Aug. 25, 1942. J. O. AMSTUZ 2,294,064

SANDING HEAD

Filed Aug. 4, 1940 6 Sheets-Sheet 1

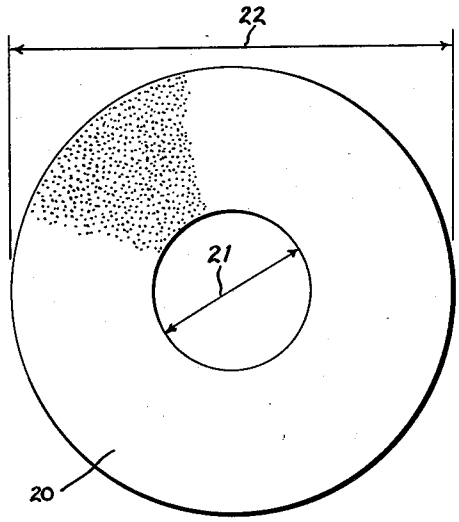

Fig.1

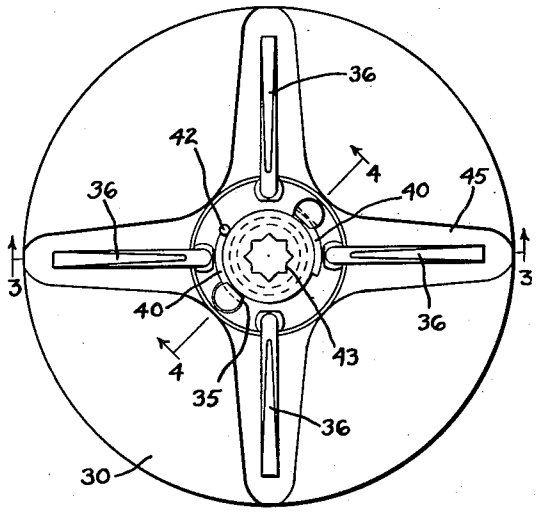

Fig.2

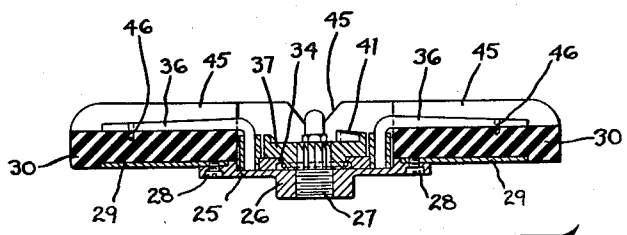

Fig.3

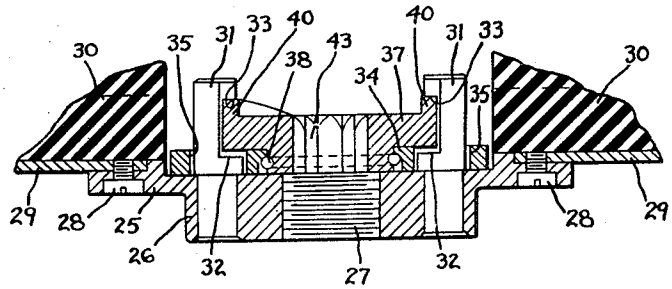

Fig.4

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SANDING HEAD

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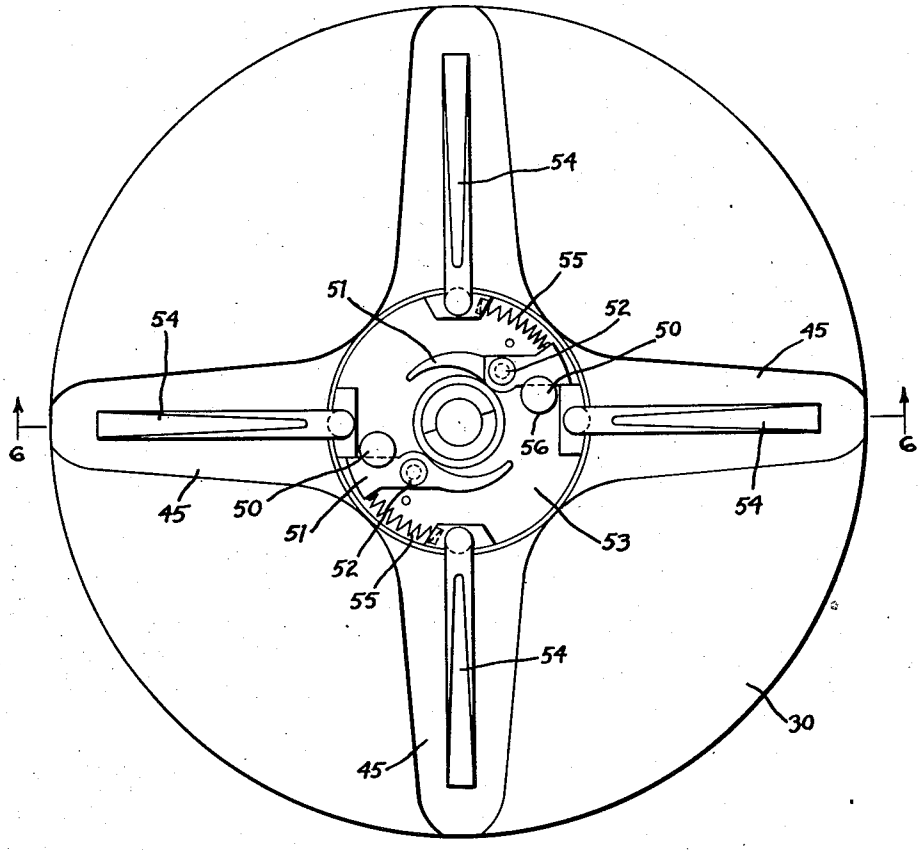

Fig.5

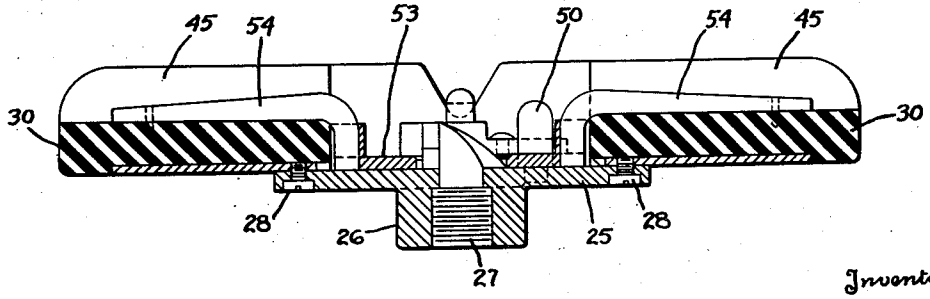

Fig.6

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SANDING HEAD

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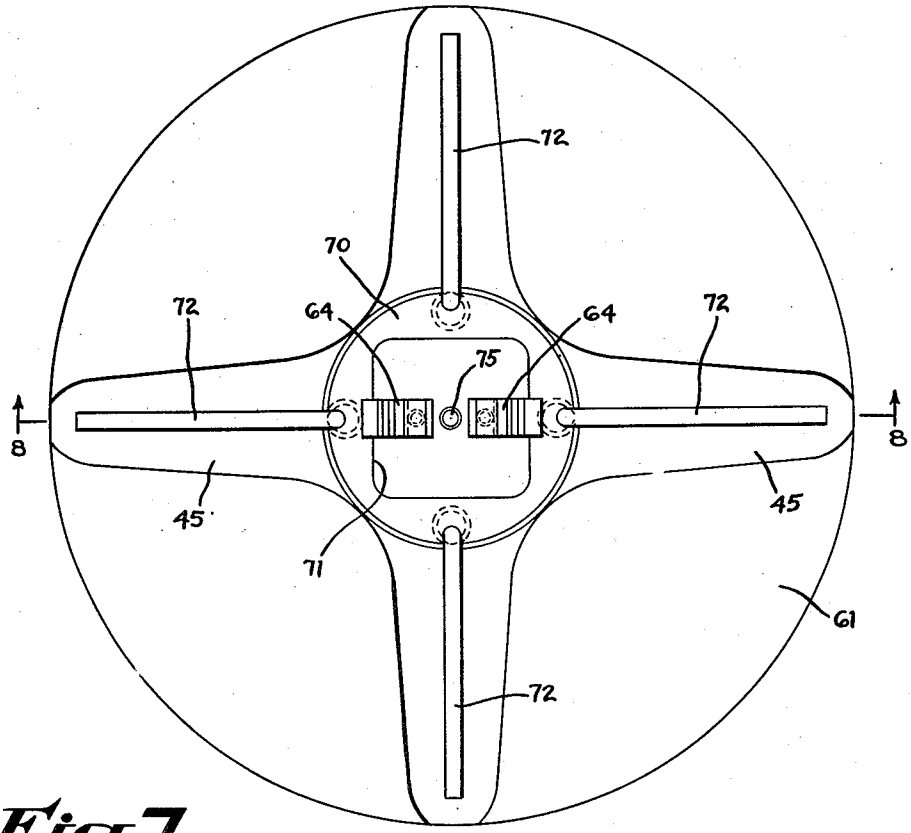

Fig. 7

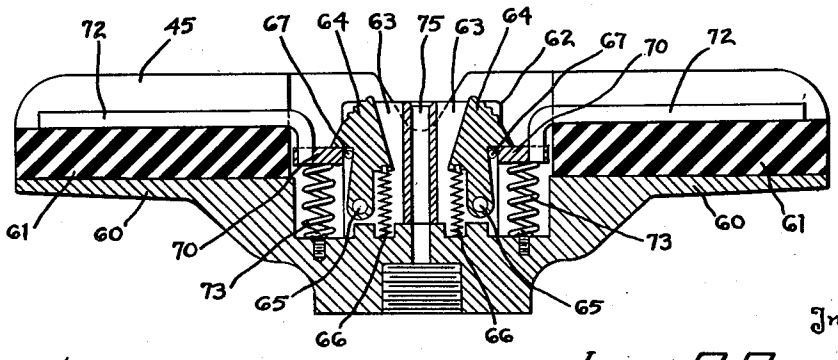

Fig. 8

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SANDING HEAD

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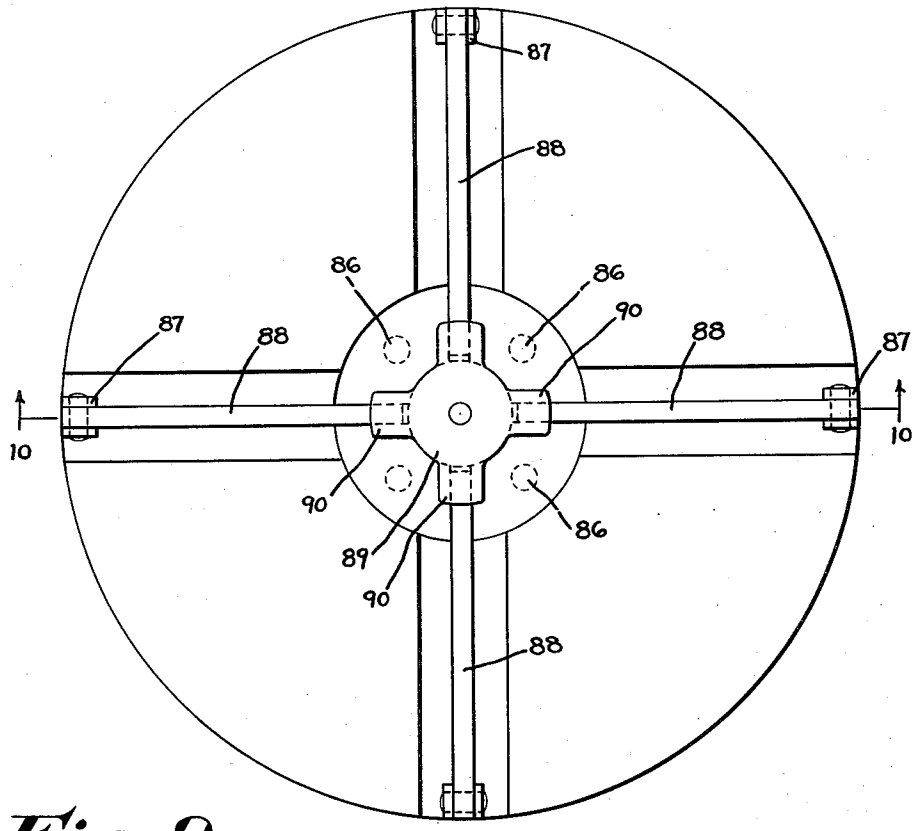

Fig. 9

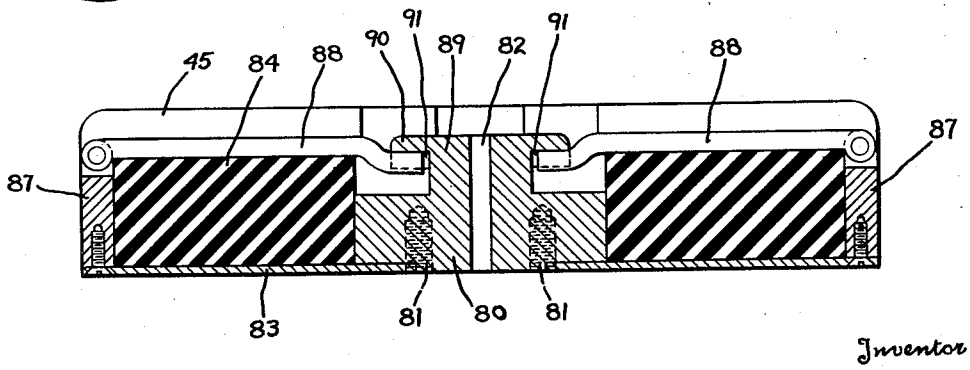

Fig. 10

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SANDING HEAD

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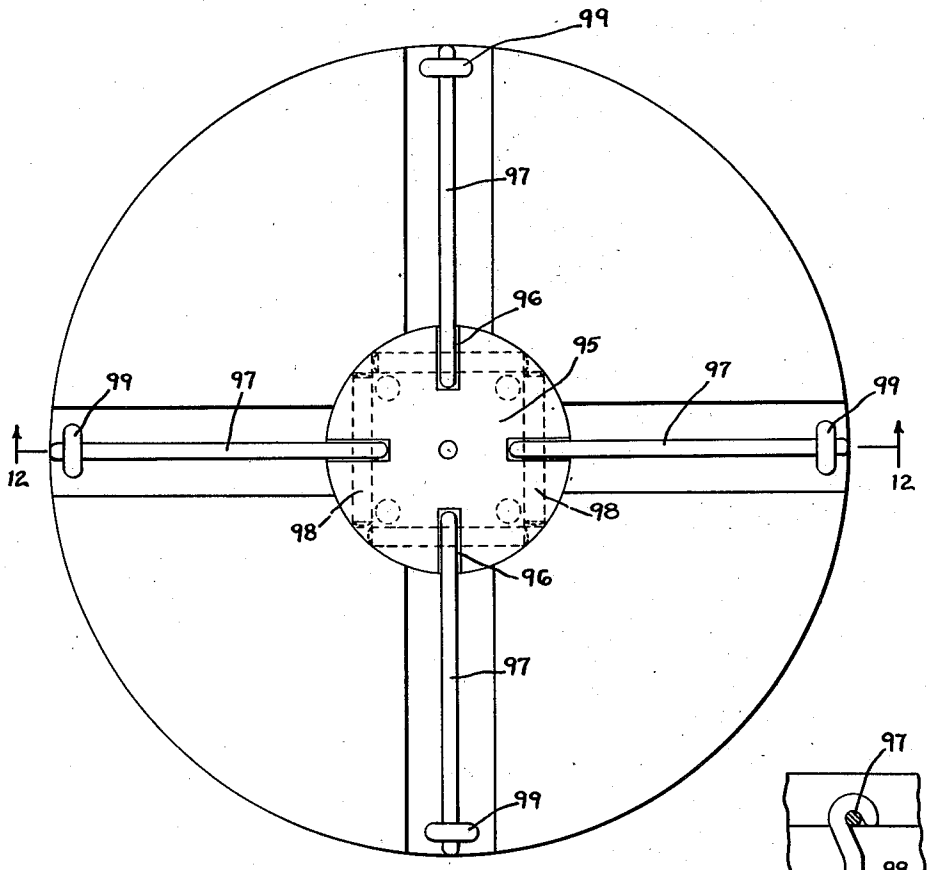

Fig.11

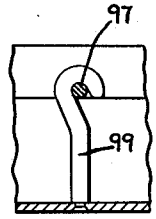

Fig.13

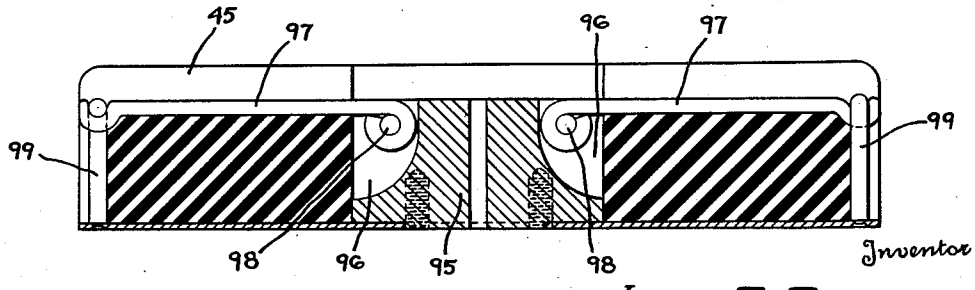

Fig.12

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SANDING HEAD

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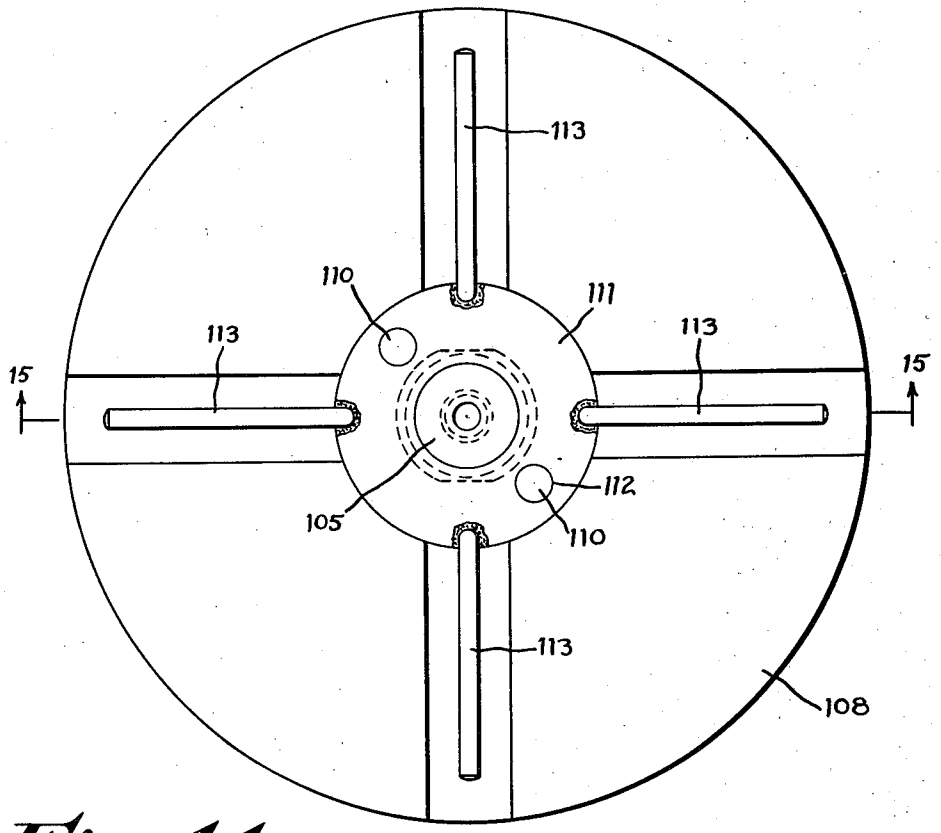

Fig. 14

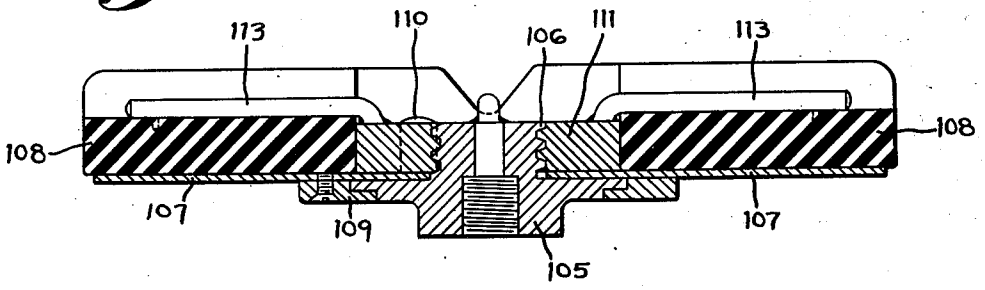

Fig. 15

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Patented Aug. 25, 1942 2,294,064

UNITED STATES PATENT OFFICE

2,294,064

SANDING HEAD

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Application August 4, 1940, Serial No. 351,317

2 Claims. (Cl. 51—197)

The invention relates to sanding heads.

One object of the invention is to provide a sanding head adapted to hold a light weight piece of sandpaper in the form of a disc. Another object of the invention is to provide a sanding head for the efficient lubrication of a sanding disc secured to the head. Another object of the invention is to provide practical and efficient clamps to clamp a light weight sanding disc to a head. Another object of the invention is to provide a complete sanding head with a sandpaper disc, including a cushioning support and spider with radially extending arms for holding a light weight piece of sandpaper, preferably of the waterproof variety, over a large radial distance.

Another object of the invention is to provide an efficient instrumentality for surfacing such objects as automobile bodies, for example, after they have received priming coats. Another object of the invention is to provide a sanding disc and head for sanding soft materials which shall not load up. Another object of the invention is to distribute water to abrasive paper in the form of a disc while it is sanding in an efficient and thorough manner. Another object of the invention is to provide an apparatus for the centrifugal distribution of water over the face of sandpaper during a disc sanding operation.

Another object of the invention is to provide a head for the mounting of thin discs of waterproof sandpaper so that they will not tear in spite of the use of high speeds, and to provide a copious supply of lubricant and clearance spaces so that the waterproof sandpaper will not load up with any soft material, such as paint, which is being sanded. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangements of parts, and in the several steps and relation and order of each of said steps to one or more of the others thereof, all as will be illustratively described herein, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings showing several possible embodiments of the mechanical features of this invention:

Figure 1 is a plan view on a reduced scale, of a piece of sandpaper, preferably of the waterproof variety, adapted to be held by any one of the heads of the present invention.

Figure 2 is the front elevation of a head constructed in accordance with the present invention.

Figure 3 is a cross-sectional view taken on line 3—3 of Figure 2.

Figure 4 is a fragmentary sectional view taken on line 4—4 of Figure 2.

Figure 5 is a front elevation of a modified form of sanding head.

Figure 6 is a sectional view taken along line 6—6 of Figure 5.

Figure 7 is a front elevation of another modification of the invention.

Figure 8 is a cross-sectional view taken on line 8—8 of Figure 7.

Figure 9 is a front elevation of another modification of the invention.

Figure 10 is a cross-sectional view taken on line 10—10 of Figure 9.

Figure 11 is a front elevation of another modification of the invention.

Figure 12 is a sectional view taken on line 12—12 of Figure 11.

Figure 13 is a fragmentary peripheral view of the modification of Figures 11 and 12.

Figure 14 is an elevation of still another modification of the invention.

Figure 15 is a sectional view taken on line 15—15 of Figure 14.

The disc holding heads of the invention are adapted to be attached to existing machines involving a motor driven flexible hollow shaft with means for supplying water through the hollow shaft so that the water will emerge at the center of the sanding disc and lubricate it.

Referring now to Figure 1, I provide an annular disc 20 of sandpaper. This has an internal diameter identified as 21 and an external diameter identified as 22. According to the preferred form of the present invention the annular disc 20 consists of a sheet of thin, flexible sandpaper cut to the shape shown. I prefer to use flexible waterproof sandpaper involving a paper backing suitably treated or impregnated with semi-drying oils, drying oils or resins, so that the backing will not deteriorate in use, even under conditions of sustained immersion in water throughout the effective life of the abrasive coating. Within the scope of the invention, any suitable abrasive grit may be used, such as fused alumina, silicon carbide, garnet, quartz (flint) or crushed glass, but for many sanding operations of the type indicated, silicon carbide is preferred. Waterproof sandpaper usually involves the use of fine grit abrasive, such as #100 grit size or finer. For a typical embodiment of the present invention I may use grit sizes, ranging between #240 and #360. The abrasive grit is secured to the waterproofed paper by a waterproof adhesive binder such as suitable varnishes or resins as is now known in the art. Thus, according to the preferred form of the present invention, the disc 20 is made from a typical piece of thin, light weight, waterproof sandpaper, for example, weights known as "A" weight or "C" weight, as distinguished from the heavy fibre backed discs with relatively coarse abrasives which have been

used in the prior art with apparatus for water sanding of the type indicated.

Referring now to Figure 3, the head therein illustrated comprises a circular adapter 25 having a central boss 26 internally threaded at 27 for attachment to a flexible hollow shaft which may be rotated and through which water is supplied. The adapter 25 is fastened by means of screws 28 to an annular metal backing plate 29.

Referring now to Figures 2, 3 and 4, an annular disc of soft rubber 30 is cemented, as by means of any suitable cement for attaching rubber to metal, to the annular metal backing plate 29. This disc 30 is preferably made with rubber vulcanized with a small amount of sulphur and is, therefore, a flexible cushioning or deformable material as distinguished from ebonite. Any other material of the same nature, such as synthetic rubbers, chloroprene or neoprene, having similar physical properties may be substituted.

Referring especially to Figure 4, extending in an axial direction from the boss 26 of the adapter 25 are a pair of identical pins 31 which are spaced at equal distances from the axis of the adapter 25 and are irremovably fastened to the adapter. These pins 31 have wide cut-outs 32 facing the center of the adapter, leaving shoulders 33 for gripping engagement with cams to be described.

I further provide a spider assembly for holding the sandpaper disc 20 against the annular disc 30, which comprises a central hub plate 34 having a pair of holes 35 for mounting the entire spider assembly upon the pins 31, a plurality of radial arms 36 rigidly secured to the hub plate 34, and a rotatable circular cam plate 37. Cam plate 37 interfits with the central hub plate 34 and is rotatable and is prevented from coming out by means of a ring 38 fitting in a groove in the cam plate. The cam plate 37 has a pair of wedge cams 40. The cam plate 37 can be turned so that the wedge cams 40 are clear of the holes 35 and then the entire spider assembly can be placed in position upon the pins 31. After the spider assembly has been thus placed in position, the rotatable cam plate can be rotated, thus moving the wedge cams 40 into the cut-outs 32 and causing the high points of the cams to engage the shoulders 33. Preferably, shoulders 33 are V shaped in front elevation, forming virtually points which fit in depressions 41 (shown in Figure 3) in the high points of the cams 40. A stop pin 42 may be provided in the hub plate 34 for limiting the rotation of the cam plate 37 to the exact position where the points of the shoulders 33 coincide with the depressions 41.

The cam plate 37 has a central hole 43 of irregular shape to fit a suitable end wrench. This may be star shaped, as shown, which will take a T shaped square end wrench whereby the cam plate can readily be rotated.

The adapter 25 is mounted on the end of a flexible hollow shaft as above stated and when it is desired to secure the sandpaper disc 20 to the head, the operator first removes the entire spider assembly which may be done by holding the entire unit and turning the cam plate 37 to move the wedge cams 40 out of the cut-outs 32, using an end wrench in the irregular hole 43. Thereupon an annular sheet of sandpaper 20 is placed upon the annular disc of soft rubber 30 co-axial therewith and then the spider assembly is again placed upon the pins 31, and by means of the wrench, the cam plate 37 is turned to lock the parts together. As shown in Figures 2 and 3 I provide relatively deep radial recesses 45 in the annular soft rubber disc 30 in which the spider arms 36 fit. When the parts are put together as described, the disc 20 is bent out of a plane to conform to the surface of the rubber disc 30 and fits in the radial recesses 45 conforming to the surface thereof. I preferably provide spikes 46 extending laterally from the radial arms 36 to pin the sandpaper in place, these spikes perforating the sandpaper and extending into the deformable soft rubber, thus the sandpaper, whose internal diameter 21 and whose external diameter 22 may be approximately the same as the respective internal and external diameters of the soft rubber annular disc 30, is firmly but releasably held by the rubber disc and conforms to its irregular surface, that is to say, depressions or grooves are formed in the sandpaper and sandpaper is everywhere backed up by the soft rubber. While I have shown four spider arms 36 and four radial recesses 45, a greater or lesser number might be employed within the scope of the invention.

I have found that despite the light weight of the sandpaper and despite the use of the apparatus with fairly heavy work at high speeds up to 1800 R. P. M. for discs whose overall diameter is 8 inches, sandpaper does not go to pieces nor tear and will last through the effective abrading life of the abrasive material thereof. The tool may be used in many sanding operations and it is preferably used wet, that is to say, water is introduced through the hollow, flexible shaft, through the hollow boss 26 and through the irregular hole 43 and then by centrifugal force spreads over the sanding disc. The water has a tendency to follow the radial recesses 45 but largely on the abrasive side or outside of the sandpaper, that is to say, along the radial arms 36. The radial arms 36 are not so large that they entirely fill the radial recesses 45 and in fact, as shown, they fill but a small part thereof. Radial grooves are thus provided for water to move centrifugally along the abrasive surface of the sandpaper, and thus a copious supply of water can be delivered to the abrading operation and is most effective for lubricating. The clearance provided by the grooves or recesses formed in the sandpaper itself prevents loading of the sandpaper and prolongs its life.

Referring now to Figures 5 and 6, a modification of the invention is shown in which the spider may be placed in position and removed simply by squeezing together a pair of levers. The circular adapter 25 has a pair of rigidly attached pins 50 having cut-outs in their sides adapted to cooperate with levers 51 mounted on pins 52 extending axially from center hub plate 53. Center hub plate 53 has radial arms 54 fitting in the radial recesses 45 in order to hold the annular disc of sandpaper 20 in place. Springs 55 extending between the anchorages of the arms 54 and the ends of the levers 51 urge the levers into engaging position. The hub plate 53 has holes 56 fitting over the pins 50 which may be tapered at the outer ends. Thus for inserting the spider it is only necessary to place it over the pins 50 and push. For releasing the spider it is sufficient to squeeze the inner ends of the levers 51 toward each other and pull.

Referring to Figures 7 and 8, another modification of the invention is shown, the action of

engaging and disengaging, however, being somewhat similar to that of the modification of Figures 5 and 6. The adapter is a large plate 60 to which the annular rubber disc 61 may be cemented. Suitably secured to the front side of the plate 60 is a block 62 having rectangular cutouts 63 for the reception of latches 64 mounted on pins 65 extending across the block 62. Spring 66 urges the latches 64 apart and stops pins 67 and holds them from moving beyond a certain position. The spider assembly is in the form of a ring 70 with a square hole 71 and arms 72. Cushioning springs 73 are provided to hold the ring 70 firmly against the latches 64; thus the spider may be snapped into position by pushing the arms 72 into the radial recesses 45 and the spider may be released by pressing the latches 64 together with the fingers. In the embodiment of Figures 7 and 8 water enters through a central hole 75 in the block 62 and moves radially through the recesses or depressions 45 as in all the embodiments of the invention.

Referring now to Figures 9 and 10, therein is shown an embodiment in which the adapter 80 is a cylindrical block having a pair of spaced threaded holes 81 for attachment to a shaft with a flanged head by means of screws. As in all cases, a central hole 82 is provided to convey water to the sandpaper. A thin metal plate 83 has an annular disc 84 of soft rubber with radial recesses or depressions 45 suitably attached to it as by rubber cement. The metal plate 83 is likewise attached to the adapter 80 as by screws 86. Forked posts 87 are attached to the plate 83 at spaced positions as shown, and these receive wires 88 preferably pivotally attached thereto. Integrally formed with the adapter block 80 is a cylindrical projection 89 having radial arms 90 with under-cut grooves 91. The ends of the pins fit into grooves 91. The pins can be flexed sidewise to clear the arms 90 and then swing outwardly to allow the sandpaper to be placed in position. This clamping device operates in the nature of a safety pin.

Referring now to Figures 11, 12 and 13, an adapter block 95 has cut-outs 96 for receiving wires 97 pivotally mounted therein by means of pins 98. The outer ends of the wires 97 may be releasably held in position by means of hooks 99. The construction is otherwise similar to that illustrated in Figures 9 and 10 and just described.

Referring now to Figures 14 and 15, the spider is adapted to be held in place by turning the entire head, spider and all. An adapter block 105 can be screwed onto the end of the flexible shaft mentioned. The front end of the adapter block 105 is externally screw threaded, providing large, strong screw threads 106. An annular metal backing plate 107 has an annular disc 108 of soft rubber cemented thereto. An under-cut ring 109 holds the adapter block 105 rotatably in position. Extending forwardly from the backing plate 107 are a pair of plain pins 110. I provide a spider assembly comprising an internally threaded hub 111 to fit the thread 106 having spaced holes 112 to fit the pins 110 and arms 113. To assemble this embodiment of the invention, sandpaper is placed on the annular disc 108, the spider is put in position with the holes 112 over the pins 110 and the hub 111 upon the screw 106 and then the entire unit is turned which rotates the parts relative to the adapter block 105, thus screwing the assembly together.

It will thus be seen that there has been provided by this invention, sanding heads and flexible annular sanding discs having many practical advantages and according to which the objects hereinbefore set forth are successfully achieved. As various possible embodiments might be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereinbefore set forth is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. A sanding head comprising adapter means for attachment to a rotatable hollow shaft, said adapter means having a hole therethrough, an annular backing plate concentrically attached to said adapter means, an annular disk of flexible deformable rubber secured to said backing plate, there being radial recesses in the front face of the annular disk opposite the backing plate, a plurality of arms each individually movable pivoted to the backing plate, said arms being of a size to fit in the radial recesses, and catches for the arms for removably securing them in the radial recesses in sandpaper holding position whereby to secure an annular disk of sandpaper to the flexible, deformable rubber forming complementary radial recesses in the annular disk of sandpaper, whereby water can flow through the hollow shaft, the adapter, the backing plate, the annular disk, and outwardly along the arms and the radial recesses to lubricate the sandpaper in use.

2. A sanding head comprising metal disk means having a central axial hole therethrough, screw threaded means in said disk means for attachment to a hollow driving member, a flexible, soft, resilient, deformable pad of annular shape having an axial hole coinciding with said first mentioned axial hole, said pad being fastened to one side of said disk means, a plurality of individually movable radial arms pivotally attached to the metal disk means and radiating from the axis of said disk means, radial depressions in said flexible, soft, resilient, deformable pad radiating from the axis of said disk means, catches for said radial arms capable of securing all of them in said radial depressions in sandpaper holding position, one in each of said depressions to hold a disk of sandpaper in said radial depressions and against said deformable pad, and said catches being releasable to permit all of the radial arms to be removed from said depressions by a sufficient distance to allow a used piece of sandpaper to be removed and a fresh piece of sandpaper to be placed on said pad and secured in position by the arms secured by the catches, said catches being all of them located on the same side of said disk means as is the said pad, whereby water may be directed axially through the disk and may flow outwardly in the radial depressions, thus providing a copious supply of water to the sandpaper, and the head being capable of being furnished with fresh sandpaper by simply releasing the radial arms and fastening them again.

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