July 4, 1933. P. A. SOLEM 1,916,897

BEARING FOR SANDING MACHINES

Original Filed Oct. 16, 1925

Fig. 1.

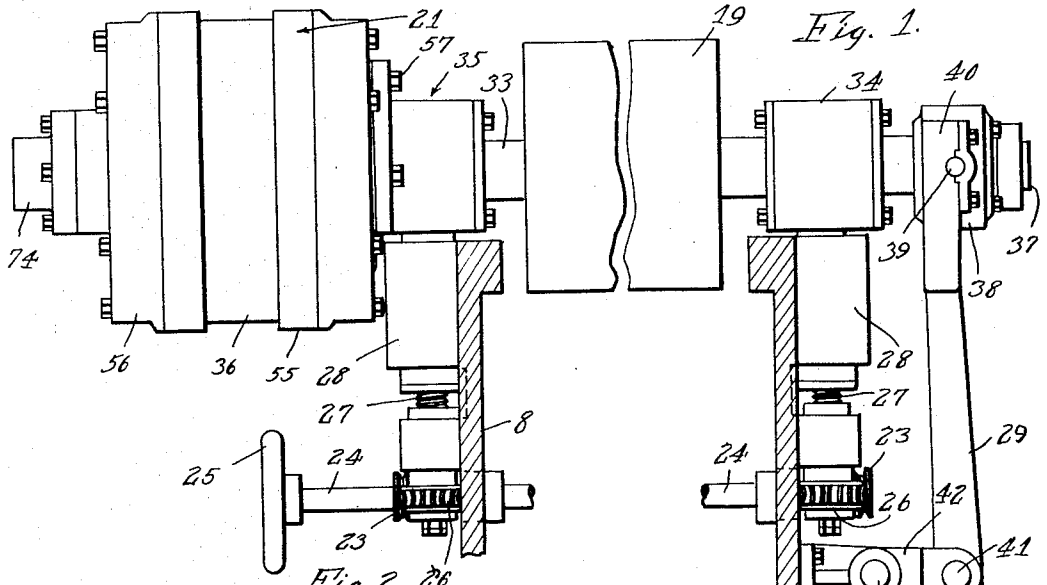


Fig. 2.

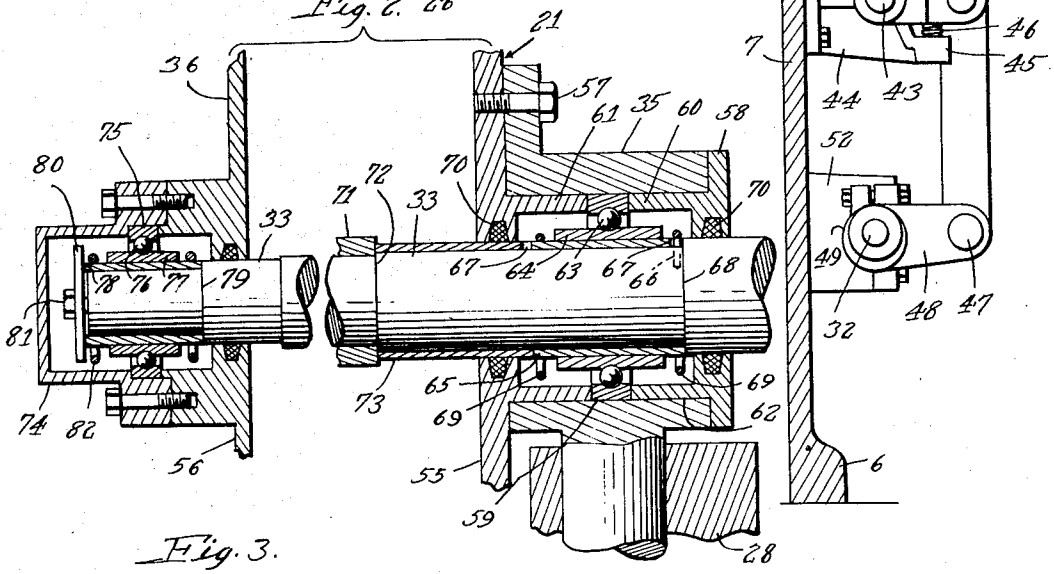
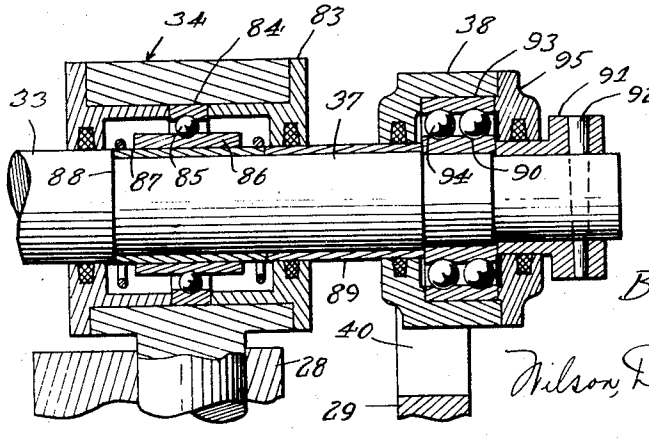


Fig. 3.



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UNITED STATES PATENT OFFICE

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BEARING FOR SANDING MACHINES

Original application filed October 16, 1925, Serial No. 62,694. Divided and this application filed December 26, 1929. Serial No. 416,523.

This invention relates to sanding or abrading machinery, and has particular reference to improvements in the bearings for the drum shafts which, as is well known, have to be oscillated or reciprocated during the turning thereof.

Due to the necessity for oscillating movement of the drum shafts and because of the heavy loads imposed thereon, the practice has been to provide ordinary babbitt or bushing bearings for the shafts. This meant greater frictional losses and consequent inefficiency and expense in operation, and also incurred greater expense due to the short life of the bearings and the need for the frequent shutting down of a machine for the purposes of renewal. It is, therefore, the principal object of my invention to provide improvements in the drum shaft mountings enabling the use of anti-friction ball bearings which are more economical, easy to keep lubricated, have a much longer life, and give far better operating efficiency generally.

Other important advantages of my invention are the fact that it facilitates assembling and disassembling, thus making it a simple matter for the operator of average mechanical skill to inspect and repair the machine, and the fact that it facilitates the provision of built-in motors for giving direct drive for the drum shafts.

This application is a division of my application Serial No. 62,694, filed October 16, 1925.

The invention is illustrated in the accompanying drawing, wherein—

Figure 1 is a transverse section through a sander of the endless bed type incorporating the improvements of my invention, portions of the drum and frame being broken away to conserve space in the drawing;

Fig. 2 is an enlarged fragmentary sectional detail of the motor housing and its mounting, an intermediate portion of the drum and armature shaft being broken away at the armature, and

Fig. 3 is a similar enlarged sectional detail taken at the opposite end of the drum and armature shaft and showing the connection with the rocker arm.

The same reference numerals are applied to corresponding parts in the three views.

The sanding machines of the type to which the present improvements are intended to be applied usually comprise a base 6 having heavy upright side frame pieces 7 and 8 extending therefrom and suitably fixed together in spaced relation. The frame provides supports for ways over which an endless bed (not shown) is arranged to move. A plurality of abrading drums such as that indicated at 19, are provided to operate over the bed and are driven individually by motors 21, the latter being controlled singly or collectively to give a one, two, or three drum machine as desired and to permit any one or more or all of the motors being started or stopped as desired. Pressure bars are provided between the drums in the usual way and have polished under surfaces for the passage therebeneath of the stock fed on the bed. The abrading drums are capable of adjustment as to elevation for light or heavy cuts, usually by the simultaneous adjustment of the elevation of the drum shaft bearings, by the operation of worms 23 on the ends of shafts 24. The latter are fitted with hand wheels 25 for convenient manual operation from the side of the machine. The worms 23 mesh with worm wheels 26 to operate jack screws 27 to raise and lower the shaft bearings relative to bosses 28 provided on the frame of the machine. Usually the first drum of the set is given simple rotation for the initial rough finishing cut. The other drums are arranged to have endwise oscillation or reciprocation during rotation. By this compound movement it has been found that the grade of finish on the stock is highly improved as the fibers of the wood are not drawn or strung out and left in loose fuzz or fur on the surface of the stock. The drums are usually oscillated by rocker arms or beams 29 which have a suitable thrust bearing connection with the drum shafts. The rocker arms are given a rocking motion by eccentrics on the shaft 32, and since the shaft 32 is ordinarily driven only during the feeding movement of the endless bed, the drums

are oscillated only during the normal operation of the machine.

The drum 19 is mounted on a shaft 33 supported in bearings 34 and 35 carried on the frame pieces 7 and 8 at opposite ends of the drum. The features of these bearings, with which the present invention is particularly concerned, will be fully described hereinafter. Furthermore, the housing 36 of the motor 21 is supported in the bearing 35 in a manner more particularly described hereinafter, for adjustment as to elevation with the bearings 34 and 35. The shaft 33 is in a single continuous piece without the interposition of a coupling or any intermediate transmission for the driving of the drum shaft from the armature shaft, since the rotor or armature shaft is integral with the drum shaft. The use of the one-piece shaft gives various advantages among which might be mentioned the fact that it is certain that the motor shaft and drum shaft will remain in line at all times regardless of whether a heavy or light cut is being made, and the fact that the directness of the driving connection gives smooth and noiseless operation. Needless to state, there is a further advantage of extreme compactness so that the overall dimensions of the machine are reduced to a minimum and less floor space is required.

The shaft 33 has an integral extension 37, as shown in Fig. 3 for the mounting thereon of a thrust collar 38, which has a pivotal connection with the rocker arm 29 at 39 in trunnions provided on the forked end 40 of the rocker arm. As described and claimed in the parent application, the rocker arm 29 is pivoted at 41 to a link 42 which in turn is pivoted at 43 on a bracket 44 bolted to the side of the adjacent frame piece 7. The bracket 44 provides a ledge at 45 on which one end of a coiled compression spring 46 rests, while its other end is in contact with the under side of the link 42. The lower end of the arm 29 is pivoted at 47 to a link 48 having a split strap end 49 enclosing an eccentric suitably secured on the shaft 32. The shaft 32 is supported in bearings provided in brackets 52 on the side of the frame piece 7. It will appear that the weight of the rocker arm 29 is substantially counterbalanced by the compression of the spring 46 and none of the weight of the arm is imposed on the shaft 33. The arm is in floating relation to the collar 38 and the shaft 33. This avoids the deflection of the projecting end of the shaft and eliminates the whipping action and consequent vibration, which in previous machines resulted in a slight chatter or tremor of the abrading drum, or at any rate destroyed its smooth and even contact with the stock being operated upon. The links 42 and 48 also permit the vertical adjustment of the drums but the adjustment is usually so slight as not to affect the counterbalancing action of the springs 46. Just as the elimination of intermediate coupling connections between the drum shaft and the armature shaft is of advantage, so also is the provision of a vibrationless and smoothly operated oscillating drive. Both improvements contribute toward considerable improvement in the grade of the work produced by the machine. They also are factors in prolonging the life of the bearings for the drum shafts and in this way reduce operating costs and give generally better efficiency.

Referring now to Fig. 2, wherein the present invention is illustrated in detail, it will be noted that the housing 36 of the motor 21 has the bell ends 55 and 56 providing spaced armature shaft bearings. The bell end 55 is bolted to the bearing 35 as indicated at 57. A cap 58 bolted on the bearing 35 positions an outer ball race member 59 between the hollow neck 60 thereof, and a similar hollow neck 61 on the bell end 55 of the motor housing. The race member 59 and the necks 60 and 61 are all received snugly within the bore 62 of the bearing 35, and the race member 59 is held stationary between the necks 60 and 61 in an obvious manner. Anti-friction balls 63 operate between the outer race 59 and an inner race 64. The race 64 is of elongated collar form and has a sleeve 65 slidable therein. The sleeve 65 is fixed, as by means of a pin 66, against rotation relative to the shaft 33, the pin 66 being received in a notch 67 provided at the end of the sleeve 65 where the sleeve comes in contact with a shoulder 68 provided by an enlargement in the diameter of the shaft 33. It will appear that the rotation of the shaft 33 with the sleeve 65 and the inner race member 64 is permitted and is rendered almost frictionless by the provision of the balls 63. At the same time, the telescoping relation of the sleeve 65 in the inner race 64 permits the oscillation of the shaft 33 with the abrading drum as previously described. The lubrication of the sliding joint between the sleeve and the race is induced by rings 69 dipping in the oil in the bottom of the chamber provided about the shaft within the hollow necks 60 and 61. The lubricant is retained in the chamber referred to by packing provided at 70 in the cap 58 and bell piece 55.

The armature core, the end of which appears at 71, is suitably splined on the shaft 33 and rests in engagement with a shoulder afforded by an enlargement of the diameter of the shaft 33. A spacing sleeve 73 abuts against the end of the armature core 71 at one end and at its other end abuts against the adjacent end of the bearing sleeve 65, thereby keeping the sleeve 65 in proper relation to its ball bearing in an obvious manner. The sleeve 73 is preferably of the same diameter and of the same length as the sleeve 65 to be

interchangeable therewith. For this reason, it is also provided with a notch 67 in one end thereof to receive the pin 66 when the sleeve 73 is substituted for the sleeve 65. The purpose in this provision is to obviate having to shut the machine down for an extended period in the event the sleeve 65 becomes worn to any appreciable degree. With the spacing sleeve substituted for the bearing sleeve and the bearing sleeve in turn performing the function of the spacing sleeve, the machine may be kept in service and necessary replacement sleeves ordered from the manufacturer of the machine or otherwise made to have in readiness when another replacement is necessary. The stepping in the diameter of the shaft toward the outer end affording the shoulders at 68 and 72, etc., enables the removal of the parts and easy replacement thereof.

The outer end of the shaft 33 is received in a bearing held in the bell end 56 of the motor housing 36. A cap 74 is bolted to the bell end 56, as shown, and clamps an outer race 75 in place. The anti-friction bearing balls 76 operate between the outer race 75 and an inner race 77. The latter similarly to the race 64 is extended in the form of a collar and arranged to slide freely on a bearing sleeve 78 which, like the sleeves 65 and 73, is renewable. The sleeve 78 is held in engagement at one end with a shoulder 79, provided by an enlargement in the diameter of the shaft 33, by means of a disc 80 at its other end bolted, as at 81, to the free end of the shaft 33. The loose rings 82 serve, in this instance, the same function as the rings 69; to feed lubricating oil onto the sliding joint between the sleeve 78 and the race 77. It is apparent that the arrangement provides for the compound movement of the shaft 33 by the sliding of the sleeve 78 in the race 77 and the rotation of the inner race relative to the outer race.

Referring now to Fig. 3, it will be seen that the opposite end of the shaft 33 from the end previously under consideration has similar provisions in the bearing 34 for permitting simultaneous rotation and reciprocation of the shaft in anti-friction bearings. A pair of caps 83 are bolted to the opposite sides of the bearing 34 and clamp the outer race 84 between them in an obvious manner. The bearing balls 85 are held between the outer race 84 and an inner race 86 sliding on the bearing sleeve 87. This sleeve is held in engagement with the shoulder 88 by a spacing sleeve 89. The latter is in turn held in place by the inner race 90 of an anti-friction bearing within the thrust collar 38. The sleeves 89 and 87 are interchangeable in like manner to the sleeves 65 and 73. The inner race 90 is held in place by a collar 91, secured as by means of a tapered pin 92 to the free end of the shaft 33. The outer race 93 for the balls 94 is held within the thrust collar 38 behind a cap 95 which bolts on the end of the collar 38. It will thus be seen that the provision of anti-friction bearings is extended throughout the machine so far as practicable with a saving in operating costs and an increase in general efficiency.

I claim:

1. In a machine of the character described, a rotating shaft having means for communicating reciprocatory movement thereto, and means for supporting said shaft for combined rotation and reciprocation comprising an outer anti-friction race member received in a bearing for said shaft, an inner anti-friction race member, anti-friction rolling elements between said race members, a bearing sleeve on said shaft reciprocable in said inner race member, means providing a shoulder for an abutment at one end of said sleeve whereby said sleeve is movable endwise with said shaft in the reciprocation thereof, a spacing sleeve engaging the other end of said bearing sleeve, and means forming a shoulder to provide an abutment for the free end of said spacing sleeve whereby the latter moves with said bearing sleeve in the reciprocation of said shaft, said spacing sleeve and said bearing sleeve being of equal diameters to afford interchangeability thereof.

2. The combination with a rotary spindle and means for reciprocating the same, of outer and inner race members, the former being suitably fixedly supported and the latter being arranged to turn with respect thereto, a series of anti-friction bearing elements between the race members, the inner race member being held against endwise movement and having the shaft reciprocable therein, the said race member being of elongated form to provide adequate bearing surface for the shaft, a bearing sleeve mounted on the shaft for reciprocation in the inner race member to serve as a renewable wear member, said sleeve being longer than the inner race member so that the latter has bearing contact its full length with the sleeve during reciprocation, means for fixing the sleeve on the shaft to turn therewith as well as move endwise therewith, and another sleeve disposed on the shaft in abutment with one end of the first sleeve serving as a spacer for holding the first sleeve in its operative position, the second sleeve being a duplicate of the first sleeve and being arranged to be substituted therefor when the first sleeve has become worn, the first sleeve being then used simply as a spacer.

3. The combination with a rotary spindle and means for reciprocating the same, of outer and inner race members, the former being suitably fixedly supported and the latter being arranged to turn with respect thereto, a series of anti-friction bearing elements between the race members, the inner race member being held against endwise move-

ment and having the shaft reciprocable therein, the said inner race member being of elongated form to provide adequate bearing surface for the shaft, and a renewable elongated bearing sleeve removably fixed on the shaft and providing an intermediate wear member between the shaft and the inner race member.

4. In an anti-friction bearing for shafting and the like, an anti-friction bearing having an outer race member suitably of normal width, an inner race member of abnormal width constructed to provide a wide bearing surface therein for the reciprocation of a shaft received therein, and thereby minimize the danger of binding of the inner race member on the shaft in the simultaneous reciprocation and rotation of the shaft, anti-friction bearing elements between said race members, and a renewable bearing sleeve mounted on said shaft for reciprocation inside the inner race member, said sleeve being long enough to permit the full amplitude of reciprocation of the shaft with the inner race member remaining in bearing contact its full length with said sleeve.

5. In a bearing structure as set forth in claim 1, the provision of a recess in said bearing sleeve, and means providing a complementary projection on said shaft to engage therein to turn the sleeve with the shaft, and the provision of a similar recess in the spacing sleeve arranged when the bearing sleeve and the spacing sleeve are interchanged to have the aforesaid projection received therein.

6. In a bearing structure as set forth in claim 2, the provision of a recess in said bearing sleeve, and means providing a complementary projection on said shaft to engage therein to turn the sleeve with the shaft, and the provision of a similar recess in the spacing sleeve arranged when the bearing sleeve and the spacing sleeve are interchanged to have the aforesaid projection received therein.

7. In a bearing structure for a sanding machine of the character described, the combination of a drum shaft arranged to be simultaneously rotated and reciprocated, an anti-friction bearing housing mounted on the frame of said machine and having one end of said shaft projecting therethrough, an anti-friction bearing in said housing for reception of said shaft, the shaft being slightly reduced in diameter where it enters said bearing and thereby providing an annular shoulder thereon, a renewable bearing sleeve on the reduced portion of said shaft engaging the shoulder at one end thereof and arranged for reciprocation in the inner race member of said anti-friction bearing, a thrust bearing mounted on the projecting end of said shaft and serving by cooperation with the other end of said sleeve to hold the same against endwise movement relative to the shaft, said thrust bearing being arranged to have means cooperating therewith for communicating reciprocation to said shaft, and means removably mounted on the end of said shaft serving to retain the thrust bearing in position on the shaft.

8. A structure as set forth in claim 7 including a second renewable bearing sleeve similar to the first mentioned bearing sleeve and interchangeable therewith, said second sleeve being disposed between the outer end of the first sleeve and the adjacent thrust bearing and serving as a spacing sleeve so long as the first mentioned sleeve is mounted in the position described, and vice versa.

9. In a bearing structure for a motor-driven sanding machine, the combination of an anti-friction bearing housing mounted on the frame of said machine, a drum shaft having one end projecting through said housing, a motor housing mounted on the aforesaid housing and having the end of said shaft extending therethrough, the motor housing providing a secondary anti-friction bearing housing on the outer end thereof into which the end of said shaft projects, an anti-friction bearing in the first mentioned housing, a second anti-friction bearing in the last mentioned housing, said shaft being slightly reduced in diameter where it enters the first bearing and thereby providing an annular shoulder thereon, a renewable bearing sleeve mounted on the shaft in abutment with said shoulder at one end and arranged for reciprocation in the inner race member of said bearing, there being an armature in the motor housing mounted on said shaft between said bearings and serving by cooperation with the other end of the bearing sleeve to hold the same against endwise movement relative to the shaft, said shaft being further reduced in diameter where it enters the second bearing, and a renewable bearing sleeve mounted on the shaft in abutment with said shoulder at one end and arranged for reciprocation in the inner race member of said bearing, and means removably secured on the end of said shaft and cooperating with the other end of said bearing sleeve for holding it in position and against endwise movement relative to the shaft.

10. A bearing structure as set forth in claim 9 including a second bearing sleeve mounted on the shaft in abutment with the end of one of the other bearing sleeves and serving to hold the latter in position, said second sleeve being similar to the other sleeve and interchangeable therewith and arranged to serve merely as a spacing sleeve until interchanged with the other sleeve whereupon the latter serves as a spacing sleeve.

11. A bearing structure as set forth in claim 9 including a second bearing sleeve mounted on the shaft between the armature

and the adjacent end of the first mentioned bearing sleeve, said second sleeve being similar to the first sleeve and interchangeable therewith and arranged to serve merely as a spacing sleeve until interchanged with the other sleeve whereupon the latter serves as a spacing sleeve.

12. A bearing structure as set forth in claim 7 wherein the anti-friction bearing comprises an outer race member suitably of normal width and an inner race member of abnormal width constructed to provide a wide bearing surface so as to minimize the danger of the bearing binding in the simultaneous rotation and reciprocation of the shaft, and wherein the bearing sleeve is held against turning relative to the shaft and is provided of sufficient length to permit the full amplitude of reciprocation of the shaft with the inner race member remaining in bearing contact its full length with said sleeve at all times.

13. A bearing structure as set forth in claim 9 wherein each of the anti-friction bearings comprises an outer race member suitably of normal width and an inner race member of abnormal width constructed to provide a wide bearing surface so as to minimize the danger of the bearing binding in the simultaneous rotation and reciprocation of the shaft, and wherein each of the bearing sleeves is held against turning relative to the shaft and is provided of sufficient length to permit the full amplitude of reciprocation of the shaft with the inner race member remaining in bearing contact its full length with said sleeve at all times.

14. A bearing structure as set forth in claim 9 wherein at least one of the anti-friction bearings comprises an outer race member suitably of normal width and an inner race member of abnormal width constructed to provide a wide bearing surface so as to minimize the danger of the bearing binding in the simultaneous rotation and reciprocation of the shaft, and wherein the bearing sleeve cooperating with said bearing is held against turning relative to the shaft and is provided of sufficient length to permit the full amplitude of reciprocation of the shaft with the inner race member remaining in bearing contact its full length with said sleeve at all times.

In witness of the foregoing I affix my signature.

PETER A. SOLEM.