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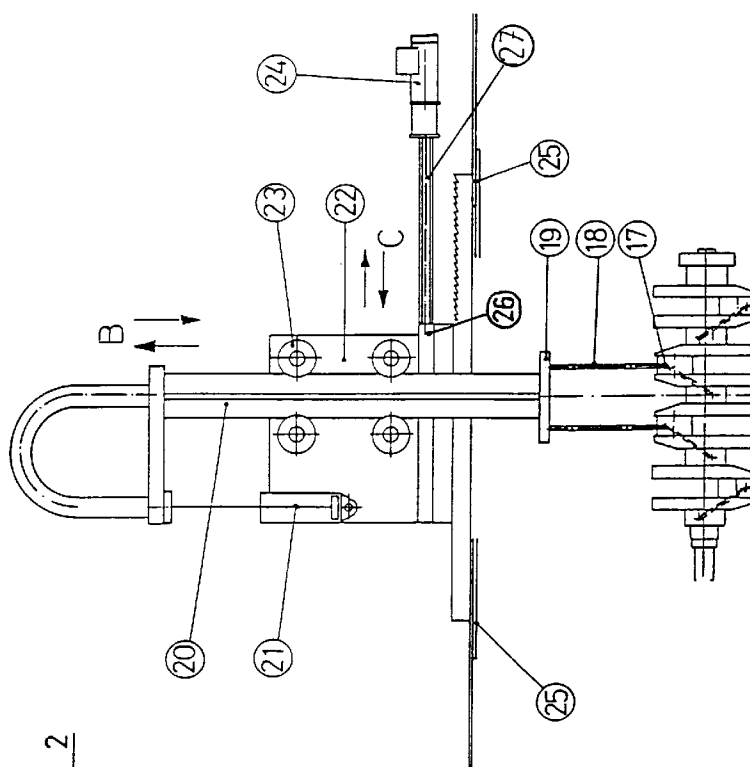
EUROPEAN PATENT APPLICATION

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08008 Barcelona (ES)(54) **Device for the precision cleaning and/or deburring of orifices in machined parts**

(57) The parts (1) are loaded into one end of the machine, are conveyed with intermittent feed by means of a feeder unit (3), and are subjected to various operations in succession. The device comprises means of supporting and spinning the part to be cleaned (1), fitted inside the cleaning chamber, and cleaning equipment, essentially arranged outside the cleaning chamber and fitted

with nozzles (17) which are inserted into the cleaning chamber by supporting lances (18) through an opening in the upper face of the chamber. The nozzles (17) move into position close to and facing the orifices (2) that need to be cleaned of the part (1). The cleaning equipment is supported by a carriage that is external to the cleaning chamber.

**FIG. 2**

DescriptionExplanation of the invention.Branch of technology of the invention.

This invention refers to a device for the precision cleaning and/or deburring of orifices in machined parts, designed for fitting in the cleaning chambers of the cleaning and/or deburring stations of cleaning machines for machined parts.

Prior art.

At present, many machined parts for kinematic and dynamic systems are fitted with orifices and ducts for channelling and receiving lubricating or cooling fluids. Machined parts likewise feature a number of blind, threaded orifices designed to take threaded fasteners.

After cold machining, hot working and chemical and/or mechanical treatment, these machined parts usually come out dirty, on account of the presence of residual products such as cutting oils, remains left on the part after drawing or descaling, sand adhered to the work, burrs etc., particularly in areas liable to such soiling, such as the above-mentioned orifices and ducts for lubricants, and the dirt in these areas, given the importance of their functions, may be detrimental to the proper functioning of the part, or accelerate wear, or even cause accidents.

Consequently, before being fitted into the mechanical system of which they are components, these parts must be subjected to efficient, precision cleaning and/or deburring, in order to leave these orifices and ducts in good condition, this process being performed in the cleaning machines for machined parts that are designed for the purpose and are well known, they needing to be suitable for treating long production runs and capable of sustaining a high output of such parts.

Devices for the precision cleaning and/or deburring of the orifices of machined parts are known in the prior art, these operations being performed by jets controlling cleaning liquid under pressure or a liquid containing abrasive material in suspension.

Specifically, there are known devices for that purpose in which the parts to be cleaned are loaded in at one end of the machine, conveyed with intermittent feed through the cleaning machine, by means of a feeder unit such as stepped-pitch feed bars, and then sent through various operation-performing stations one by one before finally being unloaded at the other end of the machine.

However, a drawback in these known devices is that the movement and aim of the jet with respect to the orifice or duct to be cleaned or deburred are not precise enough, and cannot be brought sufficiently close to the holes or ducts. As a result, the cleaning is partial and imperfect.

The aim of this invention is to solve the drawbacks mentioned above, providing a device for the precision cleaning and/or deburring of orifices in machined parts, one giving suitable movement and positioning relative to each other of the cleaning or abrasive liquid jet and the part to be cleaned, in order to obtain better results in the cleaning process.

In essence, the device of this invention is characterized in that it has:

- means of supporting and spinning the part to be cleaned, arranged inside the cleaning chamber and designed to make the part spin around;
- cleaning equipment, essentially arranged outside the cleaning chambers and fitted with nozzles for directing the cleaning liquid, these being inserted into the cleaning chamber by supporting lances passing through an opening in the chamber's upper face, in such a way that the nozzles move into position close to and facing the orifices that need to be cleaned in the part, this cleaning equipment being supported by a carriage that is external to the cleaning chamber and provided with a horizontal, shifting movement running transversely with respect to the feed direction of the feeder unit; and
- a means of closing said opening in the upper face of the cleaning chamber.

According to another characteristic of the invention, said means of supporting and spinning the part to be cleaned comprises two points for holding the part, which determine the axis around which the part can be spun during the cleaning and/or deburring operation, at least one of the holding points being fitted with rotating grippers that grip the part and are driven by one numerical-control motor, which governs the spinning of the part enabling it to take up a number of pre-programmed positions around its axis of rotation.

According to another characteristic of this invention, the above-mentioned carriage supporting the cleaning equipment comprises a frame supporting a driving member, such as a hydraulic or pneumatic cylinder; a vertical arm, carrying the lances that hold the nozzles, that can travel vertically when the driving member is operated; guide bearings for said vertical arm; and a nut, operating in conjunction with a horizontal leadscrew, fitted on the frame of the cleaning machine and driven by a second numerical-control motor, the latter also being fitted on the frame of the cleaning machine.

According to another characteristic of the invention, the above-mentioned means of closing the opening in the upper face of the cleaning chamber consists of horizontal plates arranged to form a labyrinth.

Brief description of the drawings.

The significance of the innovative design, and the advantages reaped through this invention, will become apparent from a detailed description - provided only as a non-restrictive example - which will now be given of a preferred embodiment of the invention, with reference to the drawings attached, in which:

Fig. 1 is a diagrammatic view showing the means of supporting and spinning the part to be cleaned, and the feed system for the parts, also shown, of the device of this invention; and

Fig. 2 is a diagrammatic view showing the cleaning equipment and the means of closing used in this invention in conjunction with the mechanisms shown in Fig. 1.

Detailed description of the drawings.

Fig. 1 shows a part 1 to be cleaned and/or deburred - in this case an engine crankshaft - in which the orifices 2 to be cleaned are shown. The part 1 can be moved by a feeder unit 3, e.g. of the stepped-pitch type, fitted, by way of example, with a conveying bar that can move upwards, forwards, downwards and backwards.

Fig. 1 shows the part 1 in its position as removed from the feeder unit 3 and set in the means for supporting and spinning it. These means are fitted, to one side of the part 1, with a set of grippers 4 that close on the part 1 in order to move it along, and a centring device 5 which penetrates inside a suitable zone of the part 1. The set of grippers 4 and the centring device 5 are driven by an actuating cylinder 6, preferably hydraulic though it could also be pneumatic or electric, arranged in such a way that it can make the centring device 6 move on-wards - in the directions shown by the arrows A - and the grippers 5 close on the part 1 - with the movements shown by the arrows D - gripping it, a function that can be arranged, for example, by a mechanical device involving a lever or rack-and-pinion system. The set of grippers 4, the centring device 5 and the cylinder 6 are joined to a support 7, and spin together around at least one bearing 8, the base of which is joined to the cleaning machine.

The support 7 is joined to a crown wheel 9 driven by a numerical-control motor 10 through a pinion 11 and a transmission belt 12.

On the other side with respect to part 1, the means for supporting and spinning the part are equipped with another supporting device whose function is to support the part at its other end. Specifically, it is preferable to have a tailstock 13, driven in its movement by the part of the means of supporting and spinning the parts fitted on the first side described, and spinning freely on a bearing 14 held by a support 15 attached to the cleaning machine.

Fig. 2 shows in diagrammatic form the cleaning

equipment and the means of closing that are to be used in conjunction with the mechanisms shown in Fig. 1, as explained hereabove. The cleaning equipment is provided with a nozzle 17, arranged to create the flow of cleaning material, plus at least one supporting lance 18, joined to the nozzle 17 and fitted on a support 19 joined to an arm 20. This arm 20 can be raised or lowered, driven by a cylinder 21, in the directions shown by the arrows B, in order to move the lances 18 away from the part 1 to be cleaned when that part is required to move on conveyed by the stepped-pitch feed device.

The arm 20 can slide along guide bearings 23 fitted on a frame 22 which can move transversely, as shown by the arrows C, with respect to the feed direction of the leadscrew, in a direction that is parallel to the axis of rotation of the part 1 and perpendicular to the direction of the sliding movement of the arm 20. This transverse movement is preferably transmitted through a lead-screw 27 driven by a second numerical-control motor 24. Alternatively, a rack-and-pinion system could be used for that transmission instead of the leadscrew 27.

Most of the unit formed by parts 21, 22, 23, 24, 26 and 27 is preferably located outside the cleaning chamber of the cleaning machine and is isolated from the outside by a means of closing, comprising a group of closing plates 25 forming a labyrinth.

The device works as follows: firstly, the part 1 is brought by the feed device 3, to which it is attached by known means, to the right position near the means of supporting and spinning; next, the latter clamp the part at both ends; then the stepped-pitch feed device 3 releases and moves away from the part 1, which is left ready to spin around through the agency of parts 6 to 11; afterwards, part 1 is spun to the required angle; then the nozzles 17 of the cleaning equipment are brought, through the action of the cylinder 21 and the motor 24 to the required position with respect to the part 1; at this stage the cleaning and/or deburring operation can be commenced by the ejection of a jet of cleaning material through the nozzle 17 against the part 1.

It should be noted that, thanks to the combination of movements (the spinning of the part 1 and the raising and lowering of the lance 18), it is possible to set any geometrical figure and to keep the distance between the nozzles 17 and the orifice 2 to be cleaned of the part 1 at a nearly constant distance, thereby substantially improving the precision of the washing and deburring.

Furthermore, since the movements are driven by two numerical-control motors 10 and 24, the positions of the nozzles 17 with respect to the orifices 2 are programmable and repetitive, giving great advantage in comparison with current systems.

The nature of the invention having been described in sufficient detail, along with the manner of implementing it in practice, it is pointed out that anything not altering, changing or modifying its fundamental principle may be varied in its details, the essential part, for which a patent of invention is requested for twenty years, being

summarized in the following claims.

Claims

1. Device for the precision cleaning and/or deburring of orifices in machined parts, designed for fitting in the cleaning chambers of the cleaning and/or deburring stations of cleaning machines for machined parts, in which the parts to be cleaned (1) are loaded in at one end of the machine, conveyed with intermittent feed through the cleaning machine, by means of a feeder unit (3), such as stepped-pitch feed bars, and then sent through various operation-performing stations one by one before finally being unloaded at the other end of the machine, characterized in that it has:
 - means of supporting and spinning the part to be cleaned (1), arranged inside the cleaning chamber and designed to make the part (1) spin around;
 - cleaning equipment, essentially arranged outside the cleaning chambers and fitted with nozzles (17) for directing the cleaning liquid, these being inserted into the cleaning chamber by supporting lances (18) passing through an opening in the chamber's upper face, in such a way that the nozzles (17) move into position close to and facing the orifices (2) that need to be cleaned in the part (1), this cleaning equipment being supported by a carriage that is external to the cleaning chamber and provided with a horizontal, shifting movement running transversely with respect to the feed direction of the feeder (3); and
 - a means of closing said opening in the upper face of the cleaning chamber.
2. A device according to claim 1, characterized in that said means of supporting and spinning the part (1) to be cleaned comprises two points for holding the part, which determine the axis around which the part (1) can be spun during the cleaning and/or deburring operation, at least one of the holding points being fitted with rotating grippers that grip the part (1) and are driven by one numerical-control motor (10), which governs the spinning of the part (1) enabling it to take up a number of pre-programmed positions around its axis of rotation.
3. A device according to claim 1, characterized in that the above-mentioned carriage supporting the cleaning equipment comprises a frame (22) supporting a driving member (21), such as a hydraulic or pneumatic cylinder; a vertical arm (20), carrying the lances (18) that hold the nozzles (17), that can travel vertically when the driving member (21) is operated; guide bearings (23) for said vertical arm (20); and a nut (26) operating in conjunction with a horizontal leadscrew (27), fitted on the frame of the cleaning machine and driven by a second numerical-control motor (24), the latter also being fitted on the frame of the cleaning machine.
4. A device according to claim 1, characterized in that the above-mentioned means of closing the opening in the upper face of the cleaning chamber consists of horizontal plates (25) arranged to form a labyrinth.

FIG. 1

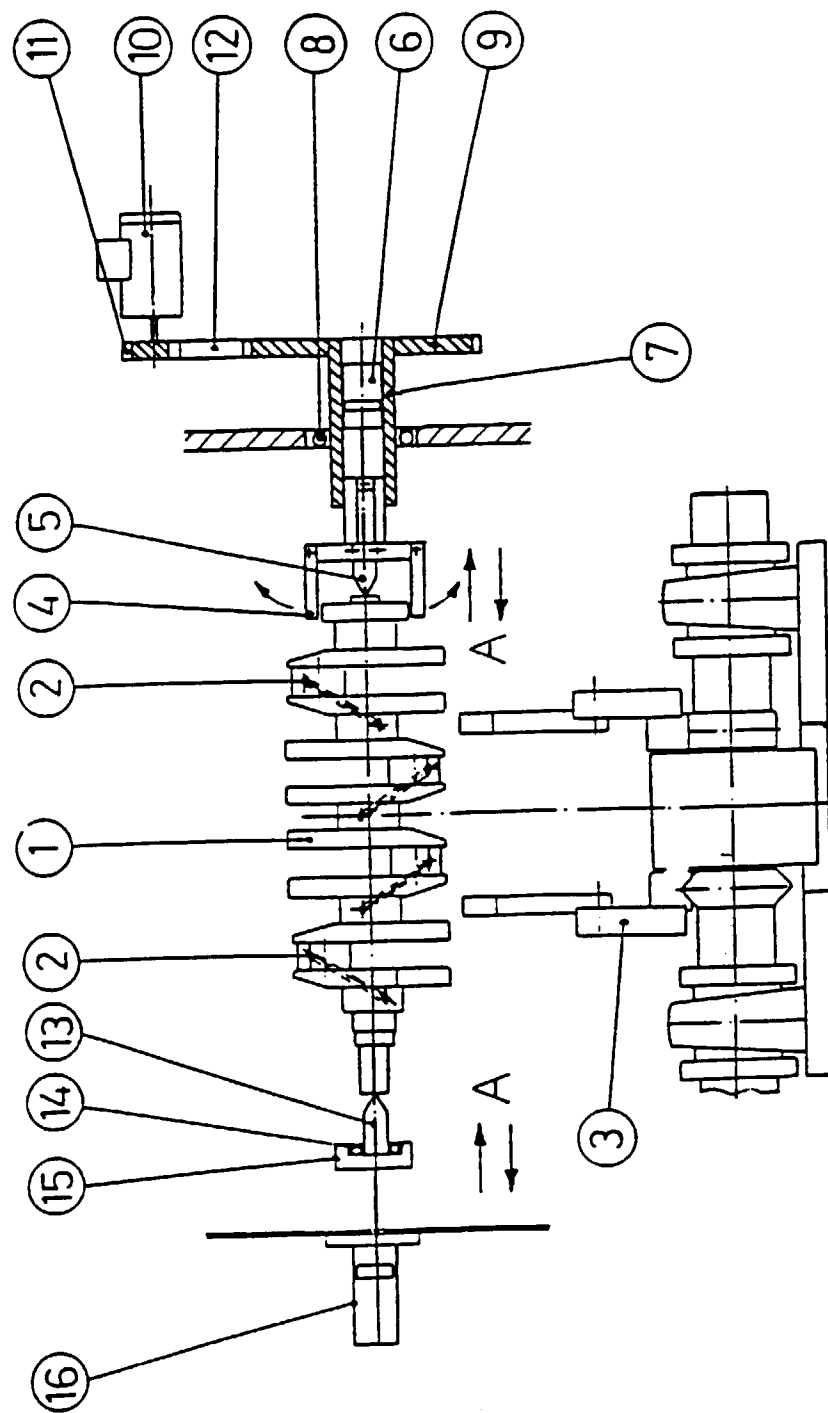


FIG. 2

