

ADAPTED DEVICE FOR GRINDING OPERATION OF VALVE SEATS

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ABSTRACT: The adapted device is used for conical grinding operations of different valve seats. This paper presents the machining process of cone using plan grinding machines of type RPO 200-320. By mounting the device on the RPO 200 machine, the cylindrical bores are processed and high conical accuracy.

KEYWORDS: adapted grinding device, machine RPO 200, abrasive stone, workpiece, conical, engines, valve

1 INTRODUCTION

The device is intended for internal conical grinding operations of valve seats for internal combustion engines (motorcycle engines, motor pumps, generators a.o).

This operation recommends the use of this device in small and medium repair shops that have in use plan grinding machines of type RPO 200-320.

The profile of the valve seat is in accordance with fig.1. The material of the valve seat is a special material: cast iron, alloy steel, hard alloys.

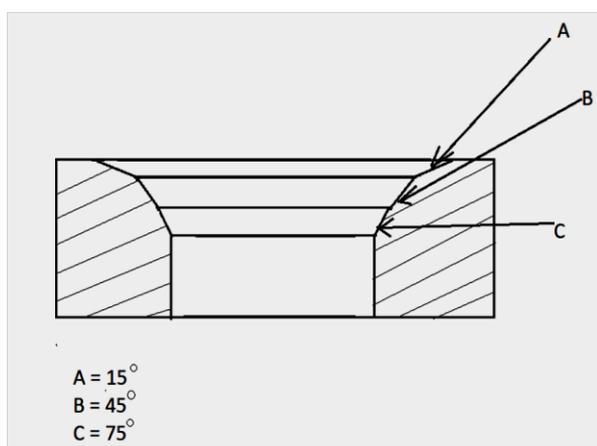


Fig. 1. The profile of the valve seat

The machining process of cone can only be performed by grinding with finger abrasive stones. (silicon carbide, diamond). In this case it cannot be machined with high speed steel tools. The operation is performed by grinding process on special machines that ensure the profile of the valve seat, a concentricity with the bore cylindrical, where the valve stem is guides.

The endowment with special grinding machines in small repair shops does not justify the endowment of a special machines for grinding valve seats being much too expensive and having no load.

The grinding process of the profile is done by two methods:

1. By penetration, where only worked with profiled stone (at an angle of 45, 75, 15 degrees)
2. By longitudinal feed (the stone is cylindrical, the device is tilted to the required angle and is moves longitudinally on the cone generator).

2 THE DEVICE

The grinding operation of valve seat on small internal combustion engines is performed on the machines of plan grinding RPO 200-320 by Romanian manufacture, using three devices (accessories):

1. Internal grinding device (AJME, VOL. 19, issue 4, p.67)

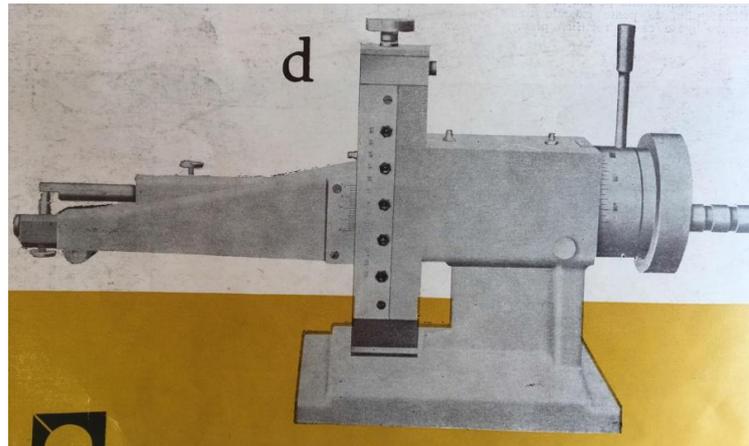


Fig. 4 Device for correcting the angle to the abrasive stone

This device (fig.4) is a basic accessory of the RPO 200-320 grinding machine with the help to which the abrasive stone (finger abrasive stone) can be profiled and corrected at an angle of 15o-45o-75o. Is a simple, robust device that can be mounted on the table of the machine with screws or on the magnetic plate.

The fixing, centering and rotating device has a robust construction made of rolled steel (fig.3)

- The base plate (12) on which the component parts are mounted is made of OL sheet with a robust configuration

which is mounted on the machine tool table.

- Mount the box (22) on the motherboard with 3 screws (16).

- Two high-precision radial thrust bearings are fixed inside the box (11)

- The main shaft (10) fixed in the bore of the bearings and pre-tightened by means of two nuts (13), making

a uniform rotational motion. The drive shaft (8) and the pin (9) are fixed on the shaft.

- In the main shaft there is a conical bore into which enters the centering mandrel (7) fixed with the screw (15)

- The adjusting nut (6), the spacer bush (5) and the flange with the joint are fixed to the centering mandrel.

ball (3,4), workpiece bolt (28) and ball joint bolt (26)

- The centering pin (2) that enters the guide bore is fixed inside the bore of the centering mandrel.

valve guide with fixing nut (30)

- The centering pin is fixed with the screw (25) which makes it easy to replace after the diameter of the rod

valve

- The gear motor (31) with drive pulley and V-belt (24) is attached to the base plate (12)

on the support plate (19) fixed with a screw (18) and locked with a nut (17)

The support plate (19) can be rotated by tightening the strap and locking it with the retaining nut.

3 THE ADAPTED DEVICE ON RPO TOOL MACHINES

This device is mounted on the PRO 200 machine on the grinding head after disassembly stone correcting device, machine guard and grinding stone.

The DRI device is attached to the plate (33) (fig.2) mounted on the grinding head by means of 4 screws M10.

Secure the DRI with the screw (35) to the sine ruler (36), track block (B) and comparator at the desired angle (45°) according to figure 5

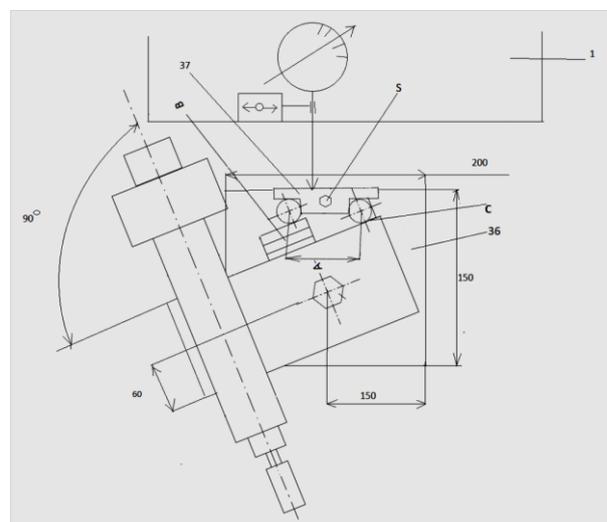


Fig. 5. Sinus device

Install the centering pin in place of the stone (32), connect the air turbine to the air source tablet (4-6 atm); mount the part drive device and center on the magnetic table a

machine (rpo 200) and center after the centering pin (2), the centering pin (32) securing it to the centering pin (32)

center. Lock the longitudinal table with the device (fig. 6).

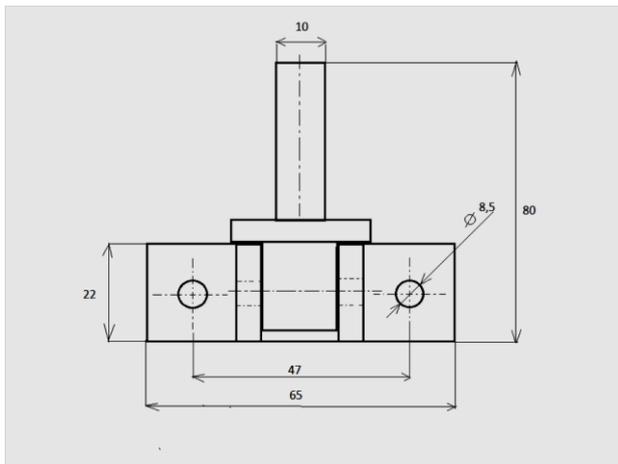


Fig. 6 Locking device for the longitudinal table

The instructions are:

Connect the gear motor (31) to the DC power source (24v) in the machine's electrical panel.

Mount the grinding wheel (cylinder head) on the centering pin (2) and tighten with the nut (30).

Lift the mounting flange (3) with the nut (7), tighten with the screw (27). It lock the ball joint with the screw (26).

The gear motor (31) is started, which transmits the rotational movement by means of the belt trapezoidal (24) to the pulley (8) which drives the main shaft (10) and rotates the grinding piece.

The movement must be uniform without vibrations and jerky.

Attach the abrasive finger stone (32) and insert it into the conical bore (31); approaching in advance vertical of the car until the stone sparkles.

Move the abrasive stone vertically with the lever (38) until the wear is removed and get a good surface with micro roughness.

4. MOVEMENTS THAT CAN BE PERFORMED WITH THE ADAPTED DEVICE ON THE RPO 200 PLAN GRINDING MACHINE (fig. 2)

-(R) - Rotational movement of the workpiece by the centering device rotating through by means of the gear motor, pulleys and V-belt (II)

- Longitudinal movement

- (X) - Rotational movement of the grinding stone by the pneumatic turbine 45000 - 70000 rotations per minute (I)

- Tilting the port support -

- (A) - The vertical advance of the machine achieving the cutting depth at an accuracy of 0.001mm from the drum.

- (C) - The inclination at different angles

5. CONCLUSIONS

The grinding devices is intended for cutting machine tools in small and medium workshops, where they are not equipped with special grinding machines. Following the design to this device (accessory) we have expanded the scope of use of RPO 200- grinding machine tools 320 obtaining precision machining.

Benefits:

1. Following the design of this device (accessory) we have expanded the scope of use of the machines RPO 200-320 grinding tools for precision machining of hardened parts

2. In small and medium-sized workshops, the investment of purchasing special machine tools is reduced

3. Complex machining is very easy to obtain (angular and profiled precision grinding)

4. When mounting the device on the machine tool, it is very easy and very fast short

5. There is no risk of injury

6. Very high speeds are obtained by using turbine air

7. Simple construction

Disadvantages:

1. High air consumption

2. Special installations for the production and preparation of compressed air

3. High noise

4. Develop small powers

5. Only valve seats can be machined for small engines

Using the sine ruler that helps us adjust the device to achieve angles and very precise taper.

Realization of the device of simple and robust construction at a low price with a small number of machines (machine tools).

The materials used to make the device are common building materials machines designed to withstand the stresses to which they are subjected.

By mounting the device on the RPO 200 machine, the cylindrical bores are processed and high precision conical.

In small workshops, it reduces the endowment with special grinding machines for cylinder heads with combustion engines small internal.

● THK LM System, KATALOG Nr. 75-1AG, THK CO. LTD.

● <https://www.gde-werkzeuge.de/Kataloge.html>

5 REFERENCES

- Bodea, Sanda, Reprezntări grafice inginerești, Editura Risoprint Cluj Napoca, 2010
- Buzdugan, Gheorghe, Manualul inginerului mecanic, Editura Tehnică București, 1976
- Catalog Produse METAL STAR 2019-2020
- Cartea mașinii, Mașina de rectificat plan RPO 200, MICM Întreprinderea UNIREA Cluj-Napoca
- DAS, S.a.o, Advances in abrasive based machining and finishing processes, Springer, 2021
- Demian, Traian, Banu, Valeriu, Micromotoare Pneumatice Liniare și Rotative, Editura Tehnică București, 1984
- Draguț, Corneliu, Aplicații și probleme de prelucrarea metalelor prin așchiere, Editura Didactică și Pedagogică București, 1981
- Frățilă, Gheorghe, Sterian, Samoilă, unoășterea, întreținerea și repararea automobilului , Editura didactică și pedagogică București – 1981
- Jeffrey, A. B, The book of grinding, 2021
- Lazarescu Ion, Abrudan Gligor, Aschiere și scule aschietoare, Editura Didactică și Pedagogică București, 1976
- Lumnitzer, Ervin - Andrejiová, Miriam - Goga Bodnárová, Alexandra: Verification of the impact of the used type of excitation noise in determining the acoustic properties of separating constructions - 2016. In: Measurement. Vol. 78 (2016), p. 83-89. - ISSN 0263-2241
- Malkin, S., Guo, C., Grinding Technologies, Industrial Press, S.E., 2008
- Marinescu, I.D. a.o., Handbook of Machining with Grinding Wheels, Taylor and Francis Inc, 2007
- PIŃOSOVIÁ, Miriama - Andrejiová, Miriam - Liptai, Pavol - Lumnitzer, Ervin : Objective and subjective evaluation of the physical risk factors near a ceonveyor system - 2018. In: Advances in Science and Technology Research Journal. - Lublin (Poľsko) : Society of Polish Mechanical Engineers and Technicians Roč. 12, č. 3 (2018), s. 188-196 [print]. - ISSN 2080-4075
- Rowe, W.B., Principles of Modern Grinding Technology, Elsevier, 2000
- Super Precision Bearings, Motion & Control NSK – 2016
- Katalog FAG Spindellager für Werkzeugmaschinen, Publ. Nr. 41119 DA