Oct. 5, 1937. E. W. HALL 2,094,650

ABRADING OR POLISHING TOOL

Filed Oct. 1, 1936 2 Sheets-Sheet 1

Fig. 1.

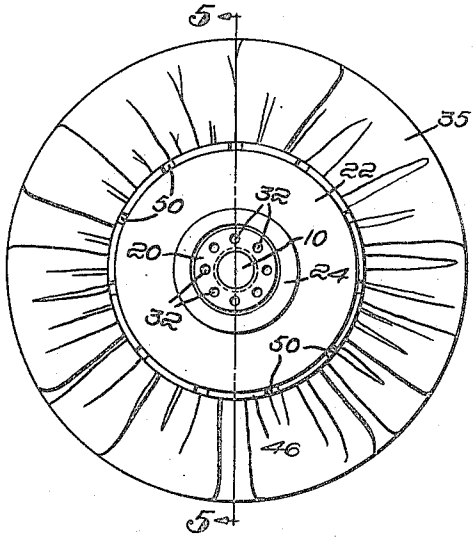

Fig. 2.

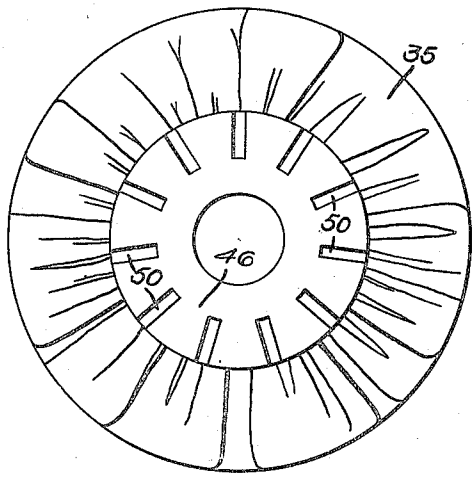

Fig. 3.

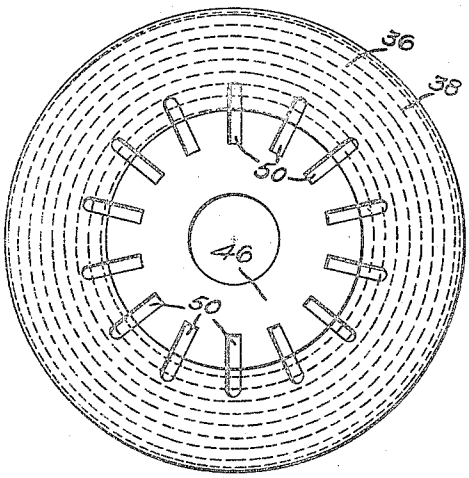

Fig. 4.

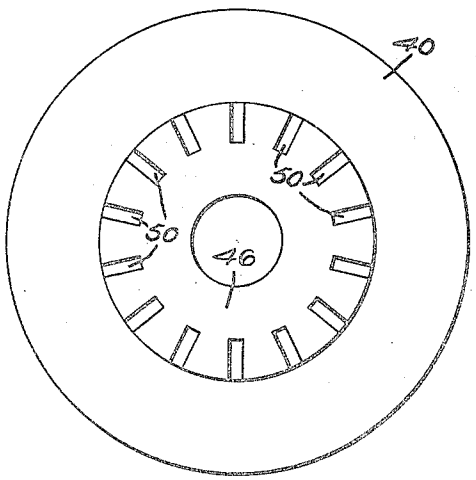

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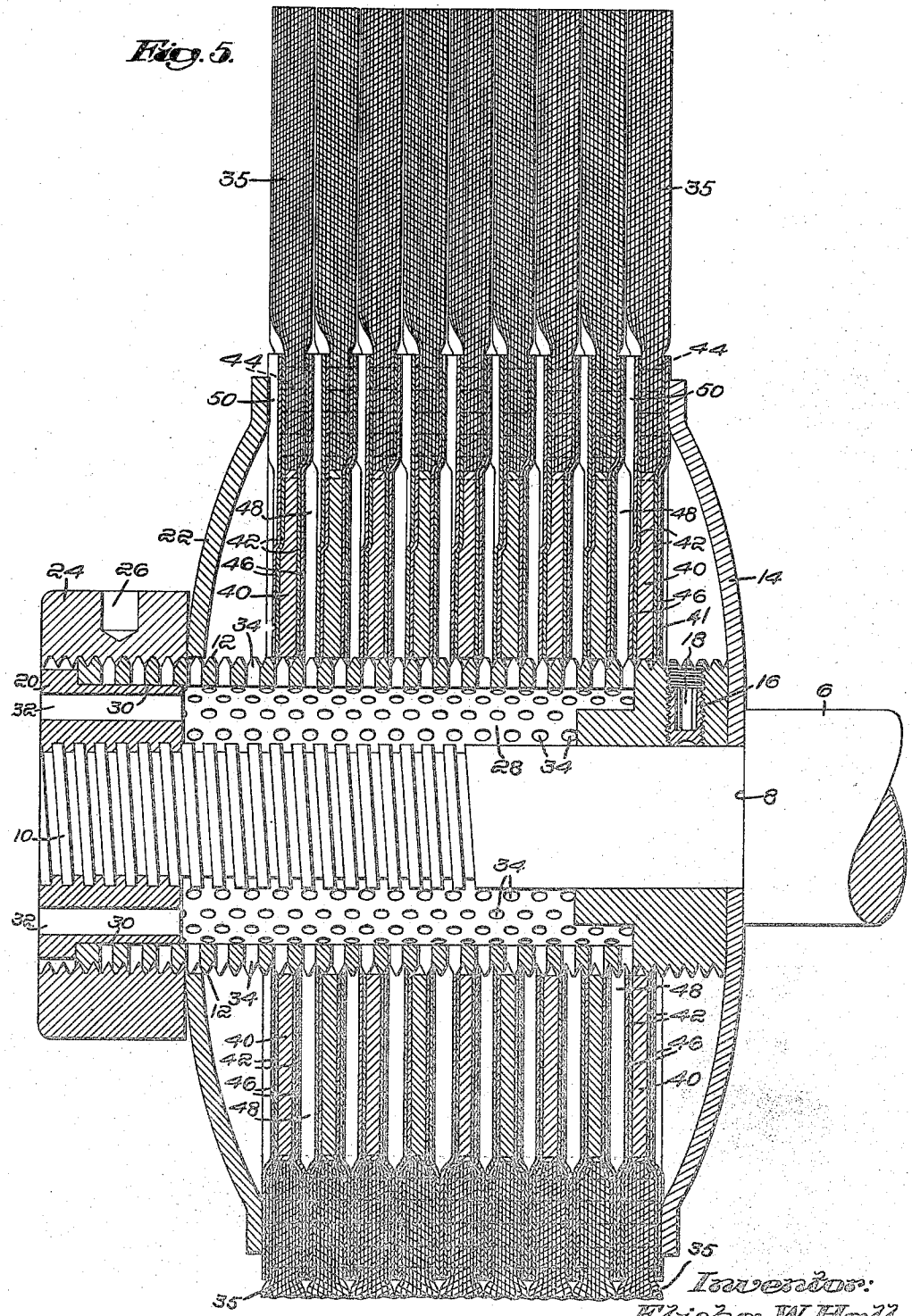
Fig. 5.



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UNITED STATES PATENT OFFICE

2,094,650

ABRADING OR POLISHING TOOL

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Application October 1, 1936, Serial No. 103,552

17 Claims. (Cl. 51—193)

This invention relates to flexible, rotary cylinder tools intended for abrading and polishing, although there may well be other applications such as brushing, scrubbing and general cleaning. These two classes of work are rather closely allied in some respects, in each there are flexible implements which rotate in contact with the work, and in each there are laminated fabric implements to which abrasive material is applied to assist in the abrading or polishing.

The implements are customarily secured to spindles which are mounted in bearings, and they are often driven by direct-connected electric motors, in which case the implement is secured to the armature shaft which overhangs the bearing or bearings. In cases where the implement is rotated at high speed, and particularly where the implement is of large diameter so that the linear speed is high, considerable heat is generated and should be dissipated rapidly to avoid charring of the fabric. In such cases, internal cooling of the implement can be effected by conducting air into the implement, but where the implement is attached to an armature shaft, there is a special problem because it is undesirable to provide a substitute armature shaft or to alter the shaft itself.

The present invention is concerned with provisions for effecting the internal cooling of the implement without the substitution of a new armature shaft and without necessarily changing its construction except by adding to it an adapter which, together with the shaft, constitutes a novel, composite spindle having means for supplying air to air spaces within the wheel assembly. In the embodiment selected for illustration, the adapter becomes a part of the spindle structure and remains attached thereto during substitution of a new wheel when the old one becomes worn away to such an extent as to require replacement. In the present embodiment, it is impossible to remove the adapter from the armature shaft without first removing the wheel from the adapter. In fact it is not at all necessary or desirable to remove the adapter at all, nor is it necessary or desirable to remove more than the clamping nut and the outer wheel clamping plate, the other plate remaining secured to the armature shaft at all times.

According to the present invention, therefore, no change of the armature shaft itself is needed in providing for the supply of cooling air. The adapter can readily be slipped onto the armature shaft along with one of the clamping plates and secured thereto, thus virtually becoming a part thereof, after which there is no need of removing the same, the only parts requiring removal to permit of replacement of the wheel being the clamping nut which is threaded onto the adapter, and the outer clamping plate which is slipped onto the adapter.

The invention will best be understood by reference to the following description of a tool embodying the invention, while its scope will be pointed out more particularly in the appended claims.

In the drawings:

Fig. 1 is an end elevation of the tool, as viewed from the outer end thereof;

Figs. 2, 3 and 4 are elevations of various wheel sections which may be employed; and

Fig. 5 is a sectional view on an enlarged scale on line 5—5 of Fig. 1.

Referring to the drawings and to the embodiment of the invention illustrated therein by way of example, and having reference at first more particularly to Fig. 5, there is shown a tool comprising a shaft 6 which is the usual armature or other shaft, hereinafter sometimes called the body of the spindle. As shown, the shaft has a shoulder 8 and a reduced portion 10, the latter being threaded as usual for the customary clamping nut which is not shown because it is discarded.

The adapter comprises a sleeve 12 which, when slipped onto the reduced portion 10 becomes a part of the resulting spindle assembly. An inner clamping plate 14 is first slipped onto the reduced portion and placed against the shoulder 8, after which the sleeve follows and is appropriately secured in place, thus also securing the clamping plate in place. While the adapter sleeve might be secured permanently as by brazing or by welding, in the present example it is removably secured so that in case of injury it can be removed and replaced.

In the present example, there are two securing means, either of which may be employed to the exclusion of the other, but the use of both is preferable because of greater strength. One of these means is a setscrew 16 herein of the headless variety having a polygonal recess 18 for the application of the special wrench used with that kind of set-screw. The other fastening means is a nut 20 threaded onto the reduced portion 10 and clamping the sleeve 12 against the inner clamping plate 14, and the latter against the shoulder 8. Thus, the adapter sleeve and the inner clamping plate become parts of the spindle assembly and are not removable with the wheel

assembly, and in fact cannot be removed without first removing the wheel assembly because the set-screw 16 is not accessible until after the wheel assembly has been removed.

An outer clamping plate 22 is slipped onto the adapter sleeve and a nut 24 threaded onto the latter and herein provided with spanner holes 26 serves to move the clamping plate along the sleeve toward the inner clamping plate to clamp the sectional wheel hereinafter described. Removal of the nut 24 and the clamping plate 22 is all that is necessary as a preliminary to removal and replacement of the wheel assembly.

The described spindle assembly has suitable provision for furnishing air to the wheel assembly hereinafter described. In the example shown, the sleeve 12 is counterbored as at 28 from its outer end to a point some distance from its inner end so that the inner end is well supported by the reduced portion 10. This provides an air chamber wholly within the spindle assembly. In this case to support the outer end of the sleeve 12 on the reduced portion, the nut 22 is provided with a reduced portion 30 which fits the internal surface of the sleeve and the external surface of the reduced portion 10.

To admit air to the chamber 28, the nut 20 is provided with one or more, herein a plurality of longitudinal holes 32 which also serve as spanner holes to receive a spanner by which the nut may be screwed in place, after which the nut remains as a part of the spindle assembly. One or more, herein a multiplicity of holes 34 provided in the sleeve 12 conduct air from the chamber 28 of the spindle assembly to the wheel assembly now to be described.

The wheel assembly comprises a plurality of wheel sections which may be of various types, three of which are shown in Figs. 2, 3 and 4, respectively. The one shown in Fig. 2 has pleated or gathered, annular plies or laminations 35, the one shown in Fig. 3 has flat, annular plies or laminations 36 sewed together for example by spiral or other stitching 38, and the one shown in Fig. 4 has flat, annular plies 40 which are unsecured to each other except as they are secured to a center. The one shown in Fig. 2 has the advantage that the pleats provide generally radial passages for the escape of air. In the others, however, air will escape between adjacent faces of the sections. The clamping plates which I prefer to employ are dished and rest against the two end sections only along a narrow, annular zone. However, the pressure in this zone in no wise interferes with the passage of air between the sections because the sections have certain characteristics which will now be described.

Taking the section shown in Figs. 1, 2 and 5 as an example, it has at its center a hub 41 composed of laminated chipboard, for instance, and two canvas disks 42 adhesively secured thereto, and overlapping and secured to the annular plies 35 as by stitches 44, after which cloth protective disks 46 are adhesively secured in place overlying the stitches and preventing wear of the latter. The total thickness of the center within the zone of the stitches is substantially less than the thickness of the remainder of the wheel section. As a result, there are thin, annular chambers 48 between the sections and communicating with the holes 34 in the adapter sleeve 12. The clamping plates, being dished, impose no pressure on this center area tending to reduce the chambers 48.

To conduct air from the chambers 48 past the narrow pressure zone produced by the clamping plates, the sections are given a novel formation herein consisting of radial grooves 50 applied by great pressure. Their permanency is assured by first treating the central area with appropriate material such as silicate or latex which makes the central area plastic, and after the pressure has been applied and the silicate or latex has hardened, the grooves are permanent. As these grooves extend inwardly and outwardly beyond the pressure zone, there is bound to be free passage of air without the use of spacing disks between the sections.

When, now, the tool is in rotation, air is drawn into the spindle assembly by way of the holes 32 and the chamber 28 and it passes through the holes 34 into the wheel assembly by entering the thin chambers 48, whence it is conducted by the grooves 50 to the comparatively loose, outer spaces between the outer portions of the wheel sections to the periphery of the latter, this action, of course, taking place by centrifugal force.

The result is adequate cooling of the wheel assembly without the addition of anything to the wheel sections and without making any change in the armature shaft, but simply by adding to the armature shaft an adapter which, with the armature shaft, constitutes a novel spindle assembly distinct from the wheel assembly and remaining in place when the wheel assembly is removed. The advantages of this novel arrangement are numerous. By way of example, a few of them which may be mentioned are simplicity, strength, lightness, ease of manufacture, efficient cooling, absence of spindle deflection, absence of metal parts which might break and fly out, ease of adaptation to existing armature shafts, and ease of replacement of wheel sections because there is nothing to remove from the spindle assembly except the clamping nut 24 and the outer clamping disk 22.

Having thus described one embodiment of the invention, but without limiting myself thereto, what I claim, and desire, by Letters Patent to secure is:

1. In combination, a cylinder provided with air spaces, a spindle on and about which said cylinder is mounted and having means for supplying air to said air spaces to cool said cylinder, said spindle comprising a body and an annular member secured to said body and provided with openings communicating with said air spaces, and two clamping plates which clamp said cylinder therebetween, at least one of said plates being disposed circumferentially about and movable lengthwise of said annular member.

2. In combination, a cylinder provided with air spaces, a spindle on and about which said cylinder is mounted and having means for supplying air to said air spaces to cool said cylinder, said spindle comprising a body provided with a shoulder, and an annular member secured to said body and provided with openings communicating with said air spaces, and two clamping plates which clamp said cylinder therebetween, one of said plates being disposed circumferentially about and movable lengthwise of said annular member, and the other being interposed and held fixed between said shoulder and the adjacent end of said annular member.

3. In combination, a wheel assembly composed of sections disposed face to face and presenting air passages, a spindle assembly composed of a shaft, an annular member secured at one end at least to said shaft, and a clamping plate secured to said shaft, said spindle assembly presenting

passages for conducting air to said passages of wheel assembly, a clamping plate circumferentially about and movable lengthwise of said sleeve, and a clamping nut circumferentially about and threaded onto said annular member to move the last-named clamping plate along the exterior of said annular member toward the first-named clamping plate to clamp the interposed wheel assembly.

4. In combination, a wheel assembly composed of serially arranged sections and presenting air passages, a spindle assembly comprising a shaft provided with a shoulder and a screw-thread, a sleeve disposed about and separated by an annular space from said shaft, and a nut threaded onto said shaft to urge said sleeve toward said shoulder, said nut and sleeve presenting passages for conducting air to said air passages in said wheel assembly, clamping plates at opposite sides, respectively, of said wheel assembly, one clamping plate only being disposed about said sleeve and another nut threaded onto said sleeve to cause said clamping plates to clamp the interposed wheel assembly onto said sleeve.

5. In combination, a wheel assembly composed of serially arranged sections and presenting air passages, a spindle assembly comprising a shaft, a sleeve disposed about and secured to said shaft, said sleeve being provided with a chamber and openings from said chamber to said air passages, clamping plates disposed at opposite sides, respectively, of said wheel assembly, and means to cause said clamping plates to clamp the interposed wheel assembly.

6. In combination, a wheel assembly composed of serially arranged sections and presenting air passages, a spindle assembly comprising a shaft provided with a shoulder, a sleeve extending through said wheel assembly, and disposed about and having a portion resting upon said shaft, said sleeve being provided with a chamber about said shaft and openings from said chamber to said air passages, a clamping plate between said shoulder and said sleeve at one end of said wheel assembly, a nut threaded onto said shaft and having a part received within said sleeve, said nut being provided with one or more passages leading into said chamber, a clamping plate disposed about said sleeve at the other end of said wheel assembly, and a nut threaded onto said sleeve to move the last-named plate toward the first-named plate to clamp the interposed wheel assembly.

7. In combination, a wheel assembly composed of serially arranged sections and presenting air passages, a spindle assembly comprising a shaft provided with a shoulder, a sleeve extending through said wheel assembly, and disposed about and having a portion resting upon said shaft, said sleeve being provided with a chamber about said shaft and openings from said chamber to said air passages, a fastening element securing said portion of said sleeve to said shaft, a clamping plate between said shoulder and said sleeve at one end of said wheel assembly, a nut threaded onto said shaft and having a part received within said sleeve, said nut being provided with one or more passages leading into said chamber, a clamping plate disposed about said sleeve at the other end of said wheel assembly, and a nut threaded onto said sleeve to move the last-named plate toward the first-named plate to clamp the interposed wheel assembly.

8. In combination, a wheel assembly composed of serially arranged sections and presenting air passages, a spindle assembly comprising a shaft provided with a shoulder, a sleeve extending through said wheel assembly, and disposed about and having a portion resting upon said shaft, said sleeve being provided with a chamber about said shaft and openings from said chamber to said air passages, a clamping plate between said shoulder and said sleeve at one end of said wheel assembly, a nut threaded onto said shaft and having a shoulder resting against the adjacent end of said sleeve and a part received within said sleeve, said nut being provided with one or more passages leading into said chamber, a clamping plate disposed about said sleeve at the other end of said wheel assembly, and a nut threaded onto said sleeve to move the last-named plate toward the first-named plate to clamp the interposed wheel assembly.

9. In combination, a wheel assembly composed of serially arranged sections each having a depression in one face and one or more passages leading from said depression outwardly, a spindle assembly comprising a shaft, a sleeve extending through said wheel assembly and secured to said shaft, said sleeve being provided with a chamber and openings leading from said chamber to said depressions, clamping plates at opposite ends, respectively, of said wheel assembly, and a clamping nut threaded onto said sleeve to move one of said clamping plates toward the other to clamp the interposed wheel assembly.

10. As a new article of manufacture, a buffing disk having a central opening, said disk being composed of fibrous material having a depression about said opening and one or more grooves leading outwardly from said depression toward the periphery of the disk.

11. As a new article of manufacture, a buffing disk composed of fibrous material and having a central opening, said disk having a portion about said opening which is relatively thin and a relatively thicker portion about said relatively thin portion, and one or more passages in said relatively thicker portion extending from said relatively thin portion outwardly toward the periphery of said disk.

12. As a new article of manufacture, a buffing disk comprising a relatively thin, center portion provided with a central opening, and a relatively thicker, annular portion about said center portion and having an annular zone which is provided with one or more passages leading outwardly from said center portion.

13. In combination, a wheel assembly comprising a plurality of buffing sections each provided with a central opening and passages about said opening, clamping plates disposed at opposite ends, repectively, of said wheel assembly and each having a central opening, a shaft, a tubular member secured to, disposed about, and spaced from said shaft and extending through the central openings of said sections and through the central opening of at least one of said clamping plates, the interior of said tubular member communicating with said passages, and a clamping nut threaded onto said tubular member and arranged to move one of said clamping plates toward the other, said nut having a passage communicating with the space between said shaft and said sleeve.

14. In combination, a shaft, a tubular member coaxial with and secured to said shaft and having its interior communicating at one end with the outer atmosphere, said member having a lateral opening communicating with said interior, a wheel disposed about said tubular mem-

ber and presenting air spaces communicating with said lateral opening, clamping plates at opposite ends, respectively, of said wheel, a nut threaded onto said shaft to secure said member to said shaft and a nut threaded onto said tubular member to move one of said clamping plates toward the other.

15. In combination, a tubular member whose interior communicates at one end with the outer atmosphere, said member having a lateral opening communicating with said interior, a shaft which closes and is secured to the other end of said tubular member, a wheel about and having air spaces communicating with said lateral opening, clamping plates at opposite ends, respectively, of said wheel, means to secure one of said plates to said shaft, and means to move the other of said plates toward the first to clamp said wheel.

16. In combination, a series of wheel sections contacting face to face, each section having a central opening, a depression about said opening, and passages leading from said depression outwardly toward the periphery of said section, a hollow member extending through the central openings of said wheel sections and furnishing air to the depressions about said openings, and means to secure said wheel sections to each other and to said hollow member.

17. In combination, a series of wheel sections contacting face to face, each section being composed entirely of non-metallic fibrous material having a central opening and being formed with passages leading outwardly toward its periphery, a rotatable wheel carrier extending through the central openings of said wheel sections and presenting conduit means receiving atmospheric air from at least one end of said carrier and delivering the same to said passages.

ELISHA W. HALL.