

June 11, 1963

B. TOCCI-GUILBERT

3,092,937

POLISHING AND ABRADING APPARATUS

Filed March 30, 1961

3 Sheets-Sheet 2

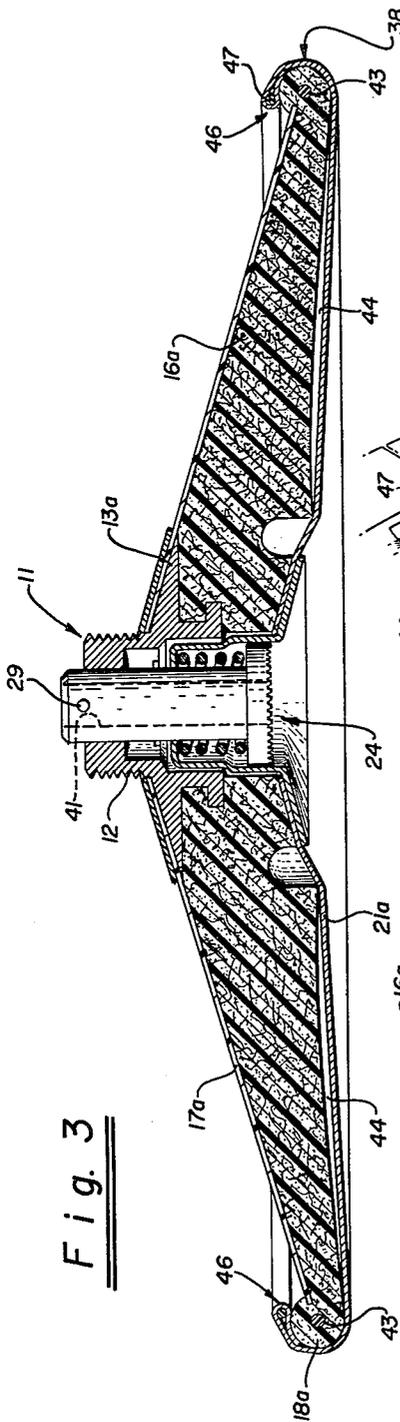


Fig. 3

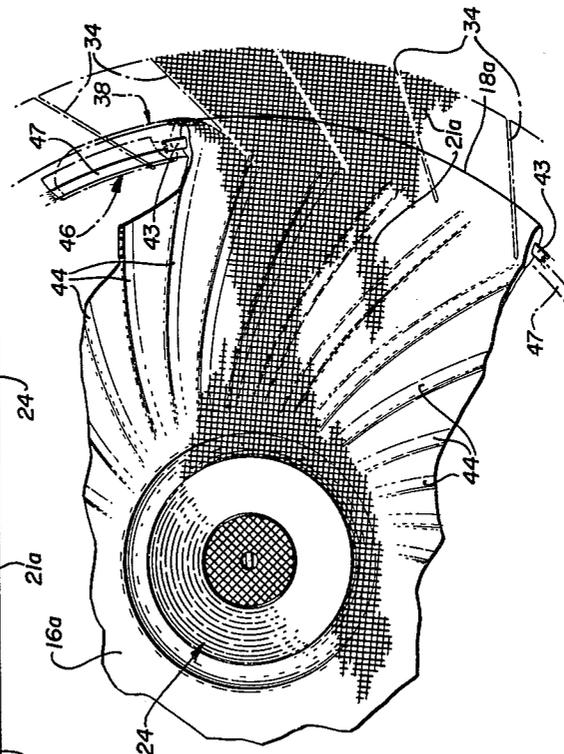


Fig. 4

INVENTOR.
Berne Tocci-Guilbert
BY *Fleke & Swain*
Attorneys

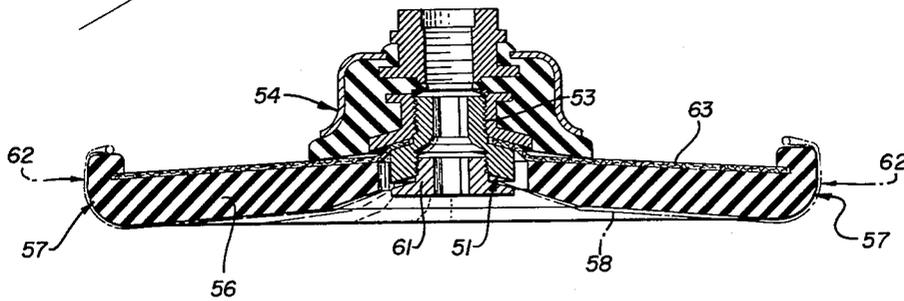
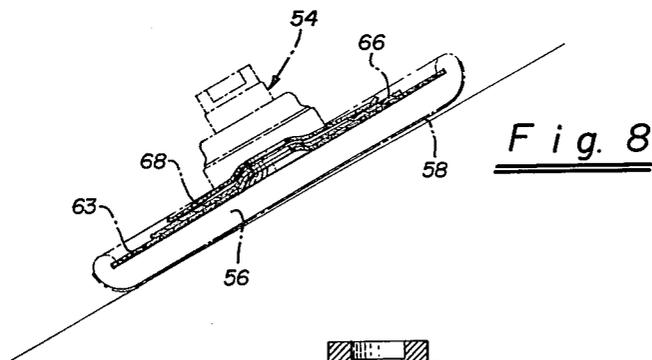
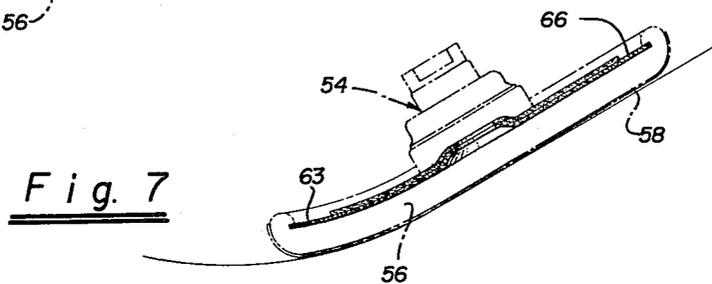
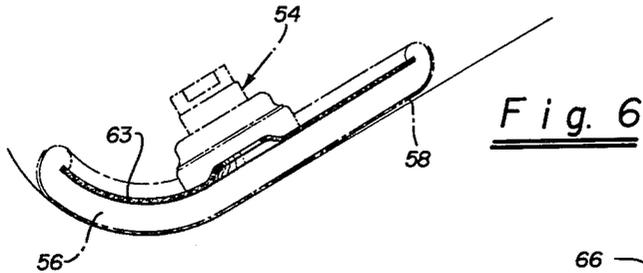
June 11, 1963

B. TOCCI-GUILBERT
POLISHING AND ABRADING APPARATUS

3,092,937

Filed March 30, 1961

3 Sheets-Sheet 3



INVENTOR.
Berne Tocci-Guilbert
BY *Flehrs & Swain*
Attorneys

1

3,092,937

POLISHING AND ABRADING APPARATUS

Berne Tocci-Guilbert, 2323 Larkin St.,
San Francisco, Calif.

Filed Mar. 30, 1961, Ser. No. 99,481

5 Claims. (Cl. 51-197)

This invention relates to a polishing and abrading apparatus and more particularly to a polishing and abrading apparatus which is particularly adapted for feathering.

Polishing and abrading apparatus heretofore provided for feathering purposes has been unsatisfactory in several respects. With certain back pads, the abrasive discs or grit cloths are actually cemented to the pad. This was found to be objectionable in that the abrasive disc or grit cloth rapidly becomes clogged because the particles removed from the surface being polished or ground cannot escape. When the abrasive discs or grit cloths are utilized in this manner, they can only be used on one side. In addition, such polishing and abrading apparatus has also been limited to relatively low speed so that optimum abrading and polishing speeds cannot be utilized. There is, therefore, a need for new and improved polishing and abrading apparatus.

In general, it is an object of the present invention to provide a polishing and abrading apparatus which overcomes the above named disadvantages.

Another object of the invention is to provide a polishing and abrading apparatus in which the abrasive or polishing disc or bonnet can be rotated at high speeds.

Another object of the invention is to provide a polishing and abrading apparatus of the above character in which the abrading elements or bonnets may be reversed.

Another object of the invention is to provide a polishing and abrading apparatus of the above character in which abrading and polishing can be accomplished without objectionable whorl marks.

Another object of the invention is to provide a polishing and abrading apparatus of the above character in which the bonnets are securely fastened to the pad so that the abrading bonnet can be rotated at high speeds.

Another object of the invention is to provide a polishing and abrading apparatus of the above character in which different degrees of flexibility in the pad can be readily obtained.

Another object of the invention is to provide a polishing and abrading apparatus of the above character in which slipping or creeping of the abrading element can be accommodated without tearing or wrinkling of the abrasive element.

Additional objects and features of the invention will appear from the following description in which the preferred embodiments are set forth in conjunction with the accompanying drawings.

Referring to the drawings:

FIGURE 1 is a cross-sectional view of a polishing and abrading apparatus incorporating my invention.

FIGURE 2 is a partial bottom plan view of the polishing and abrading apparatus shown in FIGURE 1.

FIGURE 3 is a cross-sectional view similar to FIGURE 1 showing another embodiment of my polishing and abrading apparatus.

FIGURE 4 is a partial bottom plan view with certain portions removed in the polishing and abrading apparatus shown in FIGURE 3.

FIGURE 5 is a cross-sectional view of still another embodiment of my invention.

FIGURE 6 is a cross-sectional view illustrating the use of the polishing and abrading apparatus shown in FIGURE 4.

FIGURES 7 and 8 show additional modifications of the

2

embodiment shown in FIGURE 5 in which additional backing pads or stiffner pads have been provided to increase the stiffness of the soft pad.

In general, my polishing and abrading apparatus is particularly adapted for use with a motor-operated tool having a rotating shaft. It consists of a hub-like coupling member which is removably mounted on the shaft for rotation therewith. A relatively soft pad is secured to the hub. A sheet-like abrasive or polishing element covers the lower surface of the pad. Means is provided for securing the center of the abrasive or polishing element to the center of the pad and to the hub and for securing the outer margin of the abrasive or polishing element to the pad. The portion of the abrasive or polishing element between the center of the element and the perimeter of the element is free with respect to the pad and permits the ready escape of foreign particles from the abrasive or polishing element during a polishing and/or abrading operation.

My polishing and abrading apparatus shown in FIGURES 1 and 2 consists of a hub-like mounting member 11 which is provided with external threads 12. The threads are adapted to be mounted in a suitable resilient coupling such as shown in by Patent No. 2,767,528. This resilient coupling is adapted to be mounted upon the stub shaft for a portable drive motor (not shown) so that it is rotated axially thereby.

The hub-like mounting members 11 is provided with a radially extending intermediate flange 13 and a lower radially extending flange 14. A relatively soft circular pad 16 is formed on the hub-like mounting member 11 below the intermediate flange 13. The thickness of the pad increases gradually from the outer perimeter of the pad towards the center of the pad so that the upper surface of the pad has a conical appearance, whereas the lower surface of the pad has a dish appearance. The pad 16 is formed of a suitable soft pliable material such as foam rubber so that it will be particularly adapted for feathering operations as hereinafter described. It is, however, preferable that the material used for the pad 16 be water-proof or at least water-resistant. The pad 16 is provided with a centrally located hole 19.

A backing plate 17 is secured to the intermediate flange 13 and overlies a straight or horizontal portion of the upper surface of the pad 16. The pad 16 from the backing plate slopes downwardly to a rounded edge which can be termed a bull nose or blunt nose 18. As shown in the drawings, the lower surface of the backing pad is provided with a plurality of annular grooves 20 for a purpose hereinafter described. A sheet-like abrasive element 21 covers the lower surface of the pad 16. The abrasive element can be of any suitable material such as grit-cloth. The abrasive element 21 is provided with a central hole 22 which is in general alignment with the hole 19 in the pad 16. Means is provided for securing the inner margin of the abrasive element 21 to the pad 16 and consists of a quick-disconnect coupling 24 such as shown in FIGURES 4, 5 and 6 of my Patent No. 2,789,402. As explained in that patent, the central pin 26 is disengaged from the hub 11 by first pressing the central member 26 against the spring 28 and rotating the same so that the pin 29 will come into alignment with a slot (not shown) to permit removal of the pin and the flanged member 31 to facilitate replacement of the abrasive element 21. As can be seen in the drawing, the flanged member 31 serves to firmly retain the inner margin of the circular abrasive element 21 in engagement with the lower surface of the pad. The flanged member 31 is rotatably mounted so that it can travel with the abrasive element 21 and thereby accommodate any slipping or creeping of the abrading element. This prevents tearing or wrinkling of the relatively thin abrasive ele-

ment and also helps to keep the abrasive element clean.

The outer margin of the circular abrasive element 21 is provided with a plurality of relatively closely spaced slits 34 which are inclined substantially with respect to radii of the abrasive element. It is slit in this manner so that the outer margin of the abrasive element 21 can be formed so that it will curve upwardly and around the bull nose 18 of the pad, and to firmly retain the outer margin of the abrasive element 21 in engagement with the pad. The outer cut portions of the element are overlapped as they are turned upwardly as shown in FIGURE 2 and joined together by a suitable adhesive so as to form an upwardly and inwardly curved rim 38, as shown particularly in FIGURE 1, which closely engages the bull nose 18 and retains the outer margin of the abrasive element in engagement with the pad 16. Thus, it can be seen that the polishing or abrasive element is formed as a bonnet which covers the lower surface of the pad.

From the foregoing, it can be seen that the abrasive element is mounted in such a manner that only the inner margin and outer margin of the abrasive element are secured to the pad 16. Thus, the portions of the abrasive element between the inner margin and the outer margin are not secured to the pad but are free to make slight movement with respect to the lower surface of the pad so that particles removed during polishing or abrading can drop freely from the bonnet.

The use of the polishing and abrading apparatus shown in FIGURES 1 and 2 may now be briefly described as follows. Prior to mounting the abrasive element on the pad 16, it has been formed into a bonnet by cutting the slits 34 and cementing the portions together in an overlapping relationship as shown in FIGURE 2 to provide the rim 38 and to form the abrasive element into a bonnet. The bonnet is secured to the pad by securing the inner margin of the bonnet to the pad by means of the quick release coupling 24 and then sliding the rim 38 over the soft bull nose 18.

The apparatus can then be used by those well skilled in the art for conventional abrading operations such as feathering. As is shown in FIGURE 2, the direction of rotation is arranged so that the overlapping edges face in a direction opposite the direction of rotation of the abrasive element. It has been found that this construction is advantageous in that the particles which are removed during the feathering operation by the abrasive element will pass through the relatively porous abrasive element into the grooves 20 and out through other holes in the porous abrasive element 21 so that the abrasive element does not become clogged. Thus, it is possible to use the apparatus so that the abrasive element 21 performs at full efficiency.

It has been found that constructing the pad and the abrasive bonnet in this manner makes it possible to rotate the apparatus at much higher speeds without ballooning. This is particularly desirable due to the fact that in many abrading and polishing operations it is desirable to operate at relatively high speeds.

Although I have described the pad as being formed of foam rubber, it is readily apparent that, if desired to obtain a pad having different characteristics, the pad 16 can be formed of cork, polyethylene foam, vermiculite, and so forth in any desired combination. It is readily apparent that by varying the diameters and by utilizing different materials it is possible to vary the flexibility of the pad 16 and, therefore, to control the type of abrading or polishing which can be accomplished with the pad.

Another embodiment of my polishing and abrading apparatus is shown in FIGURES 3 and 4. Many of the parts of this embodiment are identical to or similar to the parts shown in FIGURES 1 and 2. Thus, the hub-like member 11 and the quick release coupling 24 are substantially identical. The member 11 is provided with a smaller flange 13a and the coupling 24 is provided with a central flow passage 41. A pad 16a is provided

which is similar to the pad 16 shown in FIGURES 1 and 2. The upper surface of the pad 16a is inclined from the intermediate flange 13a and a backing plate 17a is secured to the flange 13a and covers the upper surface and extends outwardly to the bull nose 18a. The bull nose 18a is rounded as is the bull nose 18. However, in order to make the apparatus suitable for high speed operation, a hoop 43 of suitable material such as nylon is made an integral part of the bull nose of the pad to restrain any tendency of the pad to balloon during high speed operation. The lower surface of the pad 16a is disc-shaped as is pad 16. However, its lower surface is provided with substantially parabolic grooves 44 which extend outwardly towards the outer margin of the pad. To facilitate cleaning and cooling of the abrasive element 21a, water flowing through the passage 41 may be used.

The bonnet 21a is similar to the bonnet 21 shown in FIGURES 1 and 2. The inner margin of the bonnet is secured to the pad by the quick release opening 24. The outer margin of the circular abrasive element which forms the bonnet is provided with the same slits 34; however, it is not necessary to cement or glue the overlapping portions. The outer extremity of the abrasive element is folded over to provide a hem 46 in which is inserted a ring or hoop 47 of suitable material such as rubber or plastic. It is merely necessary that it be possible to stretch the rim 38 formed by the hem 46 and the hoop 47 over the bull nose 18a.

The polishing and abrading apparatus in FIGURES 3 and 4 is used in much the same manner as the polishing and abrading apparatus shown in FIGURES 1 and 2. However, because of the use of the hoops provided in the pad 16 and in the abrading element or bonnet 21a, it is possible to operate the polishing and abrading apparatus at a much higher speed. In addition, it is possible to utilize the apparatus in conjunction with water which passes through the passage 41 and then passes over the abrading element 21a through the parabolic grooves 44 provided in the pad 16a. Sloping of the grooves in this manner permits the water to escape rapidly and to carry with it the foreign particles.

Since the backing pad 17a extends over the entire surface of the pad 16a, additional rigidity is provided. It is readily apparent that, if desired, the backing pad 17a can be shortened or made of relatively light material so that the desired flexibility can be obtained. In the same manner, the composition of the pad 16a can be varied to obtain the degree of flexibility.

In addition to the means shown for attaching the abrasive element or bonnet 21 to the pad, it is apparent that other means can be utilized for securing the abrasive element to the pad. For example, it is possible to form the rib 38 by merely overlapping the same and providing a pressure sensitive tape on its inner surface which adheres to the surface of the bull nose.

It is apparent that the abrading element or bonnet shown in FIGURES 1, 2, 3 and 4 can be reversed merely by folding the abrading element inside out and then fastening the rim over the pad. This makes it possible to utilize both sides of the abrasive element or bonnet.

Another embodiment of my polishing and abrading apparatus is shown in FIGURE 5. This consists of a central hub 51 which is provided with external threads 53 threaded into a resilient coupling 54 of the type described in my Patent No. 2,767,528. A pad 56 of soft pliable material is mounted on the hub 51 and is provided with a bull nose 57. The pad has a slightly dished lower surface and a relatively flat upper surface. An abrasive element or bonnet 58 similar to those hereinbefore described covers the lower surface of the pad 56. Its inner margin is secured to the hub 51 by a nut 61. The outer margin of the abrasive element is provided with a rim 62 formed in the same manner as in the embodiments hereinbefore described. A relatively flexible back

5

pad 63 overlies the pad 56 which serves to provide additional rigidity to the pad 56 for a polishing or abrading operation.

Use of the polishing and abrading apparatus shown in FIGURE 5 is shown in FIGURE 6 and indicates that the pad is still relatively flexible and can be utilized for the feathering operations in relatively sharp curves as shown in FIGURE 6.

When additional rigidity is required, an additional back pad 66 is provided which overlies the pad 63. The pad 66 has a diameter which is substantially less than the diameter of the backing pad 63. This adapts the apparatus for use for more severe abrading and polishing operations although slightly limiting its usefulness in sharp curves and the like. When still additional rigidity is required, another back pad 68 is provided which overlies the back pad 66. This back pad has a diameter which is substantially less than the diameter of the back pad 66.

It is apparent from the foregoing that I have provided a new and improved polishing and abrading apparatus which is particularly adapted for feathering operations. The apparatus is such that it makes use of an abrasive element such as gritcloth formed into a bonnet which is utilized in the abrading and polishing operations.

I claim:

1. In a polishing and abrading apparatus for use with a motor-operated device having a rotating shaft, a hub-like coupling member adapted to be connected to the shaft for rotation therewith, a pad of relatively soft material secured to the hub-like coupling member, a sheet-like abrasive element covering the lower surface of the

6

pad, means for securing the center of the abrasive element to the hub, and means for securing the outer margin of the abrasive element to the pad so that the portion of the element between the center of the pad and the outer margin of the pad is free for slight movement with respect to the pad so that foreign articles may freely pass from the abrasive element.

2. A polishing and abrading apparatus as in claim 1 in which the outer margin of the pad is formed to provide a rim which seats on the outer rim of the pad.

3. A polishing and abrading apparatus as in claim 1 wherein the pad is provided with a reinforcing ring in its outer margin to prevent ballooning at high speeds and wherein the abrasive element is provided with a reinforcing element having a diameter slightly less than the outer diameter of the pad to firmly retain the abrasive element on the pad.

4. A polishing and abrading apparatus as in claim 1 in which the outer margin of the abrasive element is provided with a plurality of spaced slits and wherein portions of the outer margin of the abrasive element overlap and are cemented together.

5. A polishing and abrading apparatus as in claim 1 together with a plurality of back pads overlying the soft pad, each of the back pads having a diameter less than the diameter of the back pad below.

References Cited in the file of this patent

UNITED STATES PATENTS

1,966,299	Kent et al. -----	July 10, 1934
2,650,385	Michel -----	Sept. 1, 1953
2,934,775	Bergstrom -----	May 3, 1960