Oct. 9, 1934. H. B. GREENOUGH 1,976,016

HEEL FINISHING TOOL

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Fig. 2.

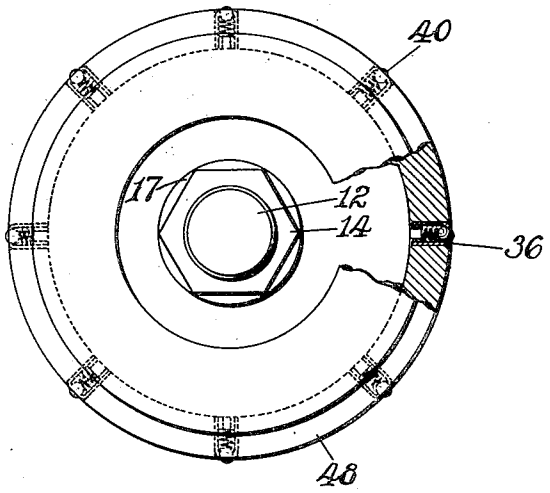
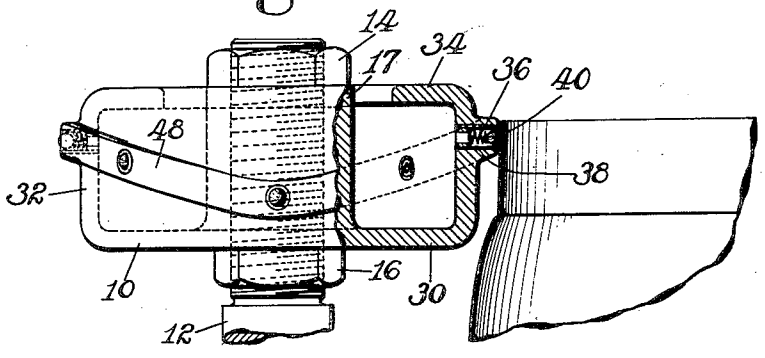


Fig. 1.



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Fig. 4.

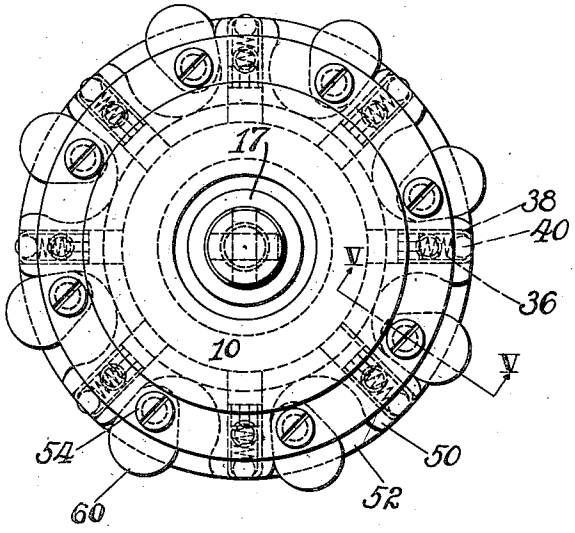


Fig. 3.

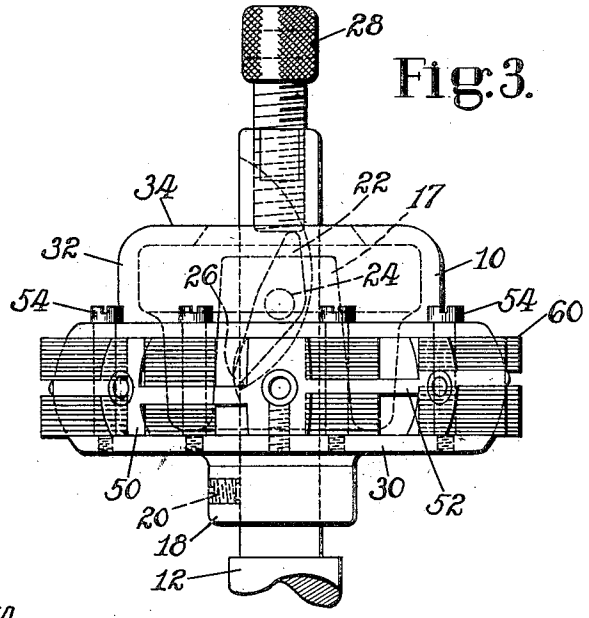
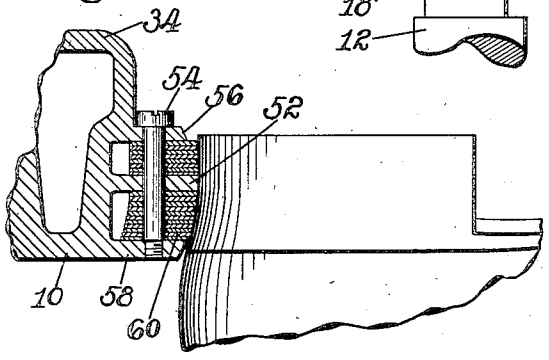


Fig. 5.



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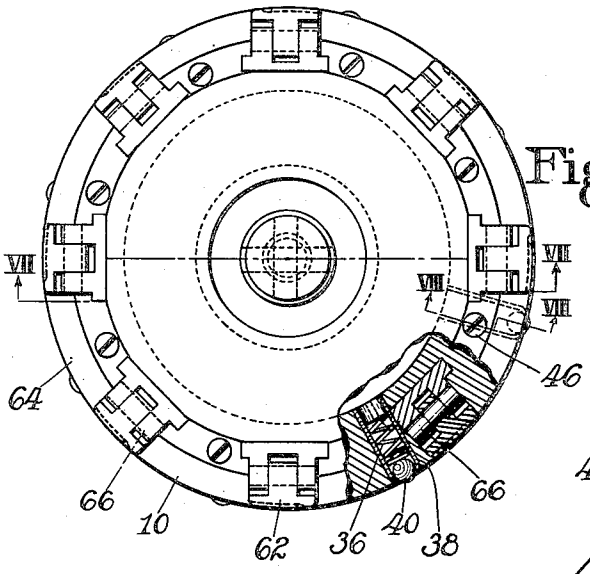


Fig. 6.

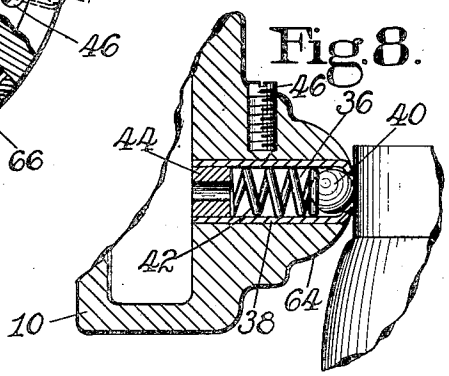


Fig. 8.

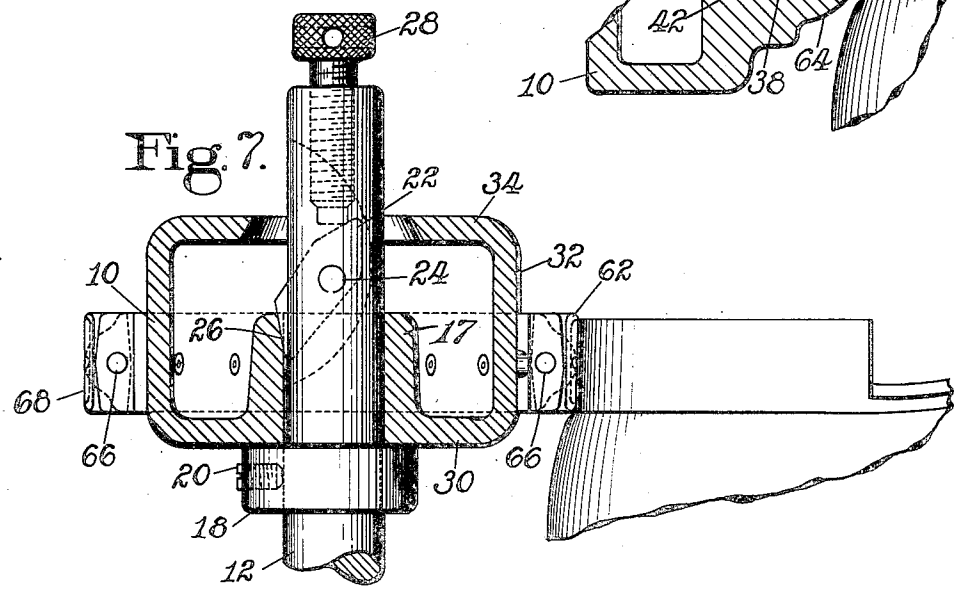


Fig. 7.

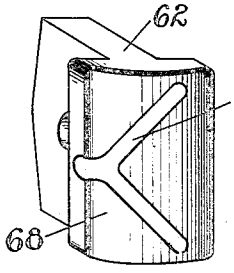


Fig. 9.

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UNITED STATES PATENT OFFICE

1,976,016

HEEL FINISHING TOOL

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Application July 18, 1930, Serial No. 468,805

24 Claims. (Cl. 12—79.5)

This invention relates to finishing tools and is herein illustrated as embodied in a tool for applying and distributing finishing medium, such as wax, over the peripheral face of a heel and also for burnishing it.

The object of the invention is to provide an improved burnishing tool of the above type.

To this end one feature of the invention consists in the provision in a finishing tool of a shell for holding a fluid finishing medium comprising a hub extending above the normal level of the medium, a wall integral with the hub constructed and arranged to retain an annular body of medium and to extend toward but terminate short of said hub above the normal level of the medium, and ducts passing through the wall. The opening between the hub and wall resulting from this construction allows, notwithstanding the rotation of the tool, the introduction therein of a fixed medium conductor for replenishing the shell with medium as it is dispensed; and the radially extending portion of the wall prevents the medium from being centrifugally thrown out of the shell through the opening.

The invention also contemplates the provision, in a tool as described above, of means operated by the application of work to the tool for controlling the egress of finishing medium from the ducts, into which the medium is centrifugally forced, and means for distributing the medium over the surface of the work to be finished.

In each of the illustrated embodiments of the invention the means for controlling the egress of the finishing medium from the reservoir comprises valve elements in ducts connecting the reservoir and the work-engaging face of the tool, the valve elements normally extending beyond the work-engaging surface of the tool. Moreover, in each of the illustrated embodiments of the invention the finishing-medium distributing means also constitutes means for burnishing the surface of the work to be finished and is constructed and arranged to adapt the tool to changes in the position of the work as the work is presented to the tool.

To this end one of the tools in which the invention is illustrated as embodied comprises, in combination with a finishing-medium reservoir and supply means as above described, a plurality of burnishing elements mounted side by side in sets, the elements being mounted and arranged so as to be centrifugally swung into contact with the work when presented to the tool as the tool is rotated and also relatively fixed burnishing surfaces disposed between the sets of burnishing elements. The invention also contemplates the combination, in a finishing tool of the type referred to, of burnishing elements as above mentioned with a finishing-medium reservoir, ducts connecting the reservoir with the work-engaging face of the tool, and means operated by the application of work to the tool for controlling the egress of medium through the ducts. The illustrated burnishing elements of this embodiment of the invention are arranged in sets, as above stated, which are peripherally spaced, successive sets being in staggered relation in order more evenly to treat the surface of the work brought into contact with the tool. As herein illustrated, the sets of burnishing elements are separated laterally and their staggered relation is preserved by means of webs disposed between the laterally spaced sets and connecting the relatively fixed peripherally spaced burnishing surfaces. The rotatably mounted burnishing elements employed in this embodiment of the invention comprise leaves which, as the tool is rotated, are centrifugally moved into contact with the work and envelop the surface of the heel to be finished along a line extending heightwise thereof. This embodiment of the invention is thus also constructed and arranged to adapt itself to changes in the position of the work as the work is presented to the tool as well as to adjust itself in conformity with the surface of work having a surface of varying contour as the work is presented to the tool.

In another tool in which the invention is illustrated as embodied and in accordance with another feature of the invention, a plurality of peripherally spaced burnishing elements are provided in combination in a burnishing tool with a reservoir and means operated by the application of work to the tool for controlling the flow of medium from the reservoir to the work-engaging surface of the tool at the leading edges of the above-mentioned burnishing elements. The burnishing elements of this embodiment of the invention are pivoted in order to enable the tool to adapt itself to changes in the position of the work as the work is presented thereto. The axes about which the burnishing elements are rotatable, as herein illustrated, extend transversely with respect to the axis about which the tool is rotated.

As herein shown, the surfaces of the pivoted burnishing elements are shaped and arranged evenly to distribute medium over the surface of the work to be finished. This end is attained in the illustrated construction by the provision on

the work-engaging surfaces of the burnishing elements of channels extending from the leading edges thereof. In the tool in which this embodiment of the invention is illustrated ducts leading from the reservoir to the work-engaging surface of the tool terminate adjacent to the leading edges of the burnishing elements, and the channels in the surfaces thereof above referred to are arranged to diverge from the leading edges of the burnishing elements from a point adjacent to the ducts.

In the drawings,

Fig. 1 is a side elevation of one form of finishing tool in which the invention is illustrated as embodied, a part of the tool being broken away and shown in section;

Fig. 2 is a plan view of the tool shown in Fig. 1 with a part broken away;

Fig. 3 is a side elevation of another embodiment of the invention;

Fig. 4 is a plan view of the tool illustrated in Fig. 3;

Fig. 5 is a sectional elevation taken along the line V—V of Fig. 4 showing also a heel as presented to the tool;

Fig. 6 is a plan view, partly in section of another embodiment of the invention of the type illustrated in Figs. 3, 4 and 5;

Fig. 7 is a sectional elevation of the tool illustrated in Fig. 6 taken along the line VII—VII;

Fig. 8 is a sectional view taken along the line VIII—VIII of Fig. 6; and

Fig. 9 is a perspective view of a work-engaging element of the tool as illustrated in Fig. 6.

Each of the illustrated tools constituting one embodiment of the invention comprises a shell 10 adapted to hold a fluid finishing medium and which is centrally bored for the reception of a rotating spindle 12. The shell 10 of a tool of the type illustrated in Figs. 1 and 2 is secured to the end of the spindle 12, the normal position of which is substantially vertical, by means of check nuts 14 and 16 engaging opposite sides of the hub 17 of the shell 10, and by means of which the shell 10 may be adjustably clamped in any desired position on the end of the spindle 12. Each of the shells 10, as illustrated in the embodiment of the invention shown in Figs. 3 and 7, is positioned axially on the shaft 12 by means of a collar 18 which may be adjustably clamped on the spindle 12 by means of a set-screw 20. Each of these shells 10 is also secured against upward axial and rotative movement with respect to the shaft 12 by means of a key 22 pivoted to the shaft on a pin 24 and arranged at its lower end to enter within a keyway 26 in the hub 17 of the shell. Each key 22 is held in locking engagement with the shell 10 by means of a set-screw 28 threaded axially in the spindle 12 and adapted to bear on the end of the key 22 opposite to that engaging the hub 17. In order to substitute one tool of the type shown in Figs. 3 or 7 for another, it is necessary merely to unmake the screw 28, allowing the key 22 to rotate by gravity to a more central position out of the keyway 26, whereupon, after an interchange of tools, the screw 28 may again be made up against the key 22, thereby locking the shell 10 to the spindle 12. The shell 10 in each tool, as illustrated, constitutes in effect a reservoir the retaining walls of which comprise the hub 17, bottom and cylindrical side walls 30 and 32 respectively, the hub and side walls being arranged to extend above the normal level of the medium, and also a substantially horizontally disposed upper wall 34 extending radially inwardly toward the axis of the spindle 12 and partially closing the space within the shell 10. The annular or ring-shaped opening remaining between the inner edge of the wall 34 and the hub 17 of the tool allows the introduction into the reservoir at all times of a fixed medium conductor (not shown) by means of which the reservoir can gradually and continuously be filled as the medium is delivered by the tool to the work notwithstanding continuous rotation of the tool.

In all of the embodiments of the invention herein illustrated, passages or ducts 36 (Fig. 8) are provided by tubes 38 having upset ends at the outer work-engaging surfaces of the tools, constituting valve seats toward which balls 40 are urged by springs 42 which also allow the balls 40, normally extending beyond the work-engaging surfaces of the tools, to be depressed within the tubes 38 when a heel is presented to the work-engaging surface of the tool, as illustrated in Fig. 8. The inner ends of the springs 42 are supported by bushings 44 and the tubes 38 are secured in the shells 10 by means of set-screws 46.

It will now be apparent that, as any of the illustrated tools are rotated, the finishing medium in the reservoirs of the tools will be centrifugally forced into the ducts 36. Normally, as the tools are thus rotated, the balls 40 prevent egress of any medium to the work-engaging surfaces of the tools, but whenever work is presented thereto the balls 40 which normally extend beyond the work-engaging surface of the tools are depressed within the tubes 38, thereby opening the outlets of the ducts and allowing medium to flow from the reservoir until the balls 40 pass out of contact with the work.

In the embodiment of the invention illustrated in Fig. 1, the work-engaging surface of the tool is constituted by a rib 48 extending continuously around and obliquely across the periphery of the shell 10 forming the medium reservoir. As herein illustrated, the work-engaging face of the rib 48 is slightly arcuate and narrower than the face of the work to be finished and is constructed and arranged so that as the tool is rotated the rib contacts continuously with the work to be finished between one extreme and another heightwise thereof. This result is obtained in the illustrated construction by so disposing the rib 48 that the distance between one of its extremes in an axial direction and its other extreme in the opposite direction is substantially equal to the height of the work to be finished.

It will now be understood that as the tool of the type illustrated in Figs. 1 and 2 is rotated, a piece of work being presented thereto, the work-engaging surface of the rib will operate alternately in opposite directions heightwise of the heel and, owing to the relatively small point of contact between the work and the tool at any time, the tool can adapt itself to changes of position of the work as it is moved to cause a transfer of the point of contact of the tool and the work from one breast corner thereof to the other. It is now apparent that by the use of a tool of a type such as described above, the finishing medium may be evenly distributed over a piece of work to be finished and that the work may be burnished simultaneously with the distribution of finishing medium, both of which operations may be effected evenly over the entire surface of the heel to be finished irrespective of ordinary variations in its contour.

The finishing surface and medium distributing

means, as illustrated in the embodiment of the invention indicated in Figs. 3, 4 and 5, comprises a plurality of peripherally spaced burnishing elements 50 connected by relatively narrow webs 52, successive webs being in staggered relation, as illustrated in Fig. 3. As illustrated in Figs. 3 and 4, the finishing medium ducts 36 above referred to are centrally disposed within the burnishing elements 50. Mounted to swing on screws 54 extending across openings included by the burnishing elements 50, the webs 52 and flanges 56 and 58, respectively, extending outwardly from the shell 10, are leaves 60 arranged side by side in sets, laterally adjacent sets being supported by one of the screws 54. As shown in Fig. 3, the sets of leaves 60, also individually rotatable on the screws 54, completely fill the space laterally between the flanges 56, 58 and the webs 52, as a result of which corresponding groups of leaves in successive sets thereof are also staggered as well as successive webs 52. It will be apparent from the above that in the operation of the tool illustrated in Figs. 3, 4 and 5, when the tool is rotated the leaves 60 will be centrifugally urged toward their extreme outward position, as shown in Fig. 4. Upon the presentation of work to be finished to the tool, the leaves 60 will thus be centrifugally held in contact with the surface of the work to be finished and therefore adapt the tool for operation on heels of varying contour since the leaves 60 tend to envelop the surface of a heel to be finished along a line extending heightwise thereof, as indicated in Fig. 5. Furthermore, owing to the staggered relation of the groups of leaves 60 above mentioned, it is apparent that as the point of contact of the tool and the heel is transferred from one breast corner to the other the heel will be completely finished heightwise thereof in the vicinity of the points of contact between the tool and the work.

The tool in which the invention is illustrated as embodied in Figs. 6 and 7 is also constructed and arranged to adapt itself to changes in the position of the work as it is presented to the tool by virtue of self-alining T-shaped finishing elements 62 which are received between peripherally spaced burnishing surfaces 64, arcuate in cross-section as illustrated in Fig. 8. The finishing elements 62 are freely mounted on pins 66 disposed transversely with respect to the axis of the spindle 12 and hence are caused, when a heel is held thereagainst, to rotate about the pins 66 until their work-engaging faces 68 are alined with the heel surface. While the faces 68 of the elements 62 are illustrated as being substantially straight for use in connection with heels having substantially straight edges, it is to be understood that it is within the scope of this invention to form the faces 68 in any desired shape so long as they are formed in accordance with that of the surface of the work to be finished.

The outlets of the ducts 36 in this embodiment of the invention are disposed closely adjacent to the leading edges of the finishing elements 62 in order that in the operation of this type of tool finishing medium exuded from the ducts 36 will immediately be caught and distributed evenly over the surface of the work to be finished by the finishing elements 62. The distribution of medium is further facilitated by V-shaped channels 70 in the faces 68 of the elements 62, which channels cause the medium retained therein gradually to be moved across the surface of the work at either side of the central portion thereof as the tool is rotated.

The webs 52 in the embodiment of the invention illustrated in Figs. 3, 4 and 5 and the burnishing surfaces 64 serve not only the purposes already set forth but also to insure a steady action of the finishing tool since they are substantially continuous with the work-engaging faces of the burnishing elements 50 and 62 respectively.

In the operation of the last-mentioned embodiment of the invention, the work held against the tool causes the elements 62 as they come into contact with the work to rotate about the pins 66 until their contacting surfaces are in alinement. Simultaneously, owing to the operation of the valves in the ducts 36 as above described and the centrifugal force resulting from the medium being rotated within the reservoir, finishing medium is supplied to the work-engaging face of the tool. The medium is thence distributed as above described and the surface of the work is finished by the action of the elements 62.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A heel finishing tool arranged to rotate continuously about a substantially vertical axis having, in combination, a reservoir for holding a fluid finishing medium comprising walls shaped and arranged to prevent medium therein from being centrifugally moved therefrom and a ring-shaped opening concentric with said axis to allow the introduction into the reservoir of a fixed medium conductor while the tool is rotating, said reservoir also comprising passages leading to the work-engaging face of the tool into which passages the finishing medium is centrifugally forced when the tool is rotated, means for controlling the egress of finishing medium from said reservoir, and means for distributing the medium over the surface of the work to be finished.

2. A heel finishing tool arranged to rotate continuously about a substantially vertical axis having, in combination, a fluid finishing-medium reservoir comprising walls shaped and arranged to prevent medium therein from being centrifugally moved therefrom and a ring-shaped opening in the upper wall thereof to allow the introduction therein of a fixed medium conductor while the tool is rotating and an outlet at the work-engaging surface of the tool into which the medium is centrifugally forced when the tool is rotated, means operable to allow the egress of medium through said outlet only when work is presented to the tool being rotated, and means for distributing the medium over the surface of the work to be finished and for burnishing it.

3. A heel finishing tool mounted for continuous rotation about a substantially vertical axis having, in combination, a fluid finishing-medium reservoir having integral inner and outer walls extending above the normal level of the medium and an annular opening between the upper extremities of said walls to allow the introduction into said reservoir notwithstanding the rotation of the tool of a fixed medium conductor and an outlet at the work-engaging surface of the tool into which outlet the medium is centrifugally forced when the tool is rotated, means in said outlet for controlling the egress of said medium from said outlet operable by the application of work to the tool, and means for distributing said medium over the surface of the work to be finished.

4. A heel finishing tool mounted for rotation about a vertical axis having a reservoir for fluid

finishing medium, the retaining walls of said reservoir comprising a hub constituting its inner vertical wall, a radially disposed flange forming its upper wall, said hub and flange being separated by an annular opening to allow the introduction therethrough into said reservoir of a fixed medium conductor, ducts leading from said reservoir to the work-engaging face of said tool, and means in said ducts for controlling the flow of medium from the reservoir.

5. A heel finishing tool adapted for rotation about a substantially vertical axis having, in combination, an open reservoir for a fluid finishing medium having an outlet at the work-engaging face of said tool, said reservoir comprising a hub arranged to extend vertically above the normal level of the medium and integral therewith a shell having a substantially horizontal flange arranged to prevent the medium from passing upwardly out of the reservoir when the tool is rotated, means operated by the application of work to the tool for allowing the egress of finishing medium from the outlet, and means for distributing said medium over the work to be finished and for burnishing it.

6. A rotary heel finishing tool having, in combination, a fluid finishing-medium reservoir comprising a shell having inner and outer side walls extending above the normal level of the medium therein, a bottom wall connecting said side walls, and a wall disposed in a plane substantially parallel to the normal exposed surface of the medium constructed and arranged to prevent the medium from being centrifugally elevated above said outer side wall as the tool is rotated, and ducts passing through said outer side wall.

7. A rotary heel finishing tool having a shell for holding a fluid finishing medium comprising a hub extending above and substantially perpendicular to the normal level of the medium and a wall integral with said hub constructed and arranged to enclose an annular body of medium, a portion of said wall being arranged to extend radially toward said hub but in spaced relation thereto whereby a fixed medium conductor can be inserted into said shell notwithstanding the rotation of the tool, a burnishing surface on the periphery of said shell, and means for conducting medium to said surface from within said shell.

8. A rotary heel finishing tool having a shell shaped and arranged to hold a body of fluid finishing medium in an annular form, said shell comprising a hub and an outer side wall extending above the level of the medium, a wall disposed below the level of the medium and integral with said outer side wall and said hub, a flange extending from said outer side wall toward said hub above the level of the medium, and ducts passing through said outer side wall.

9. A rotary finishing tool having a plurality of burnishing elements mounted side by side in sets, said elements being arranged to be centrifugally swung into contact with work when presented to the tool as the tool is rotated, and relatively fixed burnishing surfaces on said tool disposed between the sets of burnishing elements.

10. A burnishing tool comprising a plurality of sets of grouped burnishing elements disposed in spaced relation about the periphery of said tool and adapted to be centrifugally forced against the work when the tool is rotated, and relatively fixed burnishing surfaces disposed between said sets of elements, the corresponding groups of said elements in successive sets being in staggered relation.

11. A rotary finishing tool comprising peripherally spaced burnishing surfaces connected by webs, successive webs being in staggered relation, and burnishing elements disposed within recesses between said burnishing surfaces and arranged to be moved centrifugally against the work when it is presented to the tool.

12. A rotary finishing tool comprising peripherally spaced burnishing surfaces connected by webs, and burnishing elements disposed at both sides of each of said webs and adapted to be centrifugally forced against the work when the tool is rotated.

13. A rotary finishing tool comprising a plurality of peripherally spaced burnishing surfaces connected by webs, successive webs being in staggered relation, and a plurality of burnishing elements in groups one at each side of said web mounted to turn about axes parallel to the axis of rotation of the tool, the rotation of said tool causing said burnishing elements to be centrifugally forced against the work when held in juxtaposition to the tool.

14. A rotary finishing tool comprising sets of relatively movable burnishing leaves disposed in spaced relation about the periphery thereof, and relatively fixed burnishing surfaces disposed between successive sets of leaves, said last-mentioned surfaces being connected by webs.

15. A rotary finishing tool comprising a plurality of peripherally spaced burnishing surfaces, a finishing-medium reservoir having passages leading to said burnishing surfaces, means operated by the application of work to the tool for controlling the egress of finishing material from said passages, and a plurality of burnishing elements mounted side by side between said burnishing surfaces constructed and arranged to be centrifugally forced into contact with work presented to the tool as the tool is rotated.

16. A rotary finishing tool having a finishing-medium reservoir, passages leading from said reservoir to the work-engaging surface of said tool, means for controlling the flow of medium through said passages, and a plurality of burnishing elements rotatably mounted side by side, said elements being centrifugally forced into contact with work presented to the tool as the tool is rotated.

17. A rotary finishing tool having a finishing-medium reservoir, passages leading from said reservoir to the work-engaging surface of said tool, means for controlling the flow of medium through said passages, peripherally spaced burnishing surfaces connected by webs, and burnishing elements disposed at both sides of each of said webs adapted to be centrifugally forced against the work when the tool is rotated.

18. A rotary finishing tool having peripherally spaced burnishing surfaces connected by webs, successive webs being in staggered relation, a finishing-medium reservoir, passages leading to said burnishing surfaces from said reservoir, and means operated by the application of work to the tool for controlling the flow of medium through said passages.

19. A rotary finishing tool having a plurality of peripherally spaced burnishing surfaces connected by webs, successive webs being in staggered relation, a finishing-medium reservoir, passages leading from said reservoir to said burnishing surfaces, means for controlling the flow of medium through said passages, and a plurality of burnishing elements in groups one at each side of said web mounted to rotate about axes parallel

to the axis of rotation of the tool, the rotation of said tool causing said burnishing elements to be centrifugally forced against the work when held in juxtaposition to the tool.

20. A rotary heel finishing tool having, in combination, peripherally spaced burnishing elements, and a finishing-medium reservoir having outlets adjacent to the leading edges of said burnishing elements, the work-engaging surfaces of said elements being shaped and arranged evenly to distribute medium centrifugally forced from said reservoir through said outlets over the surface of the work to be finished.

21. A rotary heel finishing tool having, in combination, a plurality of peripherally spaced burnishing elements, a finishing-medium reservoir having outlets adjacent to the leading edges of said burnishing elements, means operated by application of work to the tool for allowing the flow of medium through said outlets, and channels in the faces of said burnishing elements extending from the leading edges thereof to insure even distribution of the medium over the work to be finished.

22. A rotary heel finishing tool having, in combination, peripherally spaced burnishing elements, a finishing-medium reservoir having outlets adjacent to the leading edges of said burnishing elements, the medium being forced into said outlets by centrifugal force as the tool is rotated, means for allowing the flow of medium through said outlets whenever work is presented to the tool, and channels in the faces of said burnishing elements diverging from the central portion of the leading edges thereof to insure an even distribution of the medium over the work to be finished.

23. A rotary burnishing tool having a plurality of peripherally spaced burnishing elements rotatably mounted about axes extending transversely with respect to the axis of rotation of the tool, a finishing-medium reservoir having outlets adjacent to the leading edges of said burnishing elements, and means operated by the application of work to the tool for controlling the flow of medium to the work-engaging surface of the tool.

24. A rotary finishing tool having a plurality of peripherally spaced, rotatably mounted, burnishing elements constructed and arranged to adapt the tool to changes in the position of the work as the work is presented thereto, a finishing-medium reservoir having outlets adjacent to the central portions of the leading edges of said burnishing elements, and means normally closing said outlets and operated upon application of the work to the tool to allow the passage of medium through said outlets, the surfaces of said burnishing elements having channels arranged to conduct said medium evenly over the surface of the work to be finished.

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