FUR CLEANING MACHINE

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This invention relates to a variable volume fur cleaning machine for carrying out a cleaning and a drying operation in a single drum.

The conventional method of cleaning furs is to first tumble them in an unperforated, totally enclosed cylinder or "drum" along with a solvent impregnated medium or vehicle, such as sawdust or powder, which does the actual cleaning by virtue of its scrubbing action, and then to transfer them, to an open mesh, wove wire cylinder or "cage," usually of considerably larger capacity than the "drum," where the sawdust or powder "shakes" out of the tumbling furs and is carried off to a filter or collector by fan-driven air flow, which also serves to aerate and deodorize them.

This method is objectionable not only from the standpoint of the expense of requiring two machines and the waste of valuable floor space, but also from the standpoint of the inconvenience, messiness and waste of time and/or labor involved in transferring the furs from one machine to another.

It is therefore an object of this invention to provide a variable volume fur cleaning machine which accomplishes both the cleaning and drying operations in a single machine thereby eliminating the need for an additional machine and the time and labor utilized in transferring the furs and converting the operation from one machine to another.

It is another object of this invention to provide a variable volume fur cleaning machine employing a movable partition in which the power applied to rotate the drum is also utilized to move the partition thus eliminating the need for a separate power source.

The invention features a drum, rotatable on a shaft within a housing having an imperforate front section and a perforate rear section. A plurality of lead screws, arranged about the periphery of the drum parallel to the shaft, extend beyond the front end of the drum. Threaded members engage by the lead screws and attached to a movable partition cause the partition to move along the lead screws as the screws are rotated. A pneumatic tube is disposed in an annular channel at the forward end of the housing. The lead screws have power transmitting means (wheels) on the end of their extended portions which are in longitudinal alignment with the pneumatic tube. There is contact between the pneumatic tube and the wheels only when the tube is inflated, at which time the rotational movement of the drum will be imparted to the lead screws.

Other objects, features, and advantages will appear from the following description of a preferred embodiment of the invention, taken together with the attached drawings thereof, in which:

FIG. 1 is a side sectional view of the fur cleaning machine taken along line 1—1 of FIG. 3;
FIG. 2 is a sectional view along line 2—2 of FIG. 1;
FIG. 3 is a sectional view taken along line 3—3 of FIG. 1;
FIG. 4 is a sectional view taken along line 4—4 of FIG. 3;
FIG. 5 is a sectional view similar to FIG. 4 showing the pneumatic tube expanded;
FIG. 6 is a sectional view taken along line 6—6 of FIG. 4;
FIG. 7 is a sectional view taken along line 7—7 of FIG. 1;
FIG. 8 is a sectional view taken along line 8—8 of FIG. 1; and
FIG. 9 is a sectional view taken along line 9—9 of FIG. 1.

There is shown in FIG. 1 a housing 10 having drum 12 rotatably mounted therein on shaft 14. Drum 12 is composed of an imperforated forward section 24 and a perforate rear section 26 shown in FIG. 2; rear head 28 is imperforate.

The front wall 30 of housing 10 contains a circular opening formed by inwardly turning lip 32. A door 34 of circular configuration, and having a flared outer edge, seals said opening air tight by means of a polyurethane foam seal 35 interposed between door 34 and casing 36. An air entrance damper 38, normally closed and sealed air tight by means of polyurethane foam seals, not shown, is automatically opened during the drying operation by means of electrically actuated damper motor 40 and levers 42. The forward end of drum 12 is partially closed by annular collar 44 which extends inwardly to the height of ribs 46. An outwardly turning lip 48 of annular collar 44 contacts felt seal 50 completing the drum enclosure.

In the lower portion of housing 10, a hood 52 with a filter 54 is provided to receive the air flow through damper 38 and perforated section 26 during the drying operation. The cleaning vehicle or medium is removed from the air by filter 54 as exhaust fan 56 driven by motor 58 forces the air out exhaust conduit 60.

Disposed in each rib 46 is a drive unit consisting of a lead screw 62 and drive shaft 64 shown in FIG. 9. Lead screw 62 is journaled in rear head 28 at 66 and extends more than half the length of drum 12 to permit a movable partition 68 supported by a threaded brass block 70 to be moved to the middle of drum 12. Drive shaft 64 is integrally joined with lead screw 62 so that the two effectively form a single unit. Drive shaft 64 extends through annular collar 44 at bearing 72 and carries a sprocket 74 and friction wheel 76 on its forwardmost portion beyond the annular collar 44. Friction wheel 76 is generally formed of a resilient or rubber like material; both sprocket 74 and friction wheel 76 are keyed to drive shaft 64 and rotate with it as a unit.

Brass block 78 engages lead screw 62 by means of its internal threads and is attached to partition 68, shown in FIG. 9. Being secured against rotation with lead screw 62, brass block 70 will traverse along lead screw 62 toward the rear or toward the front of drum 12 according to the direction of rotation of lead screw 62, thus moving partition 68 and increasing or decreasing the available volume of drum 12. A flexible polymer of tetrafluoroethylene member 78 fastened to brass block 70, shown in FIG. 8, extends outwardly from drum 12 for contact with one of the actuators 80 of limit switches 82 fixedly positioned in the top of housing 16, within cover 84, when partition 68 reaches its forward-most or rearwardmost point of travel.

Brass block 70 extends through slot 86 in the face 38 of rib 46 to attach to partition 68. The slot is placed on face 88 for minimum interference with the tumbling furs during the drying operation. In the drying operation drum 12 rotates in a clockwise direction thus making face 88 the lagging face. In the cleaning operation where drum 12 rotates in a counterclockwise direction partition 68 is at its forward position and slot 86 is not encountered by the furs. Further prevention against the furs being caught in slot 86 is provided by slot cover 90, retained in channel 92, which is attached to brass block 70 and is drawn along the inside of slot 86 sealing it from drum.
as partition 68 moves rearward; cover 90 resides along the forward length of rib 46 when partition 68 is at its forward extreme. A seal 94 is provided about the periphery of partition 65 where it contacts the inner surface of drum 12 and ribs 46 to preserve the integrity of the separate sections.

Sprockets 74, in longitudinal alignment with each other, engage timing chain 96 which serves to maintain uniform rotation of drive shafts 64 thus insuring alignment of partition 65 with drum head 28 and preventing wracking or binding of lead screws 62. Tension on chain 96 is maintained by the use of idler sprockets 98, 100, 102, and 104; idler 98, 100 and 102 are each welded to annular collar 44 while idler 104 is mounted on a bracket 106 and is adjustable mounted to annular collar 44 by means of two screws 108 passing through slot 110.

Disposed about the forward end of housing 10 is an annular channel 115, shown in FIGS. 4 and 6; channel 112 is generally U shaped with the open portion facing inwardly. Positioned within channel 112 is an annular pneumatic tube 114 which is inflated through stem 116 upon actuation of electrically controlled valve 118. When inflated, tube 114 will expand due to the constraint imposed on three sides by channel 112, and contact friction wheel 76 as shown in FIG. 5. As drum 12 rotates, friction wheels 76 are forced to rotate as they move along tube 114 thus causing rotation of drive shafts 64 and transverse movement of block 70 with partition 65.

The operation of damper motor 49, fan motor 58, and motor 18, and the supervision of switches 82 are coordinated by control 120. A timer programmed to effect a complete cycle including cleaning, drying and shutdown can serve as the control. In operation, the fans to be cleaned and the cleaning vehicle are loaded into the drum, which has only one half its volume available due to partition 65 being at its forwardmost position. After closing door 34, control 120 is set to start and drum 12 begins to rotate in a counterclockwise direction. During this, the cleaning operation, damper 38 is closed, fan 56 is inactive, tube 114 is uninflated, and partition 65 is at its forwardmost position dividing drum 12 into two sections 24 and 26. After the cleaning operation, which normally lasts for about fifteen minutes, control 120 will stop the counterclockwise rotation of drum 12 and cause it to rotate in a clockwise direction. Simultaneously, control 120 will cause damper motor 49 to open damper 38, open valve 118 and energize motor 58 which activates fan 56. With the opening of valve 118, air under pressure is introduced into tube 114 causing it to expand and engage friction wheels 76.

The movement of friction wheels 76, driven by the clockwise rotation of drum 12, along expanded tube 114 causes friction wheels 76, thus drive shafts 64, to rotate in a counterclockwise direction. Lead screws 62, having right-hand threads, rotating in a counterclockwise direction will cause blocks 76 to move forward the year of drum 12 until flexible member 78 contacts actuator 80 on the limit switch 82 which is at the rear of housing 12. Switch 82 directs the deflation of tube 114 thus disengaging the driving force from the lead screws 62 and stopping partition 65. Air enters through damper 38 passes through perforated section 26 of drum 12 and through filter 54 and is exhausted by fan 56 through conduit 69.

After the drying operation is completed damper 38 is closed, fan motor 58 is deenergized and motor 18 is deenergized. Upon removal of the fans a reset condition may be initiated causing partition 65 to move forward until the forward limit switch 82 is contacted.

Other embodiments will occur to those skilled in the art and are within the following claims.

What is claimed is:

1. A variable volume fur cleaning apparatus comprising:

4. a rotatable cylindrical drum, said drum having a forward section having an imperforate cylindrical wall and a rear section having a perforate cylindrical wall, an imperforate transverse partition within said drum with its peripheral edges substantially in contact with the interior cylindrical wall of said drum, means for rotating said drum, and means responsive to rotation of said drum for moving said partition axially of said drum from said first position to said second position, and back to said first position, whereby a fur piece and a cleaning medium are retained in the imperforate wall section during the tumbling cleaning action and upon movement of said partition to the rear of said drum, the cleaning medium will pass out of said drum through the perforate cylindrical wall.

2. The apparatus of claim 1 further comprising means for drawing air through said drum when said partition is in said forward position, and an impervious rear head, the forward end of said drum being partially closed by an annular collar, said cylindrical walls of said drum including a plurality of spaced inwardly protruding linguinally extending ribs.

3. The apparatus of claim 1 further comprising means for automatically cyclically activating said drum rotating means and said partition moving means.

4. The apparatus of claim 1 further comprising means for automatically limiting the axial movement of said partition.

5. The apparatus of claim 1 including a housing in which said drum resides, wherein said drum includes, an impervious rear head, the forward end of said drum being partially closed by an annular collar, said cylindrical walls of said drum including a plurality of spaced inwardly protruding linguinally extending ribs.

6. The apparatus of claim 5 in which:

said partition moving means includes a threaded member attached to said partition and a threaded shaft, with which said threaded member is engaged, journalled in said rear head and extending forward more than the axial length of said perforate rear section, a drive shaft integrally connected to said threaded shaft and extending through said annular collar, a friction means connected to the forward end of said drive shaft for rotation with said drive shaft as a unit, and an annular pneumatic member of flexible material disposed within said housing, in longitudinal alignment with said friction means, and in position to frictionally engage said friction means when said pneumatic member is sufficiently inflated.

7. The apparatus of claim 6 further comprising means for coordinating operation of said rotating and partition moving means.

8. The apparatus of claim 7 in which said partition moving means further includes:

a plurality of said threaded and drive shafts mounted around said drum,
a plurality of sprockets in longitudinal alignment, one on the forward end of each of said threaded and drive shafts,
a timing chain mounted on said sprockets and
a plurality of idler sprockets mounted on said annular collar external to said drum, one disposed between each circumferentially adjacent pair of said sprockets, means movably mounting one of said idlers for adjustment of said sprocket to maintain tension on said timing chain.

9. The apparatus of claim 5 further comprising means for drawing air through said drum including:

a loading door mounted on the front end of said housing, said door permitting access to said drum through the aperture in said annular collar,
an electrically controlled vent disposed in said loading door, the perforations in said rear section, and an exhaust vent in said housing, and an exhaust fan communicating with said rear section and said exhaust vent.

10. The apparatus of claim 9 further comprising a cycle timing means for energizing said means for rotating said drum, and after a predetermined period of time, causing said electrically controlled vent to be opened, said pneumatic member to be inflated and said fan to be energized.

11. The apparatus of claim 6 further comprising limiting means for causing deflation of said pneumatic member when said partition reaches the end of its path of travel including a switch at each end of said path actuated by said partition.

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