

July 14, 1936.

K. UYEDA

2,047,340

POLISHER UNIT

Filed April 4, 1933

2 Sheets-Sheet 1

Fig. 1

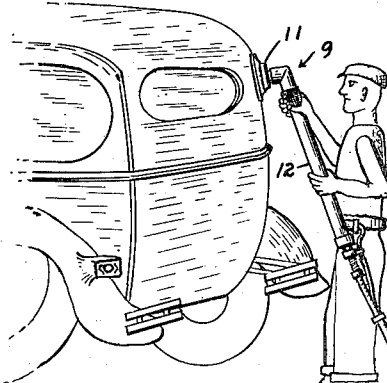


Fig. 2

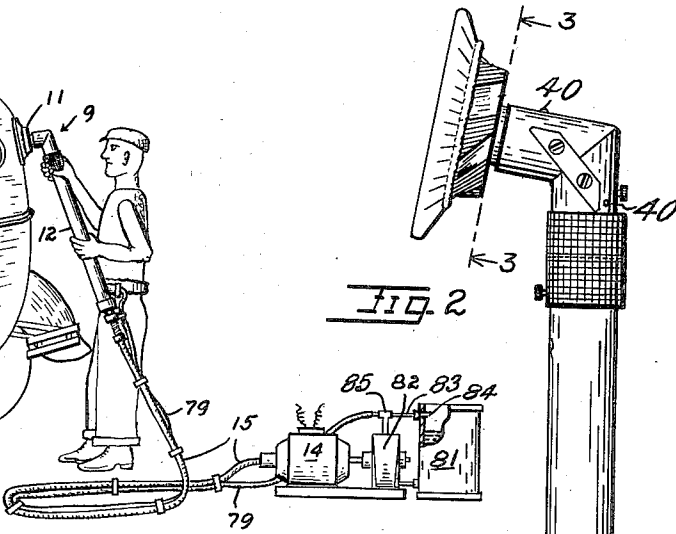


Fig. 3

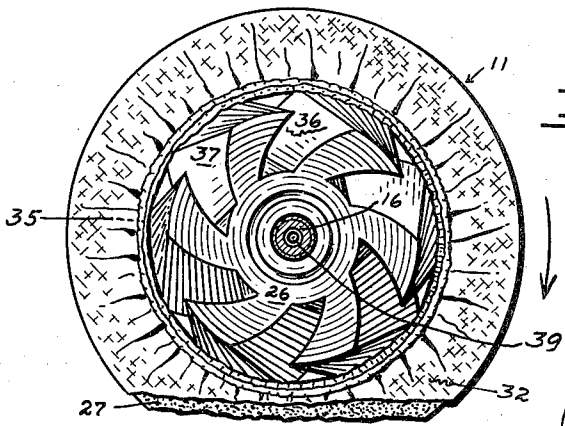


Fig. 9

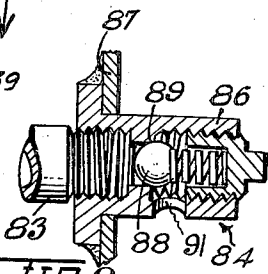
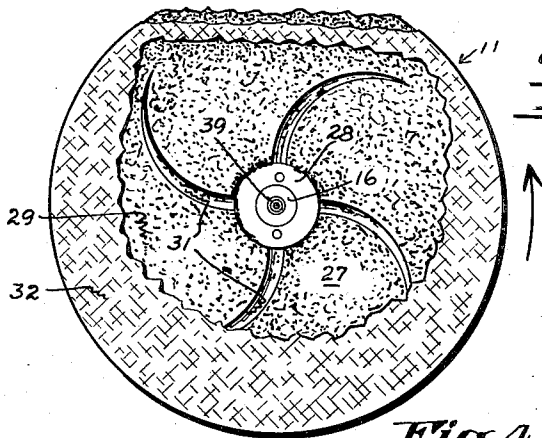


Fig. 4.

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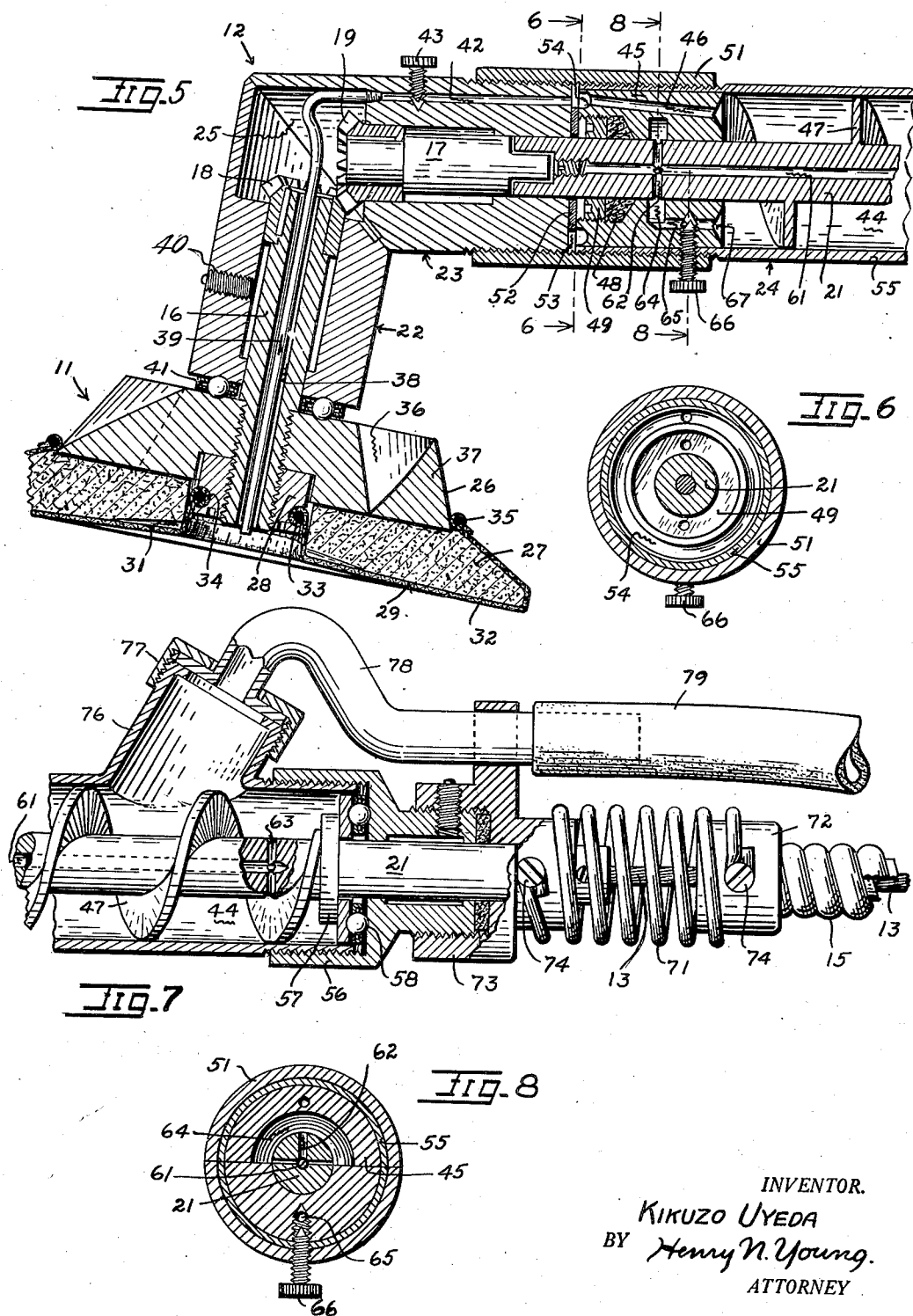
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2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

2,047,340

## POLISHER UNIT

Kikuzo Uyeda, Oakland, Calif.

Application April 4, 1933, Serial No. 664,326

6 Claims. (Cl. 15—98)

The invention relates to a device providing a rotary and power-driven head for application to a surface for performing polishing or other operations thereupon.

5 An object of the invention is to provide a unit of the class described which is arranged for manual manipulation for the application of its working head against inclined and upright surfaces as well as against horizontal surfaces.

10 Another object is to provide in the unit a reservoir for a cleaning or polishing liquid to be applied during the use thereof, and means to effect a controlled discharge of such liquid at the working head for all working positions of the unit and head.

A further object is to provide for the operation of the rotary working head by means of a flexible shaft which is actuated by a stationary motor means.

20 An added object is to provide a generally improved working head for use in units of the present class.

Yet another object is to provide a unit of the class described which is particularly adapted for use in cleaning and/or polishing the bodies of vehicles.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth or be apparent in the following description of a preferred embodiment of the device and in the accompanying drawings, in which,

30 Figure 1 is an assembly view disclosing the present unit as operatively applied to a generally upright surface of an automobile body.

35 Figure 2 is a side view of the unit.

Figure 3 is an enlarged fragmentary view taken at 3—3 in Figure 2 and showing the back of the working head of the unit.

40 Figure 4 is a fragmentary front face view of the working head, a central portion of a cover for the polishing pad of the head being broken away.

45 Figure 5 is an enlarged axial section through the unit at and adjacent the polishing head thereof.

Figure 6 is a section at 6—6 in Figure 5.

Figure 7 is an enlarged axial section of the rear portion of the unit.

50 Figure 8 is a section at 8—8 in Figure 5.

Figure 9 is an enlarged sectional view of a regulating valve shown in Figure 1.

As particularly illustrated, the features of the present invention are incorporated in a unit 9 having a rotary working head 11 mounted on a

shaft which extends through an elongated body 12 and is connected at the rear end of the body with a power-actuated flexible shaft 13. In the present instance, the flexible drive shaft 13 is arranged for actuation by connection to the shaft of an electric motor 14, and the former shaft is enclosed in a usual flexible conduit 15 for such shafts.

For reasons which will hereinafter become apparent, the shaft carried by the body 12 is sectional and comprises a forward section 16 mounting the working head 11, an intermediate section 17 angularly related to the section 16 and operatively connected thereto by means of bevel gears 18 and 19 carried by the respective shaft sections 16 and 17, and a rearward section 21 axially aligned with the section 19 and extending rearwardly from the body for connection with the flexible shaft 13. The body 12 comprises generally cylindrical sections 22 and 23 and 24 respectively carrying the shaft sections 16 and 17 and 21 journaled axially therein, it being noted that the body sections 22 and 23 abut in a plane bisecting the angle defined by their axes and are formed to cooperatively define a closed space 25 about the bevel gears 18 and 19.

Referring now to the structure of the working head 11, it is seen that this member of the unit essentially comprises a backing element 26 of rigid material threadedly mounted on the protruding end of the shaft section 16 and carrying a polishing pad 27 of yielding material at its front, and working face. Preferably, and as shown, the backing element 26 is of frusto-conical outline with a reduced and threaded portion of the shaft 16 engaged axially therethrough to extend forwardly therefrom to mount a lock-nut 28 for releasably fixing the element 26 in place on the shaft. A preferred and particularly satisfactory material for the pad 27 is a porous, or sponge, rubber composition, said pad comprising a disc of greater diameter than the face of the element 26 engaged thereby and axially perforated opposite the nut 28 to permit access to said nut. The pad 27 may be glued or otherwise secured to the element 26.

Since the working head 11 may frequently be operated over concavely rounded surfaces, it is preferred that the working face 29 of the pad be given a conically dished form opposite the element 26 whereby to insure a good working contact, it being noted that this arrangement results in a major use of the outer pad portions, when the pad is applied to flat surfaces. For insuring an even and proper distribution of pol-

ishing liquid over the pad face 29, the latter is provided with a series of grooves 31 radiating spirally from its central opening, said grooves being deepest at their inner ends and terminating short of the outer pad edge.

In the use of sponge rubber or the like for a pad 26, it will generally be desirable to cover the pad with a layer of fabric or other pliable sheet material for actual frictional contact with a surface to be treated; in the present instance, a pad cover 32 is provided, said cover arranged to generally enclose the exposed pad portions and formed of flannel or other suitable fabric. The cover 32 is arranged to be shaped from a circular piece of material having a central opening provided with a hem carrying a loop of cord or wire 33. Circumferentially thereof, the nut 28 is formed with an annular groove 34 for receiving the central cover hem and its enclosed cord 33 whereby a screwing up of the nut 28 into its operative position is arranged to draw the central cover portion inwardly against the pad face 29 and so insure a flat engagement of the cover over said face. At its circumferential edge, the cover is provided with a hem receiving a drawstring 35 for tensing the cover around the pad edge, the use of the drawstring 34 being particularly brought out in Figures 3 and 5. It will be noted that the pad 26 constitutes a friction or rubbing disc and may be so designated either with or without the facing cover 32 mounted thereon.

Means are provided for discharging a cooling draft of air against the rear of the pad 26 as the working head is rotated. As particularly shown, the smaller end of the element 26 is in opposition to the forward end of the body portion 22, and the perimeter of said element 26 is provided with a plurality of slots 36 extending spirally therein, said slots undercut and otherwise so formed that the portions 37 of the element 26 between them are operative as blades of a rotary fan for discharging air against the back of the pad 26 for cooling the same and preventing its overheating through friction as the head 45 is rotated in the indicated direction. Besides its previously mentioned functions, the element 26 is also arranged to serve as a flywheel for the rotating assembly of the unit, and the actual weight thereof is largely determined by the consideration of this element as a flywheel means.

It will now be noted that the forward shaft portion 16 is tubular to provide a duct or passage 38 through which a cleaning or polishing fluid may be conveyed to a point centrally of the polishing pad 27. As particularly shown, a pipe or tube 39 extends freely through the shaft passage 38 to discharge forwardly of the shaft end, said tube mounted on and extending from the intermediate body section 23 whereby it is clear of the gears in the space 25 and is held against any rotation in its place. A ball-bearing thrust ring 41 is engaged between the head element 26 and the opposed outer end of the body portion 22 for limiting the inward movement of the shaft portion 16.

The mutually aligned body sections 23 and 24 are arranged to jointly serve as a handle portion of the unit, and in order to facilitate the use of the unit in various working positions, it is desirable that the angularity of the axis of the working head with the axis of the handle portion be somewhat less than ninety degrees. In practice, it is preferred that said angularity be close to eighty degrees as is particularly shown, it being noted that this relation disposes the handle

portion for the ready grasping and manipulation of the unit by an operator while permitting the provision of a relatively short forward body portion 22.

As particularly shown, the intermediate body member 23 is of one-piece structure, and the inner end of the tube 39 is threadedly engaged in the forward end of a duct 42 extending axially through the member adjacent its longest side, said duct terminating at the space 25 and outwardly of the bevel gear as is shown. Valve means are provided in the duct 42, such means being particularly shown as comprising a needle valve 43 threadedly engaged in the member 23 and operative to control the flow of a liquid through the duct.

In the present structure, the bevel gears 18 and 19 are fixed to the respective shaft portions 16 and 17 and the respective assemblies are disposed in stepped bores of the body members in bearing engagement with solely the end portions of the bores. In this manner, chambers for a lubricant are provided between the bore ends, said chambers being arranged to receive lubricant through appropriate oiling ducts 40 extending radially thereto through the different body members.

The rearward body section 24, it will now be noted, is generally hollow to provide a cylindrical chamber 44 which is coaxial with the shaft portion 21 which extends longitudinally there-through and therefrom. At its forward end, the chamber 44 terminates at a cross-wall 45 which defines the forward end of the body section 24 and provides a bearing for the shaft. The cross-wall 45 is provided with a generally axial duct 46 for connection with the duct 42 of the body section 23 whereby the chamber 44 may serve as a supply reservoir for liquid to be delivered to the working head 11 through the tube 39.

Since the present unit is to be applied while in positions which would preclude a gravity feed of liquid from the chamber 44 to the working head of the unit, means are provided in the unit for effecting a pressure feed of the liquid when the valve is open. Accordingly, and as shown, that portion of the shaft 21 which lies within the chamber 44 mounts an helical feed screw 47 which closely fits within the bore of the chamber 44 whereby, upon a rotation of the shaft in the appropriate direction, liquid in the chamber may be forced forwardly therein and into the duct 46. In the present instance, the thread of the feed screw 47 comprises a radial and integral portion of the shaft 21.

By reason of the pressure created at the forward end of the chamber 44 through the functioning of the feed screw 47, packing means are preferably provided for the shaft 21 at the cross-wall 45. As particularly shown, the shaft-receiving bore of the cross-wall 45 is enlarged at its outer end for the reception of soft packing 48 and a gland 49, the latter threadedly engaging the enlarged bore portion, and the stuffing box thus provided preferably disposed inwardly of the forward end of the body section 24.

It will now be noted that the rearward end face of the intermediate body member 23 and the forward end face of the rearward body member 24 are arranged to mutually abut in the assembly of the polisher unit, and that such a relation of these members is shown as effected through the action of a coupling sleeve 51 which threadedly engages both said members for drawing the same into mutual engagement of their said end faces. As shown, an annular gasket 52 of com-

pressible material is interposed between the members for sealing the jointure thereat; said gasket lying inwardly of the discharge point from the duct 46 whereby said duct may discharge into the annular space 53 defined between the gasket 52 and sleeve 51. Preferably, the inlet and discharge ends of the ducts 42 and 46 respectively are at the same distance from the common axis of the shaft sections 17 and 21, but since a mutual registration of these duct ends would generally be accidental in the present assembly, it will be clear that the space 53 will usually provide the required connection between the ducts. If desired, an annular groove 54 may be provided in the forward face of the cross-wall 45, said groove coaxial with the shaft axis and including the discharge end of the duct 46 whereby to insure a connection of the two ducts should the gasket 52 be omitted or be relatively thin.

When the present unit elements are assembled for use, the forward end of the shaft 21 is arranged to extend into the shaft-receiving bore of the body member 23 for interlocked engagement with the opposed end of the shaft 17. As shown, a tongue-and-slot engagement of these shafts is provided whereby the shaft 17 may turn with the shaft 21, while a free axial separation of the shafts and body sections 23 and 24 is permitted.

It will now be noted that the body section 24 comprises a tubular element 55 carrying the cross-wall 45 as a separately formed element sealedly fixed in the forward tube end. At its rearward end, the tube 55 mounts an axially perforated closure element 56 providing a rear cross-wall for the chamber 44 and a bearing for the shaft 21 at its central bore. A collar 57 is provided on the shaft 21 at the rearward thrusting assembly 58 is operatively engaged between the forward face of the element 56 and the rear side of the collar 57; in this manner, the shaft 21 is held against the rearward displacement which is urged upon it by reason of the reactive thrust of the feed screw.

During the operation of the present unit, the liquid in the chamber 44 is arranged to be fed forwardly in the chamber by the feed screw 47 at a faster rate than it may be delivered to the working head 11 in the described manner, whereby a positive discharge pressure may be built up at the forward chamber end. The foregoing relationship, however, requires a return and rearward flow of a portion of the liquid in the chamber, and means are provided for permitting such a return flow to the degree required. Accordingly, and as particularly shown in Figures 5 and 7, the shaft 21 is provided with an axial duct 61, said duct extending from a point of the shaft opposite the bearing bore of the cross-wall 45 to a shaft point adjacent and forwardly of the shaft collar 57, radial inlet and discharge ports 62 and 63 for the duct 61 being provided through the shaft at the respective aforesaid points thereof.

Opposite the ports 62, the bearing bore of the cross-wall 45 is enlarged to provide an annular groove 64, and a duct 65 extends axially through the cross-wall 45 to the chamber face thereof whereby to conduct liquid from the chamber to the groove 64. A valve means is preferably provided in the duct 65, said means particularly shown as comprising a needle valve 66 threadedly and radially engaged in the cross-wall 45. As shown, the inlets for the ducts 46 and 65 are provided at the bottom of an annular groove 67 formed in the inner face of the cross-wall 45, whereby said groove is operative as a manifold with respect to the ducts.

It will now be noted that when the discharge valve 43 is open to permit a metered feeding of liquid to the working head 11, the return flow valve 66 may be set to insure the desired pressure discharge at the first valve. If no liquid is wanted at the working head, the valve 43 would be closed and the valve 66 would be fully opened to minimize the return flow pressure. In this manner, the power required for actuating the feed screw 47 may be minimized for all working operating conditions of the unit and a positive regulation of liquid discharge may be effected. It will be further understood that the constant circulation of liquid forwardly by the feed screw and rearwardly through the return duct 61 is operative to maintain an homogeneous composition of the liquid to be applied, it being noted that the present unit may be used for applying either cleaning or polishing liquids, such as liquids generally comprising solutions or emulsions of soap or wax, respectively.

A filling opening is provided for the chamber 44 at a radial and tubular extension 76 of the tube 55. As shown, the extension is provided at the rearward tube end and the outer end of the extension 76 is threaded for mounting a coupling sleeve 77 which fixes a flanged end of a 30 hose nipple 78 of a flexible hose 79 to the extension 76 to provide a usual pipe coupling structure. The hose 79 is arranged to convey the cleaning or polishing liquid to the chamber 44 from a supply tank 81 through the operation of 35 a pump 82 which is conveniently connected to the shaft of the motor 14 for continuous actuation thereby and therewith. Preferably, the operating pump 82 is arranged to automatically maintain the liquid supply in the chamber 44, returning the excess liquid circulated there through to the tank 81 through a return pipe 83 having a suitable pressure-actuated relief valve 84 therein whereby, when the pressure in the hose 79 reaches a predetermined limiting value, a portion or all of the liquid discharging from the pump is permitted to flow back to the tank 81 through the return pipe. The hose 79 and the flexible cable conduit 15 may be fixed together along their length whereby they may be handled 50 together as the unit 9 is moved about by an operator. It will be obvious that a closure cap may be substituted for the sleeve 77 should a constant renewal supply to the chamber 44 not be desired.

As illustrated, a pipe T 85 provides a common connection for the discharge pipe from the pump and the hose 79 and the return pipe 83, and the relief valve 84 is provided at the discharge end of the return pipe 83. By reference to Figure 9, it will be noted that the relief valve 84 comprises a tubular and radially flanged body 86 which is fixed in the side wall 87 of the tank 81 to extend therethrough, and receives the discharge end of the pipe 83. A spring-pressed ball 88 is operative at a seat 89 provided immediately in the body passage, and a radial discharge passage or port 91 is provided in the body 86 at the discharge side of the valve ball. The arrangement is such that the valve is constantly 70 and automatically operative to maintain a constant predetermined pressure in the hose 15.

Means are provided for permitting a relatively free rotative adjustment of the unit 9 about the axis of its handle portion, and to this end the 75

unit body is connected to the forward extremity of the flexible conduit 15 for the flexible shaft 13 through an helical spring 71. As shown, a coupling sleeve 72 is provided at said end of the conduit 15, a gland cap 73 mounted on the element 56 is reduced at its rearward end to the same size as the sleeve 72, and the ends of the spring 71 are secured to the sleeve 72 and portion 73 by means of screws 74 engaging the sleeve portion. It is noted that the rotation of the unit shaft assembly urges a rotation of the entire unit 9 in the same direction and that the conduit 15 is constantly operative to resist such rotation of the unit whereby the unit tends to maintain a fixed position with respect to the conduit; the interposition of the spring 71 in the disclosed manner permits an operator to rotate the unit out of its normal position when required for the application of its working head against a surface to be treated.

While I have described the principle of operation, together with a device which I now consider to be a preferred embodiment thereof, I desire to have it understood that the device shown is merely illustrative, and that such changes may be made, when desired, as fall within the scope of the appended claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent of the United States the following:

1. In a unit of the class described, an elongated body adapted for manual support and providing an interior reservoir chamber for liquid to be applied by the unit, a working head, a rotary shaft journaled in said body and carrying said head for rotation therewith, means providing a duct from said chamber to said working head for conducting liquid from the chamber to the head, pump means for actuation in said chamber and the liquid therein to deliver liquid from the chamber into said duct while constantly stirring the liquid, and a common means to actuate said shaft and pump means together.

2. In a unit of the class described, a body arranged for manual support and providing a cylindrical reservoir chamber for liquid to be applied by the unit, a working head, a rotary shaft carrying said head and journaled in said body to axially traverse said chamber, means providing a duct from an end of said chamber to said working head for conducting liquid from the chamber to the head, a valve in said duct adjustable to regulate the liquid flow therethrough, and a feed screw carried by said shaft in said chamber for operation as a pump means in the liquid therein during a rotation of said shaft and for effecting a pressure flow of liquid to said chamber end and into said duct.

3. In a unit of the class described, a body arranged for manual support and providing a cylindrical reservoir chamber for liquid to be

applied by the unit, a working head, a rotary shaft carrying said head and journaled in said body to axially traverse said chamber, means providing a duct from an end of said chamber to said working head for conducting liquid from the chamber to the head, a feed screw carried by said shaft in said chamber for operation as a pump means during rotation of said shaft for effecting a pressure flow of liquid to said chamber end and into said duct, and means providing a return passage for fluid from said chamber end to the other chamber end.

4. In a unit of the class described, a body arranged for manual support and providing a cylindrical reservoir chamber for liquid to be applied by the unit, a working head, a rotary shaft carrying said head and journaled in said body to axially traverse said chamber, means providing a duct from an end of said chamber to said working head for conducting liquid from the chamber to the head, a feed screw carried by said shaft in said chamber for operation as a pump means during a rotation of said shaft for effecting a pressure flow of liquid to said chamber end and into said duct, means providing a return duct from said chamber end to the other chamber end, and a valve means in each of said ducts.

5. In a cleaning and polishing unit for manual support during a working application thereof, an elongated body member providing a handle for the unit and a reservoir for liquid to be applied with the unit, a sectional driven shaft journaled in said body and having a rearward portion thereof coaxial with the body axis and a forward portion thereof tubular and defining an acute angle with the body axis, gearing means connecting said shaft portions for the coaction thereof, a rotary working head mounted on said forward shaft portion, and means providing a duct to convey liquid from said reservoir through the passage of said forward shaft portion and centrally of said working head to discharge at the head for application thereby.

6. In a cleaning and polishing unit for manual support and manipulation during a working application thereof, an elongated body member providing a reservoir for liquid to be applied with the unit, a sectional driven shaft journaled in said body and having a rearward portion thereof extending longitudinally of the body and a forward portion thereof tubular and angularly related to the body axis, means connecting said shaft portions for operation together, a rotary working head mounted on said forward shaft portion, and means providing a duct to convey liquid from said reservoir through the passage of said forward shaft portion and centrally of said head to discharge at the working face of the head for application thereby.

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