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ROTATABLE TOOL-HOLDER OR WORK-HOLDER FOR A MACHINE-TOOL

Filed July 20, 1959 2 Sheets-Sheet 1

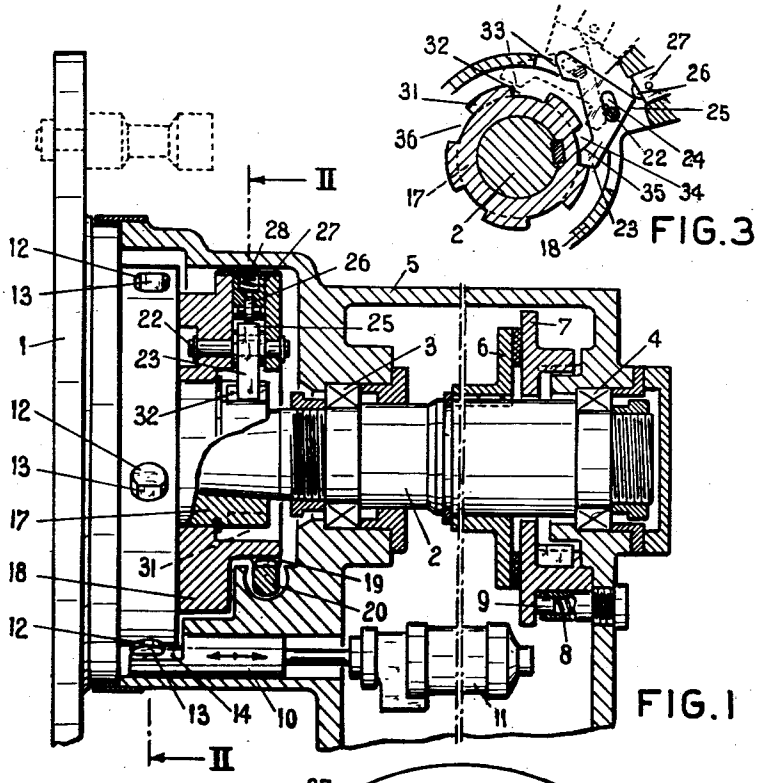


FIG. 1

FIG. 3

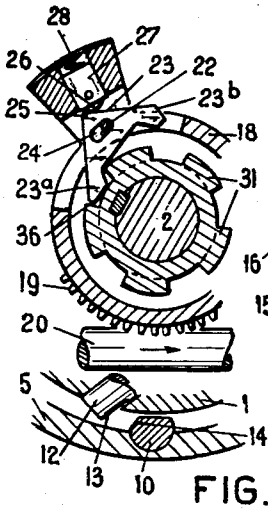


FIG. 4

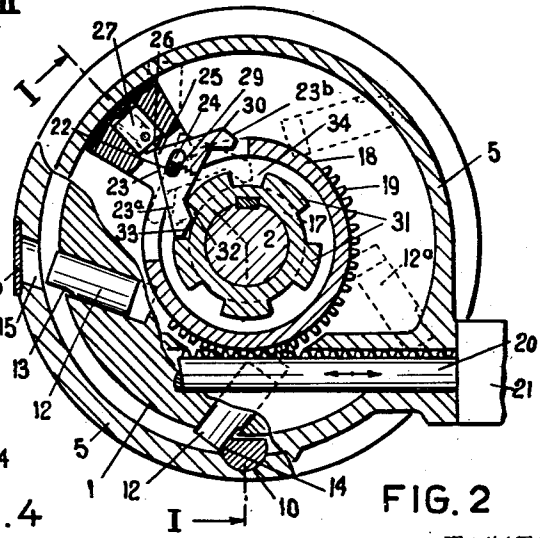


FIG. 2

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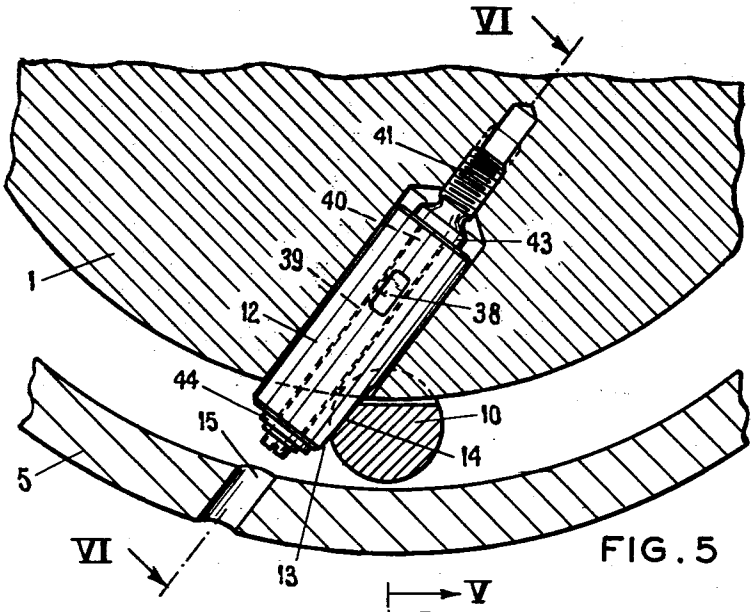


FIG. 5

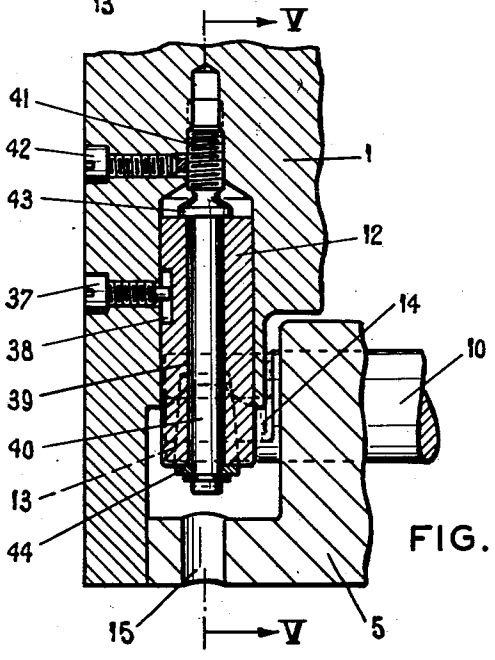


FIG. 6

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ROTATABLE TOOL-HOLDER OR WORK-HOLDER FOR A MACHINE-TOOL

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3 Claims. (Cl. 74—813)

The invention relates to a rotatable tool- holder or work-holder for a machine-tool which is provided with a mechanism for immobilizing said holder in various positions.

The invention has for object to improve this type of holder in such manner that the stopping elements adjust themselves and may be reworked in a simple manner, so that differences in the pitch of said members on the holder can easily be corrected.

According to the invention an axially displaceable cylindrical stopping pin is supported in a stationary part of the frame in which the rotatable holder is supported. This holder is supported in such a manner that said pin can freely rotate through a restricted angular distance about its own axis. Abutment pins of circular section are mounted in the holder each in a more or less radial direction and each being freely rotatable in the holder through a restricted angular distance. The abutment pins are distributed over the circumference of the holder and are provided with an abutment face adapted to engage a corresponding abutment face on the stopping pin. With this arrangement the abutment pins and the stopping pin are freely rotatable they can adjust themselves, so that a plane of contact of the abutting faces of said pins in the adjusted position of the holder is obtained. The freely rotatable abutment pins may easily be removed from the holder for reworking their abutment faces for correcting the pitch of the pins. When correcting a pitch which is too small the abutment face of the pin concerned is to be ground off and when correcting a pitch which is too large it will be required to replace the pin by a pin still having on its abutment face an excess of material so that the face can be reworked exactly to the required size.

When wear on the abutment faces of the stopping pin and the abutment pins occurs or when clearance occurs in the bearing holes for said pins in the stationary frame or in the holder respectively, the abutment pins are to be replaced by new pins having an excess of material on their abutment face for further reworking said face in order to obtain the correct pitch of the pins.

According to the invention it is also possible to correct a difference in the pitch of the abutment pins without requiring replacing the pin or even the removal of an abutment pin for reworking its abutment face. To this end the abutment face of one or more of the abutment pins encloses an angle with the axis of the pin and said pin is mounted for axial adjustment in the holder. If the abutment pin is displaced outwardly or inwardly with respect to the holder, the inclined abutment face on said pin is also displaced, whereby a correction of a pitch difference is obtainable.

For rotating the holder it is required to move the stopping pin in the stationary part axially out of the path of the abutment pins, so that the holder then may be rotated through an angle somewhat larger than required and then may be rotated in the reverse direction after the stopping pin has been returned to its operating position. In the new adjusted position the abutment faces of the abutment pins and the stopping pin are again contacting. This rotation of the holder may be obtained by a ratchet gear, a worm drive, or the like.

The invention will be further described with reference to the accompanying drawing showing an embodiment of a hydraulically operated holder having five different positions of adjustment.

In the drawing:

FIG. 1 shows a longitudinal sectional view of the holder taken of line I—I on FIG. 2.

FIG. 2 is a cross-sectional view taken on line II—II of FIG. 1.

FIGS. 3 and 4 show two different positions of the ratchet gear for rotating the holder.

FIG. 5 is an enlarged cross-section of part of the holder, having an axially adjustable abutment pin and FIG. 6 is a sectional view taken on line VI—VI of FIG. 5.

The disk-shaped holder **1** is secured on a shaft **2** which, by means of bearings **3** and **4**, is rotatably supported in a casing **5**. Secured to shaft **2** is a friction disk **6** for braking the rotation of the holder **1** on the disk **7** which is secured against rotation to the casing **5**. This disk is urged against the friction disk **6** by means of studs **9** loaded by a spring **8** so that the disk **6** exerts a constant drag on holder **1**. By varying the tension of the springs **8** the friction encountered by the friction disk **6** on the disk **7** may be varied.

A cylindrical, axially displaceable stopping pin **10** is supported freely rotatable in the casing **5**, and by means of a hydraulic cylinder **11** said pin may be moved out of its position of operation and returned into said position.

Five abutment pins **12** are supported freely rotatable in the holder **1** and each of said pins is provided with a flat abutment face **13** adapted to bear against a corresponding flat abutment face **14** on the stopping pin **10**. The rotation of both the abutment pin **10** and the abutment pins **12** is restricted to a small angular displacement by a locking element.

The abutment pins **12** preferably are not directed radially so that the pins provide a larger bearing surface in the body of the holder with the result of less danger of the pins bending and flexing.

The casing is provided with an aperture **15** closed by a cover plate **16**. As said plate can be removed the abutment pins **12** may readily be removed for regrinding the abutment face **13** if required, in mounted position of the holder.

A disk **18** is mounted on the hub **17** of the holder **1** for free rotation thereon and said disk on part of its circumference is provided with teeth **19** meshing with a rack **20** also constituting the piston rod of a hydraulic cylinder **21** and serving to rotate the holder **1** through the intermediary of a panel mechanism now to be described. A bolt **22** is rotatably supported in the disk **18** and on said bolt a double pawl **23** is secured. As the bolt **22** extends in an oblong hole **24** of the pawl **23** said pawl is adapted to slide with respect to disk **18**. A roller **26** presses on the point **25** of pawl **23** and is supported on balls in a cylindrical body **27** loaded by a spring **28** for urging the roller **26** on the point of pawl **23**. Said pawl with its hole **24** is locked in either of its extreme positions with respect to the disk **18** by a ball **29** urged against the bolt **22** by a spring **30**. Pawl **23** cooperates with teeth **31** provided on the hub **17** of the holder **1**.

The device described above operates as follows:

FIG. 2 shows the device in its initial position, in which the abutment pin **12** is pressed against the stopping pin **10** under the influence of the pressure reigning in the cylinder **21**. This pressure is transmitted to the holder by the arm **23***a* of pawl **23** engaging the notch **32** between the ratchet teeth **31**. In FIG. 2 the pawl **23** is shown in its position in the end of the hole **24** and locked by the pressure of the roller **26** exerted on the point **25**

of the pawl and by the pressure of ball **29**. As the point **25** of the pawl, the center of the cross section of the bolt **22** and the center of the teeth **31** are not lying on a straight line the pawl arm **23***a* is urged into the notch **32**. Thus the accurately ground abutment faces **13** and **14** of the abutment pin **12** and the stopping pin **10** are forced together by a constant pressure.

For rotating the holder to its following position the hydraulic cylinder **21** is set into operation so that the rack **20** is moved to the left, whereby the disk **18** carrying the pawl **23** is rotated in clockwise direction. Thereby the pawl arm **23***a* is forced out of the notch **32** between the ratchet teeth **31** by means of its inner face and the pawl arm **23***b* under the influence of the pressure roller **26** will be urged into the notch **34** between the ratchet teeth **31** as shown in dotted lines in FIG. 2.

The holder **1** continues to rotate until it has moved through an angular distance somewhat exceeding one fifth of its circumference and the following abutment pin **12***a* has passed the stopping pin **10**, which latter in the meantime has been returned to its inoperative position by cylinder **11**. Moreover pawl **23** with its oblong hole **24** is moved on bolt **22** to the full line position shown in FIG. 3, in which the point **25** of the pawl, the center of bolt **22** and the center of the ratchet teeth **31** are not lying on a straight line, so that the pawl arm **23***b* is urged into the notch **34** between teeth **31**. Since the abutment pin **12***a* has now passed the stopping pin **10** by a slight amount the pin **10** may now be returned to its operative position by cylinder **11**. The pawl **23** and the ratchet teeth **31** are now in the full line position shown in FIG. 3.

Thereupon the rack **20** is again moved to the right toward its retracted position as seen in FIG. 2 by cylinder **21**, whereby the disk **18** with the pawl **23** is rotated in counter-clockwise direction and the pawl arm **23***b* is moved in the notch **34** between the ratchet teeth **31** until the sloping face **35** on the pawl arm **23***b* contacts the adjacent ratchet tooth **31**. Under the influence of said sloping face **35** the pawl arm **23***b* will then be lifted out of the notch **34** again and the pawl arm **23***a* with its face **33** will fall down on the preceding ratchet tooth **31** as shown in dotted lines in FIG. 3. The rotation of the disk **18** together with the pawl **23** is continued, whereby the pawl arm **23***a* falls into the notch **36** between the ratchet teeth **31** as shown in FIG. 4.

If rotation of disk **18** continues, pawl **23** with its oblong hole **24** moves on bolt **22** and the holder with its abutment pin **12** is moved back through the slight angular distance by which the pin **12** has passed its intended position until the pin contacts the stopping pin **10**, so that the position shown in FIG. 2 is reached in which the holder **1** has been moved angularly exactly 72 degrees corresponding to one fifth of its circumference and the rack **20** has reached its original retracted position.

As with said reversed rotation of the holder each abutment pin **12** is moved slowly through a slight angular distance for engaging the stopping pin **10**, injurious impact strain on the pins **10** and **12** is prevented so that a smooth running of the holder without wear of said pins is provided.

As shown in FIG. 5 the abutment face **13** of pin **12** encloses an angle with the axis of said pin. The rotation of the abutment pin **12** in the holder is restricted by a screw **37** engaging a recess **38** at the circumference of the pin.

The abutment pin **12** has an axial bore **39** in which a bolt **40** extends having screw threads at its inner end **41** by means of which it is screwed in the holder **1** and secured against displacement by a locking screw **42**.

The abutment pin **12** is secured against axial displacement on the bolt **40** between a collar **43** and a ring **44**. By inserting a screw driver through the aperture **15** in the stationary frame **5** and after the locking screw **42** has been loosened bolt **40** together with pin **12** may be screwed inwards or outwards with respect to the holder, whereby the abutment face **13** is displaced and will increase or decrease the angular displacement of the holder. In this way differences in the pitch of the abutment pins may be corrected.

The device may be operated in such a manner that first the bearing pressure between the pins **10** and **12** is relieved before returning the stopping pin **10** to its inoperative position for a next rotation of the holder, so that thereby also wear on the abutment faces of the pins is avoided.

Instead of hydraulically the device described above may also be operated pneumatically or mechanically.

What we claim is:

1. In a device comprising a rotatable part to be immobilized in at least one position with respect to a stationary part, the combination of a pin-like stopping member mounted in said stationary part displaceable between an extended and a retracted position and freely rotatable through a limited angle about its axis, said stopping member having an abutment face at a side thereof, at least one pin-like abutment member mounted in said rotatable part freely rotatable through a limited angle about its axis and having an abutment face at a side thereof, said stopping member and said abutment member being disposed to be engageable with each other along their abutment faces in the extended position of said stopping member, the projection of the axis of said stopping member along a plane coincident with a radius of said rotatable part intersecting the axis of said abutment member in the abutting position of said members, and means for maintaining the abutting relation of the abutment faces of said members during immobilization of the rotatable part.

2. A device as claimed in claim 1, wherein said abutment face of said abutment member is disposed at an angle with the axis of said member, said member being axially adjustably mounted in said rotatable part.

3. A device as defined in claim 2, wherein said abutment member is provided with a bore, a bolt member extending through said bore and supporting said abutment member so as to prevent it from axial displacement, said bolt member being threaded in said rotatable part for axial adjustment of said abutment member upon rotation of said bolt member.

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