Sept. 30, 1947. C. W. STRONG 2,428,248

WORK HOLDING ATTACHMENT FOR SURFACE GRINDERS

Filed Jan. 30, 1945

FIG. 1.

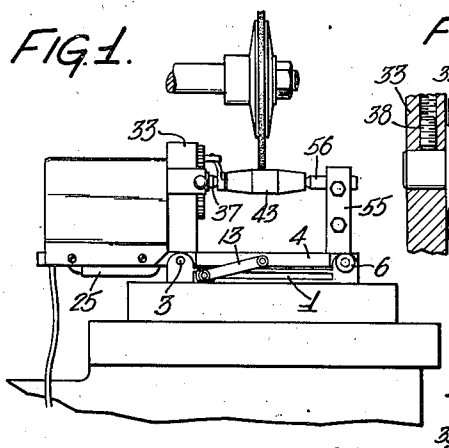


FIG. 11.

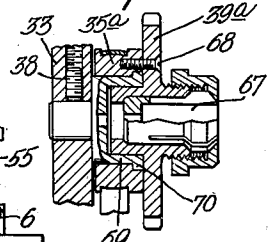


FIG. 2.

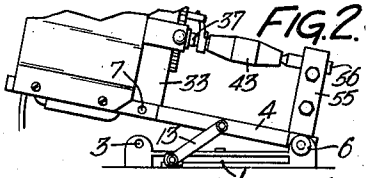


FIG. 3.

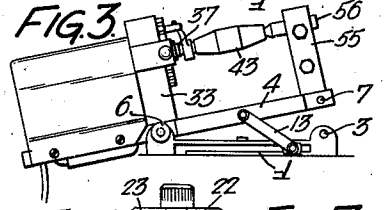


FIG. 7.

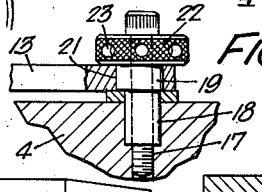
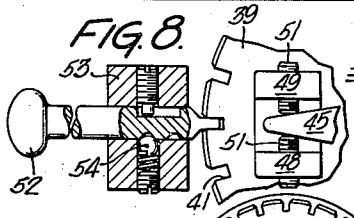


FIG. 4.

FIG. 8.



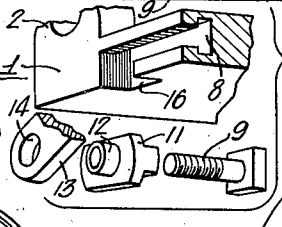


FIG. 9.

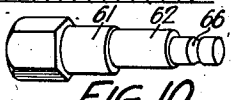


FIG. 10.

FIG. 5.

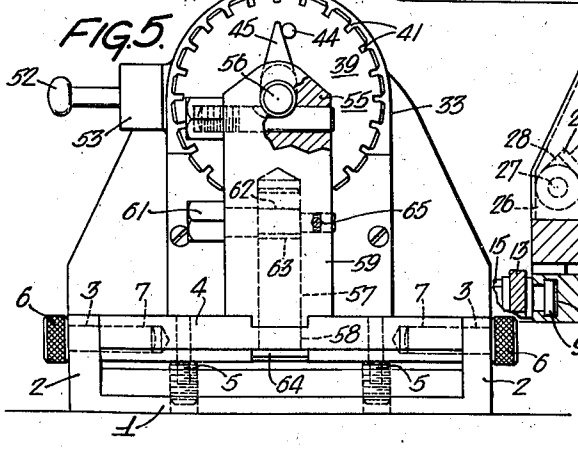
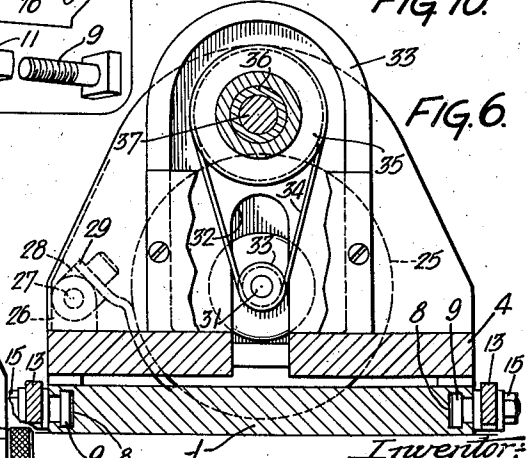


FIG. 6.



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WORK HOLDING ATTACHMENT FOR SURFACE GRINDERS

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15 Claims. (Cl. 51—237)

1

This invention relates to grinding machines and a primary object of the invention is to provide an improved attachment for surface grinders by means of which this type of machine may be adapted for cylindrical grinding and allied operations.

More specifically, the invention contemplates provision of a device, in the form of an attachment for machines of the surface grinding type, for supporting the work for rotation about an axis predeterminedly disposed with respect to the normal plane of relative traverse between the grinding tool and the work.

Another object of the invention is to provide a device of the stated character wherein means is provided for adjusting the said axis of rotation of the work angularly with respect to said plane of relative traverse.

Another object of the invention is to provide a device of the aforesaid character having means for maintaining the work fixed in said support for presentation to the grinding tool in desired positions of adjustment about said axis.

The invention further resides in certain structural and mechanical details, hereinafter set forth, by means of which the aforesaid major objects of the invention are attained and which contribute to the provision of an attachment characterized by extreme flexibility of adjustment and constituting a highly valuable precision adjunct for surface grinders capable of materially enlarging the scope of utility of machine tools of that basic type.

In the attached drawings,

Figure 1 is a side elevational view of a device made in accordance with my invention illustrated in its relation to the immediately associated elements of the grinding machine with which it is adapted to function;

Figures 2 and 3 are fragmentary side elevational views illustrating the means for adjusting the work angularly with respect to the normal plane of relative traverse between the grinding tool and the work;

Figure 4 is an enlarged sectional elevational view of the device;

Figure 5 is an end elevational view of the device;

Figure 6 is a section on the line 6—6, Figure 4;

Figure 7 is a fragmentary sectional view on the line 7—7, Figure 4;

Figure 8 is a fragmentary sectional view illustrating a detail of the indexing device shown more particularly in Figure 5;

Figure 9 is a fragmentary exploded view in perspective of one end of the base plate of the device including the immediately associated elements;

2

Figure 10 is a view in perspective of the tail stock locking pin, and

Figure 11 is a fragmentary vertical sectional view illustrating a modification of the work-holding means.

With reference to the drawings, the preferred embodiment of the invention therein illustrated consists of a bed plate 1, of generally rectangular form in the present instance, having an upstanding boss or ear 2 at each corner thereof, the two sets of ears at each end of the bed plate having coaxial apertures designated in each instance by the reference numeral 3. Adjustably mounted on the bed plate 1 is a base plate 4, said base plate normally seating upon set screws 5—5 which are threaded in the bed plate 1 and are adjustable in the latter to vary their effective height. The base plate 4 is adapted for pivotal connection with the bed plate 1 through the medium of pins 6—6 which are removably fitted to the apertures 3 and which project into recesses 7 in the ends of the base plate aligned with said apertures. Two sets of the recesses 7 are provided in the base plate, at the opposite ends thereof respectively, so that the pivotal connection may be established selectively at either end by simple transfer of the pins 6. Thereby, provision is made for tilting the base plate on the bed plate from either end as illustrated in Figures 2 and 3. The adjusting screws 5 are in position approximately midway between the two pivotal axes, which may be established selectively as described above, and operate with the pivot pins 6 to support the base plate in a normal plane parallel to the plane of the nether surface of the bed plate. Adjustment of the screws will correspondingly slightly modify the angular position of the base plate with respect to the operative pivot as may be required to establish the said plate accurately in a desired plane.

The bed plate 1 has in each side edge thereof a longitudinal T-slot 8 in which is slidably fitted a square headed bolt 9, the threaded end of said bolt projecting outwardly beyond the edge surface of the bed plate for reception of an element 11 which fits slidably on the bolt and which has on its outer face a projecting cylindrical boss 12 which forms a pivot for one end of a strut element 13. Each of the strut elements has at its lower end an aperture 14 into which the boss 12 fits accurately, and a nut 15 is provided on the outer extremity of the bolt 9 whereby the bolt,

the slide element 11, and the strut 13 may be immobilized in any desired position of adjustment longitudinally of the slot 8. As shown in Figure 9 each of the slots 8 is provided with an opening 16 in the bottom of the bed plate 1 through which the square head of the bolt 9 may be introduced into the slot.

The other end of the respective struts 13, one at each side of the bed plate as illustrated, is pivotally secured by means of screw 17 to the side of the base plate 4 at a point approximately midway between the pairs of apertures 7 so that the strut 13 may operate to support the base plate in desired angular position of adjustment about either of the alternative pivotal axes. By loosening the nuts 15 and the screws 17, the strut is free for adjustment to a position affording the desired angularity of the base plate, and it will be noted that that end of the strut which is attached to the bed plate may be moved to either end of the slot 8 so as to occupy the most favorable position with respect to the base plate for any position of the latter. Subsequent tightening of the nut 15 and preferably also of the screws 17 will lock the strut to both the bed plate and the base plate and will retain the base plate in the position of angular adjustment.

Preferably, and as illustrated in Figure 7, each of the screws 17 carries a sleeve 18 having an eccentric mid portion 19 which is positioned within the aperture 21 in the end of the associated strut 13. Beyond this eccentric bearing portion 19, the sleeve has an enlarged knurled head 22 with radial recesses 23 for reception of a suitable turning tool. When the screw 17 is loosened the sleeve 18 may be rotated about its axis in the screw with the result that the eccentric portion 19 will effect a limited angular adjustment of the base plate 4 with respect to the bed plate 1, thus affording a fine or micrometer adjustment for the base plate. Subsequently, a retightening of the screw 17 will lock the sleeve 18 in adjusted position.

The base plate 4 has a rectangular frame-like extension 24 at one end within which is pivotally supported an electric motor 25. The pivotal mounting for the motor comprises a pair of lugs 26, 26 which extend upwardly from one side of the frame 24 and which are provided with aligned apertures for reception of the trunnions 27, 27 of a block 28, said block being thus journaled in the frame for pivotal movement about an axis extending longitudinally of the base plate 4 and parallel to the rotary axis of the motor 25. A rigid strap 29 is secured to the block 28 and is attached also to the side of the motor 25, as illustrated in Figure 6, thus supporting the motor for pivotal movement about the axis of the trunnions 27.

The motor shaft 31 projects through a slot 32 in a standard 33, which standard extends upwardly from the rear end of the base plate 4, and the said shaft 31 has attached to its extremity a belt pulley 33 which is connected through a belt 34 to a pulley 35 journaled on a sleeve 36 carried by a journal pin 37 secured in and projecting transversely from the said standard. A set screw 38 is engageable with the pin 36 to lock the pin rigidly in the standard. The pulley 35 has as an integral part thereof a disc 39, this disc being provided in its periphery with a circumferential series of uniformly spaced recesses 41. The function of these recesses will be described hereinafter. The pin 37 has a conical extremity 42 whereby the pin may function as a center pin for rotably supporting one end of a work piece 43 as hereinafter set forth. The disc 39 carries a projecting pin 44 positioned for engagement with an arm 45 on a collar 46 which is adapted to be attached through the medium of a set screw 47 to one end of the work piece 43 whereby rotation of the disc 39 will effect also a rotation of the work piece about the axis of the pin 37.

The disc 39 also carries a pair of projecting lugs 48 and 49 each of which has a set screw 51. When the arm 45 of the collar 46 is positioned between the lugs 48 and 49 and the set screws 51 then turned inwardly against the opposite sides of the arm, the work will be immobilized with respect to the disc 39. The disc 39 may be similarly anchored against rotation through the medium of a latch 52 which is slideably mounted in a boss 53 on the frame of the machine. A spring pressed detent 54 holds this latch releasably in each of two alternative positions in one of which the inner end of the latch 52 projects into one or other of the recesses 41 in the disc 39, thereby immobilizing the disc, and in the other of which the latch is withdrawn from the periphery of the disc 39 to leave the latter free for rotation.

The base plate 4 also carries a standard 55 which carries a taper-ended center pin 56, said pin being engageable with the end of the work as illustrated in Figure 4 to thereby, in conjunction with the pin 42, support the work 43 for rotation about a predetermined axis in the structure. Normally this axis will parallel the plane of the bed plate, as in Fig. 4. The standard 55 comprises a pin 57 which extends upwardly through a longitudinal slot 58 in the base plate 4 so that this pin may be adjusted longitudinally of the base plate. The standard 55 further comprises a post element 59 which is recessed from the bottom for reception of the pin 57 as shown in Fig. 4. The post 59 and the pin 57 are apertured for reception of a retaining pin 61, this pin extending through said apertures and having an eccentric portion 62 which fits neatly within the aperture 63 in the pin 57. By rotating the pin 61 the eccentric 62 may be made to relatively move the pin 57 and the post 59 so that the head 64 of the pin is drawn up against the under side of the base plate 4 and the bottom of the post 59 is drawn downwardly against the top of the base plate so as to clamp the latter thereby to rigidly secure the standard 55 in adjusted position in the said plate. A set screw 65 enters a circumferential recess 66 in the inner end of the pin 61 to retain the pin and to rigidly secure the pin in the standard clamping position.

The operation of the device is as follows:

Where the surface grinder is equipped with a magnetic work table and the bed plate 1 is made of ferrous metal, the attachment may be magnetically secured to the work table. Where the said work table is the traversible member of the grinder, the device may be positioned on the table so as to bring the work piece into engagement with the grinding tool along a given line and in the plane of traverse. Thereafter with the motor 25 in operation to rotate the work, the latter may be traversed in well known manner with respect to the tool to effect a rotary grinding of the work in accordance with known principles. When the base plate 4 is resting upon the pins 5, the rotary axis of the work will parallel the under surface of the bed plate, and also the surface of the work table of the grinder. If grinding of the work piece is desired at an angle to this normal axis as in the case of the tapered ends of the

work piece 43 shown in the drawings, the base plate may be tilted to the required angle about one or other of the pivotal axes afforded by the apertured ears 2 and the recesses 7 as previously set forth. By reason of the ability to pivotally adjust the base plate on the bed plate about axes at each end of the base plate, the desired angular grinding of the ends of the work piece may be effected without disturbing the work in its support.

If it be desired to grind hexagonal or other angular faces on the work piece, the work may be immobilized with the disc 39 by means of the set screws 51 as previously described and the latch 52 then utilized to anchor the disc and to index it in the various positions which the work must assume in the grinding operation.

It will be apparent that the device as described above is subject to modification without departure from the invention. One such modification, having to do with the manner of supporting the work, is illustrated in Fig. 11. In this case the driven pulley 35*a* carries a collet 67 by means of which the work may be supported coaxially with the pulley and entirely from one side and independently of the tail stock. The disc 39*a*, which corresponds to and replaces the disc 39 of the previously described embodiment, is formed separately from the pulley and is secured thereto by means of screws 68. The pin 37 is in this case replaced by a hollow member 69 having at its outer end a flange 70 which is confined in an annular recess between the pulley and the disc and acts to retain the pulley-disc assembly against axial displacement. The disc 39*a* is formed to receive the elements of the collet, as illustrated. This assembly may constitute an attachment interchangeable with the pulley and disc assembly shown in Fig. 4. Obviously other work-holding means, such for example as the conventional chuck, may be utilized in similar manner without departing from the inventive principle.

I claim:

1. An attachment for surface grinders of the type including a rotary grinding tool and a work table relatively traversible in a predetermined plane, said attachment comprising a base adapted to be secured to the work table, a structure mounted on said base for adjustment selectively about either of two pivotal axes fixed with respect to the base, said axes being parallel to each other and occupying a common plane parallel to the said plane of traverse, means for maintaining the said structure rigidly in the adjusted positions about each of said axes, means for supporting a work piece in said structure for rotation about an axis in a plane transversely intersecting both of said pivotal axes, and means for rotating said work.

2. An attachment for surface grinders of the type including a rotary grinding tool and a work table traversible relatively in a predetermined plane, said attachment comprising a base adapted to be secured to the work table, a structure mounted on said base for pivotal adjustment selectively about either of two pivotal axes parallel to said plane, means for supporting a work piece in said structure for rotation about a predetermined axis in the latter, and an adjustable strut element operative to maintain said structure in desired position of pivotal adjustment about either of said first mentioned axes.

3. An attachment for surface grinders of the type including a rotary grinding tool and a work table relatively movable in a predetermined plane,

said attachment comprising a bed plate adapted to be secured to the work table, a base member hinged to said plate for angular adjustment with respect thereto, a work support on said member, means for releasably retaining the base member in adjusted position, and micrometer adjustment means associated with the retaining member for effecting minor angular adjustments of said member with respect to the bed plate.

4. An attachment for surface grinders of the type including a rotary grinding tool and a work table relatively movable in a predetermined plane, said attachment comprising a bed plate adapted to be secured to the work table, a base member hinged to said plate for angular adjustment with respect thereto, work-supporting means on said member, an adjustable strut between said plate and member for retaining the member in adjusted position, an eccentric anchor for one end of the strut, and means for adjusting the eccentric to effect minor angular adjustments of the member with respect to the plate.

5. An attachment for surface grinders of the type including a rotary grinding tool and a work table relatively movable in a predetermined plane, said attachment comprising a bed plate adapted to be secured to the work table, a base member supported on the bed plate, means providing for angular adjustment of the member on the plate about each of two parallel axes, a strut pivotally attached to the member at a point intermediate said axes and having an end thereof slidably supported in the bed plate, means for releasably securing said end to the plate, and work-supporting means carried by the member.

6. An attachment for surface grinders of the type including a rotary grinding tool and a work table relatively traversible in a predetermined plane, said attachment comprising a base adapted to be secured to the work table, a structure mounted on said base for adjustment selectively about either of two pivotal axes parallel to said plane, means for supporting a work piece in said structure, and an adjustable seat for said structure intermediate said axes.

7. An attachment for surface grinders of the type including a rotary grinding tool and a work table relatively traversible in a predetermined plane, said attachment comprising a base adapted to be secured to the work table, a structure mounted on said base, detachable means for pivotally attaching the structure at each end to the base whereby the said structure may be tilted on the base about either of the two axes selectively, guide means on the base extending in a direction from one of said axes toward the other, a strut member pivotally attached at one end to the structure and adjustably secured at the other end on said guide, and work supporting means carried by said structure.

8. An attachment for surface grinders of the type including a rotary grinding tool and a work table relatively traversible in a predetermined plane, said attachment comprising a base adapted to be secured to the work table, a structure mounted on said base, detachable means for pivotally attaching the structure at each end to the base whereby the said structure may be tilted on the base about either of the two axes selectively, guide means on the base extending in a direction from one of said axes toward the other, a strut member pivotally attached at one end to the structure and adjustably secured at the other end on said guide, and means on said structure for mounting a work piece for rotation about an

axis extending generally in the direction of said guide.

9. An attachment for surface grinders of the type including a rotary grinding tool and a work table relatively traversible in a predetermined plane, said attachment comprising a base adapted to be secured to the work table, a structure mounted on said base, detachable means for pivotally attaching the structure at each end to the base whereby the said structure may be tilted on the base about either of the two axes selectively, guide means on the base extending in a direction from one of said axes toward the other, a strut member pivotally attached at one end to the structure and adjustably secured at the other end on said guide, means on said structure for mounting a work piece for rotation about an axis extending generally in the direction of said guide, and means carried by said structure for rotating said work piece.

10. An attachment for surface grinders of the type including a rotary grinding tool and a work table relatively traversible in a predetermined plane, said attachment comprising a base adapted to be secured to the work table, a structure mounted on said base, means for attaching the structure to the base for tilting adjustment about each of two parallel axes in the base remote from each other, means for maintaining the said structure rigidly in the adjusted positions about each of said axes, means for supporting a work piece on said structure for rotation about an axis in a plane normal to said parallel axes, and means for rotating the work.

11. An attachment for surface grinders of the type including a rotary grinding tool and a work table relatively traversible in a predetermined plane, said attachment comprising a base adapted to be secured to the work table, a second work table mounted on the base for tilting adjustment about a predetermined axis, means for mounting a work piece on the last-named table for rotation about an axis in a plane normal to said axis of tilt and substantially parallel to the plane of said table, a motor bracket pivoted to the structure of said second table on an axis parallel to the axis of rotation of the work piece, a motor secured to said bracket, a drive pulley on said motor, and means for operatively connecting the motor with the work, said means including a drive belt engaged with said pulley and constituting a suspension means for the bracket.

12. An attachment for surface grinders of the type including a rotary grinding tool and a work table traversible relatively in a predetermined plane, said attachment comprising a base adapted to be secured to the work table, a structure mounted on said base for pivotal adjustment selectively about either of two pivotal axes parallel to said plane, means for supporting a work piece in said structure for rotation about a predetermined axis in the latter, and a strut element attached to and operating between said base and said structure to support the structure rigidly in the adjusted positions about each of said axes,

said strut being itself adjustable to opposite sides of an approximate center line in said structure located between and paralleling said axes so as to provide for location of the strut in a favorable position with respect to the axis about which the structure has been adjusted.

13. An attachment for a grinding machine having a rotating tool and a work table relatively traversible in a predetermined plane, said attachment comprising a base adapted to be secured to the work table, a structure mounted on said base, means for attaching the structure to the base for tilting adjustment about each of two parallel axes fixed with respect to said base and remote from each other, means for maintaining the said structure rigidly in an adjusted position about either of said axes, means for supporting a work piece on said structure for rotation about an axis in a plane transversely intersecting said parallel axes, and means for rotating the work.

14. An attachment for a grinding machine having a rotating tool and a work table relatively traversible in a predetermined plane, said attachment comprising a base adapted to be secured to the work table, a structure mounted on said base, means for attaching the structure to the base for tilting adjustment of the structure about either of two axes fixed with respect to the base, means for maintaining the said structure rigidly in an adjusted position about either of said axes, means for supporting a work piece on said structure for rotation about an axis extending in a direction transverse to said first mentioned axes, and means for rotating the work.

15. An attachment for a grinding machine having a rotating tool and a work table relatively traversible in a predetermined plane, said attachment comprising a base adapted to be secured to the work table, a structure mounted on said base, means for attaching the structure to the base for tilting adjustment of the structure about either of two axes fixed with respect to the base, means for maintaining the said structure rigidly in an adjusted position about either of said axes, means for supporting a work piece on said structure for rotation about an axis extending in a direction transverse to said first mentioned axes, means for rotating the work, and means for immobilizing the work piece in predetermined positions of angular adjustment about its rotative axis.

CHARLES W. STRONG.

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