Oct. 29, 1935. J. L. HILDEBRAND 2,018,671

ABRADING TOOL

Filed July 10, 1931

Fig. 3.

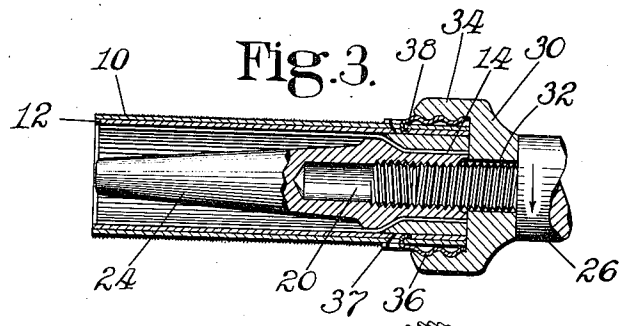


Fig. 2.

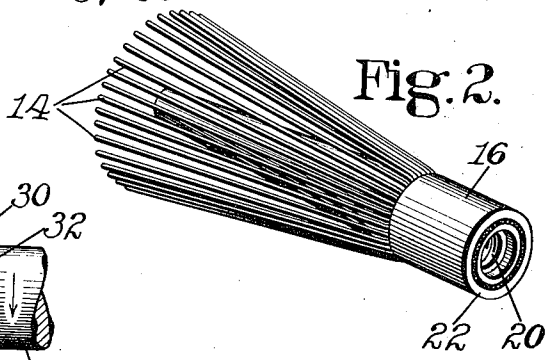


Fig. 4.

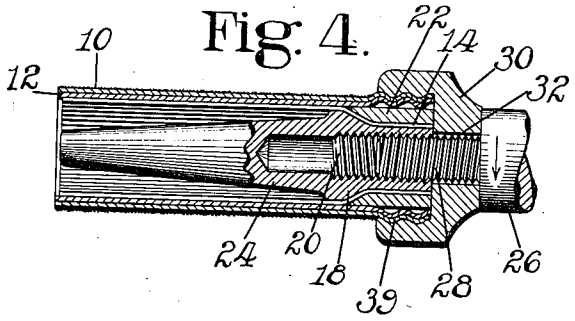


Fig. 5.

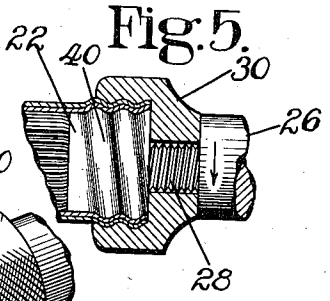
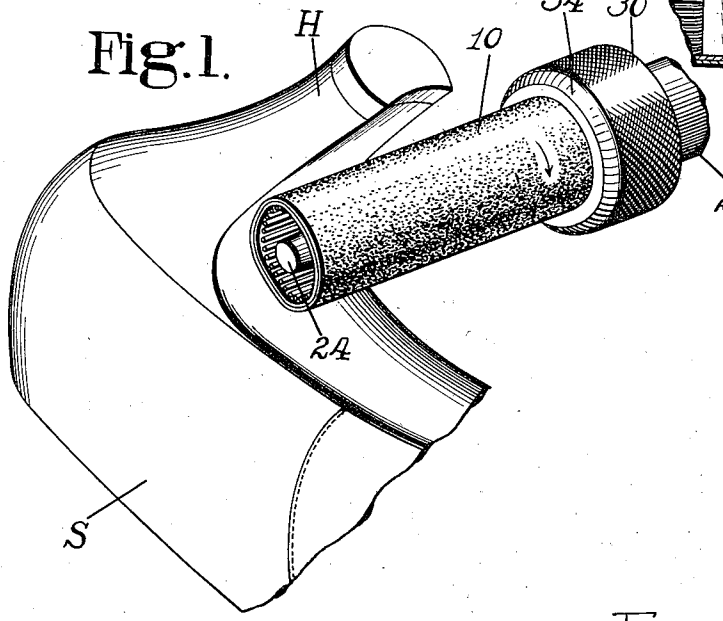


Fig. 1.



INVENTOR.

James L. Hildebrand,

By his Attorney,

Harlow M. Davis

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UNITED STATES PATENT OFFICE

2,018,671

ABRADING TOOL

James L. Hildebrand, Lynn, Mass., assignor to United Shoe Machinery Corporation, Paterson, N. J., a corporation of New Jersey

Application July 10, 1931, Serial No. 549,965

16 Claims. (Cl. 51—190)

This invention relates to abrading tools and is herein illustrated as embodied in a tool of small diameter such as is frequently employed in the buffing or scouring of the breast surfaces of Louis heels.

It is customary in buffing operations of the character above mentioned to employ cylindrical or sometimes tapered abrading rolls which are so mounted that one end of the roll is free for presentation to the work. In order to enable such rolls to conform to the varying curvatures of the surface of the heel breast and also to give the rolls the softness of touch necessary to the production of a smooth even surface, the abrasive element must be supported with a considerable degree of resilience.

It is an object of the present invention to provide an improved buffing tool of the type under consideration.

In accordance with a feature of the invention there is provided an abrasive sleeve supported from within by a plurality of elongated resilient members disposed lengthwise of the sleeve and each having one of its ends free. The elongated resilient members employed in the illustrated tool consist of wires, and each has one of its ends secured to a hub which is adapted to be attached to a rotary spindle. This assembly of wires and hub constitutes a tool body. The wires, before being inserted within the abrasive sleeve, assume the form of a frustrum of a cone with the hub at the small end. As the tool body is inserted lengthwise, hub first, into the abrasive sleeve, the wires are forced inwardy by the sleeve and thus exert an outward force against the interior of the sleeve. The abrasive sleeve is sufficiently flexible to enable it to conform to the contour of the work. By reason of the construction above described, the tool is especially yielding at its free end, and its utility is thereby extended to such difficult operations as buffing the heel breast and shank surfaces of shoes at and adjacent to the heel breast line. The less yielding portion of the tool, however, adjacent to the hub, is always available for operations requiring a relatively stiff backing for the abrasive cover. The abrasive sleeve may convenienty be cylindrical in form, as in the tool herein illustrated.

A further feature of the invention consists of an improved arrangement for holding the tubular abrasive cover from endwise slipping movement on the tool body. In the illustrated tool this is accomplished by providing the means for holding the abrasive tubular cover against endwise movement on the tool body with an internal thread which engages an externally threaded end portion of the abrasive tubular cover.

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 foregoing description, reference being had to the accompanying drawing, in which

Fig. 1 is a perspective view, showing the improved abrading tool in operation upon a heel breast;

Fig. 2 is a perspective view of the body portion of the tool without the abrasive cover;

Fig. 3 is a longitudinal section through the tool, showing an arrangement for retaining the abrasive cover against endwise movement;

Fig. 4 is a view similar to Fig. 3, showing an alternative arrangement for preventing endwise movement of the abrasive cover; and

Fig. 5 is a fragmentary longitudinal sectional view, showing still another arrangement for retaining the abrasive cover.

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 12 to which it is adhesively attached. The sleeve 10, as shown in Fig. 1, is sufficiently flexible to yield under pressure of the work. If emery cloth is used, the fabric of the emery cloth may be woven in tubular form to avoid overlapping of the ends. If the tube 10 is made from originally flat sheet material with a backing 12 of sheet material, the overlapping joints of the tube 10 and of the backing 12 should preferably not be allowed to coincide. The body portion of the tool consists of a plurality of resilient wires 14, each wire being secured at one end to a hub 16 (Fig. 2) and being free at its other end. A relatively large number of wires are desirable to support the sleeve 10 for smooth action upon the work. As shown in Fig. 2, the illustrated tool is provided with about forty wires. The hub 16 consists of an inner member 18 (Fig. 4) having an axially extending internally threaded recess 20. Surrounding the inner member 18 is a ring 22. The attached ends of the wires 14 are gripped and firmly secured between the inner member 18 and the ring 22, the ring being pressed or, if desired, shrunk over the ends of the wires to secure them permanently in position. The wires 14 are preferably of steel, and they may be made from piano wire. As shown in Fig. 2, the wires 14 in their normal or unstressed state extend in the form of a frus-

tum of a cone which is coaxial with the hub 16, the large end of the frustum being defined by the free ends of the wires. Each of the wires 14 extends in a direction the principal component of which is parallel to the axis of the hub 16.

Integral with the inner hub member 18 and extending axially within the conical frustum determined by the wires 14 is a member 24 which tapers off toward its outer end and serves as a support for the wires 14 to prevent too great deformation of the wires and also of the abrasive cover under pressure of the work. The abrading tool as heretofore described may be attached directly to a driven spindle 26 having the usual threaded extension 28 which engages the threaded recess 20 of the hub member.

It is sometimes desirable to insure against any tendency of the tubular abrasive cover 10 to move axially with respect to the tool body. In order to secure the abrasive cover against such endwise slipping, a socket 30 may be interposed between the hub of the tool and the end of the spindle 26, the socket 30 having an internal bore 32 to accommodate the threaded extension 28 of the spindle. When the hub is threaded upon the extension 28 the socket 30 is securely clamped between the hub and the end of the spindle. The socket 30 has an annular flange 34 which surrounds the hub 16 of the tool and also the end of the tubular abrasive cover overlying the hub. The flange 34 is internally threaded, and its outer surface may be knurled, as indicated in Fig. 1.

In the arrangement illustrated in Fig. 3 the tubular abrasive element is provided at one end with a sleeve or ferrule 36 preferably of brass which is formed into threads complemental to the internal threads of the flange 34. The ferrule 36 is provided with prongs 38 which are embedded in the material of the abrasive tube 10 and its reinforcing layer 12. The metallic ferrule 36 extends lengthwise of the abrading tool a sufficient distance, as indicated at 37 (Fig. 3), beyond the termination of its threaded portion to serve as a support for the abrasive element and to prevent cracking of the abrasive element at the point where the wires 14 enter the hub 16.

In Fig. 4 is shown an alternative arrangement wherein the end of the abrasive tube is itself molded into course threads 39 engageable with the internal thread of the flange 34.

Still another construction is shown in Fig. 5 wherein external threads 40 are formed in the ring 22 of the hub. The threads 40 are complemental to the internal threads of the socket 30 but are spaced therefrom a sufficient distance to enable the cylindrical end of the abrasive tube to be threaded between the ring 22 and the flange 34. It is unnecessary with this arrangement to mold threads into the abrading tube inasmuch as the end portion of the tube will readily conform to the internal and external threads of the socket 30 and ring 22, respectively.

In all of the above arrangements the abrasive coating of the tubular element 12 is preferably omitted at the attaching end of the abrading tube. The tool body and the tubular cover are assembled by inserting the hub 16 into the outer end of the abrasive tube. As the tool body member is forced lengthwise into the abrading tube, the latter will force the wires 14 inwardly so that they will react outwardly upon the interior of the abrading tube and afford a resilient yielding support to the abrasive tube. The wires 14 are relatively stiff at a locality adjacent to the hub 16, and become increasingly yielding and resilient toward their free ends. The free outer ends of the wires 14 are rounded or beveled to prevent them from cutting into the abrasive tube.

If desired, the bore 32 of the socket 30 may be threaded to fit the extension 28 so that the socket 30 may be secured upon the spindle 26 independently of the hub 16. In such case no difficulty would be presented in threading the abrasive tube into the socket for any of the three arrangements disclosed, but in the arrangement shown in Fig. 5 sufficient space should be left between the raised portions of the threads 40 and of the internal threads on the flange 34, respectively, to avoid binding as the hub 16 is threaded on the extension 28.

In Fig. 1 the complete tool is shown in operation upon the breast surface of a heel H attached to a shoe S. The resilience of the wires 14 is assisted by centrifugal force, as the tool is rotated, to enable them to support the abrasive tube against the pressure of the work. As the shoe is pressed against the tool, the wires 14 will yield, enabling the abrasive element to conform to the curvature of that portion of the heel-breast surface which presses against it. The tapered extension 24 serves to prevent undue deformation of the tool, thus insuring against any danger of cracking the abrasive tube even if the pressure of the shoe against the tool is excessive.

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

1. An abrading tool comprising an abrasive sleeve, and a support having a large number of elongated resilient members disposed lengthwise of said sleeve and within said sleeve to support the sleeve against the pressure of the work, each of said elongated members having one of its ends free and being adapted yieldingly to support the abrasive sleeve and permit it to conform to the contour of the work over the area of contact.

2. An abrading tool comprising a sleeve of abrasive sheet material, and a support having a large number of yieldable elongated members disposed lengthwise of said sleeve and within said sleeve to support the sleeve against the pressure of the work, each of said elongated members having one of its ends free, and being adapted yieldingly to support the abrasive sleeve and permit it to conform to the contour of the work over the area of contact.

3. A rotary abrading tool comprising a flexible abrasive sleeve, a hub adapted to be attached to a rotary spindle, and a large number of resilient elongated members disposed lengthwise of said sleeve and within said sleeve to support the sleeve against the pressure of the work, each of said elongated members being secured at one of its ends to said hub and having its opposite end free.

4. An abrading tool comprising a flexible abrasive sleeve, and a support having a large number of resilient wires disposed lengthwise of said sleeve and within said sleeve to support the sleeve against the pressure of the work, said wires being secured together at a locality adjacent to one end of the abrasive sleeve and affording a relatively stiff backing for the sleeve adjacent to that locality, and being free and relatively yielding at a locality adjacent to the opposite end of the sleeve.

5. A rotary abrading tool comprising a plural-

ity of wires adapted to carry an abrasive cover, means for supporting one end of each wire, the other end of each wire being free, said supporting means being constructed and arranged for attachment to a spindle and each of said wires extending in a direction the principal component of which extends parallel to the axis of said supporting means, and an abrasive sleeve surrounding and yieldingly supported by said wires.

6. A rotary abrading tool comprising a hub adapted to be attached to a spindle, a plurality of resilient wires for supporting an abrasive cover, each of said wires being secured at one of its ends to said hub and having its other end free and each of said wires extending in a direction the principal component of which is parallel to the axis of said hub, and a cylindrical abrasive sleeve surrounding and yieldingly supported by said wires.

7. A rotary abrading tool comprising a hub adapted to be attached to a spindle, a plurality of resilient wires for supporting an abrasive cover, each of said wires being secured at one of its ends to said hub and having its other end free, said wires being initially arranged in the form of a frustum of a cone the small end of which is defined by the attached ends of said wires, and a sleeve of flexible abrasive material mounted upon and confining said wires, said wires tending, by reason of their resilience and of their initial arrangement, to expand against said abrasive sleeve and thereby yieldingly to support said abrasive sleeve against the pressure of the work.

8. A rotary abrading tool comprising a hub adapted to be attached to a spindle, a plurality of resilient wires for supporting an abrasive cover, each of said wires being secured at one of its end to said hub and having its other end free, said wires being arranged in the form of a frustum of a cone which is coaxial with said spindle and the large end of which is defined by the free ends of said wires, and a tapered member coaxial with and extending from said hub and having its small end remote from said hub for limiting the extent to which said wires may yield inwardly under pressure of the work.

9. A rotary abrading tool comprising a tubular abrasive cover, a driven member, and a plurality of wires each supported at one end by said driven member and having its other end free, said wires being disposed within and extending substantially lengthwise of said tubular abrasive cover and thereby supporting the same.

10. A rotary abrading tool comprising a tubular abrasive cover, and means for yieldingly supporting said abrasive cover comprising a plurality of resilient wires each supported at one end and having its other end free, said wires being confined within and extending substantially lengthwise of said tubular cover and said wires being also constructed and arranged to exert an outward stress upon the interior of said tubular cover.

11. A rotary abrading tool comprising a tubular abrasive cover, a driven member, a plurality of wires each supported at one end by said driven member and having its other end free, said wires being disposed within and extending substantially lengthwise of said tubular abrasive cover to support the same, and means for holding said tubular abrasive cover against endwise movement relatively to said wires.

12. An abrasive tube composed of emery cloth and having an end portion molded to the shape of a screw thread.

13. An abrading tool comprising an abrasive tube composed of flexible abrasive-coated material and having an externally threaded metallic end portion, a support for said abrasive tube disposed within the same, and means for holding said abrasive tube against axial movement on said support, said holding means having an internal thread which engages the external thread on the metallic end portion of said abrasive tube.

14. An abrading tool comprising an abrasive tube of flexible sheet material, a support for said abrasive tube disposed within the same, said support having an externally threaded end portion, and means for holding said abrasive tube against axial movement on said support, said holding means being internally threaded to register with the threaded portion of said support, an end portion of the abrasive tube being gripped between the thread on said holding means and the thread on said support.

15. A rotary abrading tool comprising an inner hub member adapted to be attached to a spindle, an outer hub member surrounding and spaced from said inner hub member, and a plurality of resilient wires for supporting an abrasive cover, each of said wires having an end portion extending between said inner and outer hub members and having its remaining portion free, the free portions of said wires being arranged in the form of a frustum of a cone which is co-axial with said hub members and the large end of which is defined by the free ends of said wires, and said outer hub member being constructed and arranged securely and permanently to maintain said wires fixed against said inner hub member.

16. A rotary abrading tool comprising a tubular abrasive cover, a rotary member having a plurality of resilient wires confined within said abrasive cover for yieldably supporting said abrasive cover, an annular member secured upon said rotary member and surrounding a portion of said abrasive cover, said abrasive cover having another portion which extends beyond said annular member and which is thereby free for application to the work, and means for maintaining said abrasive cover in frictional engagement with said annular member to hold said abrasive cover against axial movement upon said rotary member.

JAMES L. HILDEBRAND.