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(19)

(54) A CLAMPING DEVICE FOR THE SUPPORT OF ANNULAR WORKPIECES FOR INTERNAL MACHINING

(71) We, GOETZE A.G., formerly known as GOETZEWERKE FRIEDRICH GOETZE A.G., a body corporate organized and existing under the laws of the Federal Republic of Germany, of Burgermeister-Schmidt-Strasse 17, 5093 Burscheid 1, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a clamping device for the support of annular workpieces for internal machining.

German Offenlegungsschrift No. 2,144,800 describes a machine for the internal machining of piston rings, in which a pack of rings is pressed axially into a stationary centring sleeve having an axial stop and a conical entry surface for guiding the rings. The inner periphery of the rings is then machined with a rotating tool. The out of balance forces acting on the rotating tool increase with increasing piston ring diameter and limit the speed of machining which is possible. German Patent Specification 1,014,410 on the other hand describes a clamping device which can be mounted on any machine tool, for example a turning machine, but is only used for external machining of piston rings.

In accordance with the present invention there is provided a clamping device for the support of annular workpieces for internal machining comprising a centring sleeve with a conical entry surface engageable with the workpiece to guide the workpiece into the centring sleeve and two clamping rings for gripping the ends of the workpiece, wherein the clamping rings are interconnected by connecting means which extend externally of the centring sleeve, said connecting means being capable of axial movement to move a first of the clamping rings through the centring sleeve and into engagement with a stop and to move the second clamping ring to clamp the first clamping ring and the workpiece against the stop.

In a preferred embodiment, to be described below, the connecting means comprise three parallel rods connected together by a cross-piece, two of the rods situated diametrically opposite one another, being connected to the second clamping ring, and the third rod extending centrally and being connected to the first clamping ring. In this way, it is possible by means of an axial clamping force engaging the cross-piece to clamp a workpiece or a workpiece pack within the centring sleeve axially between the two clamping rings.

For axial clamping preferably a hydraulic or compressed-air cylinder is used, having its piston rod connected to the cross-piece carrying the clamping rods.

It is furthermore proposed that the rods connecting the clamping rings together have an axial lost motion device for permitting a slight axial movement apart of the clamping rings for changing the workpiece or workpiece pack. The lost motion device should be provided in the central clamping rod.

Preferably, the first clamping ring is dish-shaped, so that the rod can be secured in the centre of the dish, while the radially outer part of the dish on the one hand is clampable against the axial stop connected to the centring sleeve, and on the other hand serves as an abutment for the workpieces.

The second clamping ring has preferably the form of a sleeve with an outwardly directed radial flange, so that the machining tool can be passed through the sleeve freely to the inner surfaces of the workpieces.

The centring sleeve has distributed on the periphery at least two centring pins projecting axially in the region of the centring surface, whose inside distance apart is greater than the external diameter of the

workpieces. By this means, in addition to the machine-feeding of the workpieces by means of gripping devices or the like, manual feeding of the device is possible, the centring pins holding the workpieces in postion in front of the centring sleeve. The radial flange of the clamping sleeve should have two axial passages for the centring pins to avoid a more expensive, resilient retraction of the centring pins into the centring sleeve.

Finally, it is conceivable that in the event of the use of the device according to the invention on a turning machine, the cross-piece is accommodated inside a preferably cylindrical housing for reducing the risk of accident when the device is rotating. One end of the housing is then connectable to the work spindle of the turning machine, while the other end serves for receiving the centring sleeve, and at the same time as axial stop for the dish-shaped clamping ring. It also appears expedient if the piston rod connected to the cross-piece extends through the hollow working spindle of the turning machine and at the end of the working spindle opposite the chucking device opens into a clamping cylinder, known *per se*.

An embodiment example is represented in the drawings and is described more particularly in the following.

The device according to the invention comprises a centring sleeve 1 with a conical entry surface 2, a dish-shaped clamping ring 3 and a sleeve-shaped clamping ring 4, between which a workpiece pack consisting of a number of self-springing piston rings 5 is clamped axially and is held in the centring sleeve 1 for machining the inner peripheral surfaces of the piston rings by means of a boring rod 7 carrying the tools 6. Actuation of the clamping rings 3 and 4 is effected by three rods 8, 9, 10, of which the rods 8 and 9 are situated diametrically opposite one another and axially parallel outside the centring sleeve 1, and the rod 10 extends centrally, the three rods being connected together by a cross-piece 11. Whereas the outer rods 8,9 co-operate with a radial flange 12 of the clamping ring 4 through a ring member, the central rod 10 is connected to the clamping ring 3. A lost-motion connection 13 permits a limited axial relative movement between the clamping rings 3 and 4, so that the workpiece pack can be released. The cross-piece 11 is located in a cylindrical housing 14, whose one end wall 15 is screwed to the work spindle 16 of a turning machine, while the other-end wall 17 carries the centring sleeve 1 and serves as an axial stop for the clamping ring 3. The centring sleeve in the region of the entry surface 2. has three axially-directed centring pins 18 distributed over half a circumference for the pre-centring of workpieces supplied manually to the device, the centring pins 18, in the clamped condition of the workpieces, extending in corresponding axial passages 19 of the radial flange 12 of the clamping ring 4.

piston rod 20 extending through the hollow work spindle 16, which piston rod at the outer end 21 of the work spindle is connected to a piston 22 of a hydraulic or compressed air clamping cylinder 23, frequently known in turning machines. For changing a workpiece pack, the piston 22 moves to the right, so that by means of the cross-piece 11 and rods 8, 9 and 10, the clamping rings 3 and 4 together with the workpiece pack 5 are moved axially out of the centring cylinder 1, the clamping pressure on the workpiece pack 5 being released at the same time by the lost motion device 13. After replacement of the finished workpiece pack by a fresh workpiece pack by means of a radially swingable gripping device (not shown) the workpiece pack 5 is pressed into the centring sleeve 1 by means of piston 22 and clamping ring 4. The at first diametrically larger and non-circular piston rings are compressed radially to their nominal diameter by the conical entry surface 2. After the clamping ring 3 has been applied to the housing end wall 17, acting as axial stop, the two clamping rings 3 and 4 are clamped axially against each other by still further movement to the left of piston 22.

The device described in the foregoing has the advantage that it can be readily mounted in any suitable machine tool without special equipment and special conversion, while in another embodiment example, not shown, the driving piston for the cross-piece can also be accommodated in the cross-piece housing.

WHAT WE CLAIM IS:—

1. A clamping device for the support of annular workpieces for internal maching comprising a centring sleeve with a conical entry surface engageable with the workpiece to guide the workpiece into the centring sleeve and two clamping rings for gripping the ends of the workpiece, wherein the clamping rings are interconnected by connecting means which extend externally of the centring sleeve, said connecting means being capable of axial movement to move a first of the clamping rings through the centring sleeve and into engagement with a stop and to move the second clamping ring to clamp the first clamping ring and the workpiece against the stop.

2. A clamping device as claimed in claim 1 in which the connecting means includes a lost-motion connection for said first clamping ring permitting limted relative axial movement of the clamping rings after en-

gagement of the first ring with the stop.

3. A clamping device as claimed in claim 2 in which the connecting means comprises a number of rods connected between the second clamping ring and a cross-piece and the lost-motion connection is between the cross-piece and the first clamping ring.

4. A device as claimed in claim 3 in which the cross-piece is connected to the piston rod of a fluid pressure cylinder.

5. A device according to claim 4 for use in turning machines, characterised in that the cross-piece is arranged within a housing whose one end wall is connectable to the work spindle of the turning machine, and whose other end wall serves to receive the centring sleeve and at the same time forms the axial stop.

6. A device according to claim 5, in which the piston rod connected to the cross-piece extends through the hollow work spindle and at the outer end of the work spindle opens into a clamping cylinder.

7. A device according to claim 6 in which the clamping cylinder is provided in the housing.

8. A device as claimed in any of the preceding claims in which the centring sleeve is axially fixed to the said stop.

9. A device as claimed in any of the preceding claims in which the first clamping ring is dish-shaped.

10. A device according to any of the preceding claims in which the centring sleeve has, distributed on the periphery, at last two centring pins projecting axially in the region of the entry surface.

11. A device according to claim 10 in which the second clamping ring has a radial flange with at least two axial passages for the centring pins.

12. A device according to any of claims 1 to 9, in which the second clamping ring has the form of a sleeve with a radial flange.

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1 SHEET This drawing is a reproduction of the Original on a reduced scale