.g. a normal 1/2" tube. In addition to this water spray nozzle 16 on the injector 1 a water sprinkler 18 can be arranged inside the top and/or the side of the cabin 19 in which the blasting means and the holding means are arranged. During the blast-cleaning process the amount of water used is app. 1.5 litres/min. During a final rinsing process the amount used is app. 2.5 litres/min.

[0026] The traversing movement 11 of the blasting means and the rotation 15 of the roll 12 is controlled by the controlling means 20. The whole control system can be connected to a normal power supply, such as a 220 V AD supply or the like.

[0027] The injector 1 is view in more detail in figure 2 that is a cross-sectional view of the injector housing 21 having an inlet 6 and an outlet 8 communicating through a flow channel 7. In the first part 7a of the flow channel 7 nearest the inlet 6 a sliding member 22 is disposed in an axially shiftable arrangement. The sliding member 22 is retained in a certain axial position in relation to the flow channel 7 by fastening means 23, such as a screw. The first part 7a of the flow channel 7 is cylindrical in shape and has a bigger diameter than the rest of the flow channel 7. The sliding member 22 is shaped with a main body having a diameter tightly fitting into the first part 7a of the flow channel 7 and with a tubular extension in such a way that an internal chamber 24 is created between the sliding member 22 and the narrowing 25 of the flow channel 7. The sliding member 22 is provided with a flow passage 7b through the main body and the tubular extension that preferably is concentric with the flow channel 7 and 7a. A gap 26 is created between the relatively steep decrease in diameter of the flow channel 7, the so-called narrowing 25, and the downstream end of the tubular extension of the sliding member 22.

[0028] When the pressurised air flows through the flow channel 7 a vacuum is created in the internal vacuum chamber 24. This causes sodium bicarbonate to flow into the chamber 24 from the supply conduit 10 as the vacuum chamber 24 communicates with the blast-powder container 9 through the supply conduit 10.

[0029] By adjusting the position of the sliding member 22 in the flow channel 7 the size of the gap 26 can be changed whereby the amount of blast-powder sucked into the flow channel 7 by the flow of pressurised air can

be regulated.

[0030] In the following, the function of the apparatus is explained in principle under reference to fig. 1 and 3.

[0031] A graphic roller 12 is placed in the holding means 13. The upper gripping part of the holding means 13 is mounted on a rail so that rolls of different sizes can be accommodated between the two gripping parts of the holding means 13. In an embodiment of the invention the apparatus is designed to accommodate rolls of up to 650 mm in length including roll axles. The roll 12 can be continuously rotated in the holding means by the driving means 14.

[0032] After the roll 12 has started to rotate, the blasting means can traverse up and down along the roll 12. The blasting means comprise an injector 1 having a nozzle head 8 directed towards the surface of the roll 12. The distance can be adjusted according to the setting of the actual cleaning job. On the injector 1 a water spray 16 is arranged. The blasting is turned on and the nozzle head 8 is traversed in a number of strokes, normally 1 to 5 strokes, depending on the need for cleaning. The relation between the traverse velocity and the angular velocity of the roller 12 is controlled by the control means in such a way that the cleaning is carried out in helical strips with an overlap on the roller surface. The overlap is preferably equal to half the width of the flat nozzle head so that all points on the surface has been encountered two times per stroke. The velocities involved are relative small, preferably in the order of app. 2-6 revolutions per minute. During the blast-cleaning, water is sprayed onto the surface of the roll 12.

[0033] In the top of the cabin 19 a water sprinkler 18 is arranged for rinsing the roll 12 by spraying water into the cabin and onto the roll. The water sprinkling can be increased after the blast-cleaning as a finishing rinsing of the roll dissolving and removing excess powder. In the bottom of the cabin 19 a drain (not shown) is provided leading the water and the dissolved sodium bicarbonate powder into the public drainage system.

[0034] On the side of the cabin 19 a control panel 20, a pneumatic air supply and a blast-powder supply 9 are arranged. The capacity of the supply 9 is in a concrete embodiment 6 litres (app. 5 kilos) of sodium bicarbonate powder. The use of blast-powder during normal operation is app. 200 g/min.

Claims

1. A cleaning apparatus for cleaning of graphic equipment, in particular removing ink residues and the like from the surfaces of anilox rolls, inking rolls or the like, comprising

blast cleaning means including an injector for continuous supplying a portion of blast powder material into a pressurised carrier airflow, said injector comprising

an inlet with means for connecting the injector to a pneumatic air supply providing the pressurised carrier airflow, a nozzle head for dispensing the blast powder material towards a surface of an item to be cleaned, and a flow channel connecting the inlet to the nozzle outlet, and into said flow channel blast powder material can be inserted into the pressurised airflow of the passage,

characterised in that

a sliding member having a air flow passage is provided in the flow channel creating at the downstream end of the sliding member a gap between a thereby created vacuum chamber into which blast powder material is to be fed from a preferably unpressurised blast powder material supply, said sliding member being shiftable in a first part of the flow channel whereby the size of the gap can be regulated according to a predetermined dosage of blast powder material into the air flow of through the injector.

2. An apparatus according to claim 1, wherein the blast powder material is sodium bicarbonate.
3. An apparatus according to claim 1 or 2, wherein the gap and the reception chamber being an annular chamber are concentrically arranged with the flow channel.
4. An apparatus according to claim 3, wherein fastening means are provided for maintaining the sliding member in a determined position in the flow channel.
5. An apparatus according to claim 3 or 4, wherein the upstream end of the sliding member constitutes the inlet of the flow channel.
6. An apparatus according to any or the previous claims, wherein the blast cleaning means further comprises a reduction valve, a shutter valve and preferably also a manometer inserted in the air flow supply line to the injector.
7. An apparatus according to any or the previous claims, wherein the apparatus is provided with water spraying means.
8. An apparatus according to claim 7, wherein the water spraying means comprises at least a water nozzle on the injector in a position so as to provide the surface of the item to be cleaned with a water film prior to the impact of the blast powder material.
9. An apparatus according to any of the previous claims, wherein the blasting means are mounted on a traversing carriage being driven by traversing means in a traversing movement in a direction parallel with a graphic roller or the like to be cleaned.
10. An apparatus according to any of the previous claims, wherein the blast powder material is being fed to the injector through a flexible supply conduit.
11. An apparatus according to any of the previous claims, wherein the roll, such as an anilox roll, to be cleaned is placed in holding means in a vertical position, said holding means preferably also comprising driving means for rotating the accommodated roll.
12. An apparatus according to claim 11, wherein the holding means is designed to accommodate rolls of different lengths, such as a roll lengths of up to 650 mm.
13. An apparatus according to any or the previous claims, wherein the holding means, the blasting means and the water spraying means are arranged in a cabin, said means being commanded by process control means.
14. An apparatus according to claim 13, wherein the cabin is provided with a drain, if feasible a vacuum exhaust drain.

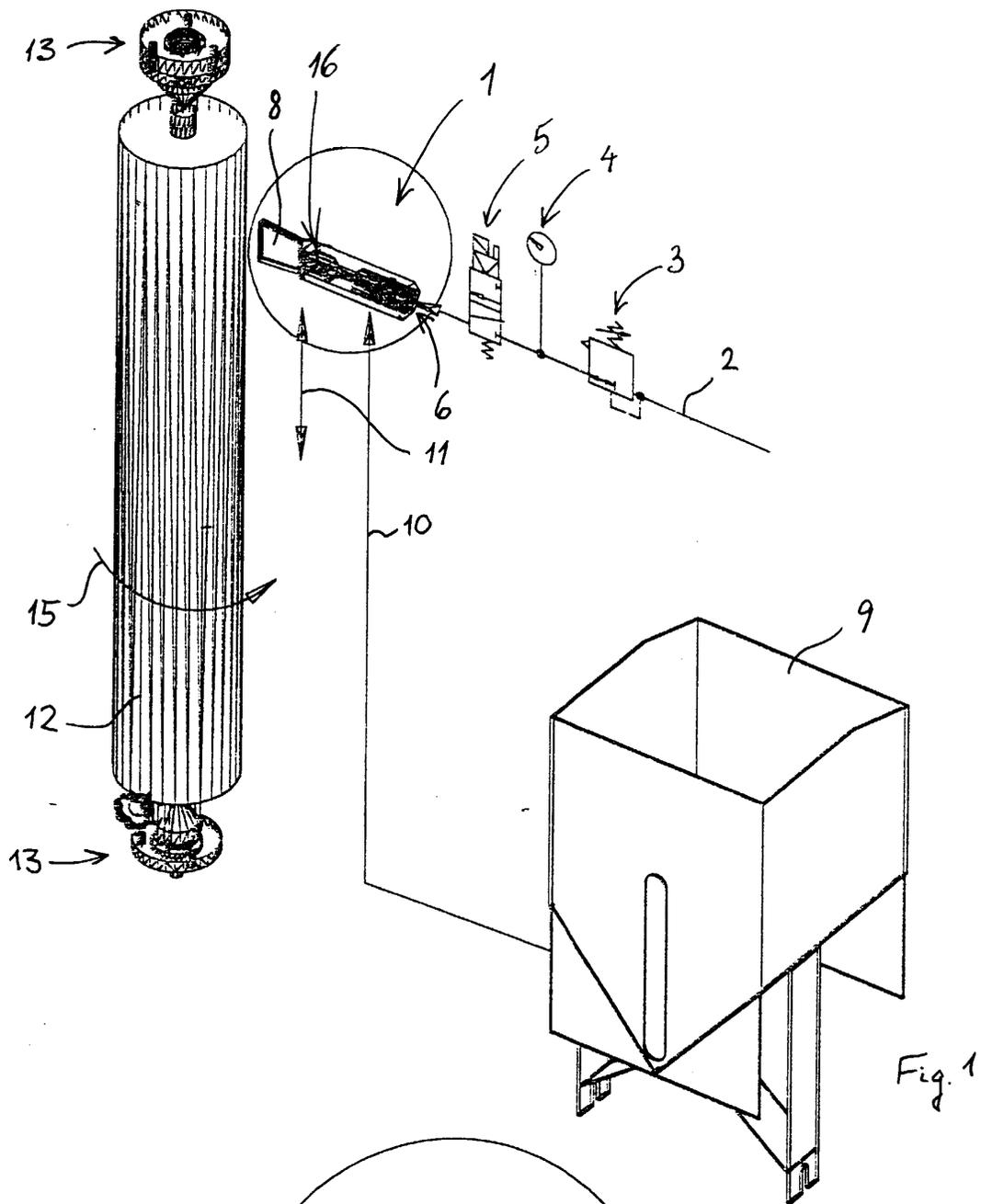


Fig. 1

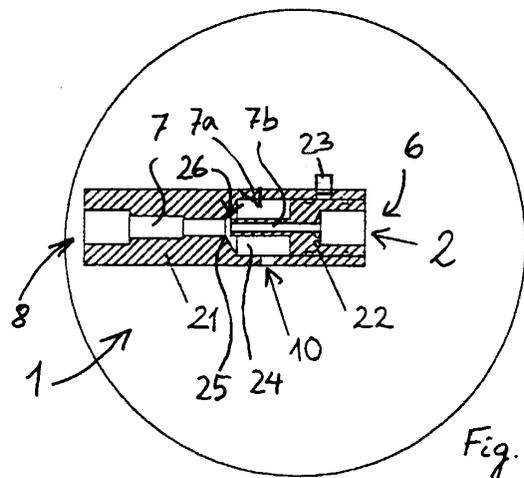


Fig. 2

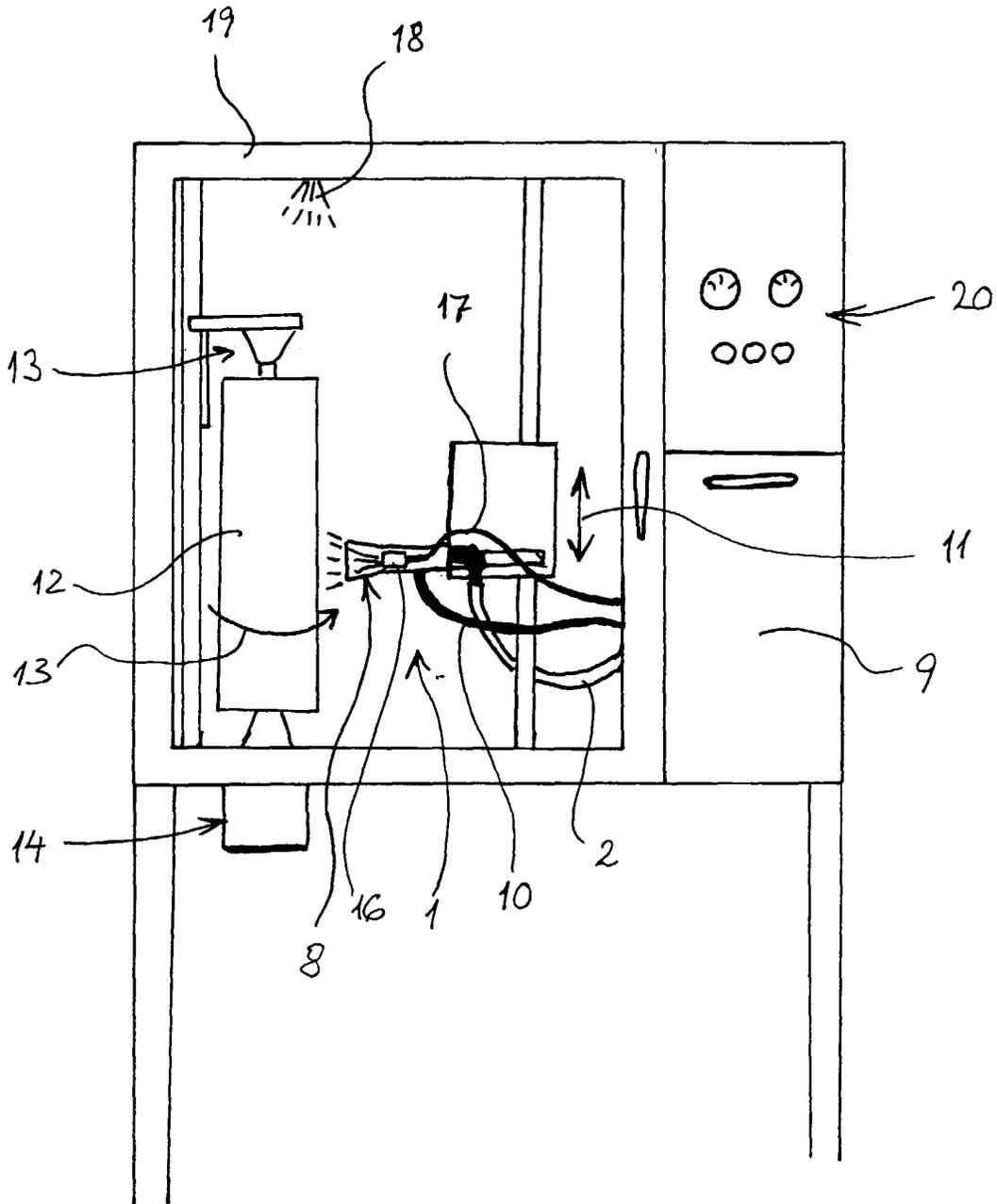


Fig. 3



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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
MUNICH		28 July 1999	Greiner, E
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EUROPEAN SEARCH REPORT

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