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FLEXIBLE ABRASIVE BANDS

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Fig. 1.

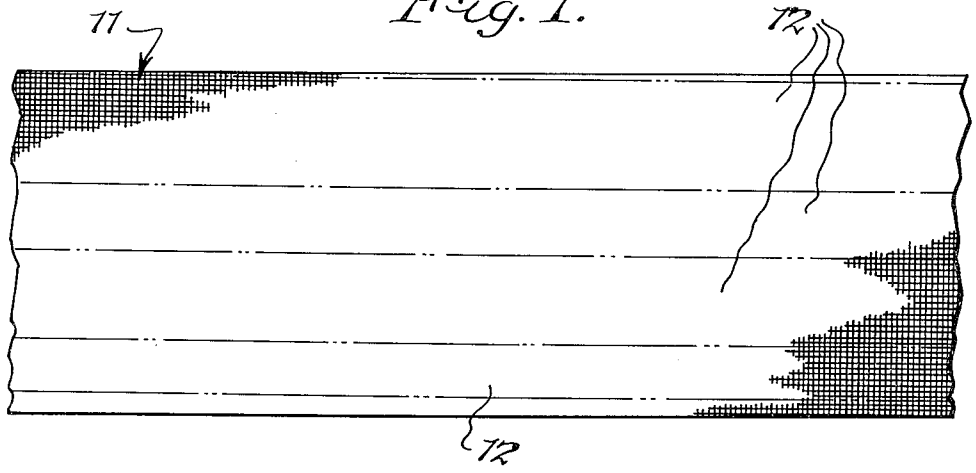
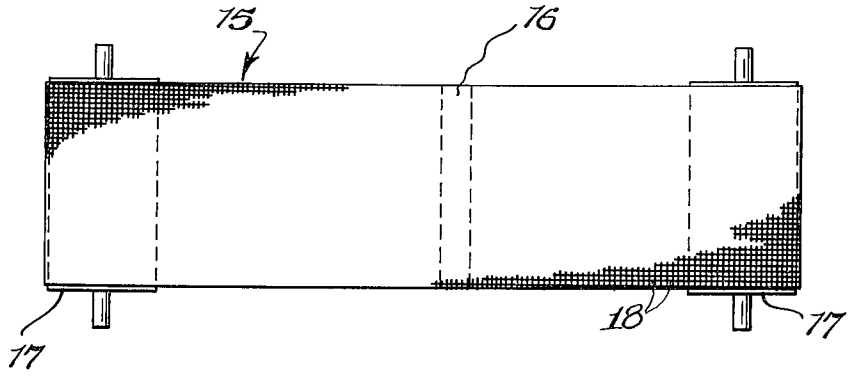


Fig. 2.



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FLEXIBLE ABRASIVE BANDS

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This invention relates to flexible abrasive bands and is particularly concerned with abrasive bands formed from strips of open-mesh abrasive-coated fabrics that are secured together at their ends.

Flexible abrasive bands, belts, sleeves, and the like (these articles being hereinafter referred to generically as abrasive bands), are in extensive use for wood and metal finishing. Conventional abrasive belts and the like are formed from strips of abrasive-coated paper or cloth by securing the ends of the strips together in suitable fashion such as by the use of adhesives. Abrasive bands have also been made from open-mesh, abrasive-coated fabrics of the type shown and claimed in U.S. Patent No. 2,740,239, the process used being similar to that employed in manufacturing conventional abrasive belts. In general, the conventional method comprises slitting the wide web of abrasive-coated fabric that is produced on the coating machine parallel with the length of said web to form strips of the desired width, cutting off the strips at the length desired, removing abrasive from opposite sides of the ends of the strips, and fastening the ends of the respective strips together by adhesive, with the cleared portions thereof in contact.

It has been found that flexible abrasive belts formed of open-mesh, abrasive-coated fabrics when used in polishing metal often produce a finish which may be described as "lined," the metal surface having a plurality of shallow grooves and small ridges alternating across the work piece in a direction normal to the travel of the abrasive belt. This apparently results from the reticular character of such belts and the consequent concentration of abrasive particles along substantially continuous and parallel longitudinal lines thereon. With abrasive belts formed from conventional abrasive-coated paper and cloth difficulties with "lining" in polishing metal are not encountered because the particles of abrasive material are substantially uniformly and randomly distributed over the surface of the backing. Nevertheless, the advantages of abrasive belts formed from open-mesh, abrasive-coated fabrics in coolness of cutting and in economy are so great that it is desirable to use them.

Accordingly, it is an object of the present invention to provide flexible abrasive bands formed from strips of open-mesh, abrasive-coated fabric materials secured together at their respective ends, which do not produce a "lined" finish in polishing metals.

Another object of the present invention is to provide flexible abrasive bands, formed from strips of open-mesh, abrasive-coated fabric materials secured together at their respective ends which produce a very smooth surface in polishing metals.

Other objects and advantages of the present invention will be apparent from the following description taken in conjunction with the drawings in which:

FIGURE 1 is a fragmentary, plan view of a web of open-mesh, abrasive-coated fabric showing the strips used in making flexible abrasive bands according to the invention; and

FIGURE 2 is a top plan view of a flexible abrasive belt according to the invention.

The open-mesh, abrasive-coated fabric material from which flexible abrasive bands are formed, according to the present invention, preferably comprises an open-mesh base fabric woven from continuous filament yarns such as

nylon, rayon, glass and the like. Prior to application of the abrasive coating to the yarns of the open-mesh base fabric the yarns thereof are preferably impregnated and/or coated, while the fabric is still under normal tension on the loom, with a flexible material such as neoprene latex which is thereafter cured before removing the fabric from the loom. The flexible coating material prevents penetration of the yarns of the fabric by the adhesive or bond that is used for securing the abrasive particles thereon and permits the production of very flexible abrasive webs. In addition the fabric is more durable and useful since the fabric yarns are attached at their points of interlacing and the mesh openings therein are more uniform.

Any desired type or types of natural or synthetic abrasive material may be used in forming the abrasive coatings on the yarns of the open-mesh fabric and the abrasive material or materials employed may be used in any suitable grit size or combination thereof and as single particles or bonded aggregates of particles. The abrasive granules are secured over the entire exposed surfaces of the coated fabric yarns by a suitable adhesive. The abrasive coating or deposit on the yarns may vary in thickness. However, the mesh openings of the fabric should not be completely filled, it being desirable for a substantial portion of each mesh opening to be left clear and unobstructed. Flexible abrasive bands made therefrom are therefore reticular.

Preferably the adhesive for the abrasive granules is relatively hard and inert to prevent softening thereof by the heat produced in grinding or polishing operations or by the coolants commonly employed in such operations. While other bonds or adhesives may be used, heat-setting, phenol-formaldehyde condensation product, liquid resins have been found to be generally suitable. When cured by heat, such adhesives are substantially insoluble in most solvents and are little, if any, affected by moderate temperatures.

The open-mesh base fabric may be of any desired type of weave although it has been found desirable in many cases to use multiple yarns in either the warp or filling or both. In using multiple yarns two, three, or even more yarns are juxtaposed and may, for weaving purposes, be treated as a single flattened, wide yarn. Such multiple yarns may be employed in various weaves. The sizes of the yarns used may vary widely depending upon the intended use of the product, the strength of the yarns, the intended cloth count of the fabric and the desired size of mesh openings. The yarns in the warp and filling may be the same or different in size.

More detailed information concerning the manufacture and nature of open-mesh, abrasive coated fabric material of the type used in forming abrasive bands according to the present invention is contained in U.S. Patent No. 2,740,239.

It has now been discovered that the "lining" hitherto often produced in polishing metal with abrasive belts formed of strips of open-mesh, abrasive-coated fabric material joined together at their respective ends may be substantially prevented by cutting the strips from which the belts are made diagonally at a small angle with respect to the length of the abrasive-coated fabric web. This is illustrated in FIGURE 1 in which the web **11** of a flexible open-mesh, abrasive-coated fabric material may have a plurality of strips **12** cut therefrom on the bias. The strips may be, as shown, of different widths as required for the desired abrasive belts.

The strips **12** after cutting may be formed into belts or other types of bands by splicing or joining the ends in any suitable way. According to a method which is preferred for most purposes the ends of the strip are squared

and a small area at each end, but on opposite sides thereof, is then cleared of abrasive particles by scraping, buffing or the like. The cleared ends after being coated with a suitable adhesive are brought together in overlapping relation and firmly clamped while the adhesive sets.

In FIGURE 2 there is illustrated, and indicated by the numeral 15, a flexible abrasive belt of the type resulting. The ends of the strip from which the belt 15 was formed are spliced as indicated at 16 and the belt is shown mounted on a pair of pulleys 17. It will be seen that the warp yarns 18 of the fabric strip forming the belt 15 (that is those yarns running longitudinally of the strip) are at an angle to the edge of the belt.

The type of adhesive employed for splicing the ends of the abrasive strips will ordinarily vary with the bond or adhesive used for the abrasive granules since the adhesives should be compatible and the curing conditions required for the former should not damage the latter. When a phenol-formaldehyde condensation product abrasive bond or adhesive is used, a liquid phenolic resin adhesive is preferred for splicing and the ends of the strip are clamped while the adhesive is set and cured by heating. There are commercially available a great many suitable phenolic resin adhesive that cure at temperatures as low as 280° F. in a resonable time, and any of these may be employed.

The joints of flexible abrasive bands produced in accordance with the present invention may extend across the width of the band normal to the length thereof as shown in FIGURE 2 or may, if desired, be diagonal. Further, if desired, other suitable and desired configurations for splices of the types known in the abrasive band art may be used. It is, of course, desirable in forming the joint or splice to have it as thin as possible, thereby to minimize irregular polishing action resulting from differences in thickness of the band. If it is desired to preserve as much as possible the open mesh or reticular characteristics of the abrasive coated fabric material from which the strips are cut, the method and apparatus described in U.S. Patent No. 2,778,169 may be employed in forming bands from such strips so that the mesh openings of the overlapping portions of the splice or joint may be in registry to the maximum extent possible.

Flexible abrasive bands made in accordance with the present invention from strips of open-mesh, abrasive-coated fabric material are highly effective in preventing "lining" of a metal surface when used for polishing. It has been found by experimentation that a belt angle of 0.5° is sufficient to give satisfactorily smooth finishes with the lining effect being substantially absent. With coarse abrasive grits somewhat improved finishes may be obtained with belt angles of 0.75°–1.0°. The belt angle thus expressed is not only the angle of the edge of the strip from which the belt is made with the length of the web from which it is cut, but is also the angle of the warp yarns in the strip with respect to a line parallel with the length of the strip and the edge of the belt. Somewhat larger belt angles may be employed, but there is generally no necessity therefor and, indeed, an excessive belt angle is to be avoided since the uneven stress on the fabric causes the belts to stretch and wear rapidly. It is, therefore, recommended that the angle not exceed 2.5°.

It will be evident from the foregoing description that there is provided by the present invention a highly desirable improvement in the manufacture of flexible abrasive bands from open-mesh, abrasive-coated fabric strips.

It will also be recognized that numerous variations and modifications in the process described and in the improved abrasive belts produced may be made without departing from the spirit of the invention. Thus, for example, short lengths of bias-cut strips may be adhesively spliced, end-to-end to form flexible abrasive belts, bands or sleeves in accordance with the invention. In this connection, it should be considered that the difference between a band and a belt is often only a matter of relative size. Accordingly, it is desired that the present invention should not be interpreted narrowly but should be construed as broadly as is permitted by the appended claims.

I claim:

1. A flexible, reticular, abrasive band formed from a strip of an abrasive-coated fabric, the ends of said strip being firmly attached together, and having the warp yarns thereof at an angle of from about 0.5° to 2.5° with respect to a line parallel with the length of said strip and the edge of said band, said abrasive coated fabric comprising an open-mesh fabric having abrasive granules adhesively secured over the entire exposed surfaces of the yarns of said fabric but not filling the mesh openings of said fabric.

2. A flexible, reticular, abrasive band formed from a strip of an abrasive-coated fabric, the ends of said strip being firmly attached together in overlapping relation and the warp yarns of said strip being disposed at an angle of from about 0.5° to 2.5° with respect to a line parallel with the length of said strip and the edge of said band, said abrasive coated fabric comprising an open-mesh fabric having abrasive granules adhesively secured over the entire exposed surfaces of the yarns of said fabric but not filling the mesh openings of said fabric.

3. A flexible, reticular, abrasive band consisting of a strip of abrasive-coated fabric having the ends thereof adhesively secured together in overlapping relation, the warp yarns of said strip being disposed at an angle of from about 0.5° to 2.5° with respect to a line parallel with the length of said strip and the edge of said band, said abrasive coated fabric comprising an open-mesh fabric having abrasive granules adhesively secured over the entire exposed surfaces of the yarns of said fabric but not filling the mesh openings of said fabric.

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