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(54) Vibrating machine for the finishing, the washing and the drying of metal pieces.

(57) A vibrating machine is described for the finishing, the washing and the drying of metal pieces consisting of a round bowl the upper part of which is closed by a cover; a portion of said cover being mobile around a pin fitted to the center of the bowl; the bottom of said round bowl being provided with three or more round openings protected by a grid, located symmetrically in respect with each other and connected to the center part of the bowl by means of tubular pipes; said central part having the function of settling tank through which the air used for the drying of the pieces contained into the bowl is suctioned at the end of the finishing and washing processes.

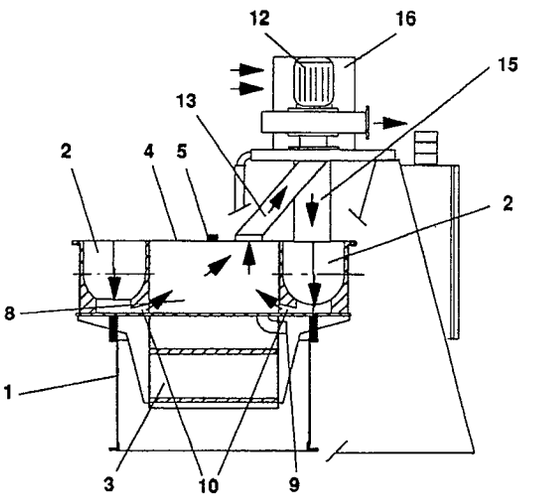

Fig. 1

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VIBRATING MACHINE FOR THE FINISHING, THE WASHING AND THE DRYING OF METAL PIECES.

The present invention relates to a vibrating machine for the finishing, the washing and the drying of metal pieces consisting of a round bowl the upper part of which is closed by a cover; a portion of said cover being mobile around a pin fitted to the center of the bowl; the bottom of said round bowl being provided with three or more round openings protected by a grid, located symmetrically in respect with each other and connected to the center part of the bowl by means of tubular pipes; said central part having the function of settling tank through which the air used for the drying of the pieces contained into the bowl is suctioned at the end of the finishing and washing processes.

In the mechanical industry, particularly in that part which is concerned with the production of mechanical small pieces, the problem of cleaning, degreasing, pickling and other similar processes constantly presents itself after the forming process of the pieces.

The aggregate of the above mentioned processes, commonly assuming the name of 'finishing", is even more frequently effected with machines, particularly vibrating machines, which give excellent surface finishes in a simple and automatic fashion.

In the vibrating machines, the finishing processes are effected with the help of the regular movement of the mass being processed which consists of the granulated solid media (of various shapes and sizes) used for the finishing processes, the aqueous solutions/suspensions of suitable chemical compounds and the pieces to be treated.

The aqueous solutions and/or suspensions of chemical compounds perform the detergent, pickling, abrasive or colouring actions and they must, therefore, always be completely eliminated not only by a settling process but by washing the finished pieces. Sometimes the mass under process lacks one or more of the above mentioned components as, for instance, when the abrasive or polishing effect is obtained by making the pieces rub one against the other or when the aqueous solution is not used.

In any case, at the end of the finishing processes, not only the compounds used for finishing operations but also the particles which have been detached from the pieces under process, must be eliminated and a washing cycle is always necessary. The washing cycle, normally carried out with water, must always be followed by a drying cycle of the washed pieces, before these are packed for shipping or submitted to subsequent terminal processes, such as painting or punching. Water, in fact, tends to adhere to the surface in the form of small drops which may leave calcareous residue (if non-de ionized water is used for the final washing) or stains, but in any case, the drops favour the surface oxidation of the pieces if these are made from metals or from alloys subject to oxidation.

In case the washing liquid does not consist of water but of a compound which cannot be dispersed in the atmosphere, the drying air must necessarily be conveyed towards waste and recovery systems of the evaporated liquid.

The Applicant has been working in the field of metal surface finishing for many years, by using vibrating machines and has described machines for finishing and/or drying processes in several Patents or Patent Applications.

In particular, reference is made to Italian Patents nos. 1.188.255; 1.188.224; 1.190.054 and Italian Patent Applications nos. 19729 A/87; 22171 A/87 and 83654 A/88.

The finishing and washing processes are normally performed in a certain machine while the drying process is performed in another machine, still of vibrating type, but having shape and devices different from those of the former.

The present invention relates to a machine which is particularly interesting because it can perform both the finishing/washing process and the drying process, in subsequent stages, without the need for the pieces under process, to be separated from the processing media and to be conveyed to another machine.

It seems thus evident the advantage of operating with a single machine especially in case of small productions of pieces which would be penalized by the high amortization cost of two machines instead of a single one.

The present invention relates to a vibrating machine for the finishing, washing and drying of metal pieces consisting of a round bowl the upper part of which is closed by a cover; a portion of said cover being mobile around a pin fitted to the center of the bowl; the bottom of said round bowl being provided with three or more round openings protected by a grid, located symmetrically in respect with each other and connected to the center part of the bowl by means of tubular pipes; said central part having the function of settling tank and through which the air used for the drying of the pieces contained into the bowl is suctioned at the end of the finishing and washing processes.

A typical embodiment of the device of the machine of the present invention will now be described by referring to the attached drawings in which:

- figure 1 shows a schematic vertical section of the machine;
- figure 2 shows a schematic plan view of the round bowl of the machine;
- figure 3 shows a schematic plan view of the cover of the machine.

The machine consists of a base 1 supporting a round bowl 2 which contains the granulated solid media used for the process, the solutions or suspensions of the chemical compounds used to obtain the type of finish required and the pieces to be treated.

The central part of the machine is divided into two superimposed sections 3 and 8. Lower section 3 holds the motor (not shown in the figure), which transmits the vibratory movement to the machine, while the upper section 8 acts as settling tank of the liquid used for the finishing and washing processes in round bowl 2. Said liquid is finally drained from the machine through duct 9. Settling tank 8 is connected to round bowl 2 by means of three pipes 10, which end in three gridded openings 11 placed on the bottom of the bowl symmetrically in respect with each other.

Round bowl 2 is closed by a cover 4 a section 6 of which rotates around a pin 5 fitted to the center of the cover. The displacement of mobile section 6 of the cover around the central pin 5 allows closing or opening a section 7 of the round bowl 2, which allows pieces to be loaded for the process and unloaded at the end of the drying cycle.

The opening or closing of mobile section 6 of cover 4 is advantageously obtained by reversing the direction of rotation of the motor which sets the machine in motion.

At the end of every processing cycle (pickling, degreasing, abrasion, etc.) the processing liquid used for said cycle is drained from the machine through settling tank 8 and duct 9. Having achieved the washing of the finished pieces and having drained the washing liquid, the drying process can start.

The air coming from heating unit 16 is conveyed by duct 15 towards an opening 14 in the fixed part of cover 4, through which it is fed into the machine. An air suction fan 12 is connected to the central part 8 of the machine by means of duct 13.

The suctioning action of the fan compels air to flow downward through the pieces and the processing media contained in bowl 2; this favours the action of the force of gravity for the draining of the residual washing liquid from the surface of the finished pieces, while reducing the quantity of liquid to evaporate with subsequent energy saving.

The temperature of the air let into the machine is controlled by a thermo-couple (not shown in the figure), fitted into suction duct 15, whereas the temperature of the outgoing air is controlled by a thermo-couple (not shown in the figure), fitted into suction duct 13.

It is very important to keep the inlet air temperature controlled because an excessive temperature value could damage the inner lining of bowl 2, which generally consists of synthetic elastomeric products.

On the other side, it is also important to control the outgoing air temperature as this allows us to know exactly when the pieces contained in bowl 2 are perfectly dry.

Said temperature is depending upon the presence of water within the mass under process and it remains constant as long as there is still water to be evaporated, owing to the great heat absorption caused by the water evaporation.

Where there is no more water to be evaporated, temperature tends to rise quickly, reaching values close to those of the inlet air.

The presence of a thermo-couple pointing out the end of the drying cycle is, therefore, particularly important to save energy (it is no use going on drying pieces which are already dry) and taking into account the fact that some types of metal alloys are particularly sensitive to heat and could change their colour with a serious deterioration of the finish degree of the machined pieces.

Claims

1. Vibrating machine for the finishing, the washing and the drying of metal pieces consisting of a round bowl the upper part of which is closed by a cover characterized by the fact that
a portion 6 of the cover 4 is mobile around a pin 5 fitted to the center of the bowl 2; the bottom of the round bowl 2 being provided with three or more round openings 11 protected by a grid, located symmetrically in respect with each other and connected to the central part 8 of the bowl 2 by means of tubular pipes 10; said central part 8 of the bowl having the function of settling tank through which the air used for the drying of the pieces contained into the bowl is suctioned at the end of the finishing and washing processes.

2. Vibrating machine as per claim 1, characterized by the fact that said mobile portion 6 of said cover 4 rotates around said pin 5 closing or opening a sector 7 of the round bowl 2 which allows pieces to be loaded for the process and unloaded at the end of drying cycle.

3. Vibrating machine as per claim 2, characterized by the fact that the opening/closing movement of said mobile portion 6 is carried out by reversing the direction of rotation of the motor which sets the

machine in motion.

4. Vibrating machine as per claim 1 characterized by the fact that said central settling tank 8 is connected to an air suc tion fan 12.

5. Vibrating machine as per claim 1 characterized by the fact that air is fed to the machine through an opening 14 in the fixed portion of the cover 4, connected to the heating unit 16 by means of a duct 15.

6. Vibrating machine as per claim 5 characterized by the fact that the air temperature is controlled by a thermocouple fitted into said duct 15.

7. Vibrating machine as per claim 1 characterized by the fact that the air is suctioned from the machine through an opening in the fixed portion of the cover 4 through a duct 13 which connects the suction fan 12 to the central part 8 of the machine.

8. Vibrating machine as per claim 7 characterized by the fact that the air temperature is controlled by a thermocouple fitted into said duct 13.

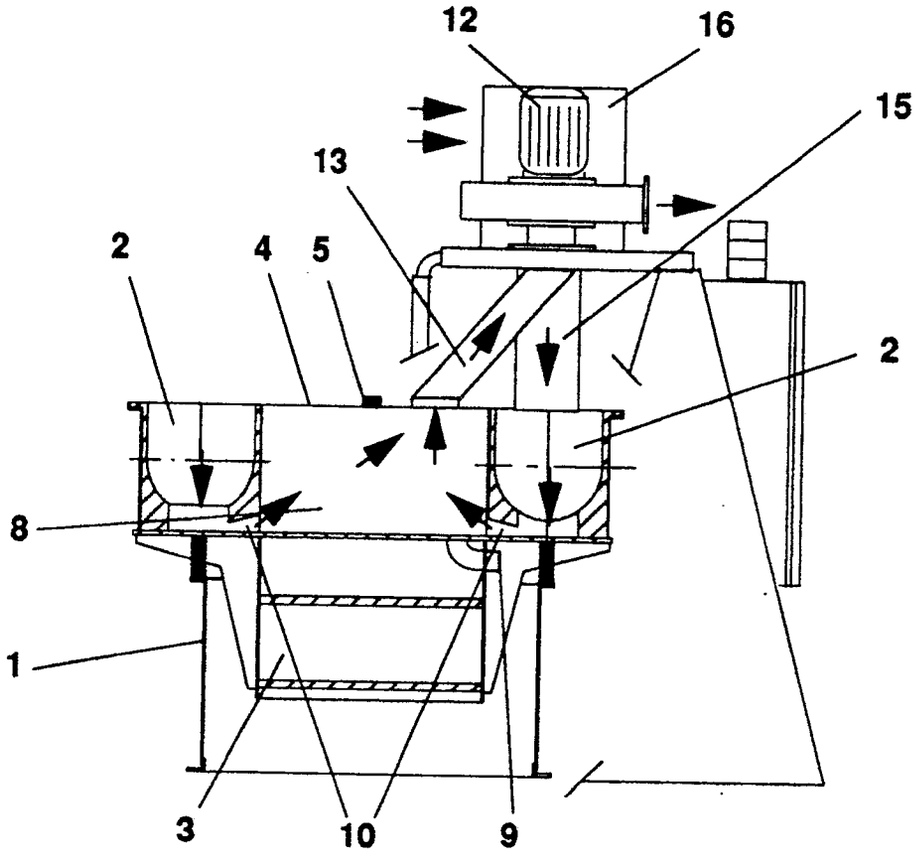

Fig. 1

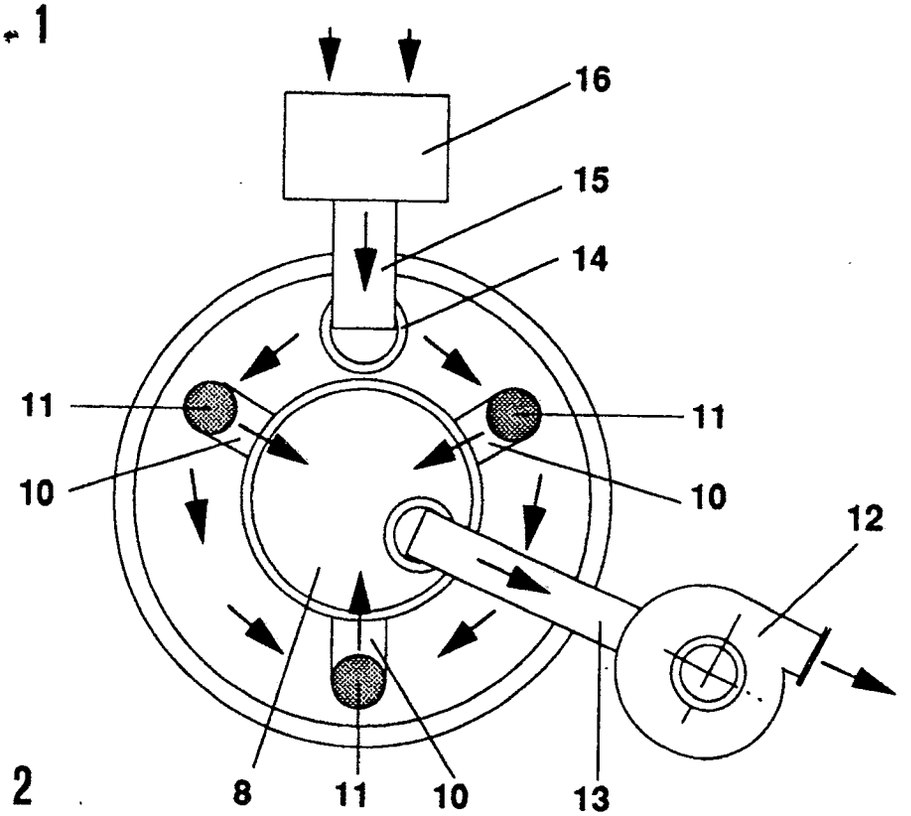

Fig. 2

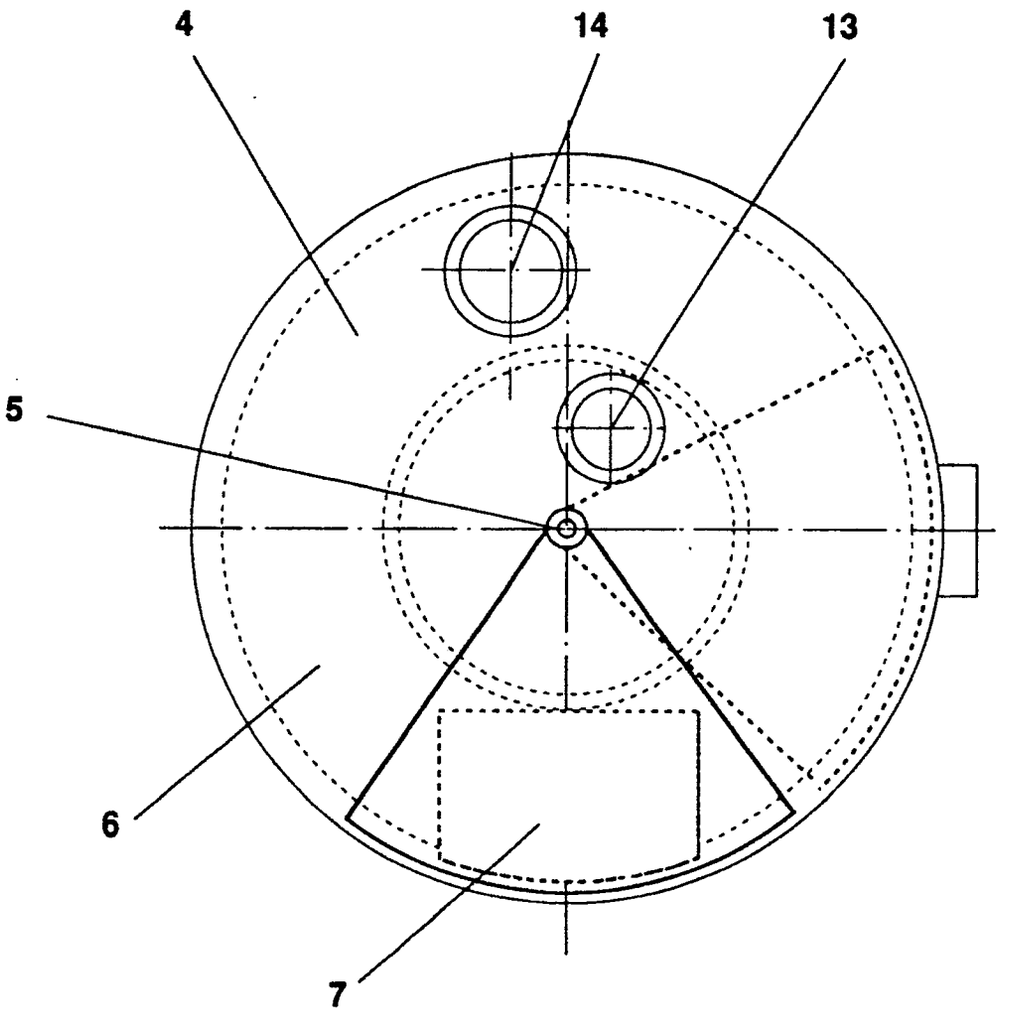

Fig. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 12 0625

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-4184290 (RAMPE) * column 6, lines 14 - 32; figures *	1	B24B31/12 B24B31/073
D,A	EP-A-282937 (RENI-CIRILLO SRL) * claims ; figures *	1, 5	
D,A	EP-A-353601 (RENI-CIRILLO SRL) * abstract; figures *	1, 4	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B24B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 FEBRUARY 1991	ESCHBACH D.P.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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