April 13, 1937. J. B. HADAWAY 2,076,776

ABRADING TOOL

Filed June 20, 1935

Fig. 2.

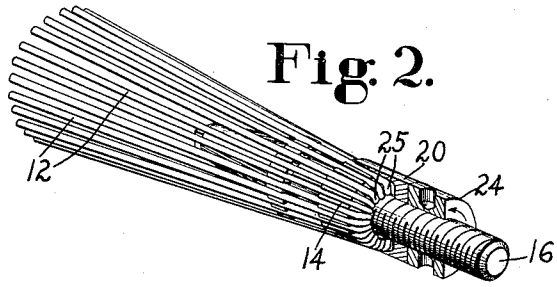


Fig. 1.

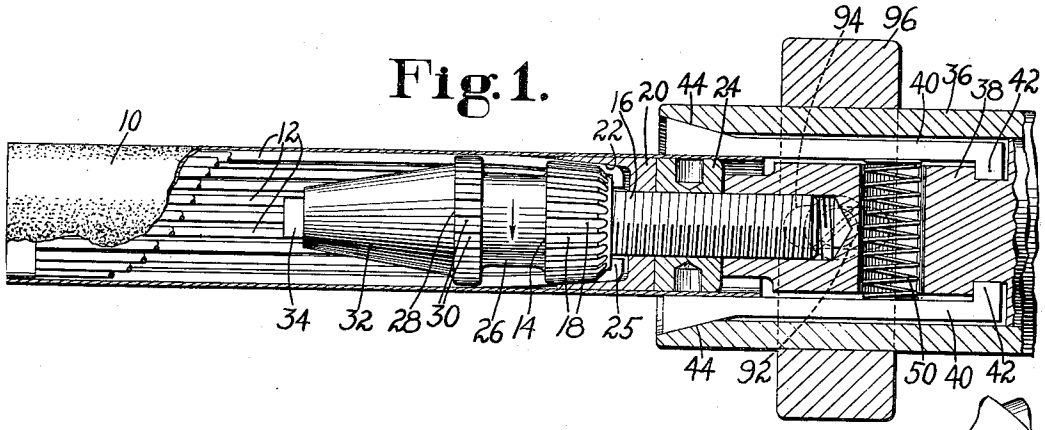
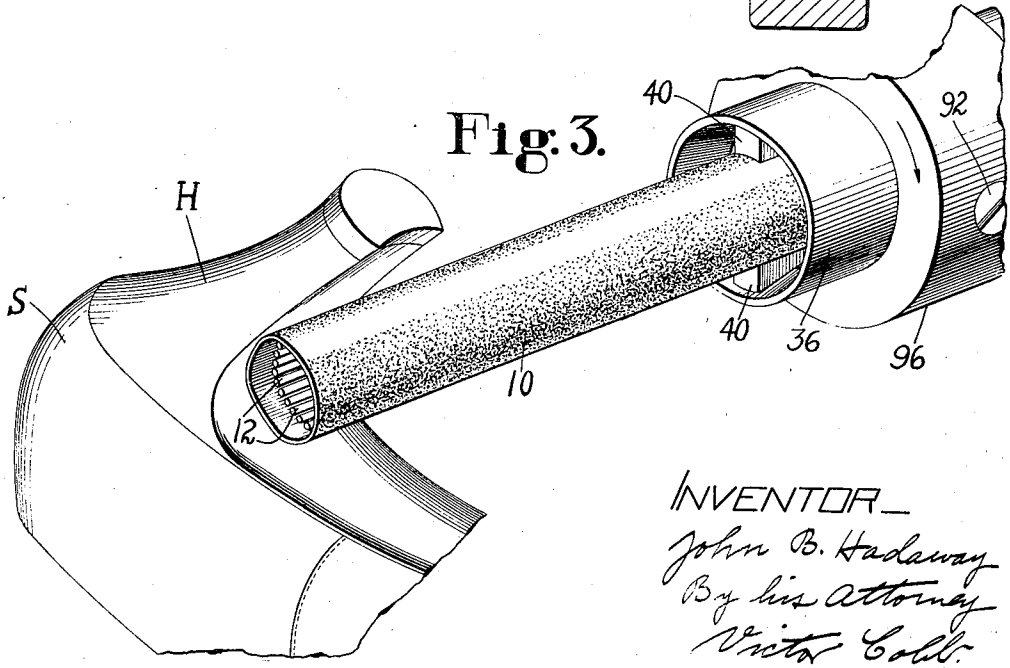


Fig. 3.



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UNITED STATES PATENT OFFICE

2,076,776

ABRADING TOOL

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5 Claims. (Cl. 51—190)

This invention relates to abrading tools and is herein illustrated as embodied in a rotary abrading tool suitable for such uses as, for example, the buffing or scouring of breast surfaces of Louis heels. The tool illustrated herein is of the type disclosed in United States Letters Patent No. 2,018,671, granted October 29, 1935 upon the application of James L. Hildebrand. Like the tool disclosed in that patent, the tool of the present application consists of a sleeve of abrasive material which is yieldably supported upon a plurality of elongated resilient members, illustrated herein as wires, extending within and supporting the sleeve. Each of these wires at one of its end portions is secured to a hub adapted for attachment to a rotary spindle, the opposite ends of the wires being free to flex under the pressure of the work. By reason of this construction the free ends of the wires provide a particularly yielding and resilient support for the outer end of the abrasive sleeve, enabling this portion of the sleeve to conform readily to the varying contours of the work.

It is an object of the present invention to provide an improved buffing tool of the character above described. In accordance with a feature of the invention the illustrated tool is provided with means for preventing localization of strain at the supported ends of the elongated resilient members resulting from stresses set up in the course of operation of the tool. As illustrated herein, the elongated resilient members consist of wires, and the means for preventing such localization of strain consists of a disk-shaped member for supporting the wires against forces tending to bend them inwardly. The periphery of this disk-shaped member is provided with notches to accommodate the respective wires, which notches serve to hold the wires against forces tending to twist them relatively to the axis of the tool as well as against forces tending to bend the wires inwardly. In accordance with a further feature, the means for securing the wires in position is constructed and arranged to facilitate the ready removal and replacement of the individual wires.

The invention further consists of various features of construction and combinations of parts herein disclosed and claimed, the advantages of which will be apparent to those skilled in the art from the following description, reference being had to the accompanying drawing, in which

Fig. 1 is a view in longitudinal section of the improved tool mounted upon a rotary spindle;

Fig. 2 is a view in perspective of the improved tool without the abrasive sleeve; and

Fig. 3 is a view showing the tool in operation upon a heel breast.

The abrasive element of the improved tool consists of a tube or sleeve 10 of abrasive sheet material, for example emery cloth, which may be reinforced on its interior by tough, heavy paper. The tube 10 is flexible and conforms under pressure to the contour of the work. It may be made by rolling flat sheet material into the desired shape and securing the ends together by cement. The abrasive sleeve 10 is supported upon a plurality of elongated resilient members or springs in the form of wires 12 which are arranged as elements of a tubular or cylindrical surface. Each of the wires 12 is secured at one of its end portions to a hub 14, the opposite or outer end of the wire being free. Extending from the inner face of the hub 14 is a threaded stem 16 which enables the hub to be secured in the end of a rotary spindle. As shown in Fig. 2, the wires 12, when not surrounded by the abrasive sleeve 10, define a tubular surface which is frusto-conical. This is accomplished by forming the hub 14 in the shape of a frustrum of a cone. In the periphery of the hub are formed a plurality of notches 18, each of which is occupied by the end portion of one of the wires 12. These notches conform in direction to the slope of the frusto-conical surface defined by the wires 12 when in their free position. Surrounding the stem 16 is a clamping collar 20 having an annular frusto-conical surface 22 which surrounds the end portions of the wires 12. A nut 24 is threaded upon the stem 16 to enable the collar 20 to be urged to the left, as shown in Fig. 1, to clamp the end portions of the wires 12 down into the notches 18. In order to prevent undesired withdrawal of the wires 12 each of the wires is formed with an offset or hook which engages the hub 14. In the illustrated construction, as shown in Figs. 1 and 2, this offset consists of an end portion 25 which is hooked over the inner and smaller face of the hub 14. The wires, either individually or as many as desired, may readily be removed by loosening the nut 24 and the collar 20, which elements are again tightened after the wires have been replaced.

Extending within the surface defined by the wires 12 and integral with the hub 14 is a stem 26 upon which is formed a disk 28 having a plurality of notches 30 in its periphery for receiving the wires 12, respectively. Extending from the disk 28 is a tapered extension 32 of the stem 26 for preventing excessive deflection of the wires 12. The end of the extension 32 is squared, as indicated by the reference character 34, to accommodate a socket wrench which may be employed to tighten the threaded stem 16 in the rotary spindle.

As shown in Fig. 1, the spindle which carries the improved abrading tool comprises a tubular shaft 36. Slidably carried within the shaft 36 is a rod 38 which carries a pair of clamping bars 40, each of which has a lug 42 extending into a re-

cess formed in the rod 38. The bars 40 extend lengthwise of the shaft 36 within grooves formed in the rod 38 and the outer ends of the bars 40 extend over the abrasive cover 10. Each of the bars 40 has a tapered or wedge-shaped outer surface 44 which cooperates with a frusto-conical cam surface formed internally upon the adjacent end of the shaft 36 to urge the outer ends of the bars 40 into clamping engagement with the abrasive cover 10, causing the abrasive cover to be clamped against the nut 24 or the collar 20. A compression spring 50 which is contained within a diametrical bore in the rod 38 tends to separate the bars 40 and to hold the wedge surfaces 44 against the frusto-conical cam surface on the shaft 36. In order to prevent turning of the rod 38 relatively to the shaft 36, there is formed in the rod 38 a longitudinal slot 94 which slidably engages the tip of a screw 92 threaded in a collar 96 and extending through an opening in the shaft 36. The shaft 36, together with the clamping mechanism associated with it, is identical with the shaft and clamping mechanism already disclosed in United States Letters Patent No. 2,058,467, granted October 27,1936, on application of Norwood H. Knowlton, to which patent reference may be had for a more complete disclosure of the shaft and clamping mechanism.

As previously stated, the tool without the abrasive cover 10 assumes the form shown in Fig. 2. To apply the cover 10, the tool is first unscrewed from the spindle and the abrasive cover is slipped over the stem 16, nut 24 and clamping collar 20, forcing the wires down into the notches 30. The tool is then mounted upon the end of a rotary spindle which may be of the type illustrated herein or which, if desired, may consist of an ordinary spindle having a suitably threaded recess formed in its outer end. When the tool is secured in an ordinary spindle it may sometimes be desirable to clamp the inner end of the abrasive cover against the nut 24 or the collar 20. A heavy rubber band may be employed for this purpose. In may cases, however, the use of the spindle and clamping mechanism shown in Fig. 1, and disclosed and claimed in the above-mentioned Letters Patent No. 2,058,467, will be found more satisfactory. The direction of rotation of the spindle, as indicated by the arrows on the several figures, should be such as to tend to tighten rather than to loosen the threads of the stem 16 in the spindle.

Fig. 3 illustrates the operation of the tool upon the breast surface of a heel H of a shoe S. As shown in Fig. 3 the wires 12 undergo considerable flexure as the work is pressed against the tool. The disk 28 supports the wires 12 internally at a locality adjacent to but spaced from the hub 14; it does not prevent flexure of the wires but serves rather to distribute the flexure along the length of the wires, thereby preventing localization of strain in the wires adjacent to the hub. The forces acting upon the wires tend not only to flex them inwardly but also, by reason of the frictional drag of the work against the abrasive cover, to twist them with reference to the axis of the hub. The notches 30 support the wires 12 against such twisting strain. It is evident, therefore, that the support afforded by the disk 28 serves to prevent localization of strain at or adjacent to the locality at which the wires are clamped against the hub 14 and to distribute such strain along a considerable length of each wire. Any tendency of wires to crystallize as a result of localized strain is thereby avoided and the life of the wires is prolonged.

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

1. A rotary abrading tool comprising a plurality of elongated yieldable members adapted to support an abrasive cover, means for supporting one end of each yieldable member, said supporting means being constructed and arranged for attachment to a rotary spindle, and means engageable with each of said members at a locality spaced from the supported ends of said members for preventing the localization at the supported ends of said members of strain resulting from forces set up in said members in the course of operation of the tool.

2. A rotary abrading tool comprising a plurality of elongated springs adapted to support an abrasive sleeve, said springs being arranged as elements of a tubular surface, means for supporting each of said springs at one end of said tubular surface, the opposite ends of said springs being free, and a disk-shaped member positioned between the ends of said tubular surface for supporting said springs against forces tending to bend said springs inwardly with reference to said tubular surface, thereby preventing the localization of strain at the supported ends of the springs.

3. A rotary abrading tool comprising a plurality of wires arranged as elements of a tubular surface for providing resilient support to an abrasive sleeve, a hub adapted for attachment to a rotary spindle, said wires being secured to said hub at one end of said tubular surface, the opposite ends of said wires being free to flex under pressure of the work, and a support extending from said hub within said tubular surface, said support having a circular periphery in which is formed a plurality of notches, said notches supporting said wires at a locality spaced from the secured ends of the wires to prevent localization at the secured ends of the wires of twisting and bending strains which are set up in said wires in the operation of the tool.

4. A rotary abrading tool comprising a plurality of wires adapted to support an abrasive sleeve, a frusto-conical hub having a threaded stem extending from its small end for attachment to a rotary spindle, said hub having formed in its periphery a plurality of notches which slope toward the axis of the hub by reason of the frusto-conical shape of the hub, each of said notches being occupied by an end portion of one of said wires, the remaining portions of said wires extending from the large end of the hub, a clamping collar surrounding said threaded stem and having an internal frusto-conical surface surrounding the portions of said wires which occupy said notches, and a nut threaded on said stem and abutting said clamping collar for urging said clamping collar toward said hub and thereby causing said internal frusto-conical surface to clamp said wires into said notches.

5. A rotary abrading tool comprising a sleeve of flexible abrasive material, a plurality of wires resiliently supporting said sleve from within, a hub adapted for attachment to a rotary spindle, means for securing an end portion of each of said wires to said hub, and a support extending from said hub and having a disk for supporting said wires internally at a locality adjacent to but spaced from said hub to prevent the localization of strain in said wires adjacent to said hub.

JOHN B. HADAWAY.