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(54) Device for the finishing of hanging parts by means of a vibrating machine.

(57) A device is described for the finishing of hanging parts (1) by means of a vibrating machine, said device consisting of a supporting element (5) which is mobile vertically with respect to the vibrating unit (8), said supporting element (5) bearing a variable number of polygonal section bars (2) inserted into passing holes (6) drilled in the same supporting element (5) and yet free to move, said bars (2) having the upper end wider than the rest so that they cannot pass through the passing hole (6) into which they are inserted and the lower end (3) in form of a hook or pin in order to fix the part (1) to subject to the finishing treatment in the vibrating unit (8).

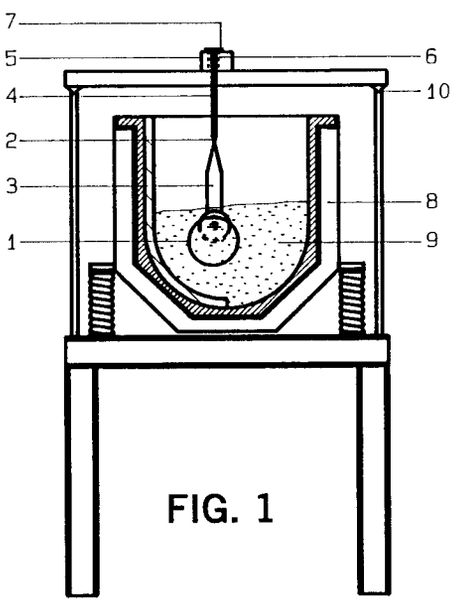

FIG. 1

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This invention relates to a device for the finishing of hanging parts by means of a vibrating machine.

In the mechanical industry , and particularly in that part which is concerned with the mass production of metal small parts, the mass finishing of the parts after their machining is very often carried out by means of vibratory equipment.

The market offers vibrating machines allowing to obtain high quality finishing degrees on metal parts with various shape and size and, in particular, slight rounding off, roughness reduction and surface polishing. These operations are controlled by adjusting the frequency of the vibrations, the composition of the processing media, the geometrical shape of the same and the possible additives (cleansing, degreasing, polishing, abrasive and protection agents) wchich are fed into the processing bowls.

The vibratory finishing has therefore become a high precision step, applicable also to delicate parts or to parts of high intrinsic value, with extremely low running costs.

Among the materials which are more frequently used for the production of the processing media, we can mention metals, ceramics, synthetic resins, with the possible addition of abrasive materials or material of different nature.

Processing media are typically commercialized in the form of chips having the maximum dimension, being the diagonal or the diameter, comprised between 2 and 60 mm and having different shapes, such as sphere, regular and irregular polyhedron, ellipse.

Notwithstanding the great improvements achieved in the vibratory finishing field, this technique is still not applicable to parts having certain features which prevent their processing in a vibratory machine as they would get damaged by bumping one against the other. These features may include shape, size, weight/volume ratio, nature of the construction material, difference between the specific weight of the part and that of the processing media.

It is in fact known that the vibratory movement produced by the motor of a vibrating machine is transmitted to the processing media and to the parts contained into the vibrating unit, being this in form of a square tub or a round bowl, through the walls of the unit itself.

The amplitude of the vibratory movement trasmitted from the walls to its content can be controlled wheares the forming of preferential courses of the parts within the vibratory mass of media can hardly be avoided, as it is depending on many variables such as the particular shape and size of the parts themselves, the ratio between the weight and the volume of the parts, the difference between the specific weight of the construction material of the parts and that of the processing media.

It is also known that the more uniforme the content of the vibrating bowl is, the better finishing degree you can obtain, the mass of processing media and parts should therefore be kept as homogeneous as possible in the course of the treatment.

For example, if spherical parts (having the maximum weight/volume ratio) made of ferrous material (having a high specific weight) are loaded into a tub vibrating machine containing polyhedric processing media (lower weight/volume ratio) made of ceramic material (having a much lower specific weight than that of the ferrous materials), the processing media will occupy and will move towards the peripherical areas of the tub whereas the spherical part will occupy and will move towards the middle of the vibrating mass.

In the same way, bulky parts such as, for example, hollow parts with a low weight/volume ratio, will tend to part from the processing media (which have full shapes) and will move towards the peripherical areas of the tub.

The lack of homogeneity of the mass, moving into the tub by effect of the vibrations, affects the quality of the abrasion process on parts of the above mentioned types, these are finished by the processing media in a non-uniform way and tend to bump one against the other with the risk of dents which affect irreparably the final quality of the parts.

In the case of hollow parts (glasses, pots, bodies of coffee-pots, motor casing and others...), it also happens that the processing media fill completely the cavity of the part thus modifying the ratio between weight and volume. This increase in weight, which is not uniform for all parts of course, depending on the quantity of media which happen to fill the parts, affect the movement of the parts within the media in an uncontrollable way and make parts become more fragile (and consequently subject to damages) when they are hit by other parts.

To obviate the above difficulties, the Applicant has tried to fix the parts onto external supports (which were not integral with the vibrating tub) so that the same did not follow the movement of the mass of the processing media but remained still in pre-fixed positions although plunged into the mass of media.

This solution succeeded in preventing parts from getting dented, but did not allow to obtain an acceptable finishing degree because some areas of the parts underwent a preferential treatment with the subsequent non-uniformity of the finishing quality. Moreover the movement of the media was greatly hindered by the part itself, kept in a fixed position by its own support, in some cases it hap-

pened that the movement of the media was actually blocked, (practically undoing the effect of the finishing treatment).

The device according to the present invention can obviate all the above mentioned problems while offering further advantages which cannot be obtained with other types of machines as will be made clear by the following detailed description.

The device according to the present invention consists of a supporting element mobile vertically with respect to the vibrating unit, said supporting element bearing a series of polygonal bars which are inserted in passing holes drilled in the supporting element itself and yet free to move with respect of the same, said bars having the upper end wider than the body, so that it cannot pass through the hole and the lower end in form of a hook or pin in order to fix the part to subject to the finishing treatment into the vibrating unit of the machine.

The supporting element of the device according to the present invention can have the shape of a bar, a tubular element, a box-type structure made of two channel sections or other shapes suitable to the job.

In the most favoured designs of the present invention the supporting element is represented by the cover of the vibrating unit.

This design offers a further advantage as it allows to obtain a reduction of the noise produced by the machine during its running.

The supporting element simply rests on the top edges of the vibrating unit without being fixed and, when moved vertically, all the parts are plunged into or extracted from the media at the same time.

The bars of the device have polygonal section, preferably triangular, rectangular or exagonal and the passing holes of the supporting element into which the bars are inserted have the same polygonal section but are oversized of a percentage comprised between 20 and 200% with respect to the bar.

During the treatment, this fundamental construction feature of the device according to the present invention allows the parts hooked to the lower end of the bar and plunged into the media, to move together with the bar but with different amplitude and course which are pre-set and adjusted following the shape of the bar and the ratio between the dimensions of the section of the passing hole and those of the section of the bar. The result obtained is that parts move within the processing media following a given course without reducing the effect of the abrasive action and exposing the whole surface to the treatment in a homogeneous way.

The distance between the passing holes of the supporting elements can be adjusted according to the size of the parts in order to prevent these to enter in touch one with the other. The supporting elements are easily interchangeable in order to suit the dimensions of the parts.

Considering that the supporting elements rest simply on the edges of the vibrating unit and that also the bars are not fixed to the supporting elements, the risk of having parts damaged by the supports (happening if rigid supports are used) is avoided and the wear of the supports produced by the processing media is substantially reduced. Furthermore the mobility of the supporting element and relevant bars reduce the noise produced by the vibrating unit.

In the most favoured embodiments, the bars have rectangular section shaped in such a way that the lower end of the bar is 90° rotated with respect to the upper end.

Having completed the finishing treatment, the support is lifted together with bars and parts and extracted from the vibrating unit, bars slide through the holes obtaining the 90° rotation of the parts, feature which represents a great advantage for the unloading of the finished parts and the following loading of new parts needing to be treated.

According to a typical embodiment of the device according to the present invention the vertically mobile device acts also as cover of the vibrating unit, with the further advantage to reduce the noise produced by the vibrating unit during the treatment.

A typical embodiment of the device according to the present invention, mounted on a square-tub vibrating unit accomplishing a polishing treatment on bodies of coffee pots, will now be described by referring to the attached drawings, in which:

- fig. 1 shows a lateral vertical section of the vibrating machine during the treatment;
- fig. 2 shows a lateral vertical section of the vibrating machine during the extraction of the parts out of the vibrating unit;
- fig. 3 shows a lateral vertical section of the vibrating machine during the phase of hooking (or unhooking) of the parts to subject to the treatment;
- fig. 4 shows a front vertical section of the machine at the moment in which parts are plunged into the vibrating unit.

The hollow parts (1) needing to be polished, consisting of the lower part of coffee-pots for domestic use, are hooked to the lower end of the rectangular-section bars (2), which are shaped in such a way that the lower part (3) of the bar is 90° rotated with respect to the upper part (4) of the same. This particular shape of the bars (2) allows parts to perform a 90° rotation when said bars (2) are lifted vertically assuming the position shown in figure 3, thus helping the operations of hooking and unhooking of the part (1) to the bar (2) carried out

by the operator, at the beginning and at the end of the polishing treatment.

The supporting element (5) supports the bars (2) which are inserted through passing holes (6) drilled in said supporting element and yet free to move with respect of the same, as the upper ends of the bars (7) are wider than their bodies and therefore cannot pass through the holes (6) into which they are inserted. The supporting element (5) rests on the top edges of the vibrating unit (8) and when moved vertically by means of the frame (10), all the parts (1) hooked to the bars (2) are simultaneously plunged into and extracted from the processing media (9) contained into the vibrating unit (8).

As shown in figure 1, the parts (1) hooked to the lower end (3) of each bar (2) and plunged into the processing media (9) move together with this but with an amplitude and a course which are preset and adjusted following the possibility of movement of the bars (2) in connection with the relevant passing holes (6). In this way the parts (1) under treatment move within the mass of media (9) following a given course but exposing the whole surface to be polished to the abrasive action of media in a homogeneous way.

In the example of embodiment shown in the figures, the bars (2) supported by the element (5) are 12, said number being in relation with the dimensions of the parts (1) to be polished. It is obvious that, if the dimensions of the parts (1) change, the number of the bars (2) will change accordingly so that the distance between two consecutive bars is such as to allow the movement of the parts (1) during the treatment without making parts enter in touch one with the other.

Claims

1. Device for the finishing of hanging parts by means of a vibrating machine characterised by the fact that it comprises a supporting element (5) which is mobile vertically with respect to the vibrating unit (8), said supporting element (5) bearing a variable number of polygonal section bars (2) inserted into passing holes (6) drilled in said supporting element (5) and yet free to move, said bars (2) having the upper end (7) wider than the rest so that they cannot pass through said passing holes (6) into which they are inserted and the lower end (3) in form of a hook or pin in order to fix the part (1) to subject to the finishing treatment in said vibrating unit (8).

2. Device as per claim 1.- characterized by the fact that said supporting element (5) has the shape of a bar.

3. Device as per claim 1. - characterized by the fact that said supporting element (5) has the shape of a tubular element.

4. Device as claim 1. - characterized by the fact that said supporting element (5) has the shape of a box- type structure consisting of two channel sections.

5. Device as per claim 1.- characterized by the fact that said supporting element (5) is represented by the cover of the vibrating unit (8).

6. Device as claim 1.- characterized by the fact that said bars (2) have polygonal section and that the passing holes of the supporting element into which they are inserted have the same polygonal section but oversized with respect to the section of the bar of a percentage comprised between 20% and 200%.

7. Device as per claim 6.- characterized by the fact that said bars (2) have rectangular section shaped in such a way that the lower part (3) of the bar is 90° rotated with respect to the upper part (4).

8. Device as per claim 1.- characterized by the fact that the distance between the passing holes (6) of the supporting element (5) is adjusted according to the size of the parts (1) in order to prevent the parts themselves from entering in touch one with the other during the treatment.

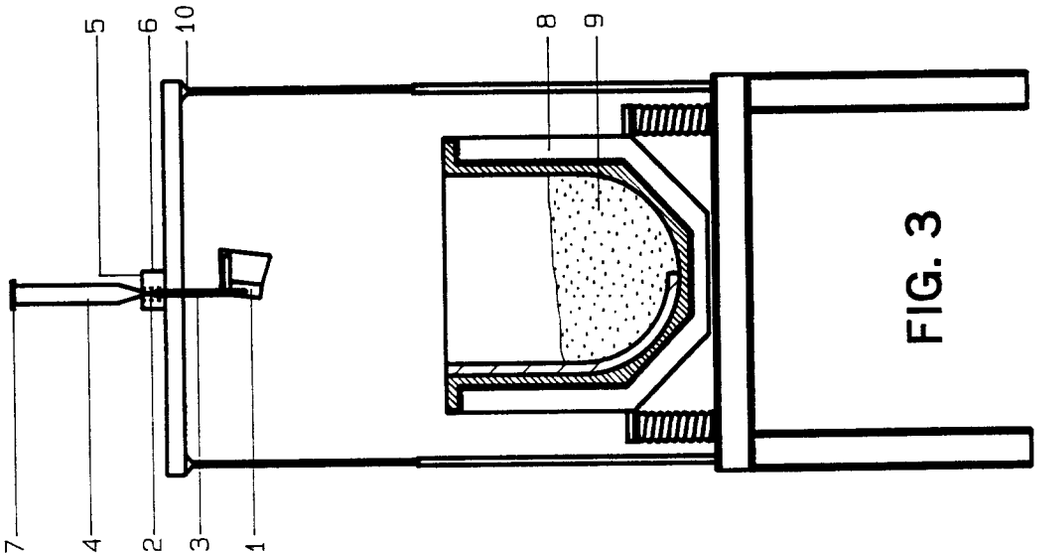

FIG. 3

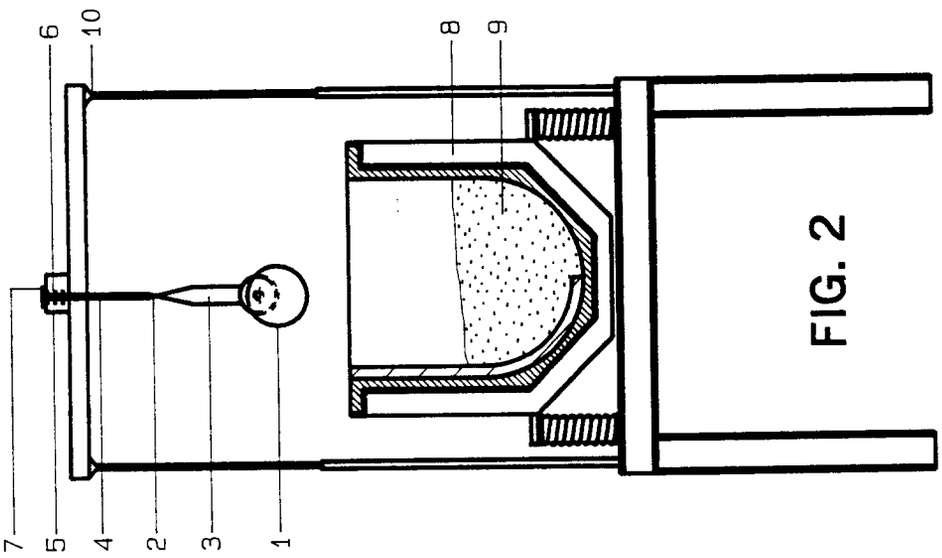

FIG. 2

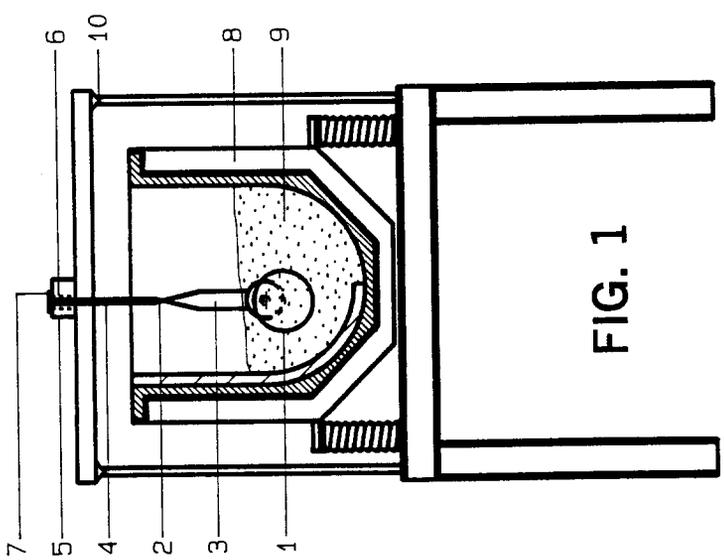

FIG. 1

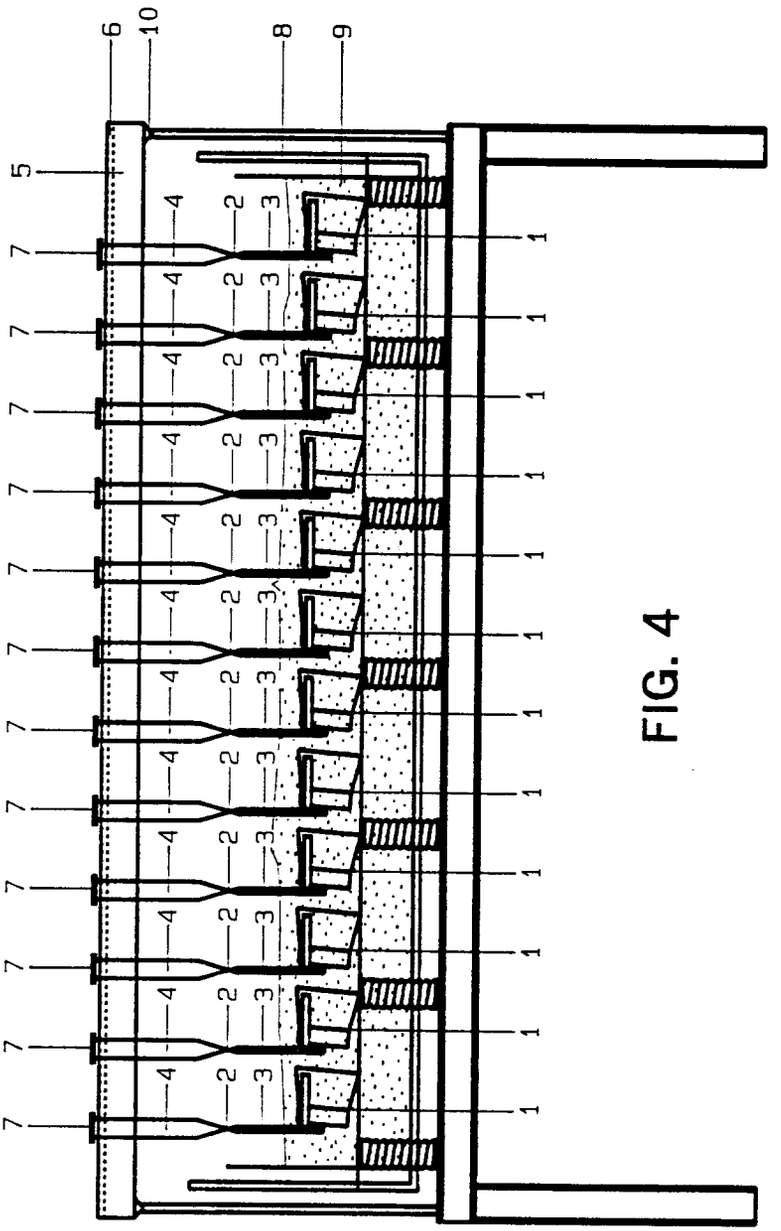

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 93 11 8430

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)
X	SU-A-884 980 (KLYUSHNIKOV) * abstract; figure *	1	B24B31/06
Y		2,3,5,6	
Y	GB-A-2 035 863 (OHNO) * page 1, line 84 - line 86; figures 1,2 *	2,6	
Y	DE-A-33 32 786 (WALTHER) * page 6, line 22 - page 7, line 6; figure 3 *	3	
Y	US-A-3 253 369 (REICHERT ET AL) * column 6, line 11 - line 23; figure 10 *	5	
X	SU-A-1 009 729 (KLYUSHNIKOV) * abstract; figure *	1	

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	18 February 1994	Garella, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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