

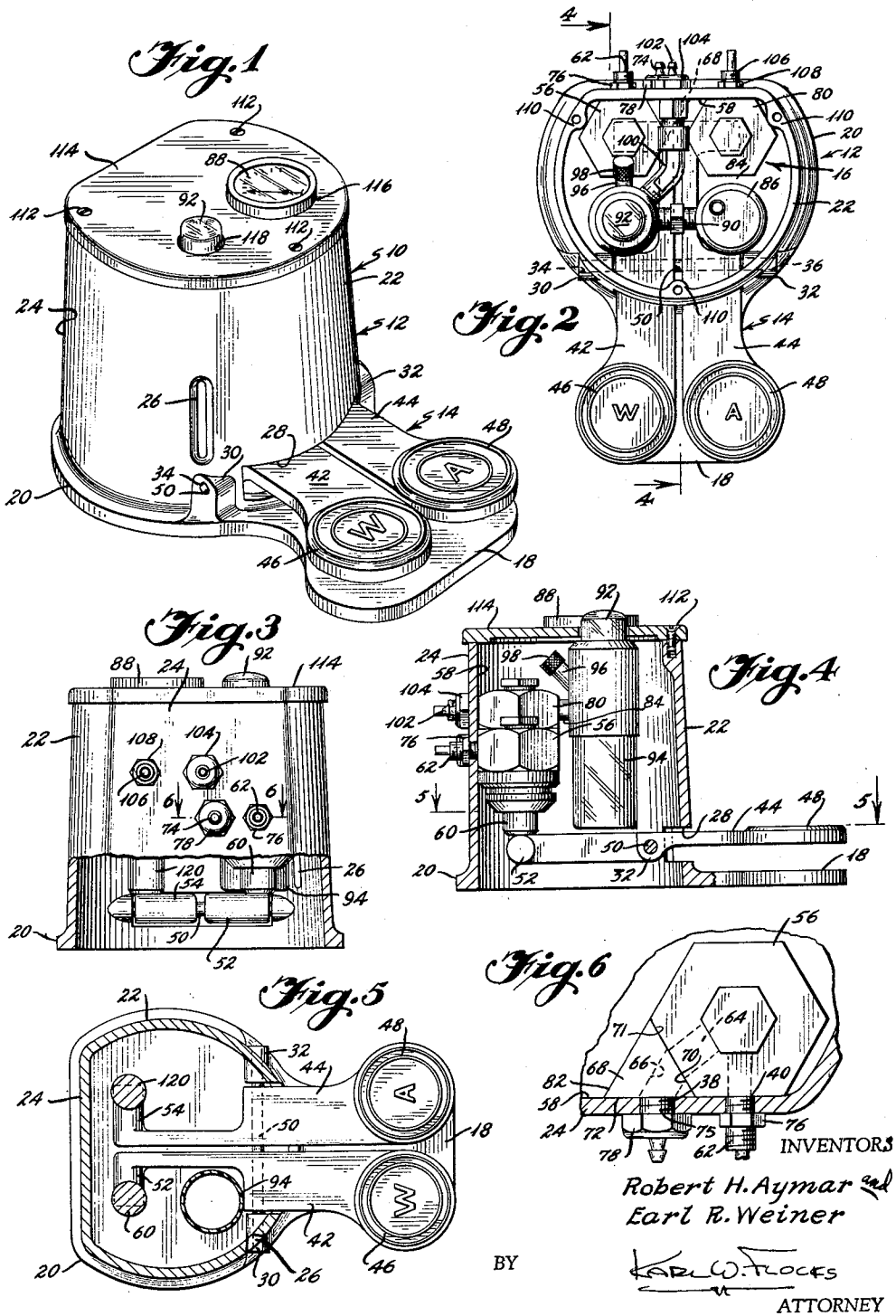
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FOOT CONTROL VALVE ASSEMBLY FOR DENTAL HANDPIECES

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This invention relates generally to appliances utilized in the dental art, and is more particularly concerned with an improved foot-operated control for dental handpieces which are driven by air pressure and which handpieces include a water supply for cooling the dental burr.

The utilization of foot-operated controls for dental handpieces are not, per se, new. However, in view of the amount of equipment found in a dentist's operating room, and the requirement that this equipment be relatively compact and disposed in a readily accessible position for use, the applicants have developed and provided a novel foot-operated control which is readily and economically manufactured, satisfactory and practical for the purpose intended, and easily maintained with a minimum amount of effort or skill.

The prior art foot-operated controls for dental handpieces incorporating an air turbine have generally involved relatively complex parts or assemblies that cause considerable maintenance difficulties and expensive repairs. Further, the prior art foot controls have generally incorporated troublesome electrical circuits and solenoid switches, and have generally required a considerable amount of floor space, which is very undesirable.

A primary object of the present invention is to provide a foot-operated control which is relatively stable during use.

Another object of the present invention is to provide a foot control for air-driven handpieces which incorporates positive-acting foot pedals for controlling the speed of the turbine in addition to a water spray utilized while drilling, and further permitting independent use of the turbine without a water spray at relatively low speeds of the dental handpiece.

A still further object of the invention is to provide a novel foot control for dental handpieces wherein the control valves and cooperating components are removable and replaceable as a unit with a minimum of skill and mechanical experience.

Other objects and the nature and advantages of the instant invention will be apparent from the following description taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view of the novel foot control of the invention;

FIG. 2 is a top plan view of FIG. 1, with the cover removed;

FIG. 3 is a rear elevation of FIG. 1, with a portion removed for purposes of clarity;

FIG. 4 is a vertical section taken substantially on the plane of line 4—4 of FIG. 2;

FIG. 5 is a horizontal section taken substantially on the plane of line 5—5 of FIG. 4; and

FIG. 6 is an enlarged fragmentary section taken substantially on the plane of line 6—6 of FIG. 3 to illustrate a water coupling incorporated in the invention.

Referring to the drawings in detail, a preferred embodiment of the foot control is indicated generally at 10 and comprises a hollow housing indicated generally at 12, cast from any suitable material, a pedal assembly indicated generally at 14, and an air-control valve and water-control valve assembly indicated generally at 16, see FIG. 2.

The housing 12, as previously mentioned, is preferably

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cast and comprises a relatively heavy "kidney" shaped base plate 18 to provide a lower center of gravity for the unit and which is integral and coplanar with a peripheral flange 20 from which projects an upwardly tapering hollow housing 22 having a flat rear surface 24. The housing 22 includes in one side thereof a vertically extending slot 26 for the purpose of observing the level of lubricating fluid which will be entrained in air directed to an air-driven dental handpiece turbine (not shown).

Extending tangentially and transversely through a lower portion of the housing 22, immediately above the base plate 18, is a horizontally extending slot 28. Also formed on the housing 22 are enlarged pivot-forming sleeve elements 30 and 32 which are in co-axial relationship, having axially aligned bores 34 and 36, respectively, which communicate with the interior of the housing 22. The housing 22 has extending transversely through the flat portion 24 thereof pairs of transverse openings 38 and 40 (only two being shown) for accommodating therethrough air and water inlet and outlet nipples.

The pedal assembly 14 includes coplanar elongated water and air pedals 42 and 44, respectively, which are disposed in overlying relationship to the "kidney" shaped base plate 18 and conform to portions thereof, and the relatively heavy base plate insures that the entire assembly 10 will be relatively stable when a dentist's foot is applied to either one or both of the circular portions 46 or 48 of the respective water and air pedals 42 and 44, either individually or simultaneously. The pedals 42 and 44 are intermediately pivoted on a pivot pin 50 which extends through the bores 34 and 36 of the pivot portions 30 and 32, respectively, the levers including, as seen in FIG. 4, a depending transverse sleeve portion 52. As seen in FIGS. 3-5, the levers 42 and 44 include, at the inner terminal ends thereof, laterally extending valve-actuating portions 52 and 54, respectively, which will be disposed beneath a valve-operating portion of the respective water and air valves to be subsequently described.

The pedal assembly 14, it will be noted, is in no manner connected to the air-control and water-control valves 16 and is of a relatively rugged character and thus relatively little maintenance is involved with respect to the pedals 42 and 44. Further, as will subsequently be described in detail, when it is desired to remove the assembly 16, this assembly is retained in position solely by a cover plate and mounting nut elements, or the like, secured on the inlet and outlet nipples connected to the water and air-control valves. The assembly 16 can be removed as a unit and replaced as a unit for overhaul at the shop, and even the dentist, or some relatively unskilled individual can replace the assembly 16 with a reconditioned or new unit with a minimum amount of time, effort, and mechanical skill.

The assembly 16 comprises a water-control valve 56 which includes an upper polygonally-shaped housing portion having one side juxtaposed on the inner surface 58 of the rear wall 24 of the housing 22. The valve 56 includes a spring-urged, depending valve operator 60 which overlies the portion 52 of the water-control pedal 42. The valve operator 60 retains the lever 42 in a substantially horizontal position, shown in FIG. 4, and a relatively slight amount of pressure on the portion 46 results in upward movement of the valve operator 60 and permits water to be metered through the valve 56. The valve 56 includes an externally threaded inlet nipple 62 which will be connected to a suitable conduit or tube for supplying water thereto. The valve 56 also includes an outlet port 64 opening into the side 70 of the valve housing, and a triangularly shaped coupling connector 68 incorporates through adjacent sides 72 and 71 an internal bore 66 which communicates with the outlet port 64. It will be noted that the side 72 is juxtaposed against the inner

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surface 58 of the rear wall 24 of the housing 22, and the coupling 68 includes an externally threaded nipple 75. The nipples 62 and 75 extend through the apertures 40 and 38, respectively, and have secured thereon retaining nuts 76 and 78, respectively, which provide the means for mounting the water-control valve 56 on the rear wall 24 of the housing 22 and the nipple 75 provides the outlet for water being controlled by the valve 56. It will be noted that the water-control valve 56 is independently mounted on the inner surface of the wall 24 by means of retaining nuts 76 and 78. The triangular coupling or connector 68 will be silver soldered or suitably secured in some similar manner to the side 70 of the valve 56, this coupling accommodating for communication of the nipple 75 with the outlet port 64 of the valve in the very minimal space provided within the housing 22. Further, by the removal of the nuts 76 and 78, and inasmuch as the valve operator 60 is not integrally connected to the valve operating portion 52 of the pedal 42, the valve 56 may be readily removed from within the housing 22.

The assembly 16 includes an air-control valve 80 having a polygonally shaped housing, having one side adjacent side 82 of the coupling or connector 68, see FIG. 2, an adjacent side of which is juxtaposed on the inner surface 58 of the rear wall 24 of the housing 22. The valve 80 communicates by means of a suitable nipple element 84 with a vertically extending air filter element 86 which incorporates in the upper end thereof a pressure gauge 88. The air filter element 86 communicates by means of a nipple 90 with a vertically extending oil reservoir element 92 having a lower transparent well portion 94 disposed adjacent the slot 26 of the housing 22 and which can be observed therethrough. The oil reservoir element 92 includes a filler spout or nipple portion 96 and having a removable cap 98 thereon and thus when the oil contained in the transparent well portion 94 falls beneath a predetermined level, the cap 98 may be removed and the oil supply can be replenished.

The oil reservoir element 92 communicates by means of a suitable angular nipple element 100 with an externally threaded outlet nipple 102 extending through a suitable transverse opening in the rear wall 24 of the housing 22. A retaining nut 104 is secured on the air outlet nipple 102 and provides a portion of the mounting means for the air valve 80, air filter 86 and oil reservoir element 92. The air valve 80 includes an integral air inlet nipple 106 which is externally threaded and projects through a suitable transverse opening in the rear wall 24 of the housing, and a retaining nut 108 is provided on the externally threaded nipple 106.

The housing 22 has formed adjacent the upper edge thereof enlarged portions 110 having formed therein internally tapped bores for receiving suitable fastening screws 112, see FIG. 1. The screws 112 extend through suitable apertures in a cover plate 114 which has extending therethrough an aperture 118 which accommodates the upper end of the lubricating oil reservoir element 92.

When it is desired to replace the valve 80, filter 86 and oil reservoir 92, the cover plate 114 is removed from the upper end of the housing 22, the nuts 104 and 108 are removed, and the air control valve 80, filter 86 and oil reservoir 92 may be removed as a unit from within the housing 22, inasmuch as the valve 80 is not connected to the operating lever 44.

The valve 80, it will be noted, includes a depending valve operator 120 which overlies the valve operating portion 54 of the lever 44, see FIGS. 3 and 5, for example, and thus the levers 42 and 44 are maintained in substantially coplanar relationship above the base plate 18.

After the cover plate 114 is removed, the nuts 104 and 108 may be removed from the respective nipples 102 and 106, and the units 80, 86 and 92 may be removed in their entirety, and as a unit, from the interior of the housing 22. Sufficient space is provided forwardly of the air

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filter 86 and oil reservoir element 92 to permit the nipples to clear the rear wall 24 of the housing. Additionally, the water valve 56 may be removed at the same time the elements 80, 86 and 92 are removed, or may remain thereon by means of the nuts 76 and 78.

Thus, it will be observed that the relatively compact foot control for an air driven handpiece, incorporates therein water and air-control valves, an air filter, air gauge and air lubricating assembly. The entrainment of oil in the air is a conventional means utilized to lubricate the air turbine of dental handpieces of the character involved.

Further, it will be noted that the triangular coupling or connector element 68 eliminates conventional L's and provides means for stabilizing the polygonally shaped housings of the valves 56 and 80.

Thus, there has been described a foot-controlled valve assembly especially adapted for use in controlling air-turbine dental handpieces, which is easily assembled, occupies a minimum space, and which is readily maintained.

It will be obvious to those skilled in the art that various changes may be made without departing from the spirit of the invention and therefore the invention is not limited to what is shown in the drawings and described in the specification but only as indicated in the appended claims.

What is claimed is:

1. A foot-controlled floor supported control unit for operating air-driven dental handpieces comprising a relatively heavy planar base plate providing a low center of gravity, a housing extending vertically and integrally from one end of said base plate, said housing including a horizontal aperture therethrough immediately above the upper surface of said base plate, pedal means intermediately and vertically pivoted on said housing through said horizontal aperture portion above said base plate, said pedal means including a foot-engageable portion extending out of said housing and overlying said base plate and a valve-operating portion disposed in said housing, valve assembly means removably mounted as a unit in and supported by said housing and including a downwardly-urged upwardly-displaceable valve operator disposed immediately above and free from said valve-operating portion of said pedal means, said valve operator being positionable by said valve-operating portion to permit fluid to be regulated through said valve assembly, and removable cover means on said housing for permitting said valve assembly means to be removed from said housing as a unit.

2. The structure of claim 1; said pedal means including a pair of adjacent foot-engageable levers each intermediately pivoted on an axis of rotation adjacent said horizontal aperture portion.

3. The structure of claim 2; said valve assembly means including an air-control and water-control valve each including an upwardly displaceable valve operator disposed immediately over the operator portion of said foot-engageable levers.

4. The structure of claim 3; said air-control and water-control valves each including an inlet and outlet nipple element, said housing including aperture portions opposite said first-mentioned aperture means, and fastener elements detachably engaged on said nipple elements for providing the sole means for mounting said valves on said housing.

5. The structure of claim 2; said valve assembly including an air filter and oil-supply chamber element connected in series to said air-control valve and removable as a unit therewith.

6. The structure of claim 5; said air-control and water-control valve assemblies including converging angular side portions adjacent the inner surface of said housing through which said conduit elements extend, and a triangular block element including adjacent side portions, one of said adjacent side portions being juxtaposed on

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the angular surface of said water-control valve, the other of said adjacent sides being juxtaposed on the inner surface of said housing, said triangular block including a nipple portion providing the outlet conduit of said water-control valve, said triangular block including a bore extending through said other adjacent side portion thereof, said bore communicating with the interior of said water-control valve and said nipple portion.

7. The structure of claim 5; said valve assembly including a pressure gauge in series with said air-control valve, filter and said oil-supply chamber element, said cover means including an aperture portion through which said pressure gauge can be observed.

8. The structure of claim 5; said oil-supply chamber element including a transparent, vertically disposed lower well disposed adjacent the inner surface of said housing, said housing including a vertically disposed open slot adjacent said vertically disposed transparent well whereby the oil level therein may be observed.

9. The structure of claim 1; said valve assembly means including an air-control valve including an upwardly displaceable valve operator disposed immediately over the valve operating portion of said pedal means and free

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therefrom, said air-control valve including an inlet and outlet nipple element, said housing including aperture portions opposite said first-mentioned aperture means, and fastener elements detachably engaged on said nipple elements for providing the sole means for mounting said valve assembly on said housing.

10. The structure of claim 9; said valve assembly including an air filter and oil-supply chamber element connected in series with said air-control valve and removable as a unit therewith.

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