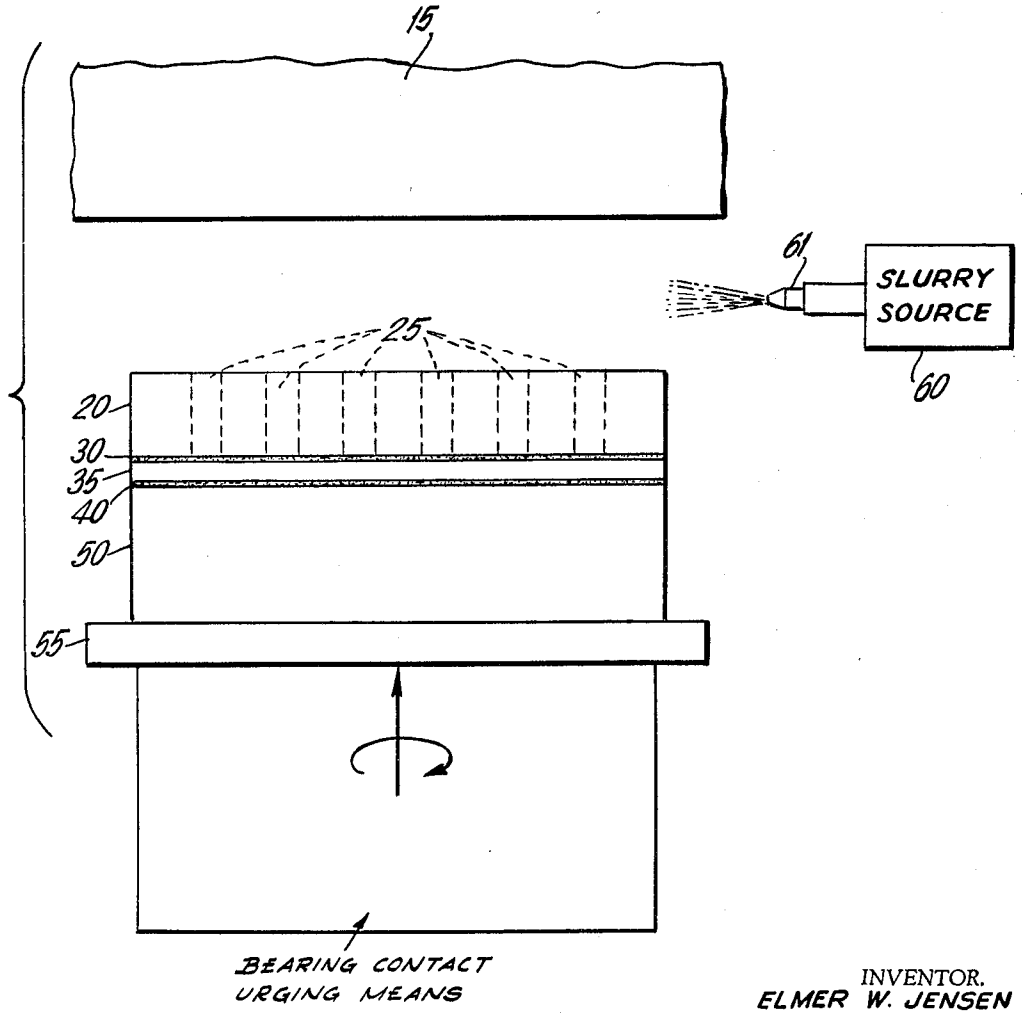
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POLISHING APPARATUS

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POLISHING APPARATUS

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ABSTRACT OF THE DISCLOSURE

An organization for polishing bulk materials such as glass, stone, metals or the like, includes layers of a poromeric material such as Corfam and sponge rubber to produce an internal self-cleaning, waste material expelling mechanism.

This invention relates to apparatus for effecting polishing operations. The application is a continuation-in-part of my pending application Ser. No. 562,757, filed July 5, 1966.

There is extensive present applications for materials to impart a highly polished finish to glass, Corning Ware (a trademark of the Corning Glass Works for a ceramic composition), stone and the like. To effect such finishing, a polishing cloth is typically used in conjunction with an abrasive polishing slurry.

However, prior art compositions which have heretofore embodied polishing cloths have been characterized by one or more of the following deficiencies: (1) temperature sensitivity, and therefore instability at high polishing rates; (2) heterogeneous consistency; (3) a propensity to pick up and retain foreign elements; (4) poor wear characteristics requiring frequent replacement; (5) variations from sample to sample; (6) the characteristic of being impermeable and thereby preventing a polishing slurry from reaching all surface areas of a work material being operated upon; (7) relatively little tensile strength, thereby being subject to distortion; and (8) a resistance to bonding thereby being difficult to affix to cooperating compositions and/or a lapping plate.

To expand upon item (3) above, a polishing cloth for finishing bulk materials must be self-cleaning, i.e., must have an internal mechanism to expel large slurry or waste particles thrown off by the subject material when materials of relatively large size, such as those illustratively specified above, are polished. Failure to expel these undesirable particles will cause scratching, rather than polishing of the workpiece surface, and also results in destruction of the polishing material when the requisite high polishing speeds are employed.

It is therefore an object of the present invention to provide an improved apparatus for polishing workpieces.

More specifically, an object of the present invention is the provision of a resilient, homogeneous polishing organization which is porous, relatively insensitive to temperature, and which is self-cleaning, i.e., which expels undesirable waste products.

These and other objects of the present invention are realized in a specific illustrative polishing organization which comprises a layer of Corfam (a trademark of the Du Pont Corporation for poromeric material, i.e., a microporous and permeable coriaceous nonwoven sheet comprising a urethane polymer base reinforced with polyester), having a plurality of apertures therethrough. A layer of sponge rubber is disposed between the Corfam material and a polishing mechanism such as a lapping or polishing plate.

The active Corfam surface is made flat, and is adapted to polish workpieces brought in frictional contact therewith. A Corfam composition including the above-mentioned apertures cooperates with the sponge rubber layer to impart a living texture, i.e., the properties of compressibility and resiliency to the composite polishing organization. Accordingly, the Corfam composition expels rather than retains slurry particles and waste materials from the workpiece coming in contact therewith.

A complete understanding of the present invention and of the above and other objects thereof may be gained from a consideration of an illustrative embodiment thereof depicted in the accompanying drawing.

Referring now to the drawing, there is shown in elevation form an illustrative polishing organization which embodies the principles of the present invention. The arrangement includes a layer of Corfam **20** having a layer of Buna-N rubber **35** affixed thereto via an adhesive **30**. The Corfam **20** has a plurality of apertures **25** therethrough from its active upper polishing surface to, and optionally through the Buna-N rubber **35**. The function of these apertures **25** is presented hereinbelow. A pressure sensitive clean release adhesive **40** is employed to bond the Buna-N rubber **35** to a layer of sponge rubber **50**. It is noted that other poromeric materials, as well as other compositions embodying the attributes of Corfam described herein may be employed in place of the Corfam **20**.

The Corfam **20** is fabricated such that the active, or upper surface thereof exhibits the requisite flatness for a particular polishing operation (assuming that a flat surface is desired for a workpiece). To effect such polishing, the layer **20** is urged into bearing pressure contact with a material **15** to be polished, with such elements **15** typically comprising, for example, glass, stone, metal surfaces, Corning Ware or the like. The polishing is advantageously performed in a slurry environment, with a slurry being supplied by a source **60** thereof via a nozzle **61**.

The Corfam material **20** is very porous, and hence the slurry is translated by the layer **20** to all portions of the surface of the element **15** thereby effecting uniform polishing. Also, the Corfam material **20** is essentially insensitive to temperature, at least in the temperature range of interest for polishing operations. Accordingly, polishing may be accomplished at the high rates of speed required for relatively large workpieces. Moreover, the Corfam **20** is homogeneous, and may be fabricated in relatively large quantities to produce many uniform polishing elements without material variation from sample to sample.

With large, bulk work elements **15** as illustratively enumerated above, prior art polishing cloths have worn very rapidly. In such polishing applications, the large, hard waste particles from the subject workpiece, and large abrasive particles in the slurry, become embedded in the cloth. Then when the cloth rubs against the workpiece at the characteristic high rate of speed, the trapped particles operate to rapidly destroy the polishing cloth.

According to one aspect of the present invention, the Corfam **20** with its associated axial apertures **25**, acting in cooperation with the sponge rubber **50**, impart a "living" texture to the cloth. That is, when the polishing surface is depressed by an applied pressure, it will spring back when the pressure is removed. Further, such a depression may traverse across the polishing surface. These qualities have been found to impart a self-cleaning property to the composite polishing cloth, i.e., to enable it to expel any waste particles with which it comes in contact. This, in turn, imparts a long service life to the polishing organization, which is not self-consuming when effecting its polishing function.

As an additional feature, the active, upper surface of the Corfam layer **20** can be treated or impregnated for special polishing operations. Such treatment may comprise, for example, brushing, knapping, skiving or texturing the Corfam surface to increase the active polishing area, or calendaring the surface to increase its flatness.

By way of functional operation, the composite laminated polishing operation 20–25–30–35–40–45–50 is urged in rotational bearing contact by a lapping plate **55** or the like in the presence of slurry supplied by the source **60**. The resulting frictional interface between the upper surface of the Corfam **20** and the workpiece **15** imparts the desired polished surface to the member **15**. During such polishing, the characteristic living texture for the composite organization is effective to expel all undesirable particles to ensure a prolonged life for the Corfam material **20**.

It is noted at this point that the clean release adhesive **40**, and the Buna-N rubber **30** to which such an adhesive readily bonds, are employed to facilitate the removal of the Corfam **20** from the sponge rubber **50** at the termination of useful life for the active layer **20**. If desired, the sponge rubber **50** may be affixed to the Corfam **20**, either directly cured therein or attached by any of the well known adhesives therefor.

It is to be understood that the above-described method and organization are only illustrative of the application of the principles of the present invention. Numerous other arrangements and modes of operation may be devised by those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. In combination in a polishing apparatus, a poromeric material having a first operative polishing surface and an oppositely disposed second surface, a plurality of vacated apertures formed in said poromeric material and included in said first poromeric surface and aligned toward said second surface, and a layer of compressible material affixed to said second surface of said poromeric material.

2. The combination as in claim **1** wherein said compressible material comprises sponge rubber.

3. The combination as in claim **1** further comprising a layer of Buna-N rubber interposed between said second surface of said poromeric material and said compressible material.

4. The combination as in claim **3** further comprising a pressure sensitive clean release adhesive interposed between said Buna-N rubber and said sponge rubber.

5. In combination in a polishing organization, a poromeric material having a plurality of vacated, formed, apertures in said poromeric material separate from the natural properties of said poromeric material, and means for urging work pieces to be polished into bearing contact with said poromeric material.

6. The combination as in claim **5** further comprising a layer of compressible material interposed between said poromeric material and said urging means.

7. The combination as in claim **6** wherein said compressible material comprises sponge rubber.

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51—401; 161—160