Jan. 4, 1955 P. L. JONES 2,698,783

METHOD OF MAKING POLISHING DISKS

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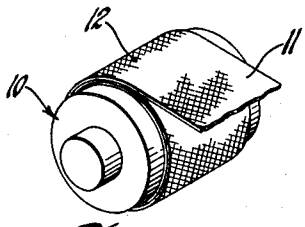


Fig. 1

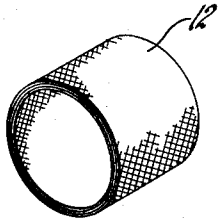


Fig. 2

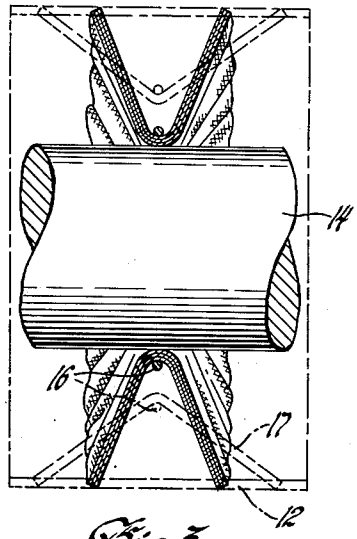


Fig. 3

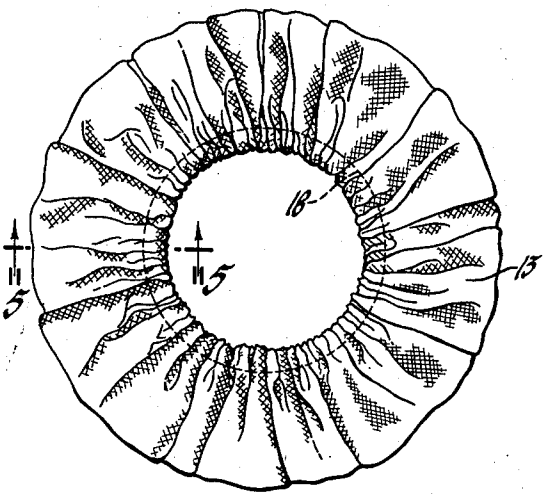


Fig. 4

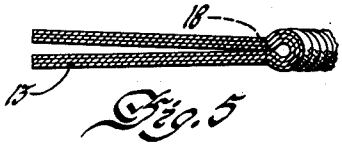


Fig. 5

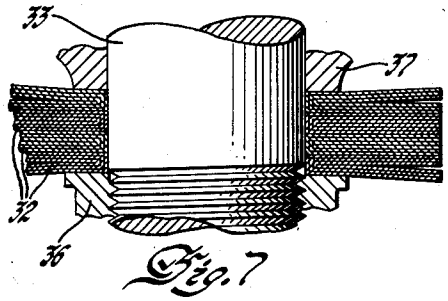


Fig. 7

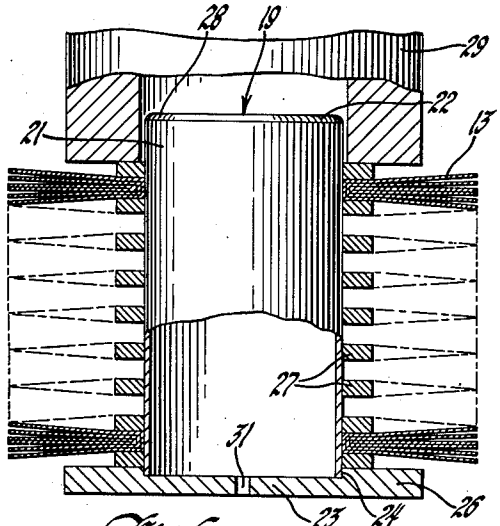


Fig. 6

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METHOD OF MAKING POLISHING DISKS

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4 Claims. (Cl. 51—293)

This invention relates to buffing or polishing discs for use in buffing or polishing various kinds of metallic and other surfaces, and, to a method of and an apparatus for forming such polishing discs to accurately fit the clamping and supporting members of a polishing tool by which such discs are operated.

Heretofore it has been customary to form polishing discs by spirally winding a strip of textile fabric material upon a cylinder or arbor and then gathering the middle portion of the cylindrically formed structure to bring the ends thereof together to provide an annular polishing tool or disc. Wire or other beads sometimes have been used for holding the middle parts together to provide a relatively permanent size or diameter for the inner peripheral parts of such dics. Such beads have been held in place and the ends of the cylinder have been held together by sewing the fabric material around and closely adjacent the beads. Polishing discs formed in this manner naturally will have irregular inner peripheral securing edges for supporting the discs, such edges consisting of successively bunched or gathered sections of irregular shapes and generally of many different but somewhat circular cross-sectional shapes. It has been the custom to force these discs upon a polishing arbor with spacing devices therebetween and then to secure the discs in operative position by tightening a nut at one end of the arbor against an annular shoulder at the other. In order to be able to force these discs upon the arbor it was necessary that the discs be made in such a way as to be only slightly smaller than the arbor. Otherwise it would be impossible to get the discs on the arbor by manual effort. When the spacing members thereafter were tightened against the inner peripheral parts of the discs, the spacing members and the arbor would tend to compress the fibrous structure of the inner peripheral parts of the discs to fit the arbor and the spacing members. However, this compressing of the fibrous structure of the discs did not occur to the maximum extent when the discs were first put on the polishing jack or machine. After the discs were run for a while, they would tend to get loose and then it would be necessary again to tighten the securing nut of the arbor. As this tightening continued, the discs would tend to stretch at the inner periphery thereof and get too large in diameter for the arbor. Intermediate all these stretching and tightening operations the discs would not be as tight and well fitting as they should be so that the operation thereof was uncertain, unsatisfactory, and unreliable.

It is now proposed to preform polishing discs of this kind, in such a way as to do all of the compressing and compacting of the inner peripheral parts of the disc before they are first applied to a polishing arbor. Hence, when the discs are clamped upon an arbor for use, the fibrous structure of the inner peripheral parts of a disc will have been previously compressed and compacted and preformed in such manner that they will fit the arbor and the clamping members of the arbor. Thereafter, when the tightening nut for the arbor is tightened to the desired extent, the discs then will run until worn out and without any further adjustment of the tightening nut.

An object of the invention, therefore, is to provide a polishing disc that will accurately fit the surface of an arbor and the annular clamping members for operating the polishing disc, so that discs can be put on an arbor without requiring excessive effort for forcing the discs onto the arbor and so that they may be clamped in such position as to remain permanently operative for polishing purposes.

Another object of the invention is to provide a method

of and an apparatus for making polishing discs that will accurately fit an arbor and the clamping members with which the discs are to be employed.

Another object of the invention is to provide a method of and an apparatus for making polishing discs by preforming and thermally setting the fibrous structure of the material of which the discs are formed.

Another object of the invention is to provide a method of and an apparatus for forming polishing discs by spirally winding a strip of fabric material to provide a cylindrical fabric work piece, contracting the middle part of the cylindrical work piece to form an irregularly gathered inner peripheral part of an annular fabric disc, and then preforming the inner peripheral part of the disc by rearranging, compressing, compacting and thermally setting the fibrous structure of the inner peripheral part of a disc, in such a way that such part will assume and permanently retain the configuration of the various clamping and supporting members of a polishing tool with which such discs are to be employed.

Other and further objects of the invention will be apparent from the specification and the drawing, and in which:

Figure 1 is a perspective view of a rotary forming member having a textile fabric strip being spirally wound upon the cylindrical surface thereof.

Figure 2 is a perspective view of a cylindrical textile fabric work piece as the work piece will appear after having been formed as is illustrated by Figure 1.

Figure 3 is a cross-sectional view illustrating the formation of an annular disc from the work piece illustrated by Figure 2. In Figure 3, the middle portion of the work piece is being contracted upon a forming tool for limiting the size of the inner peripheral part of the disc being formed, and, the ends of the cylindrical work piece are being brought together to complete the formation of such disc.

Figure 4 is a side elevational view of the disc-shape work piece after the same has been formed as is indicated by Figure 3 and after the two ends of the work piece have been stitched together around the inner peripheral parts thereof.

Figure 5 is a cross-sectional view of the disc-shape work piece illustrated by Figure 4 as the same would appear in the plane of line 5—5 on Figure 4.

Figure 6 is a vertical sectional view of an apparatus for preforming, compressing, and compacting the inner peripheral parts of the work piece illustrated by Figure 4. In Figure 6, the fibrous structure of the inner peripheral parts of the disc-shape work piece illustrated by Figure 5 are rearranged and compressed and compacted in such a way as to fit the supporting and clamping parts of a polishing tool with which such discs are to be employed as polishing or buffing discs.

Figure 7 is a fragmentary cros-sectional view of a polishing jack, machine, mechanism, or fixture, illustrating the manner in which the polishing discs formed by the process illustrated by the preceding figures are secured in operative position upon the arbor of any such device.

Referring particularly to Figure 1, the numeral **10** indicates a forming cylinder on which an elongated strip of textile fabric material indicated at **11** is adapted to be spirally wound to provide a cylindrical work piece as indicated at **12**.

The cylindrical work piece **12** is illustrated in Figure 2 after the same has been removed from the forming tool **10** illustrated by Figure 1.

In Figure 3, the cylindrical work piece **12** is indicated in dot-and-dash lines in the first step of the process by which the work piece is converted into an annular work piece as is indicated at **13** in Figure 4.

In Figure 3 the work piece **12** is positioned in any suitable manner about a cylindrical forming tool indicated at **14** and the work piece **12** is changed in shape from cylindrical shape to disc-shape by employing a spring wire or other suitable means indicated at **16**. The spring wire **16** is expanded and placed about the middle part of the work piece **12** and then is progressively released to gather by progressive stages the central portion of the work piece **12** about the forming tool **14**. The work piece **12**

is illustrated at 17, in one of the intermediate stages by which the cylindrical work piece 12 is changed into an annular work piece indicated at 13. When the spring 16 has contracted until the middle part of the work piece 12 engages the forming tool 14, the spring is removed and the ends of the work piece are brought together so as to provide an annular disc-shape work piece as indicated at 13. In order to hold the ends of the work piece together, the work piece is stitched around the inner peripheral parts thereof as is indicated at 18.

A plurality of the work pieces 13 is then placed upon a forming tool indicated at 19.

The tool 19 comprises a hollow cylindrical part 21 having a closed and chamfered end indicated at 22, while the opposite end thereof is closed by a plate 23 which is larger in diameter than the diameter of the cylindrical part 21. The central portion of the plate 23 is recessed as indicated at 24 for receiving the end of the cylindrical part or member 21. Beyond the cylindrical part 21, the plate 23 provides an outer annular part or shoulder indicated at 26, adapted to support upon the upper surface thereof a plurality of spaced annular forming members indicated at 27.

The forming members 27 have inner cylindrical surfaces adapted to accurately fit the exterior surface of the cylindrical part 21 of the forming tool to provide good thermal conductivity between the parts. With such conductivity, the spacing members 27 will be heated when the cylindrical part 21 is heated.

The opposite edges or the ends of the spacing members 27 are disposed in parallel relation and are surfaced and finished to provide smooth end surfaces of annular shape.

The work pieces 13 are positioned between the adjacent surfaces of two of the spacing members 27 to provide a series or stack of spacing members and work pieces about the outer surface of the cylindrical part 21 and resting at one end upon the outer annular part 26 of the plate 23.

The work pieces 13 are adapted to be positioned upon the cylindrical part 21 by stretching the inner peripheral surfaces of the work pieces over the relieved end surfaces 28 of the cylindrical part 21. The inner peripheral parts of the work pieces are then adapted to be compressed between the spacing members 27 by applying to the stack of such work pieces and spacing members a press such as that indicated at 29. The press 29 compresses the work pieces 13 and the spacing member 27 against the annular part 26 of the plate 23 which in turn is supported by the base plate of the press 29.

In order to be able to heat the cylindrical member 21 for evaporating water to form steam for thermally setting the fibrous structure of the inner peripheral parts of the work pieces 13, the plate 23 is provided with an opening 31 at the central portion thereof and through which any suitable liquid or gaseous heating fluid may be introduced to the interior of the cylindrical member 21. The inner peripheral parts of the work pieces 13 are sprinkled or otherwise partially saturated with water before being positioned upon the cylindrical member 21 and between the spacing members 27. When the cylindrical member 21 is heated by the introduction of heating fluid to the interior thereof as previously described, the heat will be conducted to the cylindrical inner peripheral edges of the work pieces 13 by the exterior surface of the member 21. Such heat also will be conducted to the opposite annular ends of the inner peripheral parts of the work pieces 13 by conductivity of heat from the member 21 to the spacing members 27. The heat so conducted by the cylindrical member 21 and the spacing members 27 will evaporate the moisture so applied to the inner peripheral parts of the work pieces 13 and will form steam which will thermally set the fibrous structure of the inner peripheral parts of the work pieces as the fibrous structure of such parts is compressed and compacted by the presss 29 between the cylindrical member 21 and the spacing members 27. When this heating process has been continued until all the water has been turned to steam by the conductivity of heat so described and the steam has been super-heated to some extent so that the setting of the fibrous structure will be relatively permanent, the press is opened and the stack of work pieces 13 is removed from the cylinder 21.

When removed from the forming tool 19, the work pieces 13 will provide finished polishing discs such as

are indicated by the numerals 32. The polishing discs 32 will have inner peripheral surfaces preformed to fit the exterior surfaces of the arbor 33 of the polishing device with which such discs are to be employed. Such polishing discs may be positioned on the arbor 33 merely by placing the inner peripheral parts of the discs over the end of the arbor and pressing the discs firmly upon the arbor. The discs do not require excessive stretching in order to fit the arbor.

The inner peripheral parts of the discs 32 also fit the adjacent surfaces of the securing nut 36, of the securing shoulder 37 and of spacing members which may or may not be employed about the arbor 33 and between the polishing discs 32. When the securing nut 36 for the arbor 33 is tightened on the threaded end of the arbor, the inner peripheral parts of the polishing discs 32 will be securely and permanently clamped between the members 36 and the securing shoulder 37 which is keyed or otherwise secured to the arbor 33. Thereafter the polishing fixture or device may be operated at will without having the polishing discs 32 become loosened upon or otherwise improperly fitting the arbor 33.

I claim:

1. A method of forming polishing discs comprising spirally winding a strip of fabric material to provide a flexible fabric ring, contracting the middle portion of said ring and closing the edges thereof to provide a flexible annular disc, dampening the inner edge of said disc with water, disposing said inner edge in a forming tool of predetermined cross-sectional configuration, applying pressure to said forming tool for compressing and compacting the fibrous structure of said ring to closely fit the surface configuration of said forming tool, and heating and evaporating said water to form steam for setting said fibrous structure to retain said cross-sectional configuration of said tool.

2. A method of forming polishing discs comprising forming a flexible fabric ring, contracting the middle portion of said ring and closing the edges thereof to provide a flexible annular disc, dampening the inner edge of said disc with water, disposing said inner edge in a forming tool of predetermined cross-sectional configuration, applying pressure to said forming tool for compressing and compacting the fibrous structure of said ring to closely fit the surface configuration of said forming tool and heating, and evaporating said water to form steam for setting said fibrous structure to retain said cross-sectional configuration of said tool.

3. A method of forming polishing discs comprising forming a strip of fabric material to provide a flexible annular disc, disposing the inner edge of said disc in a forming tool of predetermined cross-sectional configuration, applying pressure to said forming tool for compressing and compacting the fibrous structure of said edge to closely fit the surface configuration of said forming tool, and applying steam to said edge for setting said fibrous structure to retain said cross-sectional configuration of said tool.

4. A method of forming polishing discs comprising spirally winding a strip of fabric material to provide a flexible fabric ring, contracting the middle portion of said ring and closing the edges thereof to provide a flexible annular disc, disposing said disc in a forming tool of predetermined cross-sectional configuration, applying pressure to said forming tool for compressing and compacting the fibrous structure of said disc to closely fit the surface configuration of said forming tool, and applying steam to said disc for setting said fibrous structure to retain said cross-sectional configuration of said tool.

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