Jan. 29, 1963 C. S. MILLER 3,075,222

POLISHING PAD

Filed Nov. 4, 1959

FIG. 1

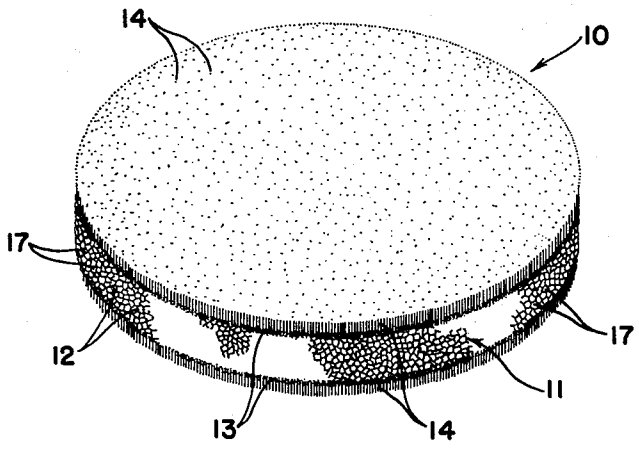


FIG. 2

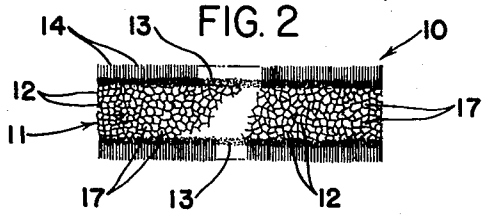


FIG. 3

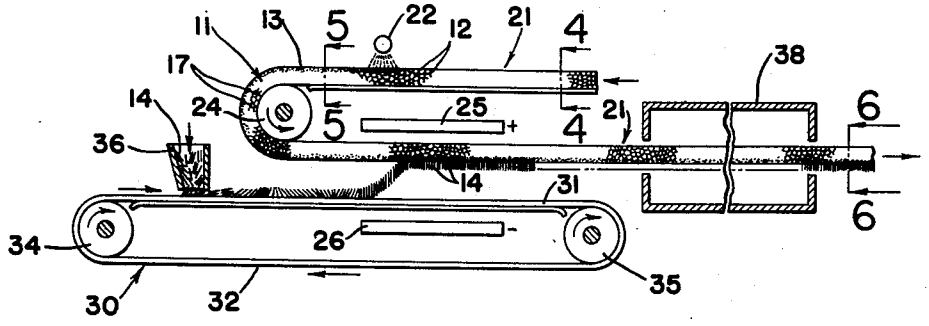


FIG. 4

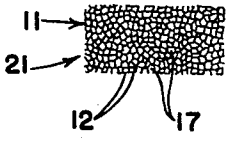


FIG. 5

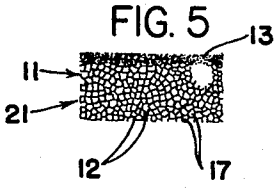
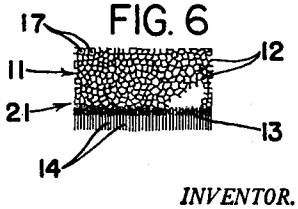


FIG. 6



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3,075,222

POLISHING PAD

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1 Claim. (Cl. 15—209)

This invention relates to a novel and improved polishing and buffing pad, and more particularly to a polishing pad for use in connection with a mechanically or electrically operated floor polisher, as well as for use in the hand polishing of highly finished surfaces.

An object of this invention is to provide a polishing and buffing pad that is superior in imparting to smooth surfaces a highly polished and glossy finish quickly and with a minimum of effort, that has a long service life, and that is odorless, rotproof, non-allergic and sanitary.

A further object is to provide a polishing pad that is superior in polishing properties when used with rotating floor brushes.

Other objects will be apparent from the following specification and the annexed drawing in which

FIG. 1 is a view in perspective of a circular polishing pad constructed in accord with this invention;

FIG. 2 is a fragmentary sectional view of the pad of FIG. 1;

FIG. 3 is a diagrammatic view illustrating a method of making the polishing pad;

FIGS. 4, 5 and 6 are each fragmentary cross-sectional views taken on lines 4—4, 5—5, and 6—6, respectively.

The polishing pad of this invention as a whole is represented by the reference numeral 10, and consists of a reticulated body portion 11 made up of intertwining interlocking fine thread-like polyurethane filaments 12, film 13 of a pliable adhesive forcefully applied to the surfaces of the body portion 11 so as to coat the filaments 12 deep down into the body portion 11 with the film 13 of pliable adhesive, and short-cut fibers 14, standing upright in parallel relation to each other and having one end of each of the fibers embedded in the pliable adhesive film 13 on the filaments 12.

The reticulated body portion 11 is preferably made of polyurethane thread-like intertwining and interlocking filaments 12, which filaments 12 are of a small cross-section, such as from 9 to 100 microns, and are so associated as to produce a fully skeletal structure having intercommunicating open spaces or chambers 17, more or less of uniform size and substantially uniformly distributed throughout the body portion 11. While the size of the open spaces or chambers 17 is not critical, it has been found that, for the purposes of this invention, the reticulated body portion 11 having the open spaces 17 defined by the thread-like filaments 12 of polyurethane of the order of $\frac{1}{100}$ to $\frac{1}{20}$ of an inch at the maximum dimensions between the filaments 12 is desirable, although smaller or larger open spaces 17 may be satisfactorily employed. A reticulated body portion 11 having from 60 to 80 spaces 17 to an inch has been found to give excellent results.

The filaments 12 in the reticulated body portion 11 are preferably of high tenacity polyurethane of great strength, very tough, highly abrasion resistant and, at the same time, are highly resilient, recovering their original position in the body portion 11, when pressure is removed, even after months of repeated distortion incident to the use of the pad 10 for polishing, a property which imparts to the pad high efficiency over a long service life, and adapts it for use in power operated polishing machines.

It has also been discovered by applicant that the efficacy of the polishing pad 10 is greatly increased by

having the fibers 14 protrude outwardly from, and generally normal to, the surface of the reticulated body portion 11; that is, extending in a generally parallel relation to each other, one end of each fiber 14 being embedded in the pliable plastic film 13 on the filaments 12.

The fibers 14 are textile fibers, such as nylon, rayon, acetate, Orlon, Dacron, Acrilan, Creslan, vinyl and like synthetic fibers, as well as natural fibers of cotton, wool, sisal, flax and hemp. The fibers should preferably be of a size (diameter in cross-section) ranging from 9 to 100 microns, and in length from $\frac{1}{16}$ to $\frac{1}{4}$ of an inch, although it is to be understood that fibers of smaller or larger diameter and of less or greater length may be employed. Preferably, each of the fibers 14 is of substantially the same length, although considerable variation in lengths has been found to be permissible. Commercial "flocks," i.e., short cut staple fibers, have been employed with satisfactory results.

The surface film 13 of adhesive is forcefully applied to the individual filaments 12 lying in a zone adjacent to the surface of the reticulated body portion 11 in any suitable manner, as by pressure spraying with a liquid adhesive which readily solidifies to a flexible solid film upon standing or on being subjected to heat. Thus, the liquid adhesive may be applied by power spraying minute particles of the liquid adhesive onto the filaments 12 in the surface zone of the reticulated body portion 11, the spraying being effected with such force as will drive the particles of adhesive deep down into the reticulated body portion 11 so as to coat the filaments 12 in the surface zone with a film 13 of adhesive without bridging the open spaces 17.

Applicant has also discovered that a polyanil liquid adhesive is most effective in the production of the polishing pad 10, in that it imparts better service life to the pad. Thus, the following adhesive gives superior results:

Adhesive Recipe

Ingredients:	Parts by weight
Multranil 176 (20% sol. of polyanil in ethyl acetate and acetone)	100
Arachlor 1254 (polychlorinated polyphenol)	20
Mondur C (75% polyisocyanate and 25% ethyl acetate)	5
Ethyl acetate	50
Thinner (acetone, methyl-ethyl ketone, etc.) up to	50

The above ingredients are thoroughly admixed and are then ready for use in a power spray apparatus. It is to be understood, as is customary in the industry, that a less or greater proportion of the thinner will be employed to give to the liquid adhesive a spraying consistency, and that other thinners than the one specified may be employed.

It is feasible to produce the polishing pad 10 of this invention by forming the body portion 11 of the required size, shape and thickness, forcefully applying the liquid adhesive film 13 to the filaments 12 in the surface zone of the body portion 11, and then blowing the fibers 14 through an electrostatic field on to the liquid adhesive coated filaments 12 of the surface zone of the body portion 11, after which the liquid adhesive film 13 is converted into a flexible and pliable solid into which one end of each of the fibers 14 is embedded and securely attached to the body portion 11.

Applicant has discovered, however, that in production operations it may be preferable to produce the polishing pad 10 of this invention from lengths of reticulated polyurethane of the character of the body portion 11, as above described, and of the required thickness, which normally ranges from ¼ to 1 inch thick. It is understood that the

thickness of the reticulated polyurethane body portion **11** is not critical and is chosen to meet the requirements of the particular polishing operations in which the pad is to be used.

According to the method discovered by applicant, which is illustrated in FIGS. 3 to 6 of the drawing, a continuous length **21** of reticulated polyurethane, of the character of the body portion **11**, above described, is passed under a series of high pressure spray nozzles **22** which give a uniform film coating **13** to the filaments **12** in the surface zone of the reticulated polyurethane passing thereunder; then the adhesive coated reticulated polyurethane is passed downwardly around a roll **24** and then horizontally, with the adhesive side facing downwardly, through an electrostatic field established by an upper horizontally disposed positive plate electrode **25** and a lower negative plate electrode **26** spaced from and parallel to the positive electrode **25**. A feeder belt **30**, having a horizontally moving upper reach **31** and a lower reach **32** is disposed so that the upper reach **31** passes horizontally through the electrostatic field beneath and spaced from the adhesive coated reticulated polyurethane and the lower reach **32** passes beneath, and outside of, the electrostatic field. As shown, two rollers **34** and **35** support the belt **30** in place. A vibrating hopper **36**, containing cut fibers **14**, is disposed near the end of the belt **30**, and is adapted to deposit a predetermined amount of fibers **14** uniformly on the upper reach **31**, which carries the fibers **14** into the electrostatic field, parallel to, spaced from and beneath the adhesive coated reticulated polyurethane length **21**. When the fibers **14** on the moving belt **30** enter into the electrostatic field, each fiber is electrostatically charged and whisked up, end on, to the adhesive film **13** on the filaments **12** and partially embedded, end on, in the adhesive film **13**. Because the fibers all have the same polarity, they repel one another uniformly and space themselves at equal distances apart, all fibers being parallel to each other and protruding erectly from the adhesively coated reticulated polyurethane length **21**. Densities of from 50,000 to 300,000 erect fibers **14** per square inch may be obtained, the number of erect fibers **14** depending on the number of fibers fed to the upper reach **31** of the belt **30** by the hopper **36**. The potential required to produce a satisfactorily operative electrostatic field varies from 50,000 to 100,000 volts.

The reticulated polyurethane length **21** may pass from the electrostatic field into a chamber **38**, which is provided with means for converting the liquid adhesive film **13** on the filaments **12** into flexible pliable solids which will firmly hold the ends of the fibers **14** embedded therein. In the chamber **38**, means for accelerating the setting or solidification of the liquid adhesive films may be provided, such as infra red electric lamps, or other heating or setting means. In the event that it is desired to have the fibers **14** protruding from each of the sides of the reticulated polyurethane, the process hereinabove described is repeated, so as to build the erect fibers **14** on the other side of the reticulated polyurethane.

When the reticulated polyurethane length **21** has been produced, with the fibers **14** protruding from one or both sides, it is cut into polishing pads of the sizes and shapes required for the various polishing operations to which the pads are to be put.

In FIG. 1, the polishing pad **10** is shown as circular in shape, to adapt it for use with rotating-head polishing machines of the type now commonly used for polishing floors and other smooth surfaces, and the fibers **14** embedded in the pliable adhesive **13** protrude from each side of the reticulated body portion **11** of the pad **10**, to make the pad reversible. However, it is to be understood that the polishing pad **10** may be of any other desirable shape, such as rectangular, for use in connection with other polishing equipment, as the well known hand operated polisher mounted on a handle and effecting its polishing action by a to-and-fro motion of the polishing pad over the surface to be polished. In addition, the polishing pad **10** may be made of a size and shape to fit the hand, or to fit any of the well known polishing devices. Again, it has been found desirable for certain uses to have the fibers **14** embedded in the adhesive film **13** on only one side of the reticulated body portion **11**, and to have the other side of body portion **11** free of any surface covering, as shown in FIG. 6. This enables the polyurethane filaments **12** in the uncovered surface portions of the polishing pad **10** to be used for the preliminary removal of any foreign substances on the surfaces to be polished. In any of the forms hereinabove described, the polishing pad **10** is highly effective in the polishing of finished and/or glossy surfaces.

While there is described above what are considered to be preferred embodiments of this invention, it is evident that various modifications can be made in the specific structures herein disclosed and in the specific processes described, without departing from the purview of this invention, and that such modifications and substitutions may be made therein without departing from the scope of this invention as defined in the appended claim.

What is claimed is:

A polishing and buffing pad, particularly for use in rotating floor polishers comprising a unitary reticulated slab made up of a fully skeletal unitary structure of intersecting resilient polyurethane filaments all of which are integrally joined together to form a multiplicity of intercommunicating apertures predominantly substantially uniform in size and distribution, the maximum dimension of said apertures ranging from $\frac{1}{100}$ to $\frac{1}{20}$ inch, a pliable adhesive film on those portions of the filaments located in a zone adjacent to and extending inwardly from the surface of the slab, and short-cut fibers of substantially uniform length standing substantially upright with respect to the adjacent surface of the slab and substantially parallel to each other with one end of each fiber bonded by said pliable adhesive film to a filament.

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