

Sept. 11, 1945.

F. X. DUBAY

2,384,458

FUR CLEANING APPARATUS

Filed March 6, 1943

3 Sheets-Sheet 1

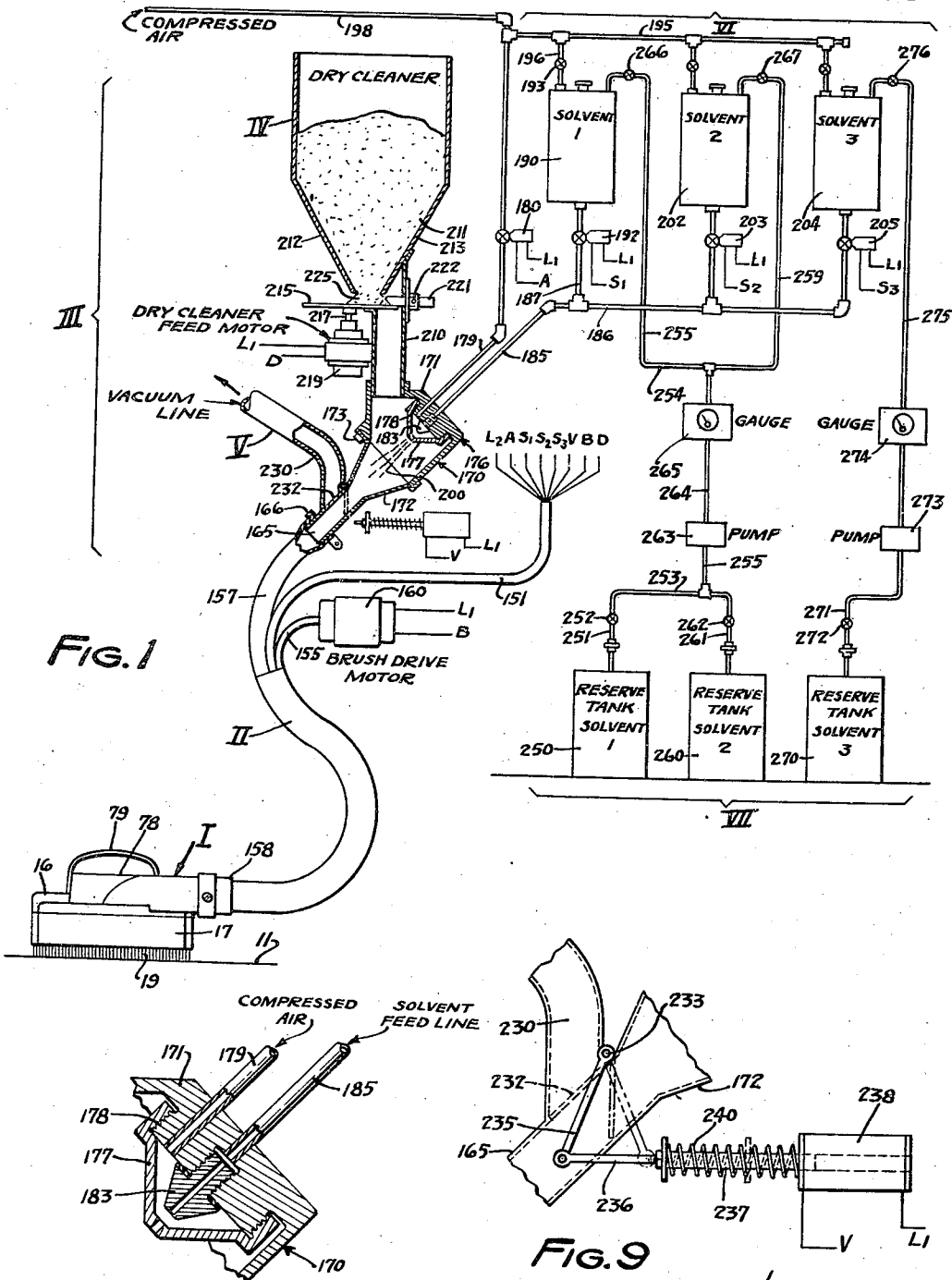


FIG. 8

FIG. 9

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3 Sheets-Sheet 2

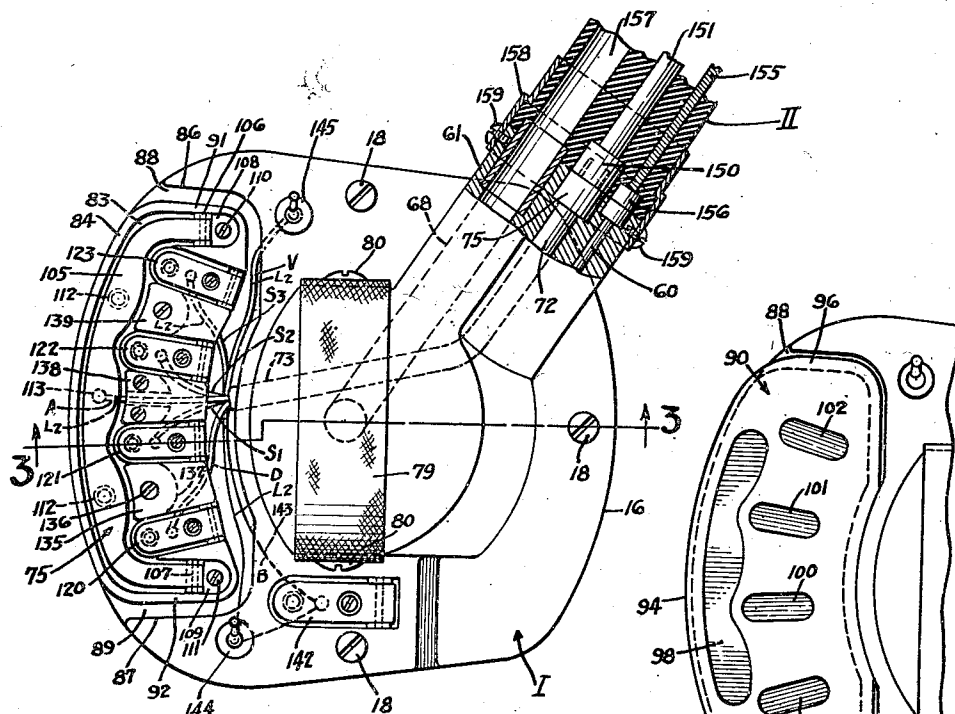


FIG. 2

FIG. 4

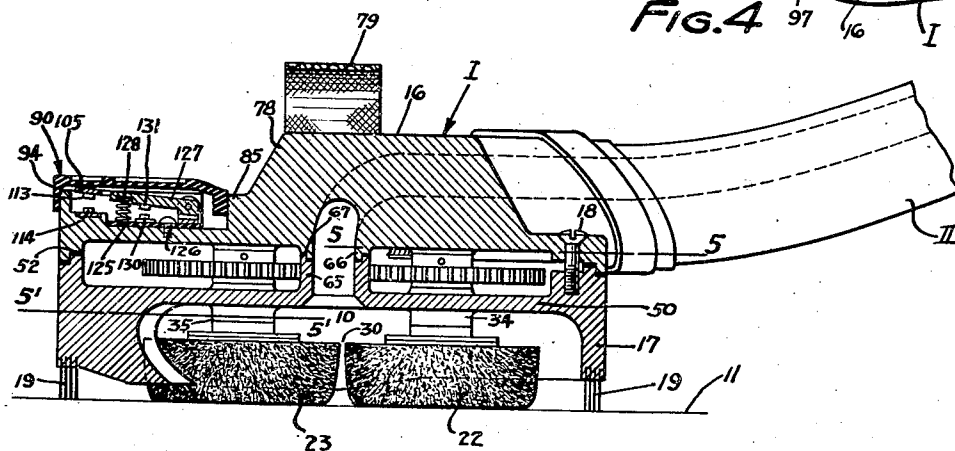


FIG. 3

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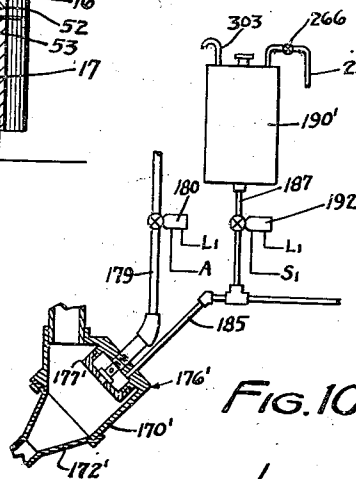
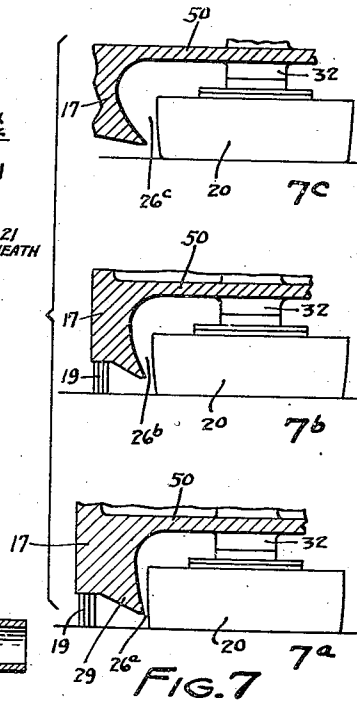
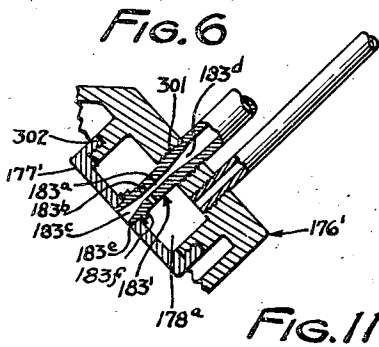
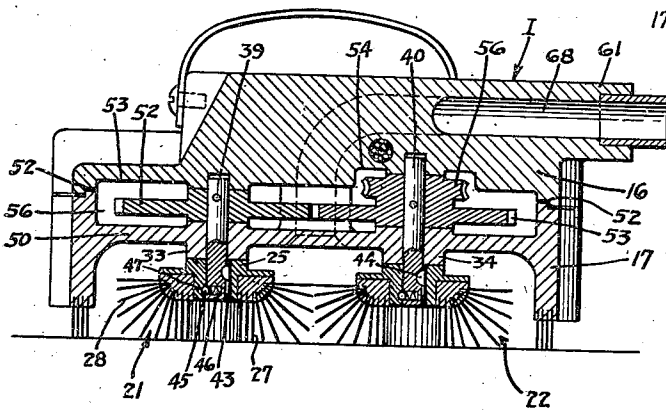
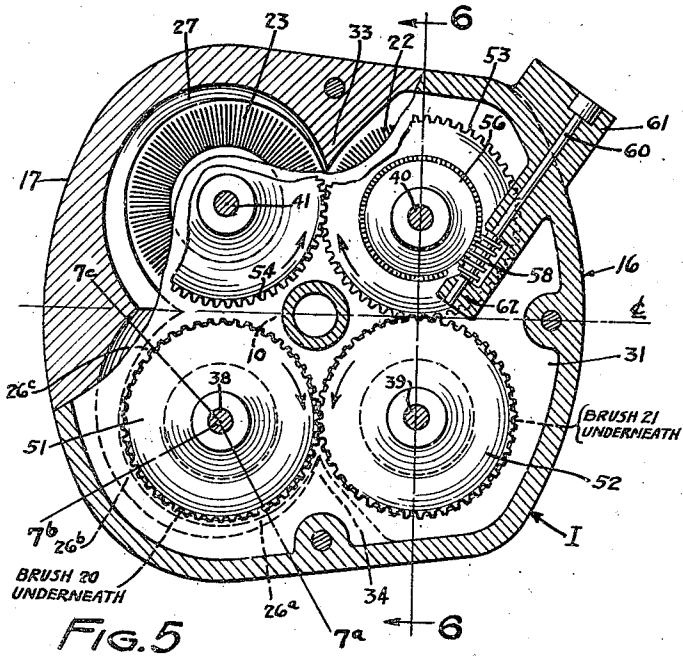
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3 Sheets-Sheet 3



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FUR CLEANING APPARATUS

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Application March 6, 1943, Serial No. 478,219

8 Claims. (Cl. 69-20)

This invention relates to apparatus for cleaning furs, more particularly to apparatus for cleaning fur garments and the like.

The cleaning of fur garments has heretofore been accomplished either by one or the other of two fairly standard procedures. In one procedure, the linings of the garments are ripped out and the fur portion of the garment is subjected to a cleaning by itself in a fur-cleaning machine usually of the tumbler type wherein the entire garment is tumbled together with other fur garments with a dry or moistened granular cleaning compound. Various granular cleaning compounds are used, viz., sawdust, corn meal, comminuted corn cobs, and the like. This method of cleaning is in most instances the best present method available inasmuch as the fur is tumbled in a considerable quantity of dry or wet detergent. However, there are disadvantages in the procedure. It is expensive, due to the fact that labor is involved in ripping out and afterwards sewing in the linings of the garments. This is all hand work and, hence, considerably adds to the overall cost of cleaning. Furthermore, the cleaning operation does not distinguish between areas of the fur soiled to varying degrees and, as a consequence, it is necessary to continue the cleaning (tumbling) operation until the most dirty spots of the fur have been cleaned or otherwise simply to clean (tumble) until the broad areas of the fur are cleaned, and terminate the cleaning operation without in fact removing all of the dirt from the dirtiest portions. A further disadvantage is the relatively large amount of wear that is given to the fur in the tumbling operation. Due to the fact that in tumbling, the cleaning is accomplished by mutual attrition of numerous pieces of fur and heat is generated thereby, it frequently happens that the fur, or rather portions of the fur garment, may be seriously deteriorated. Not the least of the disadvantages is the fact that the fur cleaning apparatus is of large size and is heavy, and requires a large capital investment and considerable floor space. As a consequence, the tumbling method of fur cleaning cannot be carried out in the small fur shops. In some instances, in attempting to economize, furriers attempt to clean the whole fur garment without first removing the lining. The granular detergent which works into the garment through rips and seams, lodges in the hem and cuffs, and is difficult if not impossible to remove. Removal involves costly hand labor.

The other common procedure for cleaning fur garments is the so-called "hand method." This consists in hand application of a dry or moist detergent to a fur garment (from which the lining is not usually removed). The dry detergent is applied and rubbed by hand and is then beaten

out. This method is very unsatisfactory from the standpoint of cost in that the process is very costly if done thoroughly. In many instances, the cost is greater than that of drum cleaning. This method is adaptable to small establishments but the results are haphazard for they depend upon the skill of the operator, and in the majority of operations the amount of cleaning which actually takes place is negligible. In addition, hand cleaning methods are undesirable due to operator fatigue.

It is the object of the present invention to provide an apparatus for cleaning a fur garment which is capable of being carried out in small or large fur cleaning establishments and by eliminating guess work it is capable of producing excellent cleaning results. It is a further object of the invention to provide fur cleaning apparatus wherein the degree of cleaning may conveniently be varied so that exceptionally dirty spots of the garments, such as collars, cuffs, elbows and the like, may be treated selectively for the removal of adherent dirt without treatment of adjacent, less dirty, areas.

It is a further object of the invention to provide an apparatus wherein the cleaning action may be accomplished by means of a dry, granular detergent, a moistened granular detergent or by means of any one of a number of fluid solvents, separately or in combination; and to provide facilities for the convenient removal of the detergent after the cleaning operations have been accomplished.

A further object is to provide apparatus for positive cleaning of furs and fur garments, wherein the hair of the fur is subjected to the controlled action of multiple brushes and every hair is contacted by brush action with a sweeping and scraping action. In utilizing the apparatus of the invention, matted sections of fur are combed out by the bristles and at the same time the bristles drive granular and liquid detergents to the bottom of the pelt. The complete hair from top to bottom is reached by the cleaning action of the brushes revolving in opposite directions thereby assuring cleaning action on all sides of the hair filaments.

It is also an object of the invention to provide apparatus for cleaning fur efficiently and thoroughly without necessity for removal of the garment lining and without danger of introducing detergent into the space between the pelt and the lining.

It is another object of the invention to provide apparatus for fur cleaning utilizing labor of average skill and intelligence.

The invention is illustrated by reference to the drawings in which Figure 1 is a schematic view illustrating the cleaning apparatus in its entirety. Figure 2 is a fragmentary plan view, partly in

section and with certain parts removed, illustrating the manipulated cleaning instrument of the apparatus. Figure 3 is a sectional elevational view taken along the lines 3—3 of Figure 2. Figure 4 is a fragmentary view of the left-hand part of the apparatus shown in Figure 2 but with the controller cover in place. Figure 5 is a sectional plan view of the apparatus shown in Figure 2, the right-hand and lower portion of Figure 5 being a section at the level 5—5 in Figure 3 and the upper left-hand portion of Figure 5 being at the level 5'—5' of Figure 3. Figure 6 is a sectional view of the apparatus shown in Figure 5 taken along the lines 6—6 of Figure 5. In Figures 3 and 6, the bristle wall has been omitted behind the section line 6—6, in the interests of clarity. Figures 7^a, 7^b and 7^c are a series of sectional views taken along the lines 7^a, 7^b and 7^c of Figure 5. Figure 8 is a fragmentary enlarged sectional view of the injector apparatus of Figure 1. Figure 9 is a fragmentary enlarged view of the vacuum control apparatus of Figure 1. Figure 10 is a fragmentary view partly in section of a portion of a modified form of solvent injections and air blast apparatus. Figure 11 is a fragmentary sectional enlargement of a portion of the apparatus shown in Figure 10. Throughout the drawings, corresponding numerals indicate corresponding parts.

Referring to Figure 1, there is illustrated the entire system which comprises an operator manipulated cleaning tool, generally designated I, which is constructed so as to be readily movable over the surface 11 of the garment undergoing cleaning. The cleaning tool I is connected by a flexible cable, generally designated II, to stationary apparatus shown opposite the bracket III. The stationary apparatus III includes a mechanism IV for feeding dry granular detergent at a controlled rate together with suitable controls, a vacuum system, generally designated V together with its controls, and pneumatically operated fluid cleaner injectors shown under the bracket VI together with suitable controls. In addition, the stationary apparatus may include a reserve tank supply and piping system shown over the bracket VII.

Referring to Figures 1 through 7, the operator manipulated cleaning tool I consists of a main casing having an upper housing portion 16 which is fitted to a lower housing portion 17 by a plurality of fastening screws 18. The upper and lower housings 16 and 17 are somewhat larger than a man's hand and have the plan view shape illustrated in Figures 2 and 5. The lower housing 17 is provided with a marginal wall of relatively stiff bristles 19 of sufficient stiffness and marginal width so as to form a means of retaining to a reasonable degree the granular and solvent detergents applied to the fur. The bristle wall 19 adds to the stability of the cleaning tool I without, however, presenting a hard surface to the fur.

The underside of the housing 17 is cut away so as to provide a space of four brushes 20, 21, 22 and 23 which are preferably identical so as to be interchangeable. Each of the brushes consists of a hub 25 (see Figure 6) carrying an annular plaque in which bristles are embedded by any desired brushmaking technique, some of the bristles being in a downward direction as shown at 27 and some radial as illustrated at 28. The bristles are trimmed to a diameter so that when all of the brushes are in place the bristles of

adjacent brushes do not engage each other, there being slight clearance between the brushes as illustrated at 30, Figure 3.

The lower portion of the housing in which the brushes 20, 21, 22 and 23 are situated is molded or cast to the shape shown in Figures 3, 5, 7^a, 7^b and 7^c. Thus at the rear part of the housing, there is considerable clearance offered by the space 31 but at each side of the housing, clearance is limited by protuberances 33 and 34 which extend into the space between brushes 20 and 21 and the space between brushes 22 and 23, respectively. Toward the front of the housing 17, the clearance space gradually increases in the direction of rotation of brushes 20 and 23. Thus, as illustrated in Figure 7^a, there is a relatively small space 26^a between the inwardly extending portion 29 of the housing 27 and the bristles of brush 20. The clearance is increased gradually at 26^b illustrated by the section view 7^b and continues to increase to a maximum at 26^c toward the front of the housing as illustrated in 26^c in Figure 7^c. In addition, it will be noted that there is a slightly rising curvature of the space 26^a—26^b—26^c. This has the effect of slightly elevating the granular detergent so as to toss it upwardly and backwardly into the space between brushes 20 and 23, where, due to the rotation of the brushes (indicated by arrows in Figure 5), the detergent is again brought to the central area between brushes 20, 21, 22 and 23. In this way, the detergent is recirculated and reworked into and through the fur, so as to absorb and remove a maximum amount of dirt.

In this connection, it may be noted that the rotation of the brushes, illustrated by the arrows, is such that brushes 21 and 22 tend to throw the detergent forwardly along the center line CL to the center space 10, whereas brushes 20 and 23, due to their rotation, tend to throw the detergent backwardly to the center space. The detergent that is discharged sideways by the rotation of brushes 20 and 21 is caught by the land 34 on the underside of the casing and projected along the converging scroll 28^a—26^b—26^c, and then discharged between brushes 20 and 23 so as to be thrown backwardly to the center space 10. Similarly detergent thrown outwardly by brushes 22 and 23 is caught by land 33 and is thrown along scroll 27 and discharged into the space between brushes 20 and 23 whence it also is projected backwardly to the center space. In this manner, the detergent is worked into the fur repeatedly for maximum effectiveness.

The lower portion of the housing is provided with four spaced journals which serve rotatably to mount four vertical brush shafts 38, 39, 40 and 41. The drawings (Figures 3 and 6) show only journal 33, 34 and 35 which support shafts 39, 40 and 41, respectively. It will be understood that a similar journal supports shaft 38. The brush shafts each extend downwardly into the hollow underspace of the lower housing part 17, and are machined so as detachably to receive the four brushes 20, 21, 22 and 23. Any suitable quick detachable connection may be provided so as to allow convenient removal of the brushes for cleaning and replacement. Thus each of the shafts may be provided with a key way slot 43 for receiving the corresponding key 44 of the brushes as illustrated for brush 21 at Figure 6. The shaft, in this instance shaft 39 of brush 21, is also provided with a ball detent 45 which is spring-pressed outwardly by spring press 46 so as to be received into the notch 47 of the brush hub. Thus, by pushing

the brush 21 directly upon the shaft 39 until the ball detent 46 is received in the notch 47, the brush is restrained from falling downward and at the same time the key 44 in key slot 43 prevents rotation of the brush with reference to the shaft. A similar connection is provided for each of the brushes in the cleaning tool so that they may be interchanged, if desired, for balancing the wear on the brushes. It will be noted that the brushes 20 and 22 rotate clockwise and brushes 21 and 23 rotate counterclockwise. By exchanging the positions of brushes 20 and 21 and by exchanging the positions of brushes 22 and 23, a permanent deformation of the bristles can be prevented.

The bearing journals 32, 33, 34 and 35 are conveniently constructed as an integral part of the diaphragm wall 50 of the lower portion 17 of the housing and the upper housing 16 is likewise recessed on its underside as illustrated at 53-54, and provided with bearing recesses for receiving the upper ends of the shafts 38, 39, 40 and 41. There is thus formed a closed gear box 56 in which there is situated a plurality of gears for driving the vertical shafts 38-41. Thus upon shaft 38, there is mounted a gear 51 which runs in mesh with a gear 52 upon shaft 39. The gear 52 in turn meshes with a gear 53 upon shaft 40 and the latter meshes with a gear 54 upon shaft 41. Each of the gears 51-54 may be simple spur-gears or bevel gears, if desired. Gear 53 has an integral or attached worm gear 56 which is positioned above gear 53 and engages with a cooperating worm gear 58 upon shaft 60. The shaft 60 is journaled in the boss 61, which extends at the upper right rear side of the housing 16. An inward extension 62 of the boss within the gear housing serves to support the end of the shaft 60 against deflection under load. It will be noted that the housing wall extends upwardly as illustrated at 52 and that the upper part 16 of the housing is closely fitted to it so that a grease-tight connection is maintained between the housings.

The diaphragm 50 of the lower portion 17 of the housing is built up in the center as illustrated at 55, and matches with a downwardly extending portion 66 of the upper housing part 16. These matching portions are fitted with a slip-joint shown at 67 so as to be grease-tight. The portion 66 of the upper housing is a terminus of the internally formed bore 68 which extends through the upper housing portion 16 and terminates in the boss 61.

As shown in Figure 2, the upper housing 16 also has a conduit 72 which extends from the boss 61 toward the front of the cleaning tool at 73, where it terminates adjacent the finger control generally designated 75. The upper portion of the housing 16 has a raised pad 78 which is shaped like the palm of a man's hand so that the operator's hand can rest on it with the fingers curved downwardly at the front of the unit. A loop strap is provided at 79, the strap being fastened to the palm-pad 78 by means of the screws 80. In use, the palm of the operator's hand rests on the pad 78 and under-strap 79 with the fingers extending forwardly and downwardly to the controls 75.

For controlling the various cleaning operations, as hereinafter more fully explained, there is provided a plurality of electric switches located in a recess 83. The recess has a front wall 84 which extends around the sides at 91 and 92, and a rear wall 85 which extends forwardly at the sides as shown at 86 and 87. The front wall 84 extensions

at the parts 86 and 87 are spaced from 91 and 92 respectively, so as to provide channels 88 and 89 which receive the side flaps of a flexible rubber cover, generally designated 90. The cover 90 is stretched over the side portions 91 and 92 of the wall 84 and around the front thereof, as illustrated at 94. The side flat portions 96 and 97 of the cover reside in channels 88 and 89 and the back flap portion abuts against wall 85. The cover 90 is provided with a long transverse depressed thin portion 98 and a plurality of smaller, radially arranged thin portions 99, 100, 101 and 102 which are all arranged so that the four fingers of the operator's right hand will rest upon the depressed thin portions for the selective operation of control switches thereunder. Thus, when the operator's right hand is in place upon the cleaning unit I, he may move the whole unit by virtue of the pad 78 and strap 79 about the palm of his hand and merely by pressing on the soft rubber cover 90 on the appropriate spot he may effect the desired selective operation. Thus, if desired, one or all of the fingers may be moved forwardly upon the spot 98 for operation of the switch thereunder or, if desired, the index fingers may bridge the spots 99 and the end of space 98 simultaneously for simultaneous operation of both controls thereunder. Similarly, the first, second, third or fourth fingers may bridge any one or any combination of the spots 99, 100, 101 or 102 and spot 98 simultaneously, so that any combination of operational controls may be effected.

In the space below the soft rubber cover 90 there are situated a plurality of switches. A long bar switch 105 extends across the front of the machine, is pivoted at 106 and 107 upon the stationary blocks 108 and 109 held in place by screws 110 and 111. The bar is maintained in normal elevated position by means of springs 112, and the center portion of the bar 105 carries a switch contact 113 which is positioned so that it engages a lower switch contact 114 when the bar 95 is depressed. A conductor A is connected to contact 113 and a line conductor L₂ is connected to the lower contact 114.

Similarly, switches 120, 121, 122 and 123 are likewise mounted in spaced relation as shown in Figure 2 so as to be situated below the depressed spots 99, 100, 101 and 102, respectively, of the soft rubber pad 90. The switches 120, 121, 122 and 123 are preferably identical and hence only one need be described. Thus the switch 121, shown in Figure 3, includes a base plate 125 which is attached to the upper casing 16 by means of a screw 126. The base plate serves as a pivot for the upper switch part 127 which is normally maintained in raised position by means of a spring 128. The base plate carries an insulated line contact 130 and the upper portion 127 of the switch carries a contact 131. The contact 131 is connected to a conductor S₁.

In a like manner, the upper contacts of each of the switches 120, 122 and 123 are connected to conductors D, S₁, S₂ and S₃. The lower contacts of each of the switches 102, 120, 121, 122 and 123, that is to say, the lower contact 114 of switch 105, the lower contact 130 of switch 121, and the corresponding lower contacts of the switches 120, 122 and 123 are all connected to a power source L₂, the conductor of which is illustrated in Figure 1. The conductors are illustrated in single lines in Figure 2. For purposes of clarity in the drawings, all of the conductors are omitted in Figure 3, but it will be understood

that the conductors are nested in the space below the rubber pad 75 and against wall 85.

Between switches 120 and 121 there is a rest block 135 which is held in place by a screw 136. The rest block is cut out at the lower back end as illustrated at 137 so as to allow convenient passage of the conductor D thereunder. A similar rest block 138 is situated between switches 121 and 122, and a rest block 139 is situated between switches 122 and 123. The rest blocks serve to support the area of the rubber cover between the spots 99, 100, 101 and 102 so as to allow the operator of the instrument to apply an appreciable force to the cleaning tool by means of his fingers without at the same time depressing the switches.

A rheostat control 142 is positioned at the left middle portion of the upper housing 16 alongside the hand strap 79 in a position to be engaged by the operator's thumb. The control 142 may conveniently be similar to switches 120 except that in place of simple contacts for making and breaking a circuit, there is provided a variable resistance control of any suitable design for varying speed of the brush drive motor. One terminal of the rheostat control 142 is connected by conductor B, whereas the other terminal of the rheostat is connected by means of a wire in conduit 143 to a snap switch 144 positioned at the left front part of the housing 16. The switch 144 is of the on-and-off type, and is connected to conductor L₂. At the right front part of the housing, there is provided an on-and-off switch 145 which is likewise connected to conductor L₂ and to a conductor V for the purpose of controlling the vacuum operation of the cleaning tool I.

Thus, when the operator's hand is in place under strap 79, the four fingers are extendable into positions so as to engage switches 105, 120, 121 and 123 for controlling the air blast (conductor A), the flow of dry cleaning material (conductor D), and the control of three different cleaning solvents, (conductors S₁, S₂ and S₃). Additionally the thumb of the operator is in a position to depress the rheostat control switch 142 for varying the speed of the brushes (conductor B), and on-and-off switches 144 and 145 are provided for operation by either the right or left hand of the operator for controlling the application of vacuum in the cleaning instrument (conductor V, switch 145) and for shutting off the operation of the brushes (switch 144).

The various electrical conductors are grouped in a cable and run through the conduit 72 to a separable connection at 75 in the boss 61. The connection 75 is engagable by a detachable coupling 150 which is the terminus of a multiple conductor cable 151 in conduit II. The housing II also contains a flexible drive shaft 155 which terminates in coupling 156 and an open conduit 157 which terminates at the end of bore 68. The housing II is preferably of rubber so as to be reasonably flexible and is coupled to the boss 61 of the cleaning tool I by means of a collar 158 which is held in place by a plurality of screws 159 or any other suitable fastening device. The flexible conduit II extends to the stationary apparatus illustrated opposite bracket III of Figure 1, where the flexible shaft 155 branches off and is coupled to a brush drive motor 160. Power is supplied to the drive motor by two conductors, one being labeled L₁ and the other B, it being understood that the terminal B of the drive motor is connected by wiring, not shown, to conductor B of the cable 151.

The cable 151 is illustrated as terminating in conductors L₂, A, S₁, S₂, S₃, V and D; but it will be understood that the conductor B of the cable is connected to the conductor B of the drive motor. The intermediate wiring has been omitted from Figure 1 for purposes of clarity. Accordingly, when switch 144 is in the "on" position and the rheostat controller 142 is depressed, a circuit connection is established for supplying power to the brush drive motor which consequently causes the flexible shaft 155 to rotate and this, in turn, rotates the worm drive shaft 60. The gears 56 and 53 are accordingly rotated and the latter, in turn, rotates gears 54 and 52. Gear 52 in turn rotates gear 51. The direction or rotation of the gears 51, 52, 53 and 54 is illustrated by the arrows shown in Figure 5 and these gears in turn serve to rotate the brushes 20, 21, 22 and 23 in the lower housing portion 17.

The open tube 157 of the conduit II is clamped by fastener 166 to the spout end 165 of an injector and mixing casing, generally designated 170. The injector and mixing casing 170 includes a housing 171 to which funnel 172 is attached by means of screws 173. The funnel terminates at spout 165 and in line with a spray apparatus generally designated 176, having a spray nozzle 177, the nozzle being attached by means of screw threads 178. Air is supplied to the nozzle by means of compressed air line having an electromagnetically operated control valve 180, the two electrical conductors of which are connected to a power source L₁ and to conductor A of cable 151. The intermediate wires between conductor A of the control valve 180 and the cable 151 are omitted for purposes of clarity, but it will be understood that when power is supplied to L₁ and L₂ and when switch 105 of the cleaning tool I is depressed by any of the fingers of the operator, a circuit is closed, valve 180 opens, and the compressed air is introduced into the spray nozzle 176 by way of pipe 179.

Liquid detergents are introduced into the spray nozzle 176 by means of the jet 183 which is connected by means of pipe 185 to a header 186. The header 186 is in turn connected by means of pipe 187 to pressure tank 190 containing solvent 1 and an electromagnetically operated control valve 192 is provided in pipe 187 so as to shut off or permit flow of solvent 1 therethrough. The solvent tank 190 is provided with a filling inlet and with a compressed air line 196 which is controlled by a shut-off valve 193, the line 196 being connected to a header 195 supplied by compressed air line 198. The control valve 192 is connected in a manner similar to that described for the valve 180—that is to say, one terminal of valve 192 is connected to the power lines L₁ and the other terminal to line S₁ of the cable 151, so that when the switch 121 of the cleaning tool I is closed the valve 192 will be operated, thus allowing solvent to flow under pressure through pipes 187 and 186 and 185 to the jet 193 where it is broken into a mist and discharged as a spray 200 into the interior of housing 170, and thence into the funnel 172 where the spray continues into the open bore 157 of the conduit II. The spray then continues downwardly to the cleaning tool I, thence through the bores 66 and 65, and is distributed into the central area 10 between brushes 20, 21, 22 and 23, and into the fur being cleaned. The rotating brushes supply the necessary rubbing action for working the solvent detergent into the fur.

In a similar manner, solvent 2 and solvent 3 are introduced from tanks 202 and 204 by means

of operator control valves 203 and 205, respectively. One terminal of valve 203 is connected to L₁ and the other to line S₂ of cable 151 which terminates in switch 122 in the cleaning tool. Similarly one terminal of valve 205 is connected to L₁ and the other to line S₃ of cable 151, whence it terminates at switch 123 of the cleaning tool I. In this manner when switches 122 and 123 are operated either individually or in combination, solvents 2 and 3 are introduced into the header 186 and thence through pipe 185 into the jet 183 where the solvent is caught and sprayed outwardly at 200 by the air blast and, as previously described, the spray is conducted to the cleaning tool I through the bore 157 of the conduit II. It will be appreciated that the air blast may be used alone by operation of switch 105 or, if the operator so desires, the air blast may be used in combination with one or more of the solvents 1, 2 and 3 by appropriate pressure of the operator's fingers on the areas 98, 99, 100, 101 and 102.

Dry granular detergent material is introduced into the housing 170 through the vertical pipe 210 which terminates and supports the dry cleaner feeder IV. The feeder has a hopper 211 shaped to converge downwardly at sides 212 and 213 so as to deposit the dry granular cleaning material in hopper 211 onto a circular plate 215. The plate 215 is mounted upon the shaft 217 of the dry cleaner feed motor 219 which is of the slow rotating type, preferably a motor geared down for slow rotation of the shaft 217. Any convenient design of motor or motor and gearing may be used. One terminal of the motor 219 is connected to L₁ and the other terminal is connected to wire D of the cable 151 which terminates and is controlled by switch 120 of the cleaning tool.

Upon pipe 210 there is mounted a cut-off knife 221, which extends inwardly across the upper surface of the circular plate 215, the knife 221 being slideably adjustable in a more or less radial direction across the plate. Set-screw 222 is provided so as to lock the knife in any desired adjusted position. The dry granular detergent is deposited in a cone shaped pile 225 upon the plate 215 and the pile is rotated so as to bring an edge of the pile against the cut-off knife 221, which, accordingly, scrapes off a regulated supply of dry cleaning material whenever the motor 219 is in operation. Thus the operator of the cleaning apparatus may, by depressing the switch 120 under area 99 of the rubber pad, cause motor 219 to operate and thus cause a gradual feed of the dry granular detergent into the pipe 210 whence it falls downwardly into housing 170 where it is caught and driven by the air discharge 200 from spray nozzle 176.

As previously explained, the nozzle 176 can be controlled so as to discharge air alone or air and any one of the solvents 1, 2 and 3 as a mist. Hence by an appropriate operation of the control switches on the cleaning tool I, the operator may cause the feeding of dry granular detergent or moistened granular detergent, depending upon whether the granular detergent is dropped into either a dry stream of air or a wet spray of air.

In the lower portion of the funnel 172, there is a branch line 230 connected to a vacuum line, not illustrated. The vacuum line may be either of the permanent vacuum supply type or a vacuum supply produced by a vacuum blower intermittently operated, as desired. The junction of the vacuum branch 230 and the funnel 172 is ordinarily closed by means of an electromagnetically operated gate 232 which is pivoted about hinge

pin 233. Referring to Figure 9, it will be observed that the hinge pin 233 has attached thereto an operating arm 235 to which there is connected a link 236 terminating in armature 237 of the solenoid 238. The armature is normally spring pressed to the left as shown in Figure 9 by means of the spring 240 so as normally to hold the gate 232 in a position to shut off the vacuum branch 230. When it is desired to apply a vacuum to the cleaning tool, the solenoid 238 is energized, it being noted that one terminal of the solenoid is connected to the supply source L₁ and the other terminal V is connected to the correspondingly designated wire V of the cable 151. The wire V of the cable terminates in switch 145 of the cleaning tool, and thus the operator may, by closure of switch 145, cause the operation of solenoid 238, thus opening the gate 232 and allowing the vacuum to be applied to the bore 157 of housing II. The vacuum is communicated to the space 10 between bristles 20, 21, 22 and 23. In this way, a considerable portion of the detergent, wet and dry, may be withdrawn from the fur undergoing cleaning while the fur is brushed due to the operation of the revolving brushes. Of course, during such operation, all of the switches 105, 120, 121, 122 and 123 remain open, and the operator's fingers may, during this period, rest upon the spaces between spots 99 and 100, etc., of the rubber pad so as to allow the operator to apply appropriate force to the cleaning tool without, however, closing any of the air or solvent control switches. When the vacuum is of the intermittent type, the wire V may be connected, not only to the control solenoid 238, but also to the vacuum drive motor, so that when gate 232 is opened, an appropriate vacuum will be drawn in pipe 230.

In order to supply solvents 1, 2 and 3 to the operating tanks there may, if desired, be provided a filling system for introducing solvents 1, 2 and 3 from the reserve supply to the corresponding operating tanks 190, 202 and 204. The filling system is shown over the bracket VI and may conveniently be of the following form.

The reserve tank 250 for solvent 1 is connected by pipe 251, controlled by valve 252, to a header 253. Reserve tank 260 is connected by pipe 261 and is controlled by a valve 262 to the same header 253 from which header there extends pipe 255 to pump 263 and then through pipe 264 to a volumetric gauge 265 to a header 254 and thence through a pipe 255, controlled by valve 266, to a solvent supply tank 190. Similarly, there is provided a pipe 259 running from header 254 to tank 202 for solvent 2. The pipe is controlled by valve 267.

It is contemplated that the common pump 263 and gauge 265 may serve all miscible solvents that are used for detergent purposes. Thus, cleaner's naphtha may be used as solvent 1 and a similar miscible detergent used as solvent 2. These may be pumped through the pipe connection shown and pump 263 and gauge 265 from tanks 250 and 260 to tanks 190 and 202 respectively by appropriate manipulation of valves 252, 262, 266 and 267. Thus by closing valves 262 and 267 and opening valves 252 and 266, solvent may be pumped from tank 250 to tank 190, whereas by closing valves 252 and 266 and opening valves 262 and 267 solvent may be pumped from tank 260 to tank 202. It is contemplated that for some cleaning operations a water type detergent, solvent 3, may be desired, this being transferred from the reserve tank 270 through the pipe 271

which is controlled by valve 272 and thence through pump 273 and gauge 274 through pipe 275 controlled by valve 276 to the solvent 3 tank 204. In this manner, the reserve supply of solvent 3 may be transferred to the working tank 204 for solvent 3 without mixing with either of the non-aqueous solvents used for cleaning purposes.

In Figures 10 and 11, there is illustrated a modified form of air blast nozzle and spray head, generally designated 176', adapted for injection of the liquid detergents at atmospheric pressure rather than at the pressure of the air line. This form has the advantages in allowing lighter construction of the solvent tanks 190' (and additional solvent tanks, not illustrated) as compared with the construction shown at 190, 202 and 204 in Figure 1. In Figure 10, housing 170' has the same overall shape as housing 170 of Figure 1, but the air blast nozzle 183' is in the form of a Venturi tube having astricted orifice at 183a, and fluid inlet holes 183b. The orifice 183a has a smooth upstream approach 183d and a smooth downstream flare 183e. Due to the restriction of area at 183a, the static (air) pressure is reduced to less than atmospheric pressure, the energy of the air stream being represented by an extremely high velocity in the orifice. Consequently, fluid detergent in antrum 176a is drawn through holes 183b into the air stream and thence projected by the air blast. The Venturi nozzle 183' is threaded into the housing 175' as shown at 301, and the nozzle cap 177' is threaded onto the housing at 302. When pulled down tight, the nozzle cap 177' rests upon a flange 183f of the nozzle tube 183', and a soft gasket may be provided between the flange and nozzle, if desired.

Air is introduced into nozzle 183' via pipe 179 which is controlled by electromagnetically actuated valve 180 as in Figure 1. The solvent tank 190' may be of light weight construction and feeds pipe 187 which is controlled by valve 192, and is connected through pipe 185 to the antrum chamber 176a of the nozzle. Tank 190' may be filled by pipe 255 controlled by valve 266. Tank 190' has no connection to the air line 198 (comparable to pipe 196 and valve 193) but instead, is provided with a vent to atmosphere shown at 303. Thus, liquid in tank 190' flows by gravity and due to the pull of Venturi nozzle 183' whenever valve 192 is opened. It is understood, of course, that when utilizing this type of construction, all of the solvent tanks are similarly constructed.

Many obvious variations will appear to those skilled in the art and are intended to be within the purview of the invention herein illustrated, described and claimed.

I claim as my invention:

1. An apparatus for cleaning fur comprising an open bottomed housing, a flexible marginal wall, a plurality of rotary bristle brushes journaled in said housing for rotation about vertical axes, said brushes being spaced from each other and positioned with the bristles about level with the flexible marginal wall, gear means in said housing for simultaneously rotating the brushes, flexible shaft means for rotating the gears, a remotely situated motor connected to the flexible shaft for rotating the shaft, the housing being shaped to receive an operator's hand, remote detergent introduction apparatus and a flexible

conduit connecting said apparatus and the housing, electromagnetically operated means for regulating said apparatus, switch means within reach of an operator's fingers when his hand is in place on the housing for controlling said electromagnetic means, and circuit connection between the switch means and remote electromagnetic means.

2. The apparatus of claim 1 further characterized in that the flexible shaft, flexible conduit, and circuit connections are grouped in a single flexible housing.

3. An apparatus for cleaning fur comprising an operator controlled brushing tool, a flexible conduit extending thereto and fixedly mounted remote means for introducing detergents into said conduit comprising an air blast nozzle, operator controlled means for controlling the air blast from said nozzle, and operator controlled means for selectively introducing dry and wet detergents into the conduit along with said air blast from the nozzle.

4. The apparatus of claim 3 further characterized in that the operator controlled means for selectively introducing dry and wet detergents into the conduit along with said air blast from the nozzle includes an operator controlled electric motor dry detergent feed for feeding a regulated supply of dry detergent into said air blast.

5. The apparatus of claim 3 further characterized in that the operator controlled means for selectively introducing dry and wet detergents into the conduit along with said air blast from the nozzle includes operator controlled wet detergent feed means for selectively introducing any of the plurality of wet detergents into the air blast from said nozzle.

6. The apparatus of claim 3 further characterized in that the blast nozzle is situated in line with said conduit for forcing air directly thereinto.

7. An apparatus for cleaning fur comprising an open bottomed housing having a marginal wall, an operator handrest on the housing, said handrest being shaped to fit an operator's hand for movement of the housing thereby, a plurality of brushes mounted in the open bottom of the housing for rotation about vertical axes, said brush axes being spaced laterally with respect to the operator's hand when on the handrest, said brushes being provided with bottom bristles and side bristles for brushing material on which the housing is placed, opposite laterally spaced brushes being rotated in opposite directions, and scrolls formed on the inside of the marginal wall of the housing, said scroll being curved to conform with the brush adjacent thereto and extending forwardly and slightly rising with respect to each brush, said scrolls being converged backwardly at the forward median line of the housing.

8. An apparatus of the type set forth in claim 7 further characterized in that the open bottom housing contains brushes symmetrically arranged about the median line of the housing, one pair in front and one pair in back, the rotation of said brushes being such that the bristles of contiguous portions of the front brushes move in a backward direction and the bristles of contiguous portions of the rear brushes move in a forwardly direction.

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