April 27, 1937. DE FOREST A. LAPHAM 2,078,859

MOUNTING FOR A HIGH SPEED CUTTING TOOL

Filed March 23, 1935

FIG. 1.

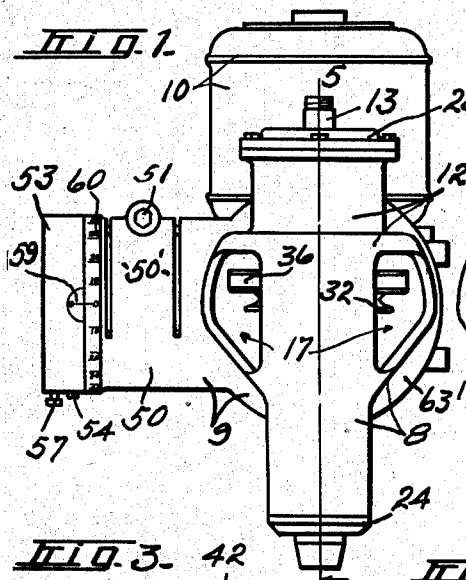


FIG. 2.

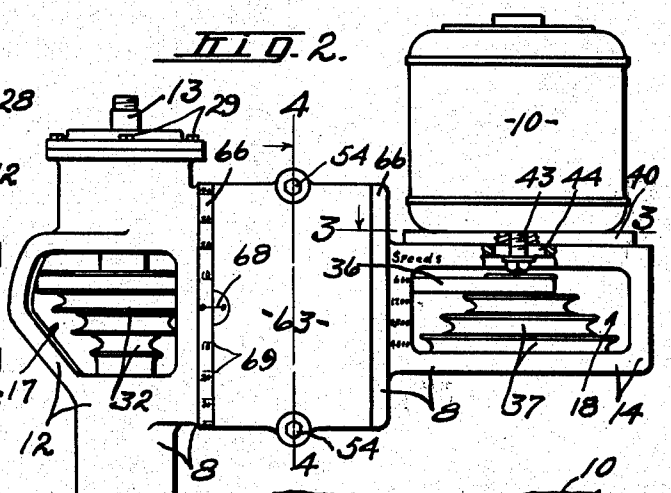


FIG. 3.

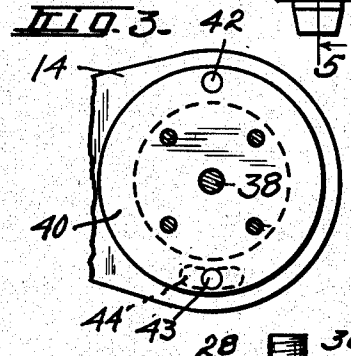


FIG. 4.

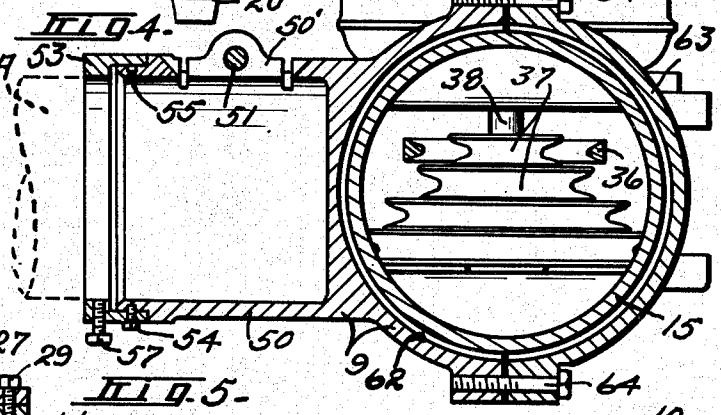
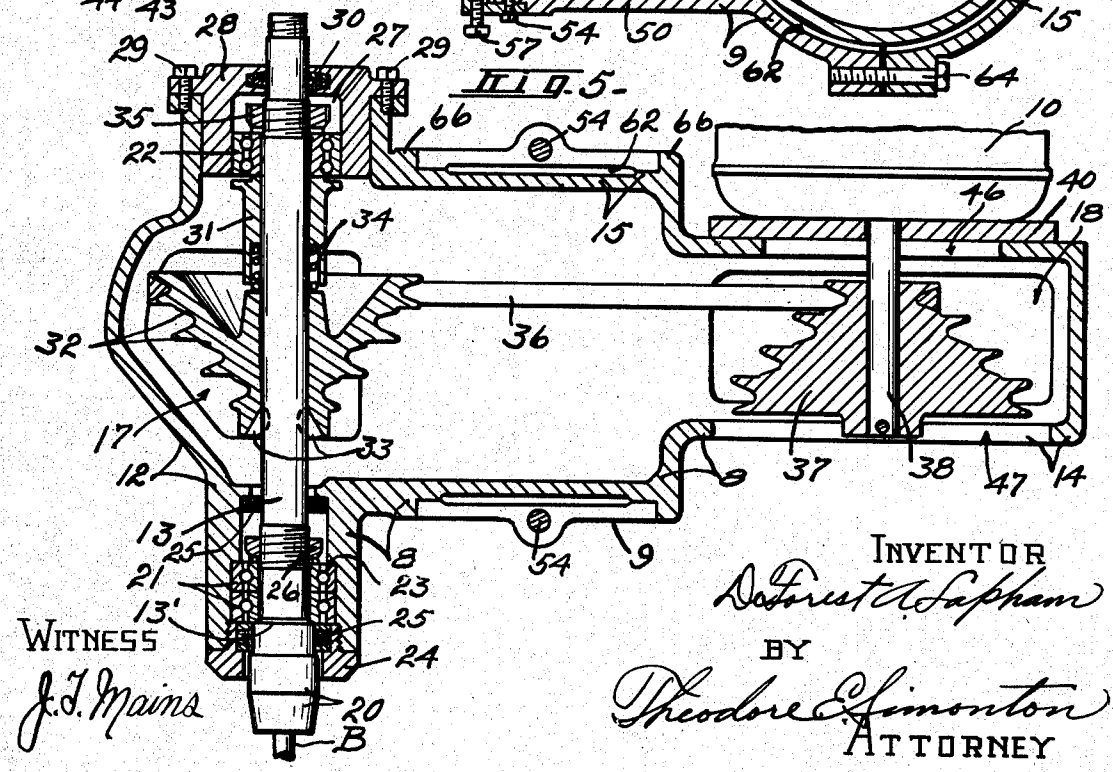


FIG. 5.



WITNESS

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MOUNTING FOR A HIGH SPEED CUTTING TOOL

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3 Claims. (Cl. 90—17)

This invention relates to improvements in a universally adjustable mounting for a high speed cutting tool in which a tool spindle and an electric motor are supported by a common housing in cooperative relation with each other.

An object of the invention is to provide a high speed tool mounting that may be readily detachably secured to a conventional mechanism used in the manufacture of articles from metal, wood, fibre, and so forth, and which has a work-supporting table such as a milling machine.

Another object of the invention is to provide a mounting of the above mentioned class which may be universally adjusted whereby the tool may be moved to any required angular position for advantageously engaging the work.

In carrying out the above mentioned objects, I have provided a supporting housing or frame for the tool spindle and motor which may be revolved 360° in either direction about both of a pair of intersecting axes extending normal to each other.

A further object resides in mounting the tool spindle and motor in balanced relation at diametrically opposite sides of the point of intersection of the axes of revolution thereof, whereby the tool spindle may be quickly and easily adjusted to any required angular position and be secured therein with a minimum amount of physical effort or mechanical skill.

Still other objects of the invention are to provide a universally adjustable mounting for high speed cutting tools that is light, durable and economical in construction and which is simple and efficient in operation.

Other objects and uses relating to the specific parts of the mechanism will be brought out in the following description taken in connection with the accompanying drawing in which:

Figure 1 is an end elevation of an adjustable mounting for a high speed cutting tool embodying the various features of this invention.

Figure 2 is a front elevation partly in section of the device illustrated in Figure 1.

Figure 3 is a detail horizontal sectional view taken in the plane of the line 3—3, Figure 2.

Figure 4 is a vertical sectional view taken on line 4—4, Figure 2.

Figure 5 is a longitudinal sectional view taken through the housing in substantially the plane of the line 5—5, Figure 1.

The device as illustrated in the drawing comprises primarily a housing 8, a bracket 9 and an electric motor 10. The housing 8 is a one-piece member having an elongated end portion 12 forming a case for a tool spindle 13, an opposite hollow end portion 14 providing a support for the motor 10 and an intermediate cylindrical bearing portion 15 adapted to be rotatably engaged by the bracket 9. The interior of the end portions 12 and 14 and the cylindrical portion 15 of the housing 8 are all in communication with each other as clearly illustrated in Figure 5, while the wall of the end portions 12 and 14 are preferably provided with spaced openings 17 and 18 respectively in the walls thereof to provide air passages which are also conducive to lightness in structure.

The spindle 13 extends longitudinally through the elongated end portion 12 of the housing in a plane at substantially right angles to the axis of the cylindrical portion 15 and has secured in any suitable manner to one end thereof a chuck 20 for releasably maintaining a cutting tool, as a drill or the like, in operative relation with the spindle 13. The spindle 13 is journaled in axially spaced rolling bearings 21 and 22 mounted in the end portion 12 adjacent the respective end of the spindle 13. One of the bearings as 21 is arranged at the lower or chuck end of the spindle and is mounted directly in the end portion of the housing between a shoulder 23 provided therein and a nut 24 screw threaded to the housing end as illustrated in Figure 5. The inner ball race of the bearing 21 is as shown preferably clamped to the spindle 13 between a shoulder 13' and a nut 26 so that the bearing and spindle may be assembled prior to mounting the same in the housing end 12. Also, it will be noted that this bearing structure maintains the spindle and housing against relative axial movement when they are assembled together.

Suitable packing washers as 25 composed of felt or a similar material may be mounted as shown at either side of the bearing 21 for preventing the passage of oil or other lubricating means for the bearing 21 along the spindle 13. The other bearing 22 is mounted as shown in a recess 27 provided in a bearing supporting member 28 which is secured to the upper end of the end portion 12 of the housing as illustrated in Figure 5, by screws 29 or their equivalent. The upper end of the spindle extends outwardly through the bearing supporting member 28 and the adjacent portion of the upper or outer end of said supporting member may as shown be provided with a packing member 30 for preventing the escape of a lubricant between said supporting member and the spindle.

A multiple speed pulley 32 is mounted upon

the spindle 13 intermediate the bearings 21 and 22 in alignment with the interior of the end portion 14 of the housing. The pulley 32 is secured to the spindle 13 so as to be rotated thereby, by a pair of keys 33. The keys are arranged at the lower end of the pulley in angular relation to the axis of rotation of the spindle and pulley so that the pulley will be maintained thereby against longitudinal movement along the spindle in one direction. The pulley is yieldingly maintained in operative engagement with the keys 33 and against axial movement along the spindle in the opposite direction by a spring 34 mounted on the spindle 13 between the upper end of the pulley and a sleeve 31 slidably mounted on the spindle in contact with the upper bearing 22 as shown in Figure 5. A nut 35 is screw threaded on the upper end portion of the spindle 13 in engagement with the outer face of the bearing 22 to hold the bearing and sleeve 31 in predetermined relation on the spindle against the action of the spring 34. This novel manner of mounting the pulley 32 and bearing 22 on the spindle 13 not only contributes to the ready assembling thereof in the housing but also permits a certain degree of latitude in the spacing of the pulley and bearing 22 without precision in the machining of the abutting surfaces of the pulley, sleeve and bearing.

The pulley 32 is operatively connected by a belt 36 with a reversally arranged multiple speed pulley 37 positioned within the inner chamber of the end portion 14 in operative alignment with the pulley 32 upon the drive shaft 38 of the motor 10.

The motor 10 in this instance has secured in any suitable manner to one end thereof a supporting plate 40 which normally rests upon one side surface of the end portion 14 of the housing 8. The plate 40 is adjustably secured to the housing by means of a pair of clamping studs or screws 42 and 43 which are screw threaded in said plate at diametrically opposite sides thereof. One of the screws as 42 extends upwardly through a circular hole provided in the adjacent portion of the housing end 14, to be rotatably supported thereby, while the other screw 43 extends upwardly through an elongated arcuate slot 44 provided in the adjacent portion of the housing end, said slot being concentric with the screw 42 whereby upon loosening the screw 43 the plate and motor may be swung about the screw 42 as an axis for adjusting the shaft 38 relatively to the spindle 13.

The side wall of the end portion 14 of the housing adjacent the motor 10 is provided with an enlarged opening 46 through which the motor shaft 38 extends and which permits ready adjustment of said shaft relative to the spindle 13. The opposite side of the housing end portion 14 is provided with a similar opening 47 co-axial with the opening 46 and which is of sufficient diameter to permit the pulleys 32 and 37 to be passed therethrough when mounting said pulleys within the housing 8.

It will be seen, therefore, that when it is necessary to assemble a pulley 32 upon the spindle 13 said pulley may be entered into the interior of the housing through the opening 47 before the motor 10 and pulley 37 are mounted in position and then passed through the interior of the cylindrical portion 15 into alignment with the spindle 13, whereupon said spindle may be moved axially through the central opening of the pulley 32 and then the pulley and spindle are secured in position by the nut 35, bearing 22, sleeve 31 and spring 34. If, however, it is necessary to change or replace the belt 36 this may be readily accomplished by first removing the bearing supporting member 28 from the housing and then inserting the belt through the opening thus provided into the interior of the housing, whereupon said belt may be brought into desired operative relation with the multiple speed pulleys 32 and 38.

The bracket 9 in this instance, comprises a tubular body portion 50 adapted to receive therein one end of a fixed supporting element of the machine with which the mounting is to be used, such as an over-arm A indicated by broken lines in Figure 4. The body portion 50 is provided with a split portion 50' intermediate the ends thereof which is adapted to be brought into frictional engagement with the supporting member A by a clamping screw 51 which passes through aligned openings provided in adjacent sections of the split portion 50' and screw threaded in one of said openings.

It will thus be seen that the bracket 9 may be rotatably adjusted to any desired position about the supporting member 8 and secured in the adjusted position by the manipulation of the screw 51. In order that the degree of adjustment of the bracket 9 relative to the support A may be readily determined, I have rotatably mounted upon the inner end of said bracket a collar 53 which is rotatably secured to the body of the bracket by a screw or stud 54 mounted in a portion of the collar over-lapping the body 50 and which is in engagement with an annular recess or groove 55 provided in the peripheral surface of said body portion adjacent the rear or inner end thereof. The collar 53 extends some distance beyond the body 50 and is provided with an interior bore adapted to receive the supporting member A therethrough while one or more clamping screws as 57 is screw threaded into the collar for frictional engagement with the support A to maintain said collar against rotation during the rotation of the bracket 9. The adjacent portions of the body 50 and collar 53 may as shown in Figure 1 be provided in the peripheral surface thereof with an indicating mark 59 and a graduated scale 60 respectively for assisting in determining the degree of relative rotation of the body 50 of the bracket and the support A and collar 53.

The opposite or outer end portion of the body 50 is provided with a semi-circular recess 62 adapted to receive the cylindrical portion 15 of the housing therein. A semi-cylindrical cap 63 also adapted to receive the cylindrical portion 15 of the housing therein is secured in cooperative relation with the recessed end of the body 50 for securing the cylindrical portion of the housing to the bracket. The cap 63 in this instance is removably secured to the body 50 by a pair of clamping screws 54 which extend through diametrically disposed aligned openings provided in the body portion 50 and cap 63. The relation of the cap 63 and recess 62 to the periphery of the cylindrical portion 15 of the housing is such that when the cap 63 and body 50 of the bracket are securely clamped to each other that the housing will be frictionally engaged thereby to maintain said housing and the bracket against relative rotary movement. The axial length of the cylindrical portion 15 is defined by a pair of outwardly extending peripheral flanges 66 provided on the housing 8 as shown in Figures 2 and 5 which are spaced apart a distance substantially

equal to the width of the cap 63 and recessed end portion of the body 50 so that when the housing is mounted upon the bracket 9 said housing will be maintained by the flanges 66 against lateral movement relative to the bracket 9. An edge portion of the cap 63 and the periphery of the adjacent flange 66 may as shown in Figure 2 be provided with indicium 68 and a graduated scale 69 by which the degree of relative rotary movement of the housing 8 and bracket 9 may be readily determined.

It will now be observed that by loosening the clamping screw 51 the bracket 9 and the housing 8 may be rotated in either direction 360° or any fraction thereof about the axis of the supporting member A for bringing the tool as B carried by the spindle 13 and chuck 20 into any required angular position about the axis of the support A relatively to the work and the housing and tool may be secured in the adjusted position by merely turning the screw 51 to tighten the same. Furthermore, the tool as B may be brought into any angular position about the center of the cylindrical portion 15 as an axis by loosening the screws 64 and the cap 63 and then rotating the housing relatively to the bracket 9 after which the housing may be secured in the adjusted position by tightening the screws 64.

It will thus be seen that by utilizing both of these adjusting means the tool may be brought to any required advantageous angular position relative to the work within the range of said tool and that the tool will be operated as efficiently in one position as in another. Furthermore, it will be observed that due to the motor 10 being mounted directly to the housing 8 at the diametrically opposite side of the axis of rotation of the bracket 9 to that of the spindle 13 the spindle and motor are thus counter-balanced to a very marked degree which permits the easy rotation of the housing and these members about the axis of the bracket 9 and the ready close adjustment thereof necessary to obtain the correct position of the drill relative to the work.

Also, it will be noted that, inasmuch as the drive connection between the motor 10 and the spindle 13 is mounted in a plane substantially mid-way between the bearings 21 and 22 for supporting the spindle 13, the operation of the tool carried by said spindle will be effected with a minimum amount of vibratory movement of said tool and thereby contributes to the maximum efficient operation of the device.

Although I have shown and particularly described the preferred embodiment of my invention, I do not wish to be limited to the exact construction shown as various changes in the size, form and relation of the parts thereof may readily be made without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. In a machine of the class described, a bracket member adapted to be rotatably and adjustably connected with a fixed support to rotate about a horizontal axis, a housing member rotatably and adjustably connected intermediate its ends with said bracket to rotate about an axis extending at right angles to said horizontal axis, a tool spindle journaled in the housing at one side of the horizontal axis of rotation of the bracket member, an electric motor secured to the housing at the opposite side of said horizontal axis with the armature shaft thereof extending into the housing in parallel relation with the spindle, and means mounted wholly within the housing and including a drive belt for operatively connecting the motor with the tool spindle.

2. In a high speed cutting tool mounting adapted to be removably attached to a milling machine or the like having a work supporting table and a non-rotating carrier member, in combination, a tool spindle, supporting means for the spindle including a pair of elements rotatably connected with each other and with the carrier member to permit the spindle to be revolved 360° in either direction about both of a pair of intersecting axes extending substantially normal to each other, means releasably securing said first mentioned elements to each other to permit relative rotary adjustment thereof, a third element, separate means adjustably securing one of said first mentioned elements and the third mentioned element to the carrier member whereby said elements may rotate independently of each other and of said carrier member, said first mentioned elements being provided with graduations on adjacent surfaces thereof coacting for indicating the degree of relative rotary movement of said elements about one of said axes, and separate graduation marks provided on adjacent surfaces of the third mentioned element and the adjacent one of the first mentioned elements coacting for indicating the degree of relative rotary movement thereof about the other one of said axes whereby the degree of revolution of the spindle about said axes may be accurately determined with respect to the work supporting table.

3. In a high speed cutting tool mounting adapted to be removably attached to a milling machine or the like having a work supporting table and a non-rotating carrier member, in combination, a tool spindle, supporting means for the spindle including a pair of elements rotatably connected with each other and with the carrier member to permit the spindle to be revolved 360° in either direction about both of a pair of intersecting axes extending substantially normal to each other, means releasably securing said first mentioned elements to each other to permit relative rotary adjustment thereof, a third element, separate means adjustably securing one of said first mentioned elements and the third mentioned element to the carrier member whereby said elements may rotate independently of each other and of said carrier member, said first mentioned elements being provided with graduations on adjacent surfaces thereof coacting for indicating the degree of relative rotary movement of said elements about one of said axes, and separate graduation marks provided on adjacent surfaces of the third mentioned element and the adjacent one of the first mentioned elements coacting for indicating the degree of relative rotary movement thereof about the other one of said axes whereby the degree of revolution of the spindle about said axes may be accurately determined with respect to the work supporting table, and means connecting said third element to said adjacent one of the first mentioned elements and coacting to permit free rotation of said elements relative to each other.

DE FOREST A. LAPHAM.