CONSTANT SURFACE SPEED GRINDER


Filed: May 26, 1972

Appl. No.: 257,342

U.S. Cl. 51/134.5 R
Int. Cl. B24b 47/18
Field of Search 51/134.5 R, 268-270, 51/273, 98 R, 99, 134.5 F

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ABSTRACT

A grinding wheel spindle pivoting bracket unit provides elements for effecting delivery of a constant wheel peripheral speed as the wheel diameter becomes progressively reduced. The position of the wheel spindle is adjusted by pivoting the bracket unit, upon which the spindle is mounted, in a direction toward the work-supporting table of the grinding machine. The bracket unit is pivotally mounted in bearings affixed to the machine. The grinding wheel spindle is fixedly secured to the bracket unit in a position whereby the peripheral edge of the grinding wheel is disposed closely adjacent and in operative relationship to a work table mounted upon the machine housing at a level reasonably comfortable for the machine operator. As the grinding wheel wears and gradually decreases in diameter, the pivoting bracket is adjustably pivoted forward so that the center distance between the driven spindle pulley and the driving self-adjusting motor pulley is decreased, allowing the drive belt therebetween to assume an adjusted position, and thus maintain a substantially constant peripheral edge surface speed.

14 Claims, 7 Drawing Figures
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CONSTANT SURFACE SPEED GRINDER

The invention involves a pivoting bracket construction for mounting a grinding wheel spindle driven by a constant speed motor having a self-adjusting pulley on its output shaft, so that, in any adjusted position of the wheel spindle, the peripheral surface speed of the wheel edge is maintained substantially constant. The wheel bracket support is pivotally mounted on bearings that can be positioned on the floor of the machine, on an intermediate base, or at any other suitable position in the machine, so long as the wheel spindle can be pivoted in the general direction of and toward the work-supporting table. The pivoting bracket is provided, adjacent its upper portion, with housing attached self-adjusting shock absorbers, to cushion and stabilize the wheel spindle for and during its grinding operations. The grinding wheel is adjustable pivoted upon the bracket for movement toward the work-holding table by means of a screw threadedly secured to the bracket member substantially adjacent the upper portion thereof. The adjusting screw can be actuated manually through a wheel, mechanically, electrically, or by other suitable and desirable means.

The pivoting bracket combination enables the operator to obtain a substantially constant peripheral speed at the wheel edge, with a constant speed motor driving through a self-adjusting drive pulley to the grinding wheel spindle pulley, though the wheel be gradually reduced in diameter upon wear. In one commercial embodiment of the invention, the grinding wheel had an initial diameter of 30 inches and was 3 inches thick. The pivoting bracket combination enabled the wheel spindle to be adjustable moved with facility by the operator toward the work table as the wheel diameter became gradually reduced to about 18 inches. Although such a substantial reduction in diameter normally changes the peripheral wheel speed, the pivoting movement of the spindle bracket support shortened the center distance between the spindle and self-adjusting pulleys in this combination, to maintain a substantially constant surface feet per minute delivery.

Prior art combinations in grinding machines to provide substantially constant speed surface feet delivery at the peripheral edge of the grinding wheel have long been known. Such prior art constructions include motor drives with self-adjusting pulleys mounted upon slides, and motor drives with bell crank lever arrangements. However, such arrangements do require a substantial number of complex component parts. The pivoting bracket arrangement of the instant disclosure is extremely simple in construction and operation, highly effective and of substantially lower cost.

It is therefore a principal object of the invention to provide a pivoting bracket support for a grinding wheel spindle, in combination with a power drive mechanism coupled to the spindle by a drive belt connecting a spindle pulley and a self-adjusting pulley on the power drive. Another object is to provide such spindle bracket support pivotally mounted on fixed bearings so that the wheel spindle pivots toward and away from the motor drive and a machine mounted work table. A further object is to provide screw means for adjustably positioning the grinding wheel adjacent and in relationship to the work table by rotating the spindle-supporting bracket about its pivoting axis.

Various further and more specific objects, features and advantages of the invention will appear from the description given below, taken in connection with the accompanying drawings, illustrating by way of example a preferred form of the invention. Reference is here made to the drawings annexed hereto and forming an integral part of this specification, in which FIG. 1 is a perspective view of a grinding machine embodying a preferred form of the pivoting bracket invention disclosed herein.

FIG. 2 is a transverse vertical substantially elevational view, partially in section, taken substantially on the line 2-2 of FIG. 1.

FIG. 3 is a horizontal substantially plan view, partially in section, taken substantially on the line 3-3 of FIG. 2.

FIG. 4 is a side elevational view, taken at the right of the machine illustrated in FIG. 1, showing the relative position of the grinding wheel and its spindle shaft as the wheel is reduced from its initial to a lesser diameter and in operative relationship to the work-supporting table.

FIG. 5 is a fragmentary side elevational view of the bracket unit adjusting mechanism, partially in section, taken substantially on the line 5-5 of FIG. 3.

FIG. 6 is a fragmentary horizontal sectional view taken substantially on the line 6-6 of FIG. 2.

FIG. 7 is a front elevational view of the bracket unit taken substantially on the line 7-7 of FIG. 3, in the direction indicated.

As shown particularly in FIG. 1, the grinding machine 8 comprises a shell housing 10 for the pivoting bracket and drive combination 12, upon which is mounted the work-supporting table 14 and a venting system 16 arranged over and about a major portion of the grinding wheel 18. As illustrated particularly in FIGS. 2, 3 and 5-8, the pivoting bracket and drive combination 12 comprises the grinding wheel spindle supporting pivoting bracket unit 20, the power or motor drive unit 21, and the bracket unit adjusting mechanism 22.

The grinding wheel spindle supporting bracket unit 20 comprises a plate member 23, which may be angular as shown or have any other suitable configuration, stiffening ribs 24,24 securely affixed to the plate member 23 adjacent each lateral edge thereof by welding or fasteners to strengthen and stiffen the member under the loads applied thereto, a pivoting shaft 26 rotatably mounted in bearings 26,28 affixed to a base support 30, and spindle supporting bar member 32 having openings 34 therethrough for fasteners 35 securing the wheel spindle 36 upon the bar member 32.

The wheel spindle 36 is of conventional construction and is provided with an output shaft 38 upon one end of which the grinding wheel 18 is securely affixed, the other end of the shaft having a driven pulley 40 secured thereto. Extending longitudinally of the spindle housing 42 is a bar member 44 secured to the housing by welding and having a plurality of openings 46 therethrough to receive the bolt fasteners 35. The spindle 36 is mounted upon the bracket bar member 32 so that the shoulder 50 of the spindle bar member 44 rests upon the bracket bar member 32 and the two bar members are secured together in side-by-side relationship by the fasteners 35.

The power drive unit 21 for the grinding wheel spindle 36 is conventional and comprises the electric motor drive 52, of substantially constant output shaft speed, having a self-adjusting pulley 54 affixed to its output
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shaft 56, the pulley being disposed in alignment with the spindle pulley 40 to which it is connected by the drive belt 58. The motor drive 52 can be mounted upon any suitable support, such as the base plate 60 of the machine, or it can be supported as illustrated particularly in FIGS. 2 and 3 upon a stand plate 62 fixedly secured at one edge to the housing wall 88 and upon an upright supporting member 64 affixed at its lower end to the base plate 60. Any other suitable arrangement can be used for the motor drive support, so long as the driving self-adjusting pulley 54 is positioned in alignment with the spindle driven pulley 40. The self-adjusting pulley is of conventional construction, readily available in several forms in the open market.

Although the pivoting bracket unit 20 has been particularly designed for use in a snagging grinder to abrade foundry castings, it has much broader application and can be used in a variety of grinders. In snagging grinders, grinding wheels of relatively coarse grit are often of massive size, e.g., up to 30 inches diameter or more by about 2 inches or more in thickness. The wheel is normally driven at a peripheral speed of from about 9,000 to 13,000 or more surface feet per minute. Such wheel is used for grinding away excess "flash" and other imperfections in rough foundry castings.

To maintain vibrations of the grinding wheel spindle, at such speeds and under the loads applied thereto, at a minimum, a pair of shock absorbers 70, 70 are secured at one of their ends to the housing wall 12 and at their other ends to the pivoting bracket unit 20, as for instance to the lateral edges of the member 23, to cushion the shocks generated in the wheel spindle 36 during the high speed rotation of the grinding wheel 18.

The peripheral edge 72 of the grinding wheel 18 is adjustably positioned adjacent and in grinding relation to the work-supporting table 14 by the mechanism 22 which comprises the manually operable rotatable wheel 82 affixed at its axis to the screw 84 suitably supported for rotation in a bearing 86 mounted upon the housing wall 88, the screw being threadedly engaged in the fitting 90 pivotally secured in a yoke or support 92 affixed to the plate member 23. The plate member 23 is slotted to provide an opening 94 therethrough for passage of the distal end of the screw 84 as the plate member is drawn toward the housing wall 88 upon rotation of the screw. The wheel 82 is provided with a handle 96 projecting toward the operator for its manual manipulation. To secure the wheel 82 against inadvertent rotation, a locking latch 98 is pivotally secured to the housing wall 88. The latch 98 is provided with a locking pin 100 adapted to engage the wheel 82 in notches 102 disposed in the peripheral edge of the wheel, so that when manual adjustment of the bracket unit 20 has been made and the grinding wheel edge 72 suitably spaced in relation to the work table 14, the adjusting wheel 82 is secured in substantially fixed position. Of course, it will be understood by persons skilled in the art to which the invention pertains that the adjusting mechanism 22 can be arranged for automatic or programmed control and actuation with suitable control and actuating devices, other than manual, responsive to gradual wheel reduction, whereby the desired spaced relationship of wheel edge to work table is constantly maintained.

In operation, the pivoting bracket and drive combination 12 described above functions substantially as follows. When initially installed and with a grinding wheel 18 of major diameter as shown in solid line in FIG. 4, the pivoting bracket unit 20 is disposed to the rearward side of the machine housing 10 (FIGS. 2 and 3). As the grinding wheel diameter is gradually reduced and the wheel edge to table relationship increases in distance, the operator lifts the latch 98 on its pivot, disengaging the adjusting wheel 82, which is then rotated, turning the screw 84 and drawing the plate member 23 and spindle 36 forwardly to now dispose the grinding wheel edge 72 in desired spaced relationship to the table 14. The latch 98 is then lowered to engage the locking pin 100 in one of the wheel notches 102 to fix the position of the grinding wheel.

As the adjusting screw 84 advances the spindle 36 toward the front housing wall 88, the center distance between the driven spindle pulley 40 and the driving self-adjusting pulley 54 becomes shorter. The endless drive belt 58, of substantially constant length, now assumes a position on the self-adjusting pulley 54 at a line further from its axis and having a peripheral speed greater than at the previous line of belt engagement, whereby the speed of the spindle 36 and the grinding wheel 18 is increased, effectively maintaining the peripheral speed of the grinding wheel at or relatively near its initial speed.

Although particular embodiments of the invention have been disclosed herein for purposes of explanation, further modifications or variations thereof, after study of this specification, will or may become apparent to those skilled in the art to which the invention pertains. Reference should be had to the appended claims in determining the scope of the invention.

I claim:

1. In a grinding machine designed to maintain a substantially constant grinding wheel peripheral edge surface speed as said peripheral edge is reduced by wear through abrasive action upon a workpiece, the improvements comprising in combination
   a pivoting bracket unit having a rotatable grinding wheel spindle secured thereto at or adjacent the free end thereof and a pivot at or adjacent the fixed end thereof, for swinging said spindle mounted grinding wheel in an arc toward a work supporting table on said machine,
   a motor drive for said spindle of substantially constant output shaft speed fixedly mounted in said machine and connected to said spindle by an endless drive belt engageable with and rotatable between a driven pulley of fixed diameter on one end of the shaft of said spindle and a self-adjusting drive pulley of variable diameter on the output shaft of said motor drive,
   said pivoting bracket unit being arranged to pivot toward said motor drive and thus shorten the center distance between said pulleys, to allow said drive belt to assume an enlarged adjusted position on said self-adjusting pulley whereby the peripheral edge surface speed of said grinding wheel is substantially maintained,
   and means secured to said pivoting bracket unit to adjustably and selectively pivot said bracket unit toward said motor drive as said grinding wheel diameter decreases, and for positioning the peripheral edge of said grinding wheel in preferred operative relationship to the work table of said grinding machine.

2. The apparatus defined in claim 1, wherein
said pivoting bracket unit comprises a plate member having pivot means secured thereto at one edge, grinding wheel spindle supporting means at an opposite edge of said plate member, and bearings for said pivot means fixedly mounted in said machine.

3. The apparatus defined in claim 2, wherein said pivot means comprises a pivot shaft affixed to said one edge.

4. The apparatus defined in claim 2, wherein said grinding wheel spindle supporting means comprises a bar member affixed to said opposite edge.

5. The apparatus defined in claim 2, wherein the axis of said spindle and the axis of said pivot shaft are disposed in parallel relationship.

6. The apparatus defined in claim 5, wherein said spindle is provided with a bar member extending longitudinally parallel to and radially of its axis and affixed to its housing, said bracket unit spindle supporting means being disposed in complementary relationship to said spindle bar member, and means fastening said spindle supporting means and said spindle bar member together in fixed relationship.

7. The apparatus defined in claim 3, wherein said bracket unit plate member is angulated at a line substantially parallel to and intermediate the axes of said spindle and said pivot shaft and in a direction away from said motor drive.

8. The apparatus defined in claim 7, wherein said angulated plate member is provided with reinforcing rib members secured to each of its lateral edges.

9. The apparatus defined in claim 2, and including shock absorbing means connected to said plate member and to the housing of said machine to secure said grinding wheel spindle against excessive vibration.

10. The apparatus defined in claim 1, wherein said motor drive is fixedly mounted upon a stand plate secured to a machine housing wall at a level above the floor of said machine.

11. The apparatus defined in claim 2, wherein said adjusting means for pivoting said bracket unit comprises a manually operable hand wheel, a screw fixedly and axially secured to said hand wheel at one of its ends and operatively secured to said bracket unit plate member at its opposite end, to rotate said bracket unit about its pivoting axis.

12. The apparatus defined in claim 11, and including a locking latch for said hand wheel comprising a pivoting latch mounted upon a machine housing wall in proximity to said hand wheel, a latch pin affixed to said latch and engageable with said hand wheel to secure said hand wheel against rotation.

13. The apparatus defined in claim 11, wherein said plate member is provided with a threaded fitting pivotally mounted thereon and engageable with said adjusting screw, and further provided with an opening to pass said screw therethrough as said bracket unit is pivoted toward said motor drive upon rotation of said screw.

14. The apparatus defined in claim 12, wherein said hand wheel is provided with notches in its peripheral edge each adapted to receive and engage said latch pin therein.

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