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H. J. FALLON ET AL

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SPRING GRINDER

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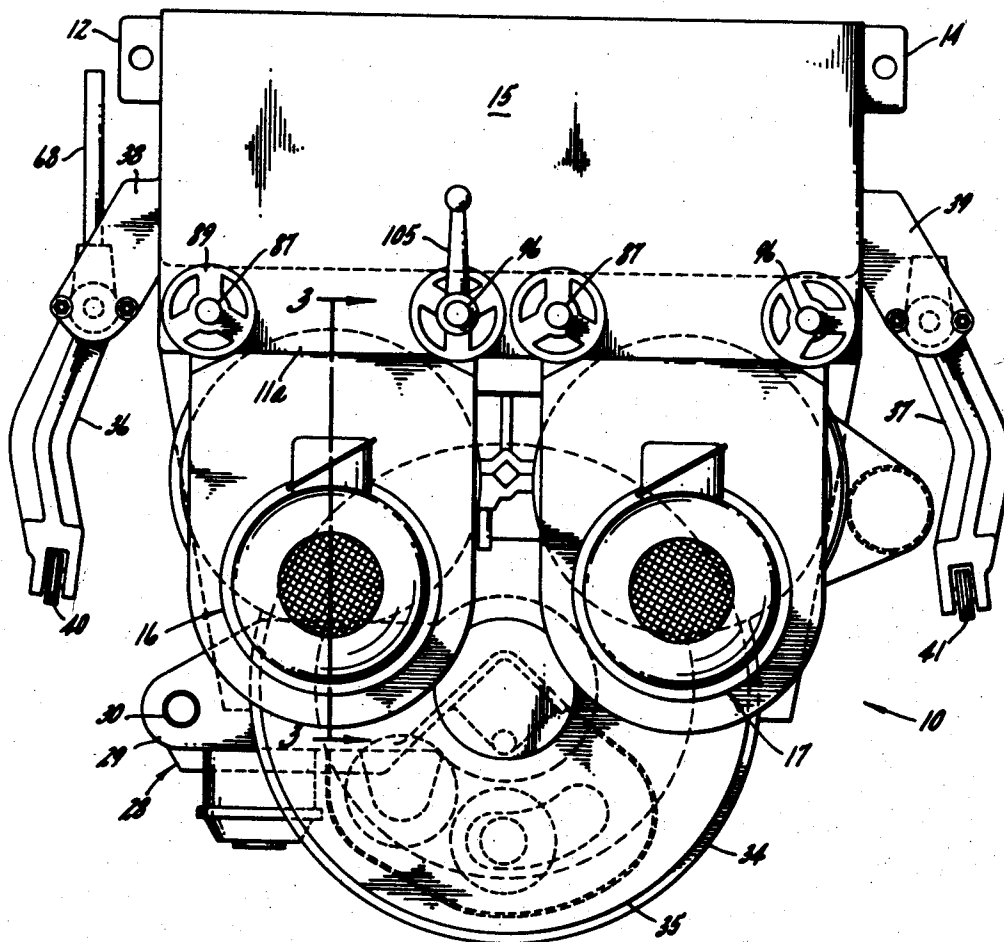
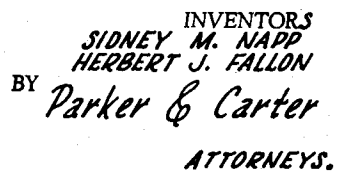


Fig. 2.

INVENTORS
SIDNEY M. NAPP
HERBERT J. FALLON
BY *Parker & Carter*
ATTORNEYS.

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SPRING GRINDER

Herbert J. Fallon, Beloit, Wis., and Sidney M. Napp, Rockton, Ill., assignors to Besly-Welles Corporation, South Beloit, Ill., a corporation of Illinois
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This invention relates to grinding machines, and specifically to a four-head grinder suitable for grinding carbon and Bakelite parts, coil springs, and similar parts.

Accordingly, the primary object of this invention is to provide a multi-head grinder which can accommodate a large range of sizes of parts, and wires quickly, economically, and accurately.

Another object is to provide a combination feed screw and supporting rail assembly for grinding heads in which a pair of opposed heads are carried by the assembly and either head can be adjusted independently of the other.

Another object is to provide a completely encased combination feed screw and supporting rail assembly for grinding head support frames which prevents fouling from grit, dirt and dust.

Another object is to provide a grinding machine in which the top and bottom head adjustments for particle size changes or abrasive wear are both made at the top of the machine where they are easily accessible.

A further object is to provide a unique mounting arrangement for a grinding head usable with or without the aforesaid combination feed screw and supporting rail structure, and with either one of a pair of opposed grinding heads, which enables the heads to be tilted in two directions to provide progressive grinding.

Other objects and advantages will become apparent upon reading the following description of the invention.

The invention is illustrated more or less diagrammatically in the accompanying figures in which:

FIGURE 1 is a left side elevation of a grinding machine incorporating the invention;

FIGURE 2 is a top plan view of the grinding machine of FIGURE 1;

FIGURE 3 is a sectional view through one of the grinding head assemblies taken substantially along the line 3—3 of FIGURE 2;

FIGURE 4 is a view taken substantially along the line 4—4 of FIGURE 3; and

FIGURE 5 is a sectional view, with parts omitted for clarity, taken substantially along the line 5—5 of FIGURE 1.

Like reference numerals will be used to refer to like parts throughout the following description of the drawings.

The invention is illustrated in a vertical four-head grinding machine indicated generally at 10 in FIGURES 1 and 2. Although a vertical, four-head machine has been chosen to illustrate the invention, it should be understood that the invention is applicable to both horizontal and vertical head machines employing any desirable number of grinding heads.

A welded steel combination column and base unit 11 which forms the main frame of the machine is bolted to the floor F by a three-point base mounting indicated at 12, 13, and 14. A starter and push button assembly for the spindle motors may be mounted inside the covered portion 15 of the frame.

Two pairs of grinding head assemblies are indicated generally at 16 and 17. It will be understood that each grinding head assembly is substantially identical, and a description of one will suffice as a description of all.

The upper head of left pair 16 includes a spindle motor 18 mounted on a platform 19 integral with the frame, a spindle structure 26 run from the motor, best seen in FIGURE 3, and a grinding wheel assembly indicated

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generally at 20. The grinding wheel assembly includes an abrasive wheel 21 which rotates within a protective cover 22. The protective cover may be of relatively heavy stock, say on the order of $\frac{5}{16}$ of an inch, to prevent portions of the abrasive wheel from flying outwardly should a wheel crack while rotating.

The lower grinding head assembly of pair 16 includes a similar motor 23 which drives an abrasive wheel 24 enclosed in a protective cover 25.

A rotary fixture unit, indicated generally at 28, consists of a support frame member 29 which pivots about post 30. A fixture motor 31 rotates the feed wheel 35, which is supported by feed wheel hub 35a, through a pulley and belt arrangement, not shown for clarity, and a gear reducer 32. The pivot post allows the unit to be manually swung out of the way for rapid abrasive and tooling changeover and, with the addition of suitable structure, a small amount of in-and-out adjustment on the rotary may be provided. A loading platen is indicated at 34. By suitable gearing the speed of rotation of the feed wheel can be varied from, for example, .335 revolution per minute to .753 revolution per minute. Extra speeds can be provided by adding step pulleys and belts.

Two ball bearing swing arm type dressers 36, 37 are mounted on brackets 38, 39 attached to the sides of the welded steel column 15. Conventional cutter assemblies 40, 41 are carried at the outer end of the dressers.

A grinding head assembly is illustrated in detail in FIGURE 3. Output shaft pulley 45 is connected to spindle pulley 46 by belt 47. Rotation of spindle pulley 46 rotates the spindle 48 to which the upper grinding head 21 is secured. In this instance, the spindle is of a one-piece construction with the spindle 48 and disc wheel 49 welded together. Suitable bolts 50 secure the abrasive to back up plate 51.

The upper end of the spindle is supported in bearing assembly 52 contained in housing 53. Base plate 54 is bolted to the upper flange 19 of chamber 53, and motor 18 in turn is bolted to base plate 54. The bottom 57 of chamber 53 is apertured as at 55. An adjustment member 56 is pressed against bosses on the upper surface of bottom wall 57 by bolts 58, 59 and 60. The bearing assembly in turn is bolted to the adjustment member by short screws 62, 63 and 64, and bolt 60. The adjustment member is apertured as at 65 to receive spindle 48. A socket 66 in projection 67 receives handle 68. When not in use the handle may be stored in a rear socket in dresser 36. Sidewalls 70, 71 carry inwardly directed adjustment bosses 72, 73 respectively. The adjustment bosses in turn are aligned with abutments 74, 75 on the adjustment member. A pair of adjusting screws are indicated at 76, 77.

The upper end of spindle 48 is supported in a standard ball bearing pillow block 52, the outer arcuate surface of the bearing being complementary to the bearing retainer wall 78.

The lower end of spindle 48 is supported in a similar standard ball bearing pillow block assembly 79, which is carried by an extension 80 of the welded steel column frame.

Head frame 80 is positioned by the feed screw arrangement of FIGURE 5 which serves the double function of supporting the grinding heads and positioning them with respect to one another.

Referring to FIGURE 5, the upper grinding head frame is indicated at 80, and the lower grinding head frame at 81. Upper frame 80 is secured to three feed screw bearings 82, 83, 84, and a feed screw nut 85. Nut 85 is threaded onto the upper threaded end 86 of feed screw 87. A column extension 11a and flange cartridges 88, 88a, restrain longitudinal movement of feed screw 87. A micro dial is indicated at 89. The feed screw bearing support 90 and support bushing 91 are secured to the machine

frame to maintain the feed screw perpendicular with the horizontal.

The lower grinding head frame 81 is similarly secured to three feed screw bearings 92, 93, 94, and feed screw nut 95. Nut 95 is threaded onto the lower end of feed screw 96 which, like feed screw 87, is supported at approximately its mid-point by bearing support assembly 97. The ends of the feed screw 96 are received in the upper and lower bearing cartridges 98, 99, and column extension 11b, which restrains longitudinal movement of the screw. Expandable and contractible boots or bellows are indicated at 100, 101a, 101b, and 102. The upper and lower grinding head frames include tubular housings 103, 104, which act as dust protectors over those portions of the feed screws not protected by the bellows.

The use and operation of the invention are as follows.

To raise or lower either one of upper or lower grinding heads 20 or 25, crank 105 is placed on the top of the appropriate feed screw 87 or 96. To move upper head 20 for example the crank is placed on the upper end of feed screw 87 and rotated in the appropriate direction. Since feed screw 87 cannot move longitudinally since its ends are held between flange cartridges and column extension 11a, the upper head frame 80 will move instead. If the head moves upwardly, boot 100 is compressed and boot 101a extended. Since lower grinding head 81 is not connected to head screw 87, head 81 will not move.

Similarly, if crank 105 is placed on the upper end of feed screw 96, and rotated, lower grinding head 81 will move upwardly or downwardly depending upon the direction of rotation of the crank, since feed screw 96 is longitudinally fixed, and feed screw nut 95 is threaded onto its lower end.

Since the upper end of feed screw 96 is not threaded into either upper or lower feed screw bearings 83, 82 the upper grinding head frame 80 will remain stationary.

Thus, the top head may be moved up or down without disturbing the position of the lower head, by the rotation of feed screw 87, and lower head may be moved up or down without disturbing the position of the upper head by rotation of feed screw 96.

Locking means, in this instance a set screw 107, locks the feed screw in place to prevent movement of the heads due to vibration or unintentional rotation of the feed screws. Although a set screw has been illustrated, it will be understood that a clamp or other suitable locking means may be just as readily employed.

Likewise, although the feed screws have been illustrated in vertical position, it should be understood that the same principle is applicable to both vertical and horizontal spindle machines.

To provide progressive grinding, the lower nuts on bolts 58, 59, and stud 60 are loosened and handle 68 inserted in socket 66. To tilt spindle 48 from the solid to dotted line position of FIGURE 3, the handle is rotated clockwise from the position shown in FIGURE 4 until abutment 74 strikes adjusting screw 76. This slight angular displacement from the perpendicular is readily accommodated because of the standard misalignment built into the bearing assembly 52. Actually, the illustrated bearing can accommodate up to 10 degrees of misalignment but it is contemplated that substantially less, perhaps on the order of about one degree misalignment would be required when the adjustment member 56 is at its extreme limits of adjustment. Lower bearing assembly 79 similarly accommodates itself to the changed position. In effect, the grinding disc is rotated about center 108. When adjustment member 56 is rotated by handle 68, either bolt 58 or 59 acts as a pivot, depending upon the direction of rotation. In the illustrated dotted line condition, bolt 58 is the pivot axis. As soon as abutment 74 strikes adjustment screw 76, the lower nuts on bolts 58, 59, and stud 60 are retightened and the machine is ready for operation. The pillow block 78 remains secured to the adjustment member 56 during the tilting adjustment since bolts 62, 75

63 and 64 and the upper nut on stud 60 are not loosened. As soon as the lower nut on stud 60 is retightened, the adjusting assembly is locked to the main head casing or housing 53.

Although the lower head is not tilted in this particular machine, it will be understood that it could be tilted if necessary. The above described tilting arrangement is equally adaptable to a lower head, or a horizontal spindle machine.

Although a preferred embodiment of the invention has been illustrated and described and several alternatives discussed, it will at once be apparent to those skilled in the art upon reading the above description that various modifications may be made without departing from the spirit and scope of the invention. Accordingly, it is the intention that the invention be limited not by the foregoing description but only by the scope of the appended claims.

1. Structure for supporting and positioning a pair of opposed grinding members, such structure including, in combination,

a pair of elongated, parallel feed screws,
the feed screws being threaded at opposite ends,
a pair of frames,

each frame receiving the feed screws and being slidable therealong, each of the frames carrying an opposed grinding member,

each frame being threadably connected to one of the feed screws and slidably connected to the other feed screw, the frames being threadably connected to different feed screws,

structure restraining longitudinal movement of the feed screws, and

means for rotating each feed screw independently of the other whereby the frames, and the grinding member carried by each frame, may be moved relative to each other to adjust the distance between grinding members.

2. The structure of claim 1 further including sealing means enclosing the feed screws, said sealing means being expandable and retractable to thereby accommodate movement of the frames toward and away from one another.

3. The structure of claim 1 further characterized by and including means releasably locking the frames with respect to the feed screws to thereby prevent unintended longitudinal movement.

4. The structure of claim 1 further characterized in that each frame is sleeve supported on the feed screw to which it is not threadably connected.

5. A grinding assembly, said grinding assembly including, in combination,

a grinding member, said grinding member having an outwardly extending spindle which is constructed and arranged to be drivingly connected to a source of power, and

means for tilting the grinding member from a generally vertical axis to thereby provide progressive grinding, said tilting means comprising,

a pair of spaced spindle supports,
one of the supports being swingable from a position in which it is aligned with the other support to a position in which said one support is displaced from the vertical, the other support being fixed, and
means for releasably locking the swingable spindle support into fixed position.

6. The grinding assembly of claim 5 further characterized in that said one spindle support includes an arcuately seated displaceable bearing,

the displaceable bearing being carried by a generally horizontally displaceable adjustment member which may be releasably secured to a grinding assembly support structure.

7. The grinding assembly of claim 6 further characterized in that the adjustment member is releasably con-

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nectable to the grinding assembly supporting structure for rotation about one of a plurality of axes.

8. In a grinding machine a pair of opposed grinding heads, each head comprising a spindle and a grinding member mounted on the spindle.

means for tiltably mounting the spindle, and thereby the associated grinding member,

a pair of parallel feed screws,

said feed screws supporting a pair of frames movable therealong,

each frame carrying one of the grinding heads,

the first frame being threadably connected to one of

the feed screws and slidably connected to the other feed screw,

the second frame being threadably connected to the

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other feed screw and slidably connected to said one feed screw,

whereby the frames and the grinding heads carried thereby, may be moved toward and away from one another, or in the same direction, independently of one another.

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