Nov. 15, 1966 M. O. KROLL 3,284,830

SWEEPING MACHINE BRUSH MOUNTING APPARATUS

Original Filed Jan. 28, 1963 4 Sheets-Sheet 1

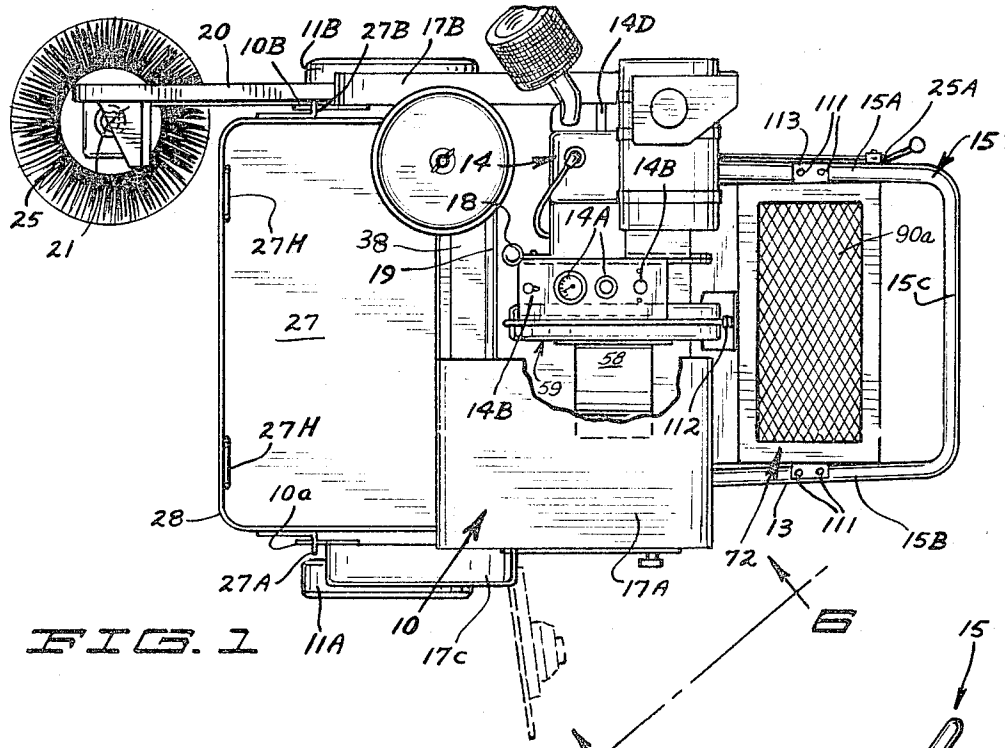


FIG. 1

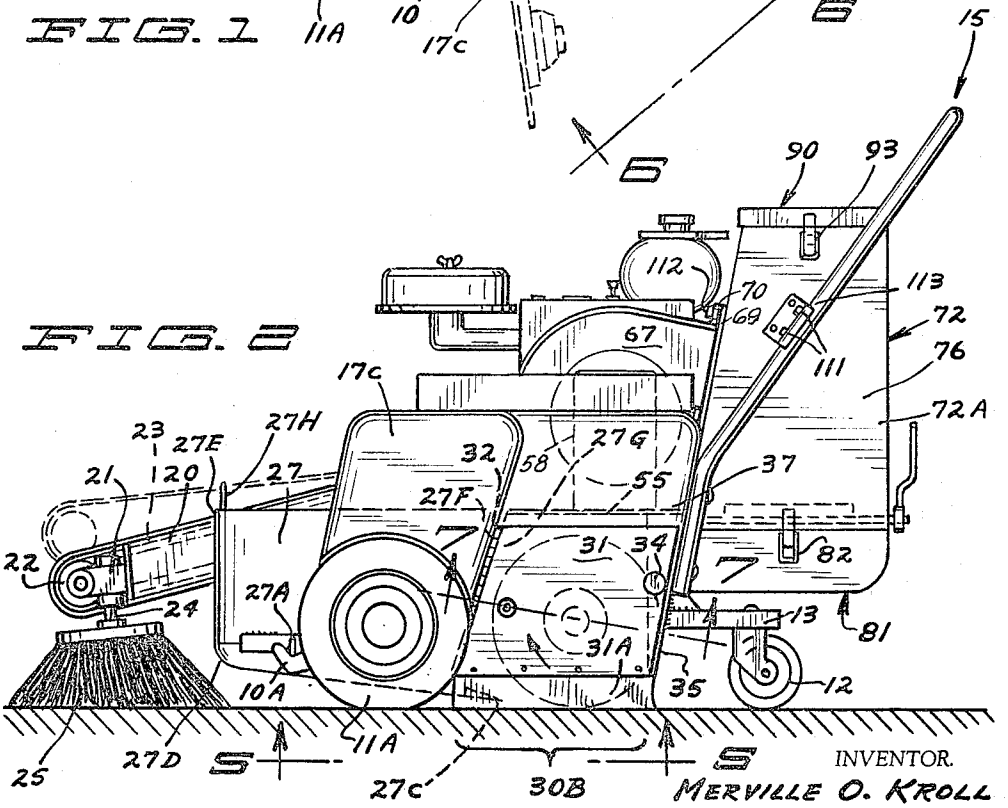


FIG. 2

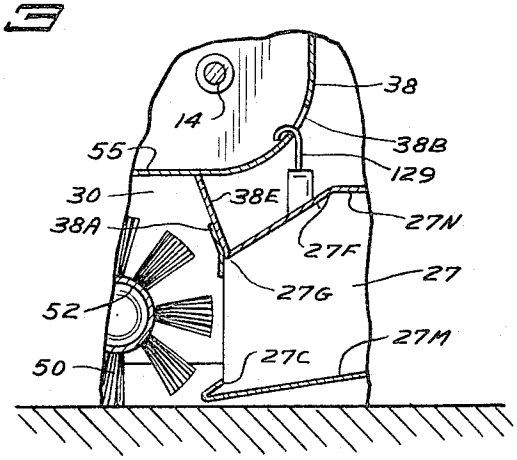
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FIG. 3



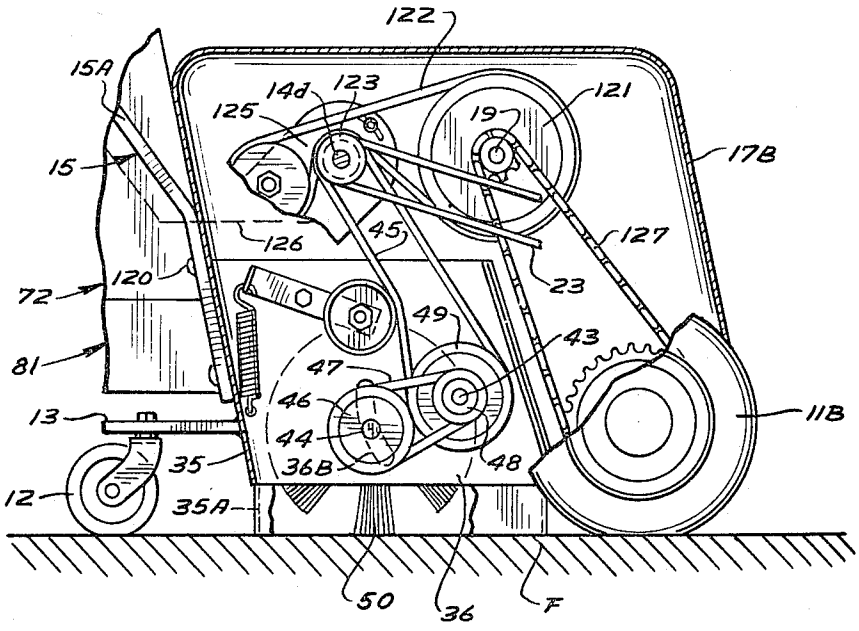


FIG. 4

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FIG. 5

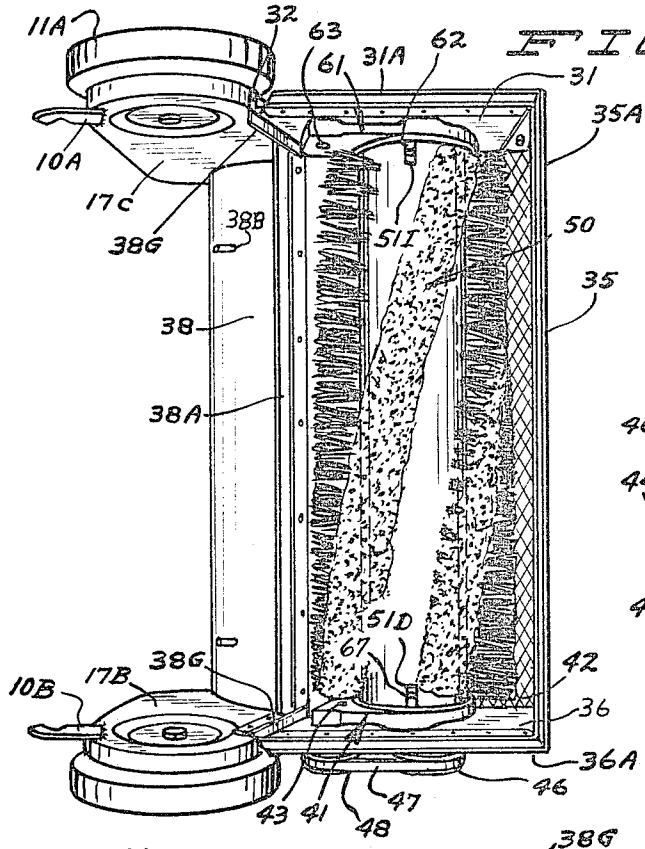
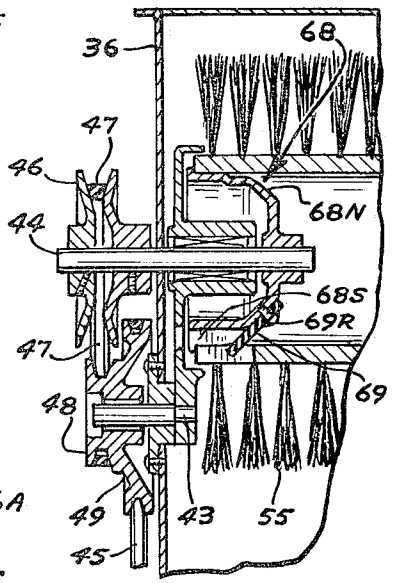


FIG. 8



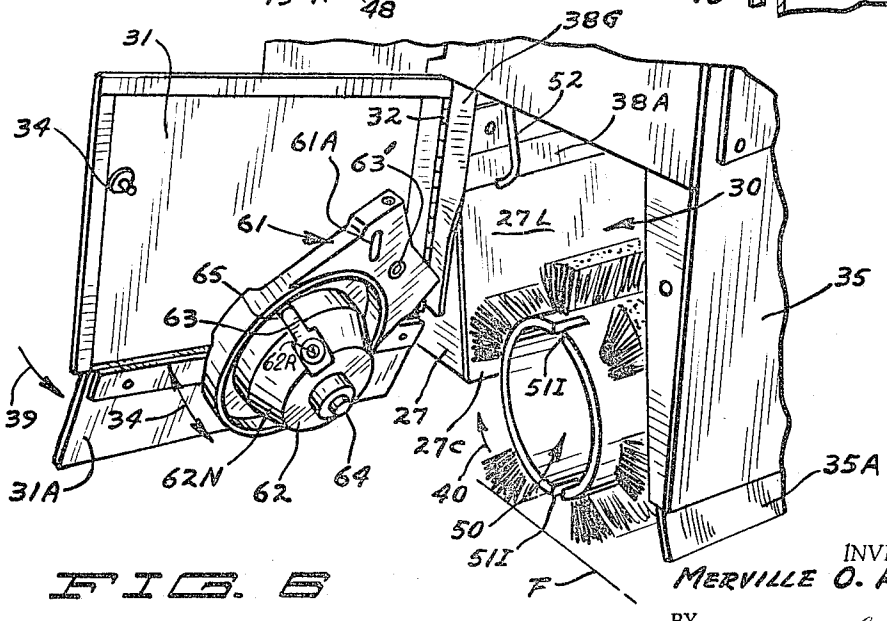


FIG. 6

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SWEEPING MACHINE BRUSH MOUNTING APPARATUS

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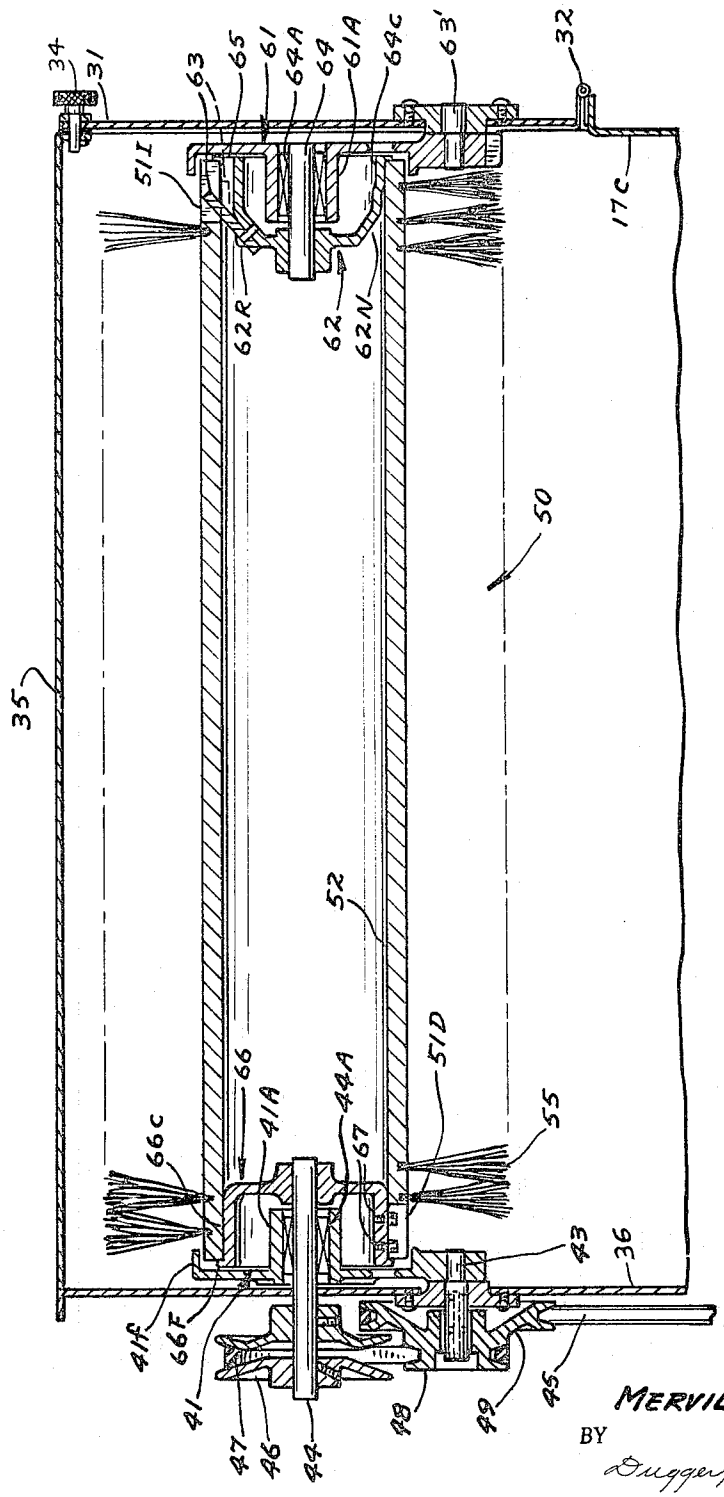


FIG. 7

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3,284,830

SWEEPING MACHINE BRUSH MOUNTING APPARATUS

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Original application Jan. 28, 1963, Ser. No. 254,288, now Patent No. 3,233,274, dated Feb. 8, 1966. Divided and this application Oct. 4, 1965, Ser. No. 511,005
9 Claims. (Cl. 15—49)

This is a division of application Serial No. 254,288, filed January 28, 1963 and now Patent No. 3,233,274.

This invention relates to improvements in floor maintenance machines and more specifically in sweeping machines. The invention relates to improved mounting of cylindrical tools of floor maintenance machines having a cylindrical brush or other floor working tools placed on supporting mandrels for cylindrical brushes and tools of such machines.

It is a further object of the invention to provide in a floor maintenance machine having a cylindrical working tool thereon, rotary mandrel mountings for such a cylindrical tool and flexible-key drives between the mandrel mountings and the cylindrical tool supported thereon.

It is another object of the invention to provide an improved floor maintenance machine having a cylindrical working tool supported by mandrels engaging the ends of the cylindrical tool and to provide keying means between the mandrels and the ends of the cylindrical tool, said keying means being flexible so as to permit the cylindrical tool to be moved onto the mandrel without reference to the orientation of the tool relative to the key on the mandrel, so that the flexible key of the mandrel will, upon rotation of the cylindrical tool relative to the mandrel, engage the tool for driving the tool from the mandrel or vice-versa.

Other and further objects are those inherent in the invention herein illustrated, described and claimed and will be apparent as the description proceeds.

To the accomplishment of the foregoing and related ends, this invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principles of the invention may be employed.

The invention is illustrated with reference to the drawings in which corresponding numerals refer to the same parts and in which:

FIGURE 1 is a plan view of an exemplary floor maintenance machine embodying the improvements of the present invention;

FIGURE 2 is a left side elevational view of the machine shown in FIGURE 1;

FIGURE 3 is a vertical cross sectional view illustrating the hooking attachment of the top of the pan to the frame;

FIGURE 4 is a fragmentary vertical sectional view illustrating the front wheel drive, side arm brush drive and the main brush drive;

FIGURE 5 is an underside isometric view of a portion of the sweeping machine shown in FIGURE 3. This is a pictorial view looking upwardly in the direction of arrow 5—5 of FIGURE 2;

FIGURE 6 is a perspective view showing the access door of the sweeping chamber on the left side of the machine swung open, and with the cylindrical brush of the machine slightly withdrawn, as during replacement of the brush, this view being taken along the line and in the direction of arrows 6—6 of FIGURE 1 while looking slightly downward;

FIGURE 7 is a fragmentary sectional view through

the cylindrical sweeping brush, its supporting and mandrel support arms, taken in a plane through the sweeping enclosure, at the line and in the direction of arrows 7—7 of FIGURE 2; and

FIGURE 8 is a fragmentary sectional view corresponding to the right side of FIGURE 7 other than it illustrates a modified embodiment of the structure for drivingly mounting one end of a rotary floor maintenance device.

Referring to the drawings, the sweeping machine comprises a frame, generally designated 10, having support and drive wheels 11A and 11B at the front end thereof. A rear wheel 12 is pivotally mounted by member 13 which in turn is attached to the central portion of the rear wall 35 of the frame. On the frame there is mounted an engine generally designated 14, engine instruments 14A and engine controls 14B, and U-shaped guide handle 15. The guide handle is fastened to the frame at 120 and extends rearwardly thereof, said handle having spaced-apart legs 15A and 15B which extend forwardly and downwardly to the machine frame, and a hand-hold 15C. Between the handle legs there is attached a dust filtration chamber assembly generally designated 72, 81.

The engine has a transverse engine shaft 14D on which there is keyed a combination type drive sheave 123 that is drivingly connected to the side brush 25 and the main rotary tool 50 which may be a sweeping brush, an abrasive tool, a polishing tool or etc. A sheave 121 is keyed on a transverse shaft 19 which is driven by a belt 122 movable into driven engagement with the combination drive sheave 123 through appropriate clutch mechanism 125, operated by control 25A on the guide handle. The above mentioned combination sheave, the driven connections, clutch mechanism and belt are for the most part located in housing 17B, other than for control 25A and the linkage (indicated by dotted line 126) from the control to the clutch mechanism. Likewise, the drive connections 127 from the shaft 19 to each of the front wheels 11A and 11B for rotating the wheels to propell the machine are within housing 17C and 17B respectively. However, it is to be understood that means for driving the wheels could be of the type for also selectively propelling the machine in a forward or a rearward direction. Control 25A on handle 15 is provided for starting and stopping the forward propulsion of the machine and for reversing the direction of drive if appropriate drive mechanism were provided.

Upon the right side of the machine there is mounted, to be selectively pivoted from the solid line sweeping position of FIGURE 2 to the dotted line non-sweeping position, a forwardly extending housing arm 20 which at its forward end mounts a gear box 21 and curb brush 25. The arm also mounts an input pulley 22 drivingly connected through the gear box to the curb brush upright shaft 24, pulley 22 being driven by belt 23 which in turn is drivenly connected to the combination drive sheave on the engine shaft. Power is, of course, supplied by engine 14. Brush arm 20 and brush 25 can manually be lifted to the dotted line position shown in FIGURE 2 and through suitable connections to the frame (not shown) the brush will be retained in this position. In this position the belt 23 is slackened and stops rotation of the belt. The arm 20 is also manually movable back to the solid line position and retained in said solid line position. The brush 25 does not interfere with the forward withdrawal of the pan.

The two wheels 11A and 11B are forwardly directed and spaced apart and are drivingly connected to the engine. The machine framing is projected slightly forwardly of the wheels with spaced-apart forwardly projecting notched arms 10A and 10B. Between the arms 10A, 10B there is removably positioned a pan 27 for collecting swept debris. This pan 27 has side projec-

tions at 27A and 27B which hook upon the frame pieces 10A and 10B and hooks 129 on the top wall of the pan for hooking into slots 38B of the frame plate 38 and hence support the pan. The pan is entirely closed except for its rear face. Thus, the pan has a forwardly and slightly upwardly sloping bottom extending from rear lip 27C over which debris is swept into the pan, thence forwardly to the rounded bottom front corner 27D and thence up the front wall to 27E where handles 27H—27H are provided. The pan top then extends back almost level to 27F (adjacent plate 38) where it drops down and then extends back to edge 27G, which tucks into the implement enclosure (over bracket 30B, FIGURE 2). The front surface of the implement enclosure is in part defined by a flexible flap 38A that is attached to the depending flange portion 38E of curved front plate 38.

The implement enclosure of the machine, such as for example a sweeping enclosure 30, is that portion shown over the bracket 30B in FIGURE 2. It has an open bottom housing that includes top wall 55, back wall 35, right side wall 36 and left sidewall, which is door 31 mounted on hinge 32. The door is held closed by thumb screw 34. When this is loosened, the door may be swung from the closed solid line position shown in FIGURE 1 to the opened position in FIGURE 6. The front of the enclosure is actually an opening contiguous to the rearwardly facing opening of pan 27; there being provided on the frame flaps 38A to seal the wall 55 to the pan top and flaps 38G to seal to the pan sides when the pan is in place. The lower edges of each of these walls 31, 35 and 36 of the enclosure is provided with flexible strip flashings, such as rubber flashings 31A, 35A and 36A.

The pan 27, for collecting swept debris, has its upper rear terminal edge portion 27G in contact with the flexible strip 38A (see FIGURE 6) and is mounted for withdrawal. The sidewalls of the pan 27 close against flexible strips 38G and 38G on either side of the opening into which the open rear face of the collection hopper 27 extends.

The rotary floor maintenance implement, such as sweeping brush 50, in normal rotation as shown by arrow 40 of FIGURE 6, will convey debris into the open rear face of the collection hopper 27. The rear part of the collection hopper 27 is shown in FIGURE 6, and it will be noted that it has a rear opening 27L, into which the implement, such as brush 50 sweeps.

At each sidewall 31 and 36 of the sweeping enclosure there are swinging mandrel mounting arms generally designated 61 (left side; door mounted; idler mandrel) and 41 (right side; frame mounted; drive mandrel) for engaging the ends of the cylindrical implement, here illustrated as the brush generally designated 50, to rotatably support and drive the same. The arms 41 and 61 each have mandrels, the keying means of this invention being provided for automatically keying the mandrel and implement, when they are oriented with the key and key way aligned.

The cylindrical working tool, here illustrated as brush 50, in accordance with the present invention, is supported transversely of the machine for limited up and down movement. The supporting devices and mounting thereof are best shown in FIGURES 5, 6 and 7. Referring to these figures, the machine frame, which also constitutes the working enclosure for the tool, has on the right sidewall 36 a pivot 43 that supports for arcuate swinging movement the radius arm casting generally designated 41. On the opposite (or left) side of the machine, on the door 31, there is provided a pivot 63' on which there is supported an oppositely faced but otherwise precisely similar radius arm casting, generally designated 61, which likewise can swing arcuately up and down. As previously noted, the door 31 can swing open on its hinge, and when thus swung open as shown in FIGURE 6, the radius arm casting 61 is carried with the door and is withdrawn from the rotating working tool generally designated 50. The tool 50 can then be adjusted or replaced.

To simplify the placing of the tool 50, the construction is as follows:

On the radius arm casting 41 there are bearings 44A that journal a drive shaft 44 which carries a mandrel, generally designated 66, that is attached to the shaft so that it will turn when the shaft is rotated. The shaft 44 is extended through an arcuate slot 36B in sidewall 36 and may have a plate arcuately movable therewith for sealing the slot. Mandrel 66 has a cylindrical surface 66C which forms a sliding fit with the interior surface of the tubular body 52 of the cylindrical tool 50. The mandrel 66 is provided with a key, here illustrated as two pins 67, these pins fitting into a slot 51D on the adjacent end of the tubular body 52 of the working tool.

The shaft 44 is provided with an adjustable pulley 46 which is driven by the belt 47 from an idler pulley 48–49 that is journaled on the pin 43, adequate lubrication being provided for this pulley. The pulley 49 is driven by the belt 45 from the combination drive sheave on the engine shaft of the machine while pulley 48 drives belt 47. Accordingly, when the drive 45–49 inclusive is actuated, the shaft 44 is rotated, and this will rotate the mandrel 66 which will accordingly rotate the cylindrical tool 50. It will be noted that the cylindrical surface 66 of the mandrel ends at the flange 66F, so that, although this mandrel is well back in the interior of the working enclosure of the machine, the operator will find no difficulty in sliding the tool 50 into the enclosure through the open door, as shown in FIGURE 6, and the tubular body 52 will "find" the rounded nose of the mandrel 66 and slide onto the cylindrical surface 66C and stop at the flange 66F. It may be necessary to rotate the cylindrical tool 50 slightly so as to register the key slot 51D with the keys 67. It will also be noted that the radius arm casting 41 has a circular flange 41*f* which extends over, and is slightly spaced from the exterior end surface of the tubular body 52 of the tool 50, thereby protecting the end of the tool body from the accumulation of string, etc. which might otherwise lodge there. This also protects the bearing 44A in the mandrel hub 41A from undue entrance of foreign material.

With the door 31 open, and the tool 50 pushed back into place so that its far end is on the mandrel 66, the near end of tool 50 will then rest upon the floor F adjacent the door. The next problem is to close the door without undue difficulty. According to the present invention, this is accomplished as follows:

The door 31 is open, being swung on its hinge 32. It carries the pivot 63' on which the radius casting 61 (identical with the radius casting 41 but oppositely faced) is arcuately swingably mounted. This casting has a hub 61A (FIGURE 7) which receives the bearing 64A in which the shaft 64 is rotatably mounted. The shaft 64 is keyed to the hub of the idler mandrel generally designated 62. This idler mandrel has a distinctly cone-shaped nose at 62N, so as to facilitate its entrance into the end of the tubular body 52 of the tool 50 when door 31 is swung shut. This tubular body 50 is likewise provided with a key slot 51I at the idler end, in order, in accordance with this invention, to ensure rotation of the idler mandrel 62. Now, when the door 31 is swung shut so as to bring the conically tapered nose 62N of the mandrel 62 into the tubular body 52 of the tool 50, the problem arises of registering the key slots 51I with a suitable key on the mandrel. This is not so easy to do, since the door is near closed position and there is not much space to reach in to provide any rotation of the mandrel 62 or the tool 50, to attain registry of a key slot with a key on the mandrel. To make this easy, the mandrel 62 is provided with a flexible key 63, which is a short bar of rubber composition, quite thick and stiff but still resilient enough to bend. This resilient key bar is fastened to a sloping surface 62N of the mandrel which is so oriented that the free end of the key 63 will project outwardly generally at an angle to the axis of the mandrel. The

rubber-bar key 63 is held in place by a screw or rivet 62R. In the position shown in full lines in FIGURE 7, the free end of the rubber-bar key 63 projects outwardly into the space of the key slot 51I which is its working position. However, when the door 31 is closed, there is no certainty that the key bar 63 will register with the key slot 51I, and consequently some other portion of the end of the tubular body 52 may engage the key 63 and bend it toward the axis of the shaft 64. In order to accommodate this bending motion, there is provided a slot 65 in the body of the mandrel 62 into which the key can bend as shown in dotted lines in FIGURE 7, in the event the slot 51I is not in registry with the key 63. This permits the door 31 to be closed to its position shown in FIGURE 7, and the holding nut 34 can then be drawn up tight. When the machine is run, there will be a slight rotation of the mandrel 62 relative to the tool 50, and the key-bar, now bent to the dotted line position of FIGURE 7, will slide around on the inner surface of the tubular body 52 until it registers with the key slot 51I. Thereupon the flexible key-bar will flex out straight into position in the key slot and further turning of the mandrel 62 with reference to the tool will then not occur.

In FIGURE 8 there is shown a slight modification of the invention wherein the rubber-bar key drive (the same as that just described) is used on the driving end mandrel of the tool 50. In this situation, there is provided a driving mandrel generally designated 68 which can be identical with the mandrel 62, in that it has an exaggerated conical nose 68N, a slot 68S and a rubber-bar key 69. One, two or more such rubber-bar keys may be provided as desired and a corresponding number of slots 68S and keyways in the tubular body so as to carry the heavier rotational torque loads at the driving mandrel of the tool as compared with those at the idler mandrel of the tool. It will be noted that the resiliency of the rubber keys, where more than two are used, will provide excellent equalization of the torque loads, as between the several keys.

When the construction as shown in FIGURE 8 is used, the operator need only push the tool 50 (with an appropriate number of keyways) back into the recess until the tubular body 52 "finds" the conical nose portion 68N of the driving mandrel 68, and he then pushes it home to the position shown in FIGURE 8, regardless of the registry of the key (or keys, if more than one is used). This makes it unnecessary for the operator to lift and rotate the tool 50 so as to attain this registry when the tool 50 is inserted into the working space of the machine. He simply pushes the tool onto the mandrel, and the first slight rotation of the drive mandrel relative to the tool 50 will bring the key or keys into registry and thereafter the keys will flex out into their mating slots and furnish the transmission of torque from the driving mandrel to the tool.

After the brush is mounted on the mandrels, the castings 41, 61 may be pivoted to move brush 50 between a sweeping position and a raised non-sweeping position through the provision of transverse rod 52 which at either end is hooked to extend into a slot 61A in the respective casting, the rod being mounted in the enclosure and operated to selectively pivot the castings 41, 61 through a control 18 adjacent the engine. The control 18 is suitably connected to a radius arm (not shown) welded to rod 52 for pivoting said rod about a transverse axis to pivot said castings about pivots 43, 63' to raise the brush and retain it in a raised condition, but upon moving the control in the other direction permit the castings to pivot so that the brush engages the floor.

Referring now to FIGURES 1–4, the implement enclosure has a top wall 55, see FIGURES 2 and 3. The rotation of the implement 50 is in the direction of arrow 40, and most of the swept debris will be swept forwardly (or to the left as shown in FIGURE 2) and thence over the lip 27C of the debris receiving pan 27, see FIGURE 2. The implement enclosure is arranged to be under slight negative pressure and for this purpose there is introduced an opening (not shown) in the top wall 55, said opening being connected by means of inlet duct 58 to the inlet of a blower 59, which is power driven from the engine 14. The blower has an outlet horn 67 terminating in a flange 69 that is faced with soft gasket material at 70 that forms a fluid seal with the adjacent separator wall. As a result, air is withdrawn from the implement enclosure in which the implement 50 rotates. Where the implement is of abrasive construction, such as a sanding drum, steel wool drum, or a sweeping or polishing brush, a considerable amount of finally divided solids will be raised by action of the implement 50. The heavier portions of these solids will be swept forward into the pan 27 whereas the finer particles will be entrained in air and drawn upwardly by the air stream moving into and through the enclosure under skirts 35A, 36A and 31A, and thence the dust laden air is drawn into the inlet 58 of the blower 59 and after passing through the blower, such dust laden air is discharged through the gasketed flange 69 and into an inlet opening (not shown) of a solid-air separator, generally designated 72.

The solid-air separator 72 is a box composed of a metal sleeve 72A, a removable pan bottom 81 and a removable screened top cover 90. Pan 81 is open at the top and is held in place by suspension buckles 82—82. When the buckles are loosened, the pan can be dropped down for emptying.

The cover 90 having a down-turned edge and a screened opening 90*a* in its upper surface, the cover being held in place by a plurality of downwardly extending buckles 93.

The entire filter chamber 72 is supported from the handle 15 and flange 69 of the blower. Thus brackets 113 removably fastened to the side walls 76 and fastened to the handle pieces 15A and 15B are thus fastened by screws 111.

As many widely apparently different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that I do not limit myself to the specific embodiments disclosed herein.

What I claim is:

1. In a floor maintenance machine having a cylindrical floor maintenance tool mounted thereon for rotation on a generally horizontal axis, said tool including a hollow core having generally cylindrical walls at least at the ends thereof, said core including key-notches in the wall adjacent the ends of said core, mandrels rotatably mounted on the machine, said mandrels being engageable into the hollow cylindrical wall ends of the core for rotatably supporting said core, each of said mandrels including a cylindrical surface having a sliding fit into the cylindrical wall ends of the core, and key-means on the mandrels, for fitting into the key-notches of the core, for rotating the core and mandrels together, said key-means on at least one of the mandrels comprising deflectable means fitted into a recess in the cylindrical surface of the mandrel and depressible thereinto, said deflectable key-means being engageable by the cylindrical wall ends of the core for depressing said key-means into the mandrel, said key-means being such that it will be moved resiliently outwardly into the key-notch of the core when the mandrel rotates relative to the core to a position in which said key-means is in registry with said key-notch.

2. The floor maintenance machine specified in claim 1 further characterized in that said cylindrical floor maintenance tool is a cylindrical brush.

3. The floor maintenance machine specified in claim 1 further characterized in that radius means are provided on the machine for rotatably mounting each of the mandrels for arcuate movement, both of said radius means including means pivotally supported on the machine for pivoting about a pivot axis which is displaced from the

axis of rotation of the mandrels to support said mandrels for arcuate movement.

4. The floor maintenance machine specified in claim 1 further characterized in that the machine includes short tubular flanges extending over the tubular ends of the core for protecting said ends as they rotate.

5. The floor maintenance machine specified in claim 1 further characterized in that the key notches on the core are slots extending longitudinally of the core from the ends thereof.

6. The floor maintenance machine specified in claim 1 further characterized in that said key-means comprises a flexible strip supported at one end on the mandrel so that in an undeflected position it will lie in a conical surface of rotation intersecting the cylindrical surface of the mandrel, said cylindrical surface of the mandrel including a recess into which said strip may be bent when the core of the maintenance tool engages it, said flexible strip in said bent condition being pressed substantially into the slot and confined within the space bounded by the surfaces of the mandrel forming said slot.

7. The floor maintenance machine specified in claim 6 further characterized in that said flexible strip is composed of rubber composition.

8. The floor maintenance machine specified in claim 1 further characterized in that one of said mandrels is a driving mandrel, and the other of said mandrels is an idler mandrel, said driving mandrel being provided with a fixed key, said idler mandrel being provided with said key-means.

9. The floor maintenance machine specified in claim 1 further characterized in that one of said mandrels is a driving mandrel and the other is an idler mandrel, and said driving mandrel is provided with said deflectable key-means.

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