Aug. 27, 1929. R. L. LEE 1,725,762

DOMESTIC APPLIANCE

Filed April 7, 1923 4 Sheets-Sheet 1

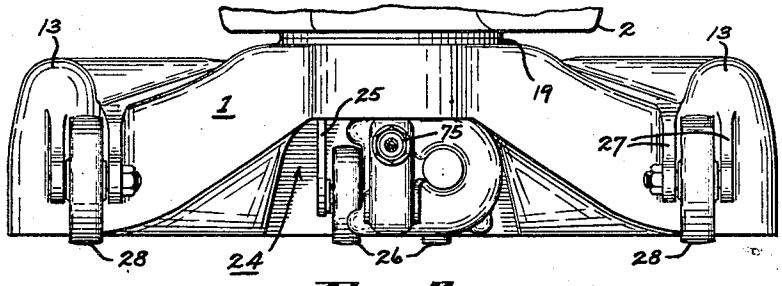

Fig. 2

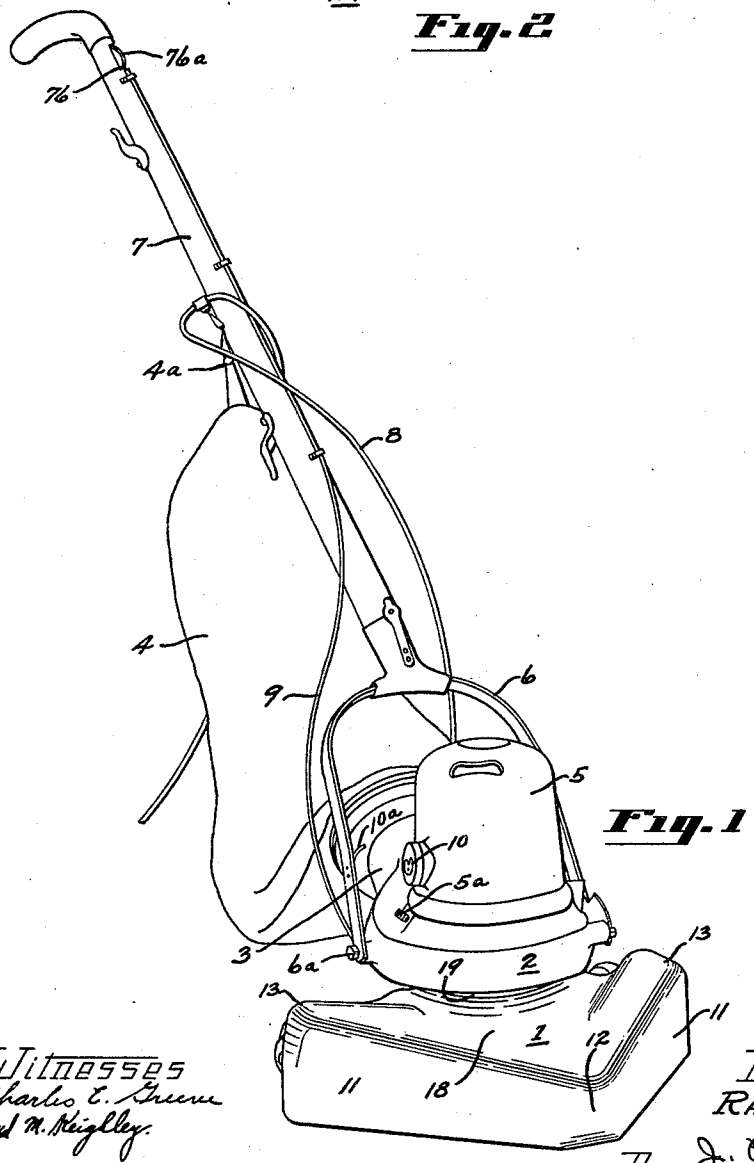

Fig. 1

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Aug. 27, 1929. R. L. LEE 1,725,762

DOMESTIC APPLIANCE

Filed April 7, 1923 4 Sheets-Sheet 2

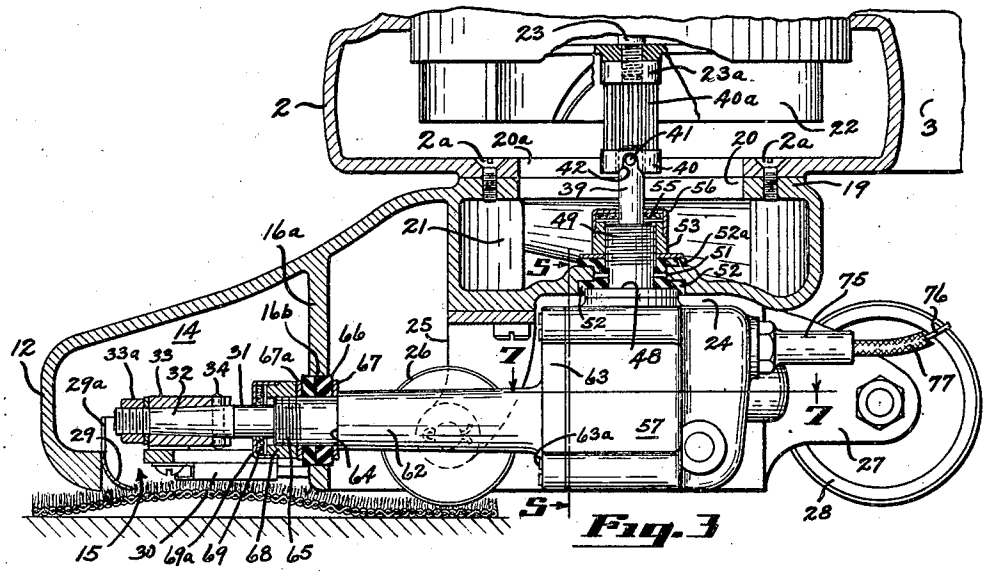

Fig. 3

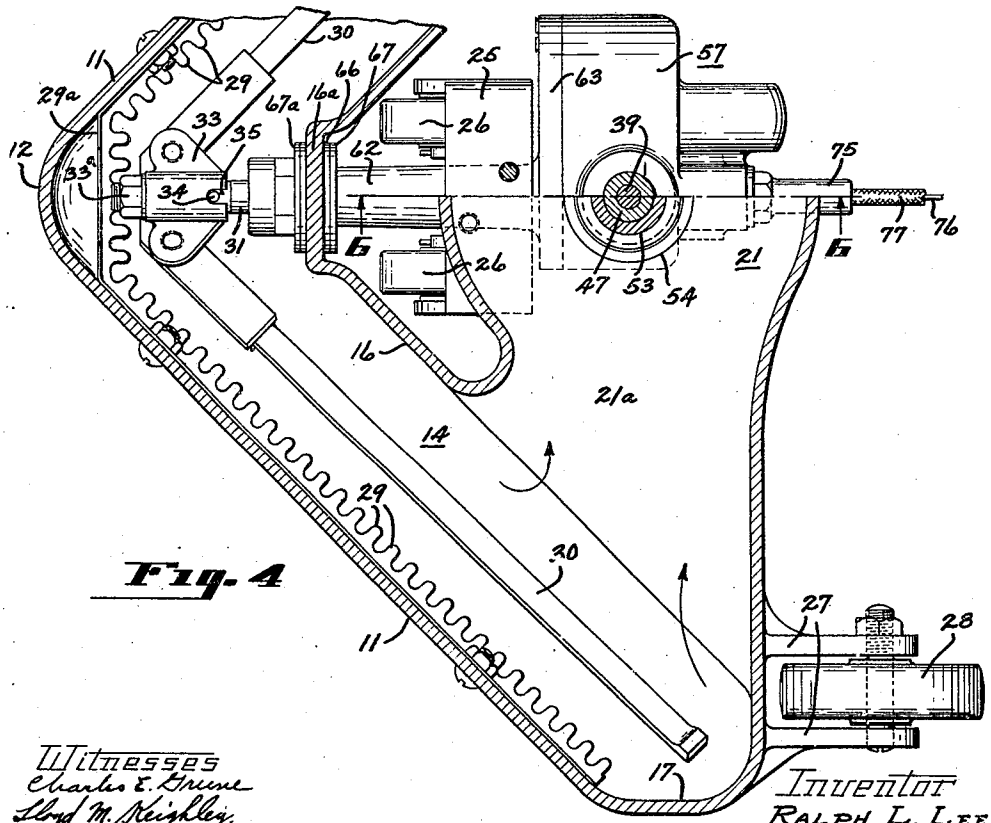

Fig. 4

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Aug. 27, 1929. R. L. LEE 1,725,762

DOMESTIC APPLIANCE

Filed April 7, 1923 4 Sheets-Sheet 3

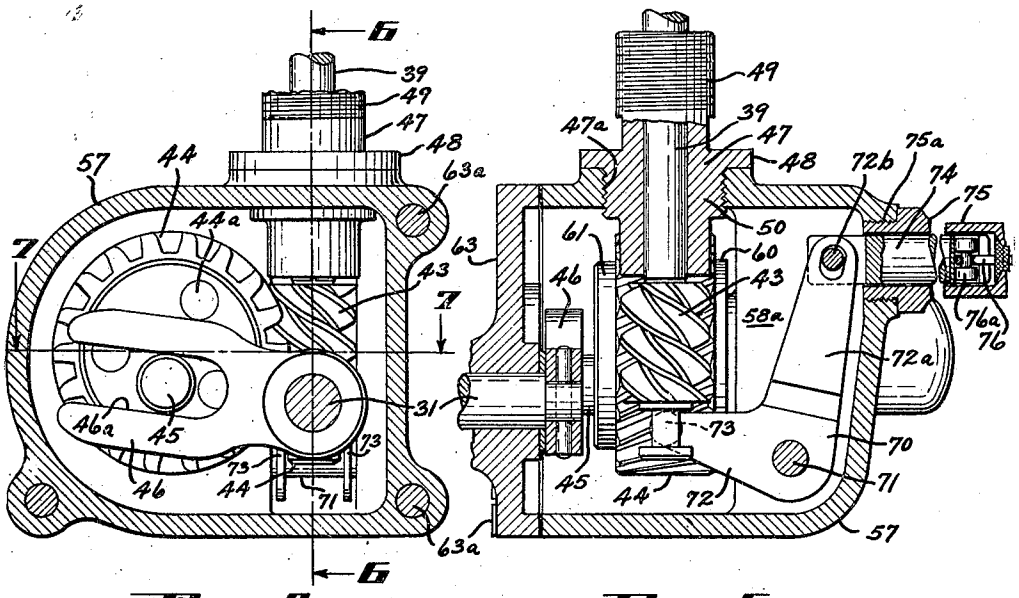

Fig. 5

Fig. 6

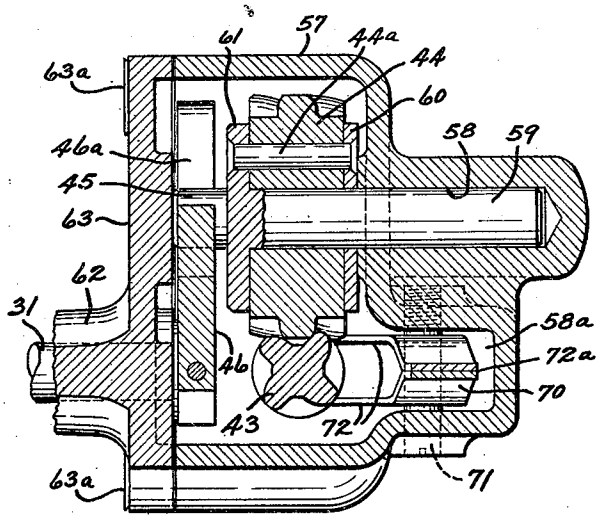

Fig. 7

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Aug. 27, 1929. R. L. LEE 1,725,762

DOMESTIC APPLIANCE

Filed April 7, 1923 4 Sheets-Sheet 4

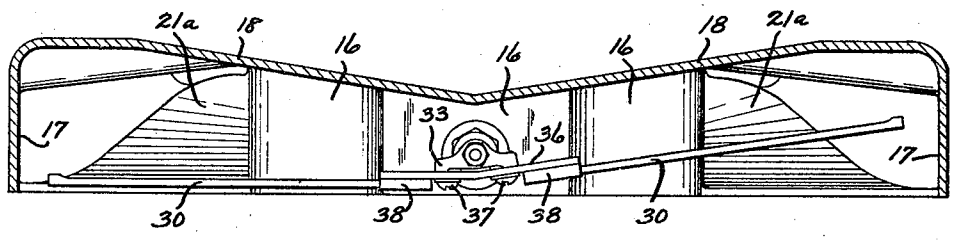

Fig. 8

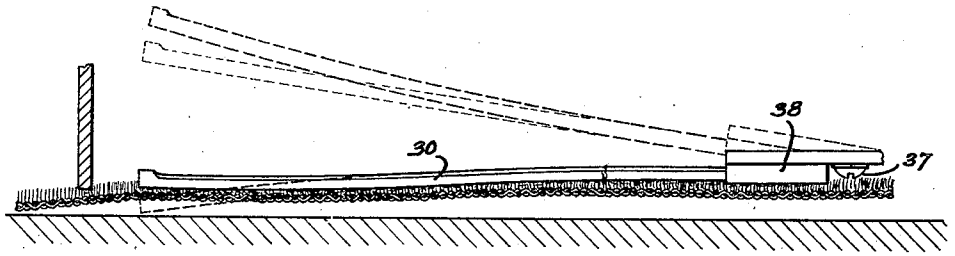

Fig. 9

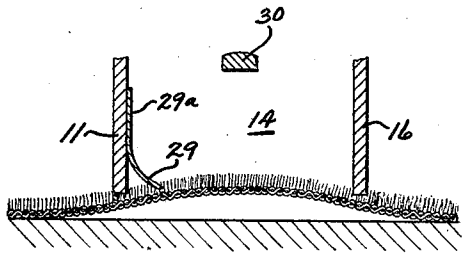

Fig. 10

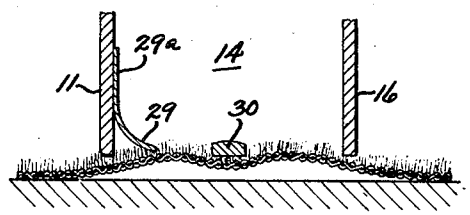

Fig. 11

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UNITED STATES PATENT OFFICE.

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DOMESTIC APPLIANCE.

Application filed April 7, 1923. Serial No. 630,629.

This invention relates to machines adapted to travel over a surface, loosen dirt or other foreign matter and remove it in a current of air.

Objects of the invention are:—to minimize noise in vacuum cleaners provided with beaters or agitators and to simplify the lubrication of the transmission mechanism of cleaners of this type; to enable the agitating or beating mechanism to be connected or disconnected from the prime mover without causing cessation of the suction; to simplify the assembling and disassembling of the operating mechanism and otherwise to increase the efficiency, improve the operation and simplify the arrangement of parts of traveling vacuum cleaners.

The invention consists in the combinations of elements and arrangement and construction of parts described in detail hereinafter, illustrated in the drawings forming a part hereof, and defined in the appended claims.

In the drawings, in which like parts are designated by like reference characters throughout the several views,

Fig. 1 is a perspective of a vacuum cleaner embodying this invention as it would appear resting upon a floor in normal operating position;

Fig. 2 is a rear elevation of the frame or main housing, the fan casing and parts above it having been broken away;

Fig. 3 is a vertical fore and aft central section through the main housing and fan casing, exposing the mechanism within;

Fig. 4 is a fragmentary view showing the main housing partly in horizontal section, exposing the beaters, beater shaft and lint gathering teeth in plan;

Fig. 5 is a section on the line 5—5 of Fig. 3;

Fig. 6 is a section on line 6—6 of Figs. 4 and 5;

Fig. 7 is a section on line 7—7 of Figs. 3 and 5;

Fig. 8 is a front elevation of the beaters and beater shaft with the front walls of the housing cut away to expose the interior;

Fig. 9 is a diagrammatic view illustrating the operation of a beater upon a portion of a fabric lifted by suction, the beater being viewed from one side of it; and

Figs. 10 and 11 are diagrammatic views representing transverse fragmentary sections through the main housing and a beater arm, Fig. 10 showing the relative positions of beater arm, lint gathering teeth and fabric when the beater arm is elevated, and Fig. 11 showing the relative position of the same parts when the beater arm is depressed.

The ensuing description assumes the position of the parts to be in the relation that exists when the cleaner rests in operative position on a floor or other generally horizontal surface, which is the position assumed in the ordinary use of machines of this character.

In the embodiment illustrated, 1 indicates as an entirety a hollow supporting frame and main housing, which incloses a suction chamber communicating with the exterior by an elongated air inlet or slot, in the under surface of the frame, through which air may be drawn; 2 a fan or air pump casing in communication with said suction chamber, said fan and casing constituting a source or generator of low pressure; 3 an air outlet conduit leading from the fan casing; 4 a dust collector communicating with the air outlet 3, and sustained as at 4^a by the handle of the instrument; 5 a housing for a motor; 6 a bail pivoted as at 6^a at opposite sides of the fan casing; 7 a handle connected to the bail, said handle having means, such as hooks or clips, for sustaining the conductor 8 that supplies energy to the motor, and a means for holding and guiding a flexible actuator indicated as a whole by 9, such as a Bowden wire, for operating a clutch, to be hereinafter described, the position of which determines whether the vacuum cleaner is to be operated with or without beaters. Numeral 10 indicates a pivoted switch adapted to be opened by engagement with the finger 10^a upon movement of handle 7 and bail 6 to an upright position, to which the handle is pushed when the operator wishes to stop the cleaning operation, and to be closed upon movement of the handle and bail to an inclined position (as shown in Fig. 1) in which it is most conveniently disposed to enable the machine to be manipulated for cleaning purposes. Motor housing 5 may be removed from fan casing 2 after loosening screws 5^a, and fan casing 2 may be released from frame 1 by removing screws 2^a.

The means hereinafter claimed are involved in the frame 1, the form of suction chamber and air inlet orifice therein, and the cooperating mechanism supported by, and housed within it.

The frame 1 is pointed or of plow-like form and is preferably triangular in plan and is adapted to be moved point foremost over a surface. The sides 11 of the frame diverge rearward from the forward rounded point 12. The sides 11 may advantageously be at right angles to each other and vary in height from the point 12 to the rear corners 13 of the frame. Within frame 1 is a hollow suction chamber 14, substantially V-shape in horizontal section, said chamber having in its under side a correspondingly V-shaped air inlet orifice or mouth 15. The outer and front sides of the chamber are formed by the inner surfaces of the side walls 11 and rounded point 12 of the frame. Rear walls 16, connected by a transverse partition 16ª, extend parallel with the sides 11 and their lower edges, together with the lower edges of the closed rear and outer end portions 17 and front walls 11, outline said V-shaped air inlet in the lower side of the frame. The space between the side walls is completely covered by an approximately triangular top plate 18, sloping rearward and upward from point 12, and preferably cast as a part of the frame. An elevated circular boss 19, having a plane top is formed on the rear portion of plate 18, midway between the corners 13, said plane top being pierced by a hole 20 opening from a chamber 21 the interior of which is connected by lateral passages 21ª, of equal capacity, with the rear outer ends of the limbs or branches of V-shape suction chamber 14.

Mounted on top of boss 19 is the casing 2 which, in this embodiment, incloses a rotary fan 22. The under wall of casing 2 has a hole 20ª in registration with hole 20 in the top of boss 19, the port formed by said registering holes constituting the outlet port for air drawn from the suction chamber 14 into and through chamber 21 by fan 22 the center of this port being equidistant from the passages 21ª.

Thus, air drawn through the air inlet 15 finds its way through lateral passages 21ª into the chamber 21 from the rear ends of the branches of the V-shaped suction chamber 14, and is drawn upward through port 20, 20ª, which is immediately adjacent to the low-pressure side of the air pump. The rearward outer extremities of the V-shaped suction chamber 14 and the corresponding ends of the V-shaped inlet 15 are nearest the outlet port 20, 20ª on the low-pressure side of the fan or pump, and the forward angular point of chamber 14 and adjacent portion of the inlet are farthest from said outlet port and the source of reduced pressure. By a gradual reduction of the cross sectional area and cubic capacity of the suction chamber 14 proceeding from the points nearest the outlet port to the points farthest therefrom in proper degree the pressure of the air entering the inlet may be substantially equalized at all points.

Mounted removably on the air pump casing 2 is the motor housing 5 inclosing, in this embodiment, an electric motor (not specifically shown) having an upright armature shaft 23 to which the rotary fan is secured. Air and dust drawn into casing 2 is forced through outlet 3 into the dust collector 4.

The under surface of hollow frame 1 between the branches of V-shaped suction chamber 14 may be recessed as indicated at 24. To the upper wall of this recess may be secured means adapted to carry supporting devices, symmetrically arranged on opposite sides of the fore and aft center line of the frame which passes through the point 12 and bisects the angle formed by the V-shaped suction chamber. Said means may conveniently be a U-shaped bracket 25 to the end of each limb of which a supporting device such as a roller 26 is pivoted. Other brackets 27, which may be formed integral with the frame, extend rearward from the rear corners of said frame, to which brackets 27 two other supporting rollers 28 may be pivoted. Said four rollers, or equivalent supporting devices, are so disposed as to hold the lower face of the hollow frame and the edges of the air inlet therein, spaced slightly from and parallel with any surface upon which said rollers may rest, or over which the machine may be caused to travel, and to guide it in a path parallel with said said fore and aft center line.

In order to remove ravelings, threads, or other filament-like mterials from a carpet or other fabric, in the nap of which they may be entangled, means are provided for disentangling and releasing them so that the current entering the air inlet may carry them onward to the dust collector or other place of deposit. In the embodiment shown the said disentangling means comprises a series of rake or comb-like teeth 29, preferably without sharp points, which may be attached to the frame so as to project downward and inward and may terminate substantially in or adjacent to the plane of the operating face of the frame or main housing in position to engage the surface of a fabric lifted by the suction exerted within the air inlet. These teeth may be formed on a strip of sheet metal secured to the lower inner surface of the front wall, the teeth being bent inward or toward the rear wall preferably in a curve presenting a convex surface downward and so disposed and constructed as to avoid digging into the weave of the

fabric, but to rake or comb the nap and detach therefrom threads, lint, or ravelings in such manner that these may be caught in the air currents and carried to the dust collector. The flange 29ª of the described toothed strip may be conveniently attached in any suitable manner as by riveting or bolting it to the inner face of said front wall 11.

In order to loosen sand, dust, mud or the like, that may be embedded in a fabric, mechanical cleaning devices in the form of beaters are provided within the suction chamber 14 and disposed so as to operate lengthwise of the inlet opening and beat and agitate the carpet or other fabric over which the cleaner is being moved. The air pump used is intended to be of such power and the structure and arrangement of parts such that air currents entering the chamber through the air inlet will lift a portion of the carpet or other fabric free from the floor or other surface on which it rests so that the beater arms operating upon this lifted portion will most effectively jar the dirt loose from the fabric throwing the loosened particles into the air currents by which they will be carried to the dust collector.

The beater arms referred to consist preferably of flexible, elastic flattened strips 30 of greater horizontal width than thickness extending oppositely from the under side of one end of an oscillatory beater shaft 31 which projects into the V-shape suction chamber 14 of the frame 1 in a fore and aft direction, substantially at the junction of the two branches of said chamber. The shaft 31 is disposed in a plane parallel with and slightly above the edge of air inlet orifice 15 and its axis intersects the rounded point 12 of the frame. The beater arms 30 extend at an angle to each other in two planes. They are arranged oblique to the axis of the shaft 31 and diverge rearward so that they occupy a position parallel with the branches of the V-shaped chamber and walls 11, (as shown, in Fig. 4) and when vibrated strike with their wider surfaces the crest of the wave of fabric that has been lifted by the suction in a wave like formation. The beater arms are also disposed at an oblique angle to each other measured in a vertical plane or planes at right angles to the axis of beater shaft 31. This relation is clearly shown in Fig. 8, the obtuse angle formed by the beater arms in this plane being disposed on the upper side of the beater arms or the side away from the mouth of the air inlet. This arrangement of the flexible, elastic beater arms allows of their striking a blow along the greater part of their length and permitting a very considerable amplitude of vibration.

In order to connect the beaters securely to the front end of shaft 31 said front end is tapered as at 32 and threaded at its extremity; and a yoke 33, provided with a correspondingly tapered hub, is sleeved upon said tapered end, relative rotation between said yoke and shaft being insured against by means of a pin 34 passing through shaft 31 and engaging notches 35 in the rear end of the hub of said yoke 33, a nut 33ª on threaded end of shaft 31 holding the yoke so engaged. The laterally extended arms of yoke 33 depend, or are offset toward the lower side of the axis of shaft 31 and have under surfaces inclined to each other substantially in the same degree as the beaters 30. A correspondingly angled holder plate 36 may be secured to said yoke by screws 37. Said plate 36 may be provided with sockets 38 into which the ends of beater arms 30 may be inserted and from which they may be removed should it be desired to replace them by new ones. Figs. 9, 10 and 11 represent attempts to illustrate graphically the mode of action of the beater arms 30, upon the portions of a carpet lifted by suction while the apparatus is operating on it. Owing to the elasticity and flexibility of the beater arms each will strike the raised surface of the carpet in such manner as to bring a considerable length of its under surface into energetic impact with the carpet, as indicated in Fig. 9, depressing the fabric, as indicated in Fig. 11 and propagating a wave, as it were, in the carpet which it has not been attempted to illustrate. When the arm 30 has moved upward to the position indicated in Fig. 10, the suction restores the surface of the fabric substantially to the position thereinshown. The action is rapid and effects an energetic progressive shaking of the fabric during the progress of the apparatus over it as presently explained.

Bamboo is a desirable material from which to form the beater arms since it is of fibrous structure, light, strong, flexible, elastic and does not in operation cut or wear a fabric to a serious extent. As the shaft 31 in operation is oscillated at a high rate of speed the beater arms 30 will flex and operate upon the fabric with an elastic whipping action that is found to be most effective for the purpose of loosening dirt.

The beater arms deliver quick, sharp blows to the raised zone of fabric along lines substantially parallel with the sides of said raised zone, the effect of which is to flex a portion thereof underneath and at each side of the beaters. Each time a beater arm is lifted the zone of fabric beneath the air inlet assumes its fully upward bowed or lifted position under the influence of the air suction. It will be understood that the force of the suction is sufficient at all times to hold the fabric raised from the floor and that while the beaters are in operation the fabric is being continuously flexed. The effect of the blows of the beater arms is transmitted

in wave like vibrations to the lifted portion of the fabric on each side and end of and beyond the beater arm, even causing the particles of sand or like extraneous particles held in the fabric outside the edges of the air inlet to become loosened therefrom and bounce or dance above the fabric around the edges of the plow shaped frame. It is to this continuous beating and flexing of the fabric that the superior cleaning capacity of this invention may be mainly attributed. The beater arms striking the fabric quick, sharp, snapping blows while the fabric is raised and flexibly held away from the floor have the effect of knocking the fabric away from the dust, so to state, and when the fabric rebounds from the flexing due to the blows of the beater arm under the influence of the air suction the dust and heavier particles of matter are thrown upward into the air currents, and being already in motion upward they are the more readily continued in motion and carried off by the air currents. It is thus possible with this apparatus easily to lift and carry off heavy particles, such as sand, which heretofore have been removable, if at all, with considerable difficulty and then only by operating the apparatus to and fro over the fabric for a considerable period of time.

A further advantage of the continuous rapid flexing of the fabric, especially when the fabric is a heavy carpet, lies in the fact that the body of the carpet below the nap is continually worked in such a way as to loosen the extraneous matter embedded therein. While the heavy matter embedded in the texture of a carpet is not ordinarily noticeable and for that reason of little concern to the average user of carpets, it is a fact, nevertheless, that such matter, especially when it is sharp or abrasive like sand, is very detrimental to the life of the carpet. The grinding in of such matter underfoot is accompanied by a relative motion of the sand and fabric which gradually cuts the fibers constituting the nap, and eventually destroys the body of the carpet.

It is obvious from the foregoing description that this invention provides an effective means for removing from carpets and other fabrics extraneous matter not removed by the methods of cleaning them in place ordinarily practiced.

The armature shaft 23 of the motor constitutes the prime shaft; and said prime shaft together with the resilient driving member connected therewith and an extension shaft 39 in continuation thereof constitutes a motor driven shaft comprising two sections adapted to be clutched together or unclutched. This flexible driving member comprises a nut 23^a secured to the armature shaft 23 and a clutching member 40, said nut 23^a and member 40 being flexibly connected by a series of spaced parallel extending spring wires 40^a. In this embodiment, shaft 39 is movable endwise to effect the clutching or unclutching. On the lower end of prime or armature shaft 23 is one member 40 of a clutch. Mating with member 40 is a pin 41 projecting from opposite sides of the upper end of movable section 39 which may be here designated the driven section of the two-section motor driven shaft. Member 40 is provided with notches 42 with which said pin 41 may be readily caused to engage by an endwise movement of shaft section 39 during operation of the motor and fan. When the shaft section 39 is connected with the armature shaft 23 through the flexible driving member, the shock caused by the load on the shaft 39 will be absorbed by the driving member. It is preferable to use a resilient driving connection between the armature shaft 23 and the clutching member 40 but it is to be understood that the armature shaft 23 can be connected with the clutching member 40 in any other suitable manner.

Suitably secured to said worm wheel 44 at one side thereof is an eccentrically disposed pin 45 engaging a slotted arm 46 which is pinned to the rear end of beater shaft 31 and by which said beater shaft may be oscillated.

Shaft 39 passes through a projecting bearing member or bushing 47 having a flange 48 and having screw threads on opposite sides of said flange at 49 and 50. Said bushing 47 passes through an opening 51 in the lower wall of chamber 21, the opening being larger than the diameter of the bushing above the flange. Engaging the upper surface of the flange 48 on the under side of the lower wall of chamber 21 is a washer 52 of suitable yielding, vibration-insulating material, which may be seated in a counter sink concentric with opening 51. Upon the upper side of said wall is another similar washer, 52^a, surrounding the bushing. A threaded nut 53 is screwed upon the upper threaded end 49 of said bushing, a hard washer 54 being disposed between it and the bushing 52^a. By setting up the nut 53 the bushing 47 may be clamped firmly to the lower wall of chamber 21 of frame 1 and vibrations set up in the mechanism will be absorbed by the yielding washers 52 and 52^a, no part of the bushing being in metallic contact with the frame.

Surrounding shaft 39 above nut 53 is an oil saturated fibrous ring 55 which is held in place by a retaining cap 56 engaging a reduced portion formed on nut 53.

To the lower threaded end 50 of bearing bushing 47 is screwed, or otherwise secured, a transmission housing 57, which is preferably oil tight; the upper wall of said housing may be provided with a threaded orifice

47ª for engaging the threaded part 50 of the bushing 47. One side of this housing is open and is adapted to be closed by a flange on a removable housing and bearing member for the beater shaft to be presently described. In the wall of housing 57 opposite the open side is an elongated shaft bearing socket 58 and a recess 58ª for the reception of a clutch-shifting lever. The worm wheel 44 is mounted so as to rotate with a shaft 59 extending axially at one side therefrom, said shaft 59 being seated within the bearing socket 58. Surrounding the shaft 59 and disposed between one face of the gear 44 and the inner wall of the housing is a collar 60 adapted to space the gear 44 from the adjacent wall of the housing. Rigidly united to the opposite face of gear 44 is a circular plate or collar 61 which may be formed integral with the shaft 59, if desired, and which carries the eccentric pin 45 previously described as adapted to vibrate the arm 46, said arm 46 being slotted, as at 46ª, for engagement with the eccentric pin. Worm wheel 44 may be secured to plate or collar 61 by rivets or bolts 44ª which may pass through said plate and worm wheel and also through said spacing collar 60.

The beater shaft housing and bearing 62 consists of a long tubular portion having a flanged end 63, said flanged end constituting a removable, oil tight cover plate for the open side of transmission housing 57 to which it is secured by bolts 63ª. At the other end said beater shaft bearing or housing 62 is reduced in such manner as to form a shoulder 64 and has a threaded extremity 65. The reduced end penetrates an opening 16ᵇ, in the rear wall or partition 16ª of chamber 14, which is of a diameter that is considerably greater than the diameter of shaft housing 62 to the right of shoulder 64 (as viewed in Fig. 3.) One or a plurality of washers or fillers 66 of yielding, vibration-insulating material may be disposed around said bearing member or housing within the opening 16ᵇ of the wall 16ª so as to substantially fill said opening. Suitable metallic washers 67 and 67ª are placed against the outer sides of the yielding washers, washer 67 being of a size to pass through opening 16ᵇ and resting against the shoulder 64 and washer 67ª resting against a nut 68 which, when screwed upon the threaded extremity 65 of housing 62, expands the vibration insulating filler radially, centering the housing 62 within the opening 16ᵇ and holding it out of metallic contact with partition 16ª in such manner that vibrations transmitted to said housing are absorbed by the yielding material. An oil soaked fibrous ring 69 may be held upon shaft 31 forward of nut 68 by a retaining cap 69ª of substantially the same construction as has been described with respect to oil ring 55 surrounding shaft 39.

It will be perceived that the housings 57 and 62 constitute a rigid structure bridged from one part of the frame to another and secured to and supported on the frame by vibration-insulating means at relatively widely separated points, with no contact between the metallic parts of said frame and structure, so that the jar and vibration caused by the operation of the beaters and transmission train are effectively absorbed by the yieldable mountings described. The housing 57 is designed to be filled with lubricant and serves to lubricate the entire transmission mechanism supplemented only by the oil soaked fibrous rings or washers described.

Within the recess 58ª, a bell crank lever 70 is pivoted upon fulcrum pin 71. In the construction illustrated lever 70 has branched arms 72 embracing said shaft 39 and engaging a circumferential groove 73 in the lower end thereof. The other arm 72ª is undivided, its end being loosely pivoted at 72ᵇ within a slot in the end of lever-operating slide 74, said slide being movable endwise within a hollow guide member 75, which is threaded at one end into a correspondingly threaded opening 75ª in housing 57. The slide 74 is connected in any suitable manner with a flexible wire 76 extending to some point on the handle 7 where it may be conveniently reached by the operator and fastened in the desired position, as by means of a small grooved pulley 76ª held by friction in a slot in the handle, to which the wire is anchored. As a convenient means for attaching wire 76 to slide 74, the outer end of said slide may be drilled diametrically and a slot made from the end of the slide to the drilled hole parallel to the axis of the latter. A pin 76ª reduced in size between its ends may be inserted within the hole, the looped end of wire 76 engaging the reduced portion of the pin and the wire passing through the slot in the end of the slide. Wire 76 between outer end of guide 75 and pulley 76ª passes through flexible sheath 77, one end of which is expanded within the guide 75. Said wire 76 and sheath 77 together constitute the flexible actuator 9 before referred to. Bell crank lever 71 may be conveniently made of two sheet metal parts, the upper arms being bent into contact and united as by spot welding.

When the wire 76 is pulled, slide 74 is drawn to the right as indicated in Fig. 6, bell crank lever 70 rocked and shaft 39 pushed upward into the position wherein pin 41 will engage notches 42 of clutch section 40. Under such conditions both the fan or air pump and the beaters will be operated. Should it be desired to render the beaters inoperative while the fan is operating the wire 76 may be pushed, slide 74

moving to the left, (as viewed in Fig. 6) and the shaft 39 drawn downward to disengage the clutch.

The transmission housing 57, beater shaft housing 62, bushing 47, and parts supported thereby constitute an assembly that may be placed in operative position with respect to the main housing, motor driven shaft and fan or removed therefrom as a unit. By inspection of Figs. 5, 6 and 7 it will be apprehended that bell crank lever 70 with operating slide 74 may be inserted through the open side of housing 57 into the recess 58[a] and slide 74 pushed through the threaded opening 75[a]. Fulcrum pin 71 may then be inserted. Wire 76 may be attached to the operating slide at this time, if desired, and guide member 75 slipped over the sleeve 77 and threaded into opening 75[a]. Shaft 39 with worm 43 may be inserted through the orifice 47[a], which is of greater diameter than the worm 43, and the lever arms 72 caused to engage the groove 73 in shaft 39. Bushing or bearing member 47 may be then passed over shaft 39 and screwed into orifice 47[a]. Shaft 59 carrying worm wheel 44 may now be pushed into the bearing socket 58. Shaft housing 62 with shaft 31 therein may now be brought to position effecting engagement of slotted arm 46 with pin 45, and bolts 63[a] screwed tight. The unitary assemblage having been thus completed, and the motor casing 5 having been removed with motor and fan, shaft 31 and the end of housing 62 may be now pushed through the hole 16[b] in partition 16[a] obliquely so that the end of shaft 39 will clear the top wall of recess 24 of frame 1. When the shaft 39 is in position to enter the opening 51 it and the threaded end of bushing 47 carrying a washer 52 may be pushed through said opening 51. The upper washers 52[a] and 54 may then be slipped over the bushing 47 and the nut 53 applied and pin 41 inserted. At this time or previously, if desired, washer 67 may be slipped over the end of shaft 31 and housing 62, and pushed through hole 16[b] against shoulder 64 on the housing 62. The washers 66 and 67[a] may be similarly applied and forced against washer 67; nut 65 may then be screwed up expanding the yieldable washers 66 radially into good frictional contact with the perimeter of the hole 16[b]. Pin 34 may be inserted at this time and beater yoke 33 engaged over the end of shaft 31 and secured by nut 43[a]. It is possible to attach the described assemblage with pins 34 and 41 previously inserted by making the pins of a length less than the inside diameter of the nuts 68 and 53, or by forming longitudinal grooves (not shown) in the bores of the nuts to permit the passage of the pins. It will be obvious also that the order of procedure in assembling the elements and securing the unitary assemblage after it has been placed in position may be varied somewhat from the order given, although the actual positioning of said assemblage should be effected as described.

By reason of the plow shape or pointed form of the hollow frame 1, with its sides at right angles to each other, rounded forward corner and V-shaped air inlet, the cleaner may be pushed into room corners and effectively remove dirt from the floor without marring room walls and without the necessity of the operator changing position, or first advancing the cleaner against one wall, then turning it at right angles and advancing it against the other. Moreover, the oblique disposition or trend of the branches of the air inlet slot with respect to the course or line of direction which the apparatus is adapted to follow in moving over a floor or other surface, enables it to be operated back and forth across the edge of a rug, loose carpet, or other fabric unsecured to the floor or surface over which the apparatus is being moved without curling up the edge of the fabric and interfering with the even travel of the apparatus. This is for the reason that the inlet slot can never be positioned wholly over a narrow zone substantially parallel with an edge of a rug or the like whereby the edge is likely to be lifted by the suction and curled over or dragged by the apparatus in its movements, as is likely to occur in operating with vacuum cleaners wherein the inlet slot is disposed at right angles to the line of travel. In a vacuum cleaner having the air inlet slot obliquely disposed in whole or in part with respect to the line of travel, and particularly where the inlet is V-shaped, the full force of the suction is not applied to the rug or other fabric until the entire under area of the main frame rests upon it and holds it flat except for the portion or area lifted to the slot nor need the width of the swath or space cleaned be narrowed. And in whatever direction the apparatus is propelled across the edge of a rug or the like the latter will be held down while the air inlet slot passes gradually over the edge in a direction either endwise or oblique with respect to at least one of the branches of the slot so that it becomes impossible to concentrate the full force of the suction close to the edge.

Although the instrumentality described is the best embodiment now known to me it is intended to be exemplary only of the invention, and modifications thereof may be made within the definition of the appended claims without departing from the principles thereof.

What I claim and desire to secure by Letters Patent is:

1. A portable vacuum cleaner, comprising in combination, a frame inclosing a chamber

having a narrow air inlet orifice, a shaft disposed in said chamber transversely thereof between the ends of the air inlet orifice, elastic, flexible beaters secured to said shaft and projecting at opposite sides thereof longitudinally of the orifice, and means for oscillating said shaft.

2. A portable vacuum cleaner comprising in combination, a frame inclosing a V-shaped chamber having a correspondingly shaped air inlet orifice, a shaft extending transversely of said chamber at the junction of the branches thereof, elastic, flexible beaters secured to said shaft and projecting at opposite sides thereof longitudinally of said branches in position to operate within said chamber and inlet.

3. A portable vacuum cleaner comprising in combination, a frame inclosing a chamber having an elongated air inlet orifice, beaters mounted within said chamber to swing on a shaft transverse of the chamber and air inlet, said beaters extending from each other at opposite sides of the shaft and arranged so as to form an obtuse angle.

4. A portable vacuum cleaner comprising in combination, a frame inclosing a chamber having a narrow air inlet orifice, a shaft extending into said chamber, flexible beaters each having one end only connected to said shaft within said chamber on opposite sides, the other end of each of said beaters being free so as to produce a whipping action of the beaters when actuated, and mechanism for oscillating the shaft.

5. In a vacuum cleaner, a frame, an upright driving shaft, a mechanical cleaning device, and transmission devices for operating the mechanical cleaning device from said upright shaft, a bearing member for said upright shaft said member passing through an enlarged opening in the frame out of contact therewith, means for clamping said bearing member to the frame, and vibration insulating washers between said clamping means and frame.

6. In a vacuum cleaner, a frame, an upright driving shaft, a mechanical cleaning device, and transmission devices for operating the mechanical cleaning device from said upright shaft, a bearing member for said upright shaft passing through an enlarged opening in the frame out of contact therewith, means for clamping said bearing member to the frame, vibration insulating washers disposed between said clamping means and frame, and a transmission housing supported by the lower end of said bearing member.

7. In a vacuum cleaner, a frame, an upright driving shaft, a beater shaft arranged at an angle thereto and driving connections between them, a bearing member for said upright shaft, vibration insulating material interposed between said member and frame, a transmission housing carried by said bearing member, a bearing housing for the beater shaft, said bearing housing being rigid with said transmission housing, and vibration insulating material disposed between said bearing housing and said frame, said vibration insulating materials securing the housings to the frame out of metallic contact therewith.

8. In a vacuum cleaner, a frame having a suction chamber, an air inlet orifice in its under face, and a cavity in its under side exterior of and below the chamber, mechanical cleaning means adapted to operate within the suction chamber, a prime shaft disposed above said cavity, and a unitary transmission assemblage detachably mounted within said cavity for transmitting movement from said prime shaft to said mechanical cleaning means.

9. In a vacuum cleaner, provided with mechanical cleaning means, the combination with a main frame having a suction chamber and a prime shaft thereon, of means for transmitting motion from the prime shaft to the mechanical cleaning means including a shaft extending into said chamber and connected with the prime shaft, and speed reducing gearing connected with the second mentioned shaft and disposed exteriorly of said chamber, a housing means for enclosing said gearing, said gearing and housing being removable as a unit from the frame, and means whereby said housing means may be removably attached to said main frame in position to establish a driving connection between said prime shaft and said cleaning means.

10. In a vacuum cleaner provided with mechanical cleaning means, the combination with a main frame and a prime shaft, of a transmission assemblage attachable to or detachable from said main frame as a unit, said assemblage comprising housing means, bearing members projecting from said housing means at an angle to each other, said main frame having openings for receiving said bearing members, at least one of which is larger than the bearing member adapted to enter it, removable means for centering and holding said bearing member in the enlarged opening, and transmission shafts journaled in said bearings adapted to transmit motion from the prime shaft to said mechanical cleaning means when the assemblage is attached to the frame.

11. In a vacuum cleaner, a main frame enclosing a suction chamber and a prime shaft; said frame having an orifice adjacent the prime shaft and an orifice in one wall of the suction chamber, the axes of said orifices being at an angle to each other; a transmission mechanism and a housing means therefor, said housing means having bearing members at an angle to each other and adapted to be seated within said orifices; said transmission mechanism comprising a

shaft protruding from one of said bearing members in position to be driven by said prime shaft and a shaft protruding from the other bearing member adapted to operate a mechanical cleaning device within the suction chamber; the orifice for admitting at least one of said bearing members being considerably larger than the bearing member; and a removable centering and filling means interposed between said last named bearing member and the perimeter of said orifice, and means for clamping the other bearing member to the frame.

12. In a vacuum cleaner, a frame having a suction chamber, a shaft, mechanical cleaning means within the chamber, an operating shaft therefor disposed at an angle to said first shaft, an oil retaining housing secured to said frame exteriorly of the suction chamber, and transmission devices including speed reducing gearing within said housing between the upright shaft and operating shaft.

13. In a vacuum cleaner, a frame, a prime shaft, mechanical cleaning means, an operating shaft for said means, transmission means between said shafts, an oil retaining transmission housing carried by the frame, said housing enclosing said transmission means and having bearings for said shafts, one of said bearings having a flange detachably secured to the transmission housing and closing one side thereof.

14. In a vacuum cleaner, a frame, a shaft, mechanical cleaning means, a shaft therefor at an angle to said first named shaft, transmission gearing between said shafts including a gear wheel having a shaft extended axially from one face, and means whereby said gear wheel operates the cleaning means shaft; an oil retaining transmission housing for said transmission gearing having a bearing socket for said gear wheel shaft in one wall and the opposite side open, and a cleaner shaft housing removably closing the open side of said transmission gear housing.

15. In a vacuum cleaner, a frame, a shaft, a mechanical cleaner operating shaft driven thereby, transmission gearing between said shafts including a gear and eccentric pin, a shaft extending centrally from said gear, an oil retaining housing for said transmission gearing, said housing having a bearing socket in one wall for said gear shaft and an opposite open side, a housing for the cleaner operating shaft closing the open side of the gear housing and adapted to engage the end of the eccentric pin to hold the gear against axial movement, and an arm on the cleaner operating shaft engaged by the eccentric pin.

16. In a vacuum cleaner, a frame, a shaft comprising two sections one of which is axially movable, a clutch member on each section, mechanical cleaning means and a shaft therefor, speed reducing gearing between the cleaning means shaft and said movable shaft section, a housing for said gearing, means whereby said movable section may be moved to couple or uncouple said clutch members, said last means including a lever disposed within the housing and operatively connected with said movable section, and operating means connected with the lever and extending through a wall of said housing.

17. In a vacuum cleaner, a frame, a handle, a shaft comprising two aligned sections one of which may be driven by the other, and a clutch for connecting or disconnecting them, a mechanical cleaning means and a shaft therefor; transmission gearing between the cleaning means shaft and the driven section of said two section shaft, a housing for transmission gearing, a clutch operating lever pivoted thereto, a guide in the housing, a slide member in the guide having its inner end attached to said lever, a flexible operating wire having one end connected to the other end of said slide member, and means on the handle for supporting said wire in position to be controlled by the operator.

18. In a vacuum cleaner, a chambered frame having sides diverging from the front, a recess in its under face between said sides and an air inlet orifice in said under face the forward edge of which is substantially parallel with said sides; a source of reduced pressure for drawing air through said inlet orifice, mechanical cleaning means within said frame adapted to operate within the orifice, a shaft for operating said cleaning means, a motor on the frame, a shaft driven thereby, and transmission gearing between the motor driven shaft and the shaft for operating the agitating means, said gearing being housed in said recess.

In testimony whereof I hereto affix my signature.

RALPH L. LEE.