United States Patent [19]

Mason

[11] **3,711,998**

[45] **Jan. 23, 1973**

[54] **ADJUSTABLE SUPPORT STRUCTURES FOR MACHINE TOOLS**

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[22] Filed: **Aug. 21, 1970**

[21] Appl. No.: **66,047**

[30] **Foreign Application Priority Data**

Aug. 22, 1969 Great Britain.....41,906/69

[52] **U.S. Cl.**.....**51/166 MH**

[51] **Int. Cl.**.....**B24b 41/04**

[58] **Field of Search** .....51/166 TS, 166 FB, 166 MH, 51/218 A, 240 A, 227; 279/5, 16

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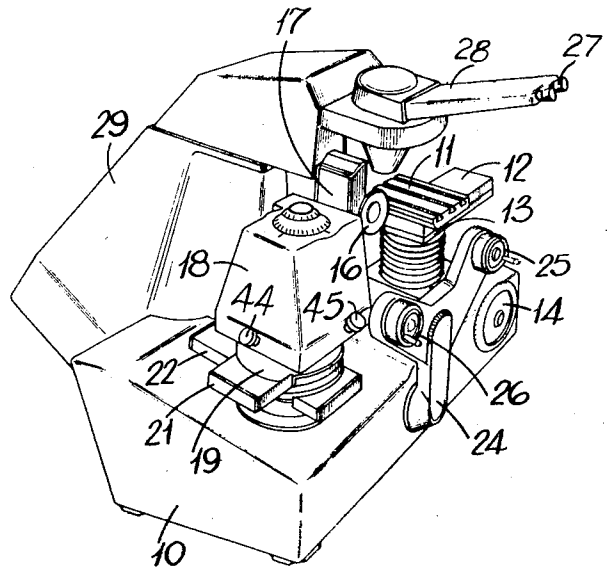
[57] **ABSTRACT**

A support structure for a grinding wheel on a grinding machine, comprising a base having part-spherical seating, a housing having a complementary part-spherical portion permitting relative adjustment between the base and housing, the housing carrying a grinding wheel or other device, releasable locking elements whereby the housing can be locked relatively to the base in any selected position, and control elements for adjusting in two mutually perpendicular vertical planes.

7 Claims, 5 Drawing Figures



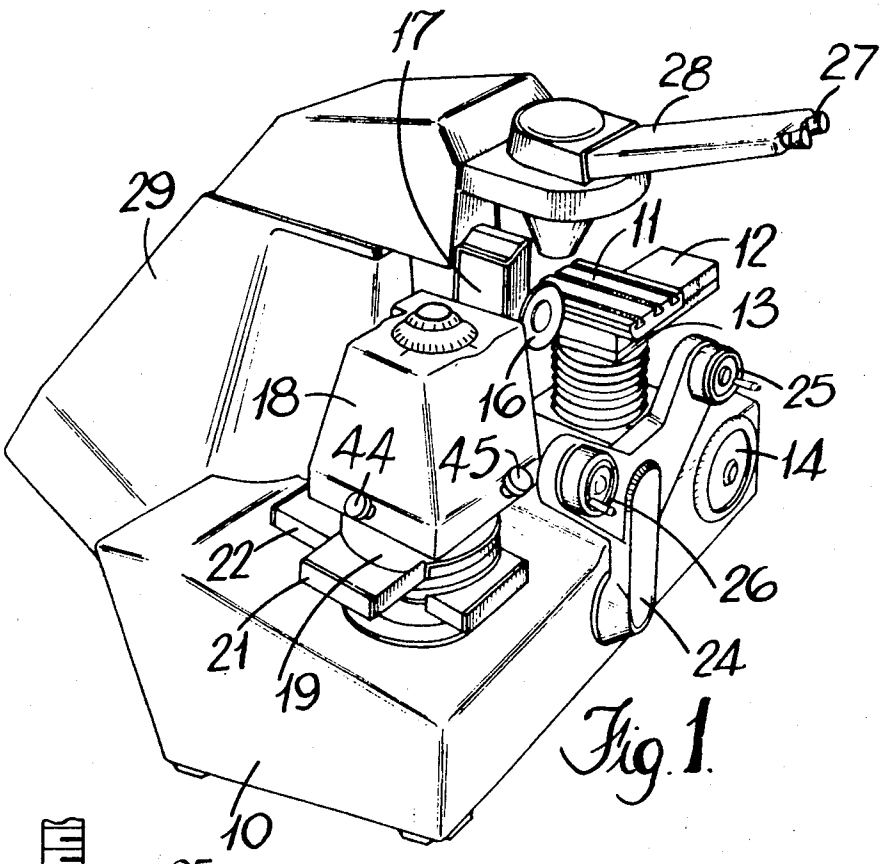


Fig. 1.

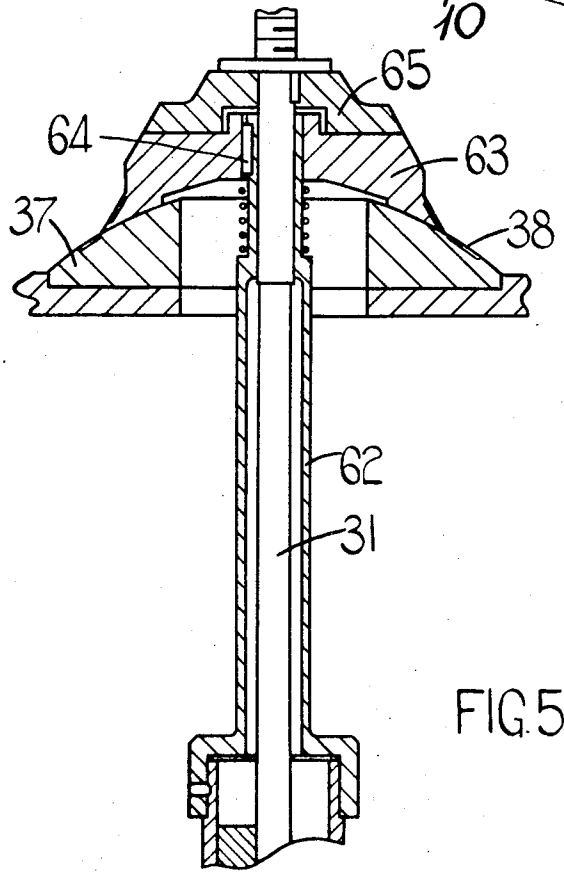


FIG. 5.

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Fig. 2.

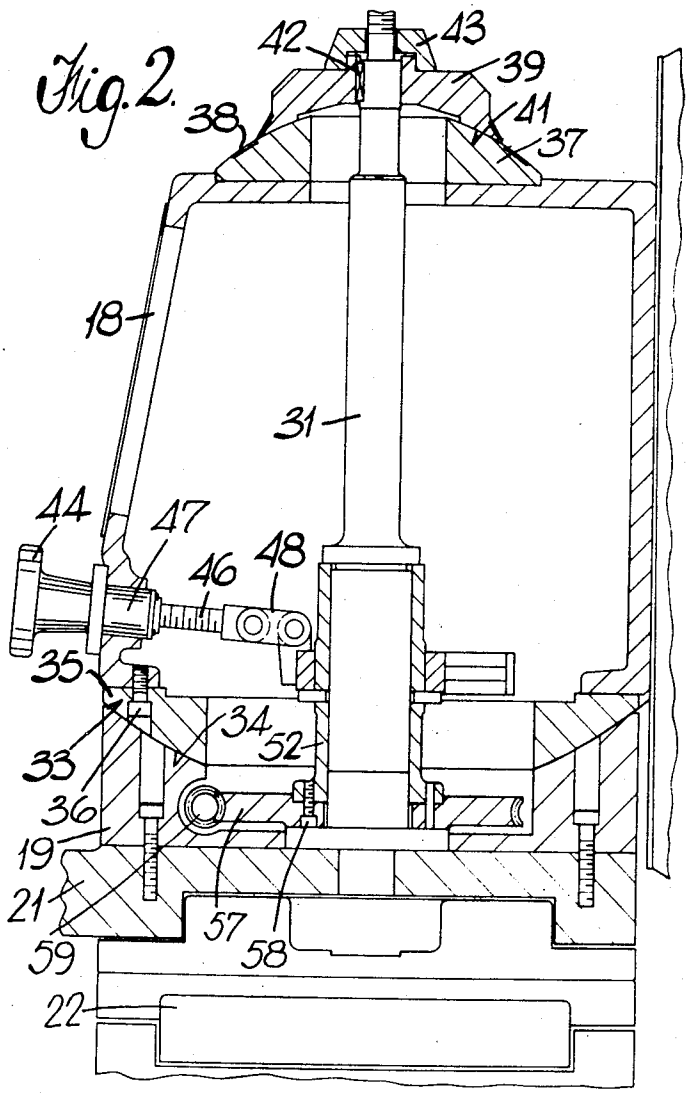

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Fig. 3.

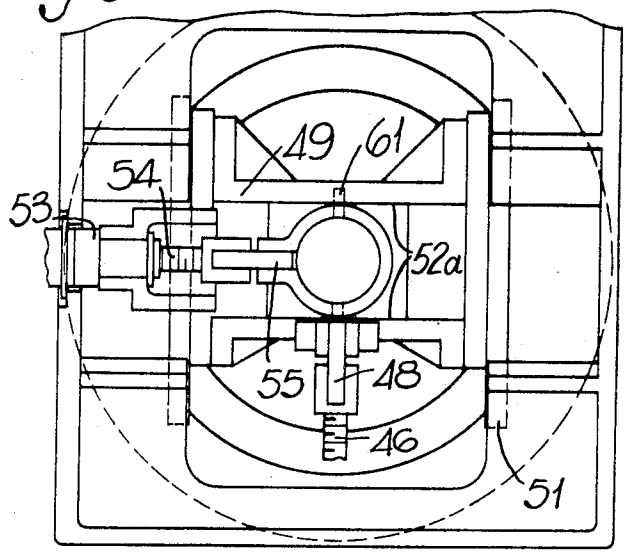
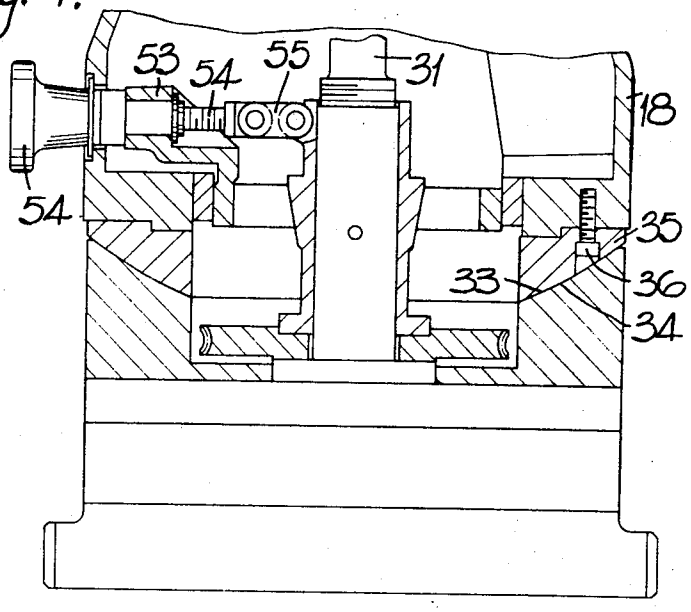


Fig. 4.



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ADJUSTABLE SUPPORT STRUCTURES FOR MACHINE TOOLS

This invention relates to adjustable support structures suitable for supporting a grinding wheel on a grinding machine, or other analogous function. For example, in a grinding machine, adjustment, can take place in two mutually transverse horizontal directions; angularly in two vertical planes which are mutually transverse with respect to one another; and also rotation in a horizontal plane about a vertical axis.

In known support structures of this kind, there are two arcuate slides arranged to move about mutually transverse horizontal axes, to achieve the angular movements respectively. Releasable locking means for these arcuate slides are provided and in order to effect an adjustment, one or both of these must be released. After the required adjustment has been carried out, they must be locked. This operation can give rise to inaccuracy because the weight of the part of the structure which has been adjusted, tends to cause movement at the slides during locking so that, when fully locked, the slides occupy incorrect positions.

The object of this invention is to provide a support structure wherein the number of joint faces compared with known constructions are reduced to provide increased rigidity of the complete structure and in which the required adjustment can be carried out in a convenient manner and in which the risk of inaccurate adjustment is minimized.

According to the present invention, a support structure of the kind specified comprises a base, a part-spherical seating on the base, a complementary part-spherical portion on a housing adjustably mounted with respect to the seating, releasable locking means for locking the housing relatively to the seating, respective control means for adjusting the housing relatively to the seating in two vertical mutually transverse planes, and support means on the housing for supporting a grinding wheel or other device thereon.

The invention will now be described by way of example with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of a grinding machine incorporating the present invention,

FIG. 2 is a cross-sectional side elevation view of the support structure which forms the subject of this invention,

FIG. 3 is a plan view in cross-section,

FIG. 4 is a cross-sectional view at right angles to FIG. 2, and

FIG. 5 is a fragmentary cross-sectional view showing an alternative locking and indicating means on the support structure.

With reference to FIG. 1 the machine comprises a base **10** on which is mounted a support structure for a workpiece and including a pair of horizontal mutually perpendicularly movable slides **11** and **12** mounted upon an adjustable base **13**. The workpiece support adjustment is achieved through a hand wheel **14**. There is also mounted upon the base a support structure for a grinding wheel **16** which includes a vertically reciprocable slide **17** carried by a housing **18** which in turn is mounted upon a base **19** carried by two mutually perpendicularly adjustable horizontal slides **21**, and **22**. Hand wheels **25** and **26** mounted upon a support **24** on the base controls the slides **21** and **22** respectively.

The machine includes also an optical mechanism whereby the operator can view the work, such optical mechanism including an eye piece **27** mounted upon a hollow extension **28** through which, not only the workpiece and grinding wheel, but also an enlarged layout, mounted in a housing **29**, can be viewed.

The support structure for the grinding wheel is shown in more detail in FIGS. **2** to **5**. With reference to these Figures, the support structure comprises the housing **18** through which extends a vertical stationary shaft **31** secured to the upper slide of the two horizontal slides **21** and **22**.

The base **19** has a concave part-spherical upper surface **33** on which rests a complementarily convex part-spherical surface **34** of the housing **18**. The surface **34** is formed on a part **35** which is permanently secured by bolts **36** to the underneath of the housing **18**.

The housing **18** is hollow and has a large opening at its upper end through which the shaft **31** passes, the opening being surrounded by a convex part-spherical member **37**. The part-spherical surface **38** of the member **37** is concentric with, but of different radius with respect to the surfaces **33** and **34**.

Engaged over the member **37** is a clamping ring **39** having a complementarily part-spherical seating portion **41** to engage the surface **38**. The ring **39** is keyed to the shaft **31** by a key **42**. Engaging with the screw-threaded extremity of the shaft **31** is a clamping nut **43** which serves to clamp the ring **39** onto the member **37** thus locking the housing **18** in relation to the seatings **33** and **41**.

The nut **43** can be released by a control arm (not illustrated) or by any other means which preferably does not exert any side load upon the shaft **31** during tightening thus minimizing any inaccuracy in the setting of the housing in relation to its seating.

The member **37** and the ring **39** are provided with respective markings on their adjacent faces whereby the angular setting of the housing in relation to the shaft axis can be determined. The ring **39** has two markings at 90° to one another, and the member **37** has a plurality of graduations which are co-operable with the markings on the ring **39** which indicate angular movements in degree increments. Since surface **38** is part-spherical the graduations are parts of equatorial circles of the sphere of which surface **38** is a part.

In order to move the housing **18** about the axis of the spherical seatings **33** and **41** it is necessary to release the nut, whereupon the housing will be capable of angular movement about the vertical axis of the shaft **31** and also angularly about two horizontal axes which pass through the axis of the spherical seatings, such horizontal axes being mutually perpendicular.

To effect such angular movement about the horizontal axes referred to there are provided two manual controls **44** and **45** which extend out of the housing **18** at right angles to one another as shown in FIG. **1**.

The manual control **44** is a combined handwheel and nut assembly which engages a screw **46** and which runs in a bush **47** in the housing **18**. Screw **46** is connected at its inner end through a link **48** to a part **49** which is slidably mounted in a sub-frame **51** forming part of the housing **18**.

A similar combined handwheel and nut assembly **45** engages screw **54** and runs in bracket **53** which is an extension of part **49**. Screw **54** is connected through link

55 to a collar 52 surrounding the shaft 31, the part 49 can thus also slide with respect to parallel faces 52a formed at opposite sides of the collar 52.

It will be seen that by adjustment of the screws 46 and 54 in the respective handwheel and nut assemblies 44 and 45, the housing 18 can be moved angularly about the horizontal axes described.

The manual control 44 is intended to move the housing 18 sideways with respect to the front of the machine at which the controls 14, 25, and 26 are provided, and the manual control 45 is arranged to move it forward and backward.

In this machine, however, it is only necessary to accommodate angular adjustment on one side of the vertical by means of the manual control 44.

In order to move the housing 18 angularly about the axis of the shaft 31, there is a gear wheel 57 secured by bolts 58 to the collar 52, this gear wheel being concentric with a shaft 31 and rotatable thereon.

The gear wheel 57 is engaged by a worm 59 driven by a manual control (not illustrated) which extends out of the base 19.

To accommodate the relative angular movement between the collar 52 and the part 49 during adjustment by means of the manual controls 44 and 45, the collar carries a pair of dowels 61 engaging in seatings in the part 49.

In the alternative arrangement shown in FIG. 5 the vertical shaft 31 is enclosed in a fixed sleeve 62. The upper end of the sleeve 62 is keyed to a ring 63 which is the equivalent of the ring 39 in the FIG. 1 construction. The key is identified at 64.

Engaging over the ring 63 is a further part 65 which in turn is locked by a nut (not shown) on the screw-threaded upper extremity of the shaft 31 to which it is keyed.

The part 65 and the ring 63 carry respective adjacent graduation marks and indicate the angular setting of the housing in relation to the shaft 31 about the vertical axis of the shaft 31. The graduation marks on the ring 63 and the adjacent surface 38 of the member 37 indicates the setting about the two mutually perpendicular horizontal axes referred to.

With both forms of clamp illustrated the clamping force is exerted over the whole of the part-spherical seating areas and since the axis about which clamping takes place coincides with the axis of the spherical seating, any tendency for the part so move during clamping is minimized.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A support structure for supporting a grinding wheel on a grinding machine, comprising a base, a part-spherical seating on the base having an axis, a complementary coaxial part-spherical portion on a housing adjustably mounted with respect to the seating, releasable locking screw means passing through the axis of the part-spherical seating and complementary portion, said locking screw means being arranged releasably to lock the housing relatively to the seating, two control means for adjusting the housing relatively to the seating in two vertical mutually transverse planes respectively and support means on the housing for supporting a grinding wheel thereon.

2. A support structure as claimed in claim 1 in which the base includes two mutually perpendicularly adjustable horizontal slides operably connected to two/control means respectively.

3. A support structure as claimed in claim 1 in which said support means comprises a slide on the housing adapted to carry a grinding wheel.

4. A support structure as claimed in claim 1, in which the locking screw means comprises a vertical shaft carrying, at its upper end, a part having a further part spherical portion engaging a complementary part-spherical seating on the housing, the two pairs of complementary surfaces being concentric.

5. A support structure as claimed in claim 1 in which the two control means for adjusting the housing comprise respective mutually slidable screw and nut mechanisms.

6. A support structure as claimed in claim 1 including a further control means whereby the housing can be angularly adjusted about the axis of the locking screw means.

7. A support structure as claimed in claim 4 in which the part carried by the shaft is formed in two sections, one being secured to the shaft and the other being rotatable relatively thereto and being non-rotatably engaged with the housing.

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