Feb. 27, 1945. G. D. RICE 2,370,491

ABRADING OR BUFFING PAD

Filed Aug. 21, 1943

Fig. 1.

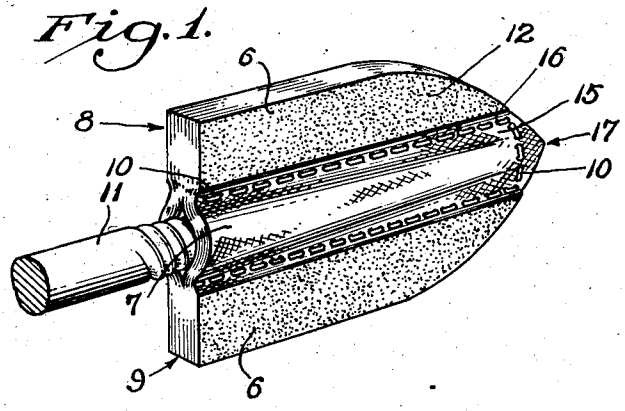


Fig. 3.

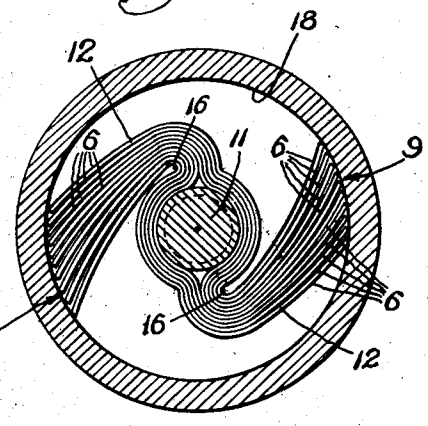


Fig. 2.

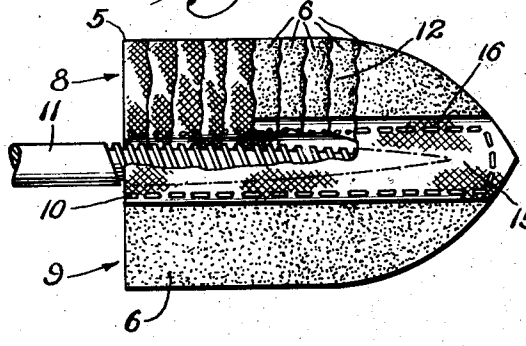
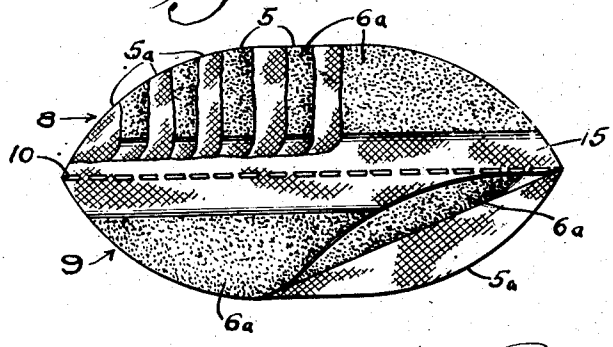


Fig. 4.



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ABRADING OR BUFFING PAD

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15 Claims. (Cl. 51—193)

The invention relates to abrading or buffing devices and more particularly to an improved multi-ply abrasive pad adapted for use with a rotatably driven shaft or mandrel.

One object of the invention is to provide a pad of the above general character which is relatively flexible and capable of conforming to bores or recesses of different diameters and shapes.

Another object is to provide an abrading pad comprising a plurality of plies of fabric or other flexible material each having a facing of abrasive particles applied on one side only and assembled in a novel manner so as to present the abrasive coatings to the work on both sides of the rotational axis of the pad.

A further object is to provide a multi-ply abrading pad constructed of abrasive sheets formed with uncoated central areas which permit the plies to be secured together by stitching without excessive wear on the needle and which enable the individual plies to flex into conformity with the surface being operated on without cracking or otherwise injuring the relatively stiff abrasive coating.

Still another object is to provide an abrading pad built up of a plurality of sheets of abrasive coated material in which the sheets are arranged in a novel manner so that the abrasive coating is presented for action when the pad is rotated in either direction about an axis extending lengthwise of the pad.

It is also an object of the invention to provide an abrading or buffing pad adapted to function efficiently in finishing a wide variety of irregular surfaces including bores and recesses of different shapes and sizes which is relatively inexpensive to manufacture.

Other objects and advantages of the invention will become apparent from the following detailed description of the preferred embodiment illustrated in the accompanying drawing in which:

Figure 1 is a perspective view of an improved abrading and buffing pad shown as mounted on a mandrel.

Fig. 2 is a side elevational view of the pad with sections of successive plies broken away to show the manner in which they are assembled.

Fig. 3 is an end view of the device as used in finishing the interior surface of the circular bore.

Fig. 4 is a side view of a modified form of the pad.

Referring to the drawing the improved pad is built up of a plurality of sheets or plies 5 consisting of a flexible backing strip such as cloth having a facing 6 of abrasive particles on at least one side. The sheets 5 are arranged one above the other in a stack and secured together along a central axis to form a central hub portion 7 with diametrically opposed projecting wing portions 8 and 9. In the form illustrated in Figs. 1, 2 and 3, the sheets 5 are provided with the abrasive facing 6 on one side only and the hub portion is defined by two parallel rows of stitching 10 extending longitudinally of the stack of sheets and spaced apart to permit the insertion of a mandrel 11 therebetween.

While the backing strips forming the plies 5 may be made of any suitable material, it is preferred to use closely woven cloth to which abrasive facing may be applied in any suitable manner. The abrasive facing may be provided on one or both sides of the backing strip as required thus forming either single or double coated plies. Plies having an abrasive facing on one side only are assembled in a novel manner so as to permit easy slippage between adjacent plies and so that the abrasive facing is presented on the leading surface of both wing portions 8 and 9 when the pad is rotated about its axis. To this end, the plies are divided into two equal piles each having the abrasive faced sides of the plies similarly accented. Thus the faced side of one ply rests against the uncoated side of the next adjacent ply, thereby permitting easy slippage between adjacent plies so that the pad may be flexed readily when twisted into the shape required to enter the bore or recess to be finished.

The two piles of plies are assembled in back-to-back relation to form the complete stack. Accordingly, the abrasive facing of one half of the plies face in one direction while the coatings of the other half of the sheets face in the opposite direction as clearly shown in Fig. 2. An abrasive faced surface is therefore presented for action on both sides of the rotational axis of the pad when the pad is rotated in either direction.

To prevent cracking or otherwise damaging the relatively stiff abrasive facing incident to the flexing of the wing portions of the pad, the abrasive facing of each ply may be removed, scored or entirely omitted from a selected area of the ply thus weakening that area and providing a clear, relatively flexible section adapted to function in the manner of a hinge. In the exemplary pad, each of the plies 5 is formed with a clear central section 15 preferably of sufficient width to leave a marginal hinge portion 16 between each row of stitches 10 and the wing portions 8 and 9. The wing portions of the plies may thus be bent sharply in either direction as shown in

Fig. 3 without cracking the abrasive facing. It will be understood, of course, that the flexible section may be located at any point where the bending of the ply is to occur.

The formation of the abrasive plies 5 with the clear areas 15 also facilitates the sewing together of the stack of plies to form the pad. Since the stitching 10 is confined to the clear area 15, a minimum of resistance is offered to the passage of the needle utilized in performing the stitching operation and excessive wear of the same is effectually avoided. Also any danger of the threads being cut by the abrasive is avoided.

In operation, a pad of the type shown in Figs. 1, 2 and 3 is mounted on a suitable mandrel or shaft and rotated at high speed. As the outer edges of the rotating pad engage the surface of the work, the wing portions 8 and 9 bend in opposite directions, the plies 5 slipping over each other in the manner of the pages of a book to expose a narrow strip of the coated face 6 of each ply for action on the work. As the edges of the plies 5 wear away, a fresh area of abrasive is presented to the work, thus enabling the pad to operate efficiently until worn down closely adjacent the hub portion 7.

To facilitate the flexing of the pad incident to its insertion into a bore 18 of smaller diameter than the pad, the plies 5 forming the pad are preferably cut with their forward end portions tapering substantially to a point as indicated at 17. With the tapered formation, bending of the plies 5 begins only after the forward end portion of the pad has been inserted in the bore and such bending increases gradually until the pad is fully inserted. The tapered form of the pad also reduces wear on the abrasive sheets.

The plies forming the pad may also be cut to provide a tapered rear end portion as shown in Fig. 4. This is particularly advantageous when working on relatively thin material, for example, in removing burrs from the edges of holes in metal plates or the like. With the double tapered construction, the pad may be pushed back and forth through the hole thus enabling it to remove the burrs from both sides of the plate.

The abrasive area of each ply actually applied against the surface of the work will depend, of course, upon the diameter to which the pad is reduced when inserted in the work. In the form shown in Fig. 1, only the first half of the leading faces of the plies on each side of the axis present their abrasive facing for action on the work. The remainder of the plies present their uncoated or clear surfaces which perform a wiping or buffing action and thus contribute to the production of a smooth finish on the work. The action of the pad is exactly the same on both sides of its rotational axis due to the novel manner in which the plies are assembled. Moreover, the same action results when the pad is rotated in either direction.

Fig. 4 illustrates certain modifications that may be made in the construction of the pad to better adapt it for certain specific operating conditions. Thus, the double tapered form of the pad as shown in this figure particularly adapts it for use on relatively thin work as explained above. Fig. 4 also shows the manner in which the plies 5 may be assembled when provided with an abrasive facing 6a on both sides. Under these conditions a plain fabric ply 5a is interposed between adjacent abrasive faced plies 5 to permit easy slippage of the plies when the pad is inserted in a bore.

In the modified form of the pad, the plies 5 are secured together by a single row of stitching 10a. The pad is thus adapted to be held in a suitable clamp, as for example a split mandrel. As in the previous instance, the plies are formed with a clear, flexible central section which functions as a hinge for the purpose heretofore explained.

In either type of pad above described, the abrasive facings 6 or 6a may be of different grades or different degrees of fineness on opposite wings 8 and 9 of the respective plies. With this construction, an abrasive facing of one grade is presented to the work when the pad is rotated in one direction while an abrasive facing of a different grade is presented when the pad is rotated in the opposite direction. Both a roughing and finishing operation can therefore be performed with the same pad.

It will be apparent from the foregoing that the invention provides an abrading or buffing pad of novel and improved construction. By utilizing abrasive faced sheets or plies having a clear, flexible central area, the stack of sheets may be stitched together without excessive wear on the needle. Bending of the sheets is facilitated by the hinge-like action of the clear areas thus avoiding cracking of the abrasive facing.

Due to the novel manner in which the plies are assembled, an abrasive surface is presented for action on the work on the leading faces of the wing portions of the pad, that is, on both sides of the rotational axis and when the pad is rotated in either direction. Insertion of the pad into a relatively small bore or recess is facilitated by the tapered construction of the sheets forming the same. In general, the abrading or buffing pad constructed in accordance with the present invention is an inexpensive yet efficient and reliable tool for finishing irregular surfaces and particularly bores and recesses of different shapes and diameters.

I claim as my invention:

1. A multi-ply abrading pad comprising, a plurality of flexible plies assembled in a stack, each of said plies having an abrasive facing on one side only, and means securing the stack of plies together along a central axis to provide oppositely disposed wing sections projecting radially from the axis and in a common plane therewith.

2. An abrading pad comprising, a plurality of flexible plies assembled in a stack, each of said plies having an abrasive coating on at least one side, and means securing the plies together to form a central hub portion extending longitudinally of the stack and a pair of wing portions projecting radially from opposite sides of said hub portion, said hub portion being adapted to receive a rotatably driven mandrel.

3. An abrading pad comprising, a plurality of flexible plies assembled in a stack, a relatively stiff abrasive facing on at least one side of each ply, and means securing the stack of plies together along an axis extending longitudinally of the stack, each of said plies being weakened to provide a hinge section adjacent said axis.

4. An abrading pad comprising, a plurality of flexible abrasive faced plies assembled in a stack, means securing the plies together along an axis extending longitudinally of the stack, each of said plies having a clear section adjacent the axis adapted to bend easily and thereby permit substantial flexing of the pad without injury to the abrasive facings of the plies.

5. An abrading pad comprising, a plurality of

flexible abrasive faced plies assembled in a stack, stitching extending across the central portion of the stack to secure the plies together, said central portion of each ply being clear of abrasive to facilitate bending of the plies substantially along the line of said stitching.

6. An abrading pad comprising, a plurality of flexible plies assembled in a stack and secured together by spaced parallel rows of stitching extending across the stack along a central axis, each of said plies having an abrasive facing on one side only extending from the outer edge of the ply to a line adjacent one of said rows of stitching, the area between the rows of stitching being clear of abrasive.

7. An abrading pad comprising, a plurality of flexible plies each faced on one side only with abrasive material and arranged in a stack, and means securing the stack of plies together along a central axis to define opposed radially projecting wing portions, said plies being assembled in back-to-back relation so that the abrasive facing is presented on the leading surface of each wing portion when the wing portions are reversely bent as the pad is rotated about said axis.

8. An abrading pad comprising, a plurality of flexible plies each coated on one side only with abrasive material and arranged in a stack, and means securing the stack of plies together along a central axis, said stack being divided into two substantially equal sections with the abrasive surfaces of the plies of each section facing outwardly of the stack.

9. An abrading pad comprising, a plurality of flexible plies each faced on one side with abrasive material and arranged in a stack, and means securing the stack of plies together along a central axis to define oppositely disposed wing portions projecting radially from the axis and in a common plane therewith, said plies being assembled in back-to-back relation so that in each wing portion substantially equal numbers of plies present their abrasive faced and unfaced sides respectively in the direction in which the wing portion advances when the pad is rotated about said axis.

10. An abrading and buffing pad comprising, a stack of flexible plies secured together along a central axis extending longitudinally of the stack and forming a pair of oppositely disposed radially projecting wing portions of substantially the same dimensions, and a facing of abrasive material on one side of each ply, said plies being assembled in a manner such that one or more of the plies adjacent the leading surface of each wing portion performs an abrading operation while the remainder of the plies perform a buffing operation when the pad is rotated about said axis in operative engagement with a workpiece.

11. An abrading pad comprising, a plurality of flexible plies arranged in a stack, each of said plies having on one side only a facing of abrasive material extending from opposite side edges of the ply to a clear area extending longitudinally of the ply, spaced parallel rows of stitching within the clear areas securing the stack of plies together and defining a central hub portion adapted to receive a rotatably driven mandrel, said plies being assembled so that the abrasive surfaces of one or more sheets is presented on the leading face of the pad on each side of the mandrel.

12. An abrading pad comprising, a stack of flexible plies secured together along a central axis by parallel rows of stitching defining a hub portion and oppositely disposed radially projecting wing portions, each of said plies having the wing portions faced on one side only with abrasive material, said rows of stitching being spaced from the abrasive faced areas so as to leave a clear marginal area therebetween for easy bending of the plies, said plies being assembled in the stack with the abrasive faced sides of one half of the plies facing in one direction and the abrasive faced sides of the other half facing in the opposite direction whereby an abrading surface is presented on the leading face of each wing portion when the pad is rotated about said hub portion.

13. A multi-ply abrading pad comprising, a plurality of abrasive faced flexible plies assembled in a stack, non-abrasive flexible plies interposed between adjacent abrasive faced plies, and means securing the plies together along an axis extending longitudinally of the stack.

14. A multi-ply abrading pad comprising, a plurality of flexible plies assembled in a stack, means securing the stack of plies together along an axis extending longitudinally of the stack to define opposed radially projecting wing portions, and an abrasive facing on at least one side of the wing portions of one or more of said plies, the abrasive facings of opposite wing portions of one ply being of different grades.

15. An abrasive element of flexible material adapted to be supported for rotation about a central longitudinal axis and presenting a stack of sheets providing radially projecting wing portions engageable with opposite sides of a hollow cylindrical workpiece, said wing portions having an abrasive coating on at least one side in back-to-back relationship and being tapered at one end to facilitate insertion of the element into a workpiece having a diameter less than the width of the element.

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