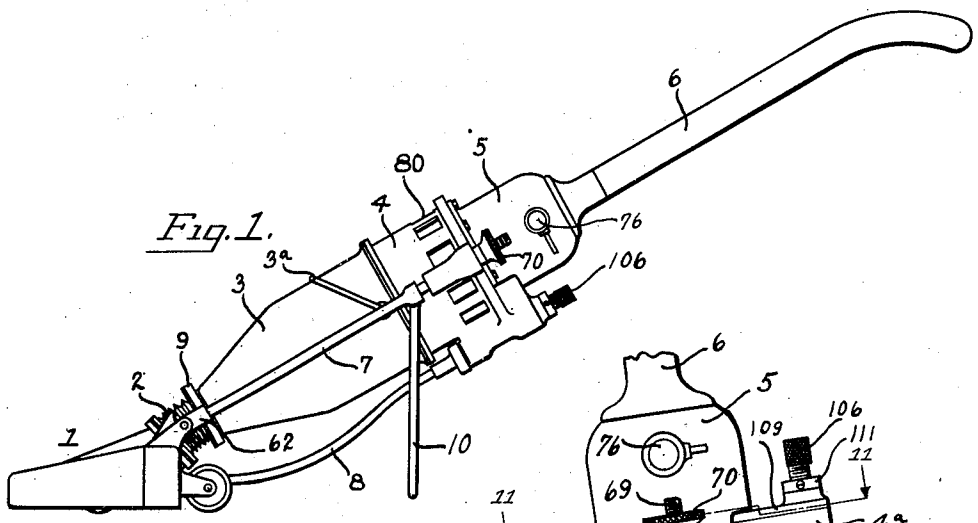
Oct. 13, 1931. R. L. LEE 1,826,798

DOMESTIC APPLIANCE

Filed April 30, 1923 5 Sheets-Sheet 1

Fig. 1.



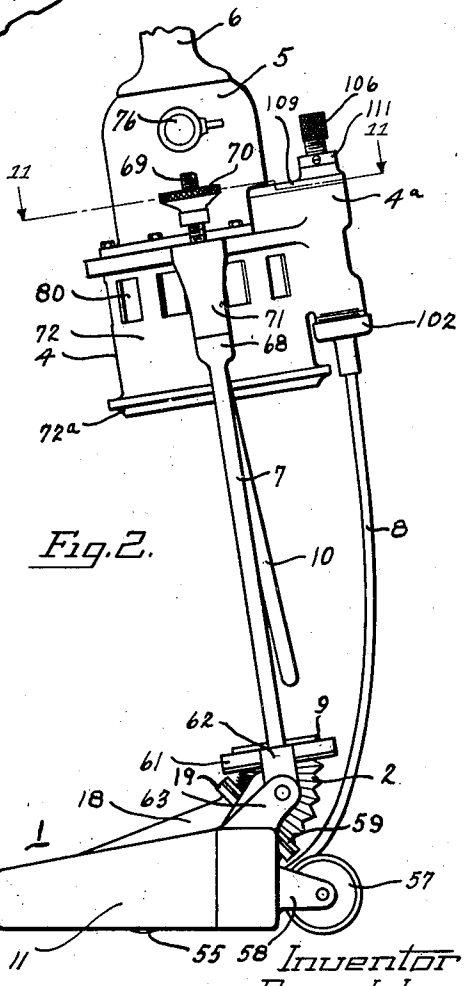


Fig. 2.

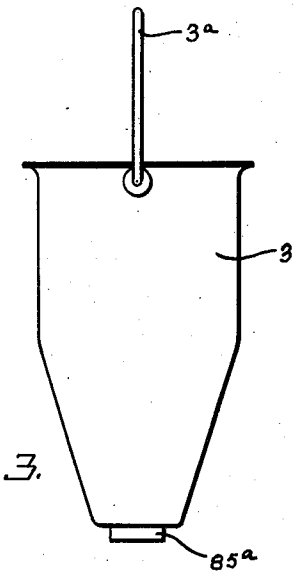


Fig. 3.

Witnesses

Charles E. Greene

F. J. Hardman

Inventor

Ralph L. Lee.

By J. Ralph Fehr

His Attorney

Oct. 13, 1931. R. L. LEE 1,826,798

DOMESTIC APPLIANCE

Filed April 30, 1923 5 Sheets-Sheet 2

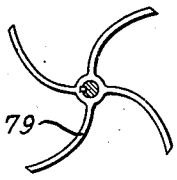


Fig. 13.

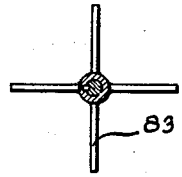


Fig. 14.

Fig. 4.

Witnesses

Charles E. Greene

F. J. Bardeman

Inventor

Ralph L. Lee.

By J. Ralph Fehr

His Attorney

Oct. 13, 1931. R. L. LEE 1,826,798

DOMESTIC APPLIANCE

Filed April 30, 1923 5 Sheets-Sheet 3

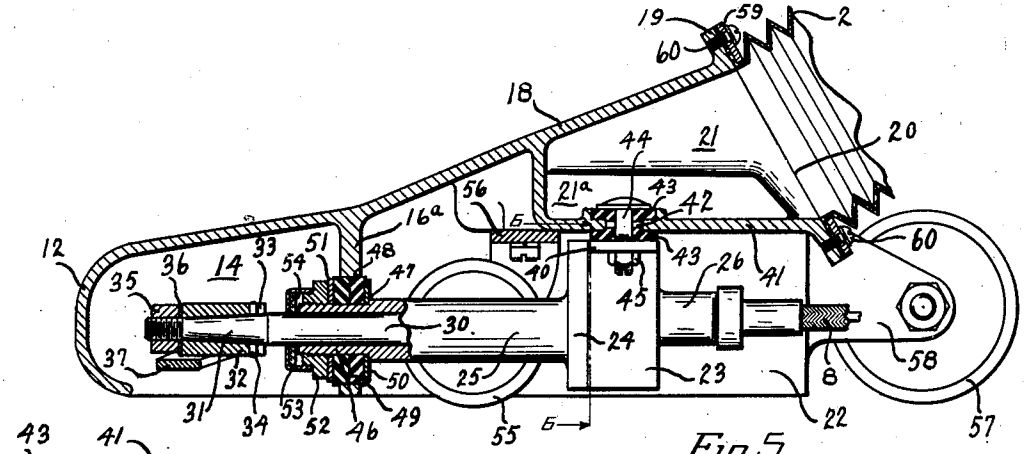


Fig. 5.

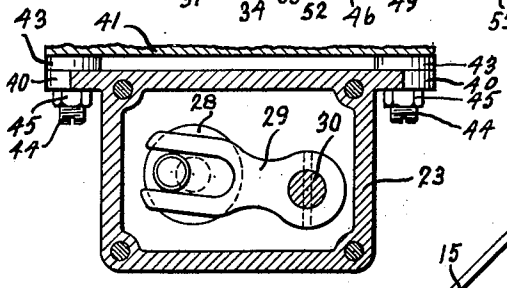


Fig. 6.

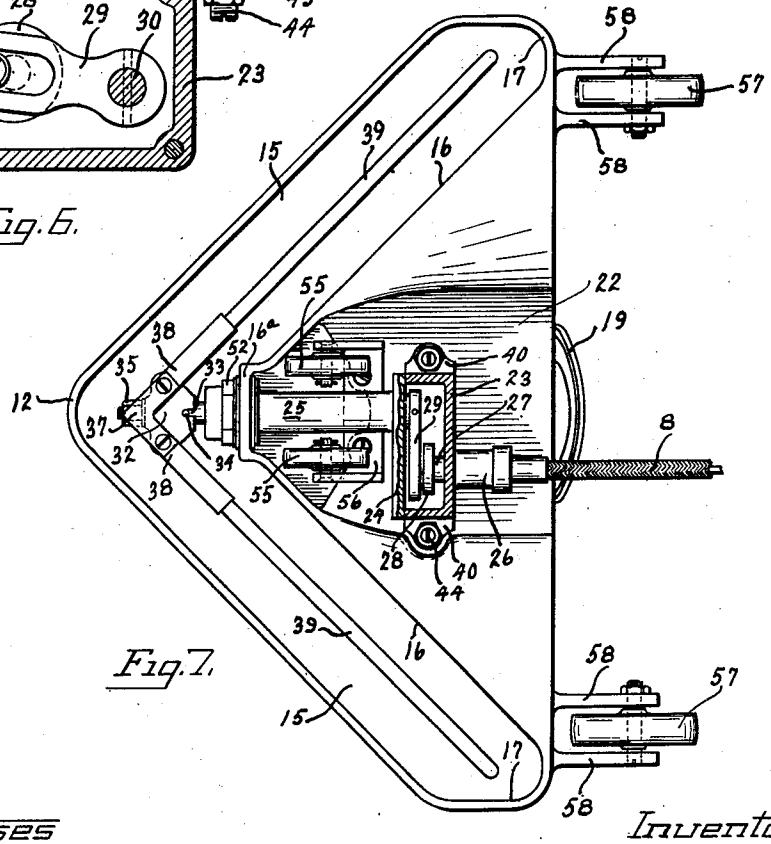


Fig. 7.

Witnesses

Charles E. Grunert

F. J. Hardman

Inventor

Ralph L. Lee.

By J. Ralph Fehr

His Attorney

Oct. 13, 1931. R. L. LEE 1,826,798

DOMESTIC APPLIANCE

Filed April 30, 1923 5 Sheets-Sheet 4

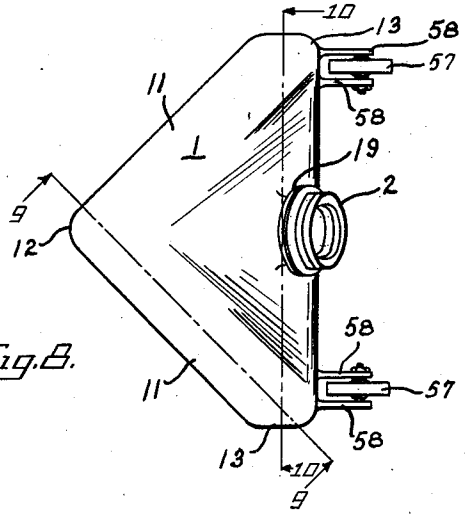


Fig. 8.

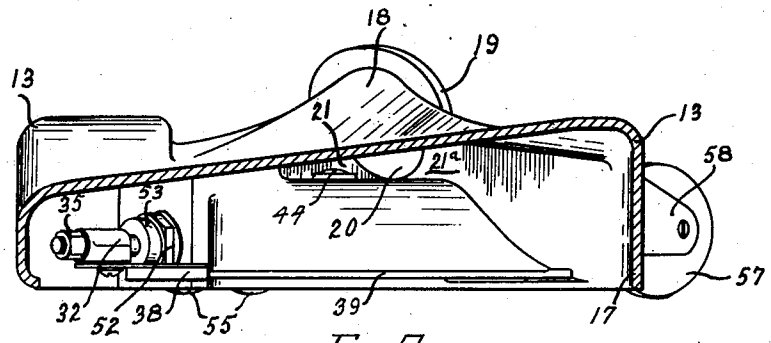


Fig. 9.

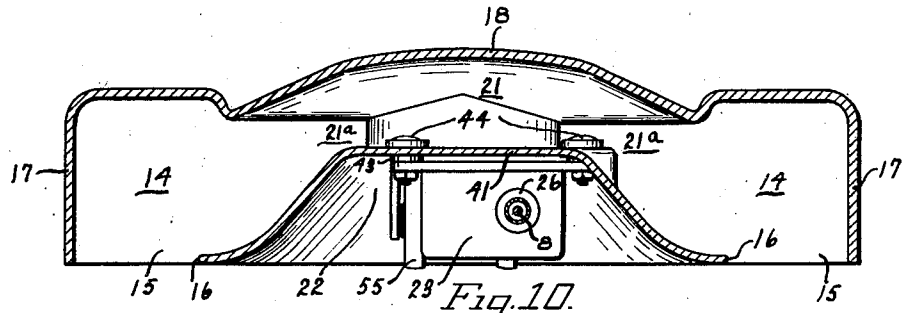


Fig. 10.

Witnesses

Charles E. Greene

F. J. Hardeman

Inventor

Ralph L. Lee.

By J. Ralph Fehr

His Attorney

Oct. 13, 1931. R. L. LEE 1,826,798

DOMESTIC APPLIANCE

Filed April 30, 1923 5 Sheets-Sheet 5

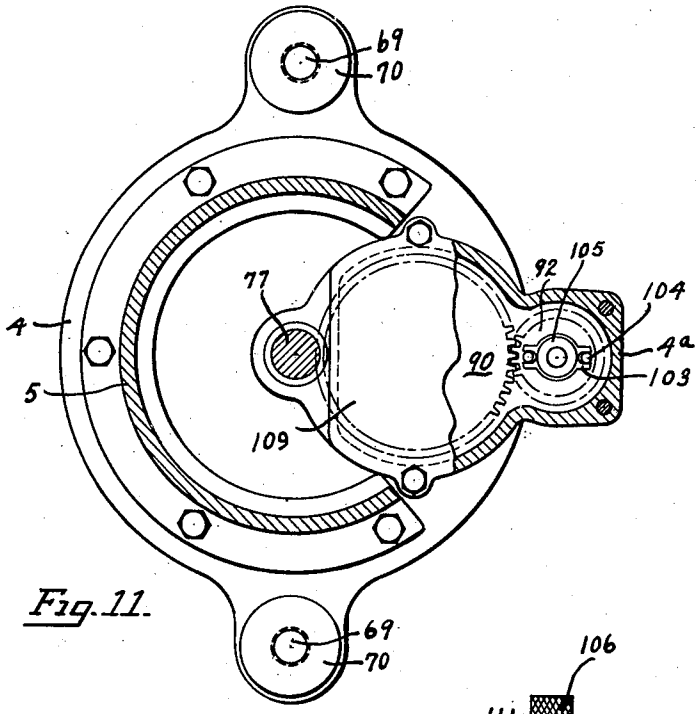


Fig. 11.

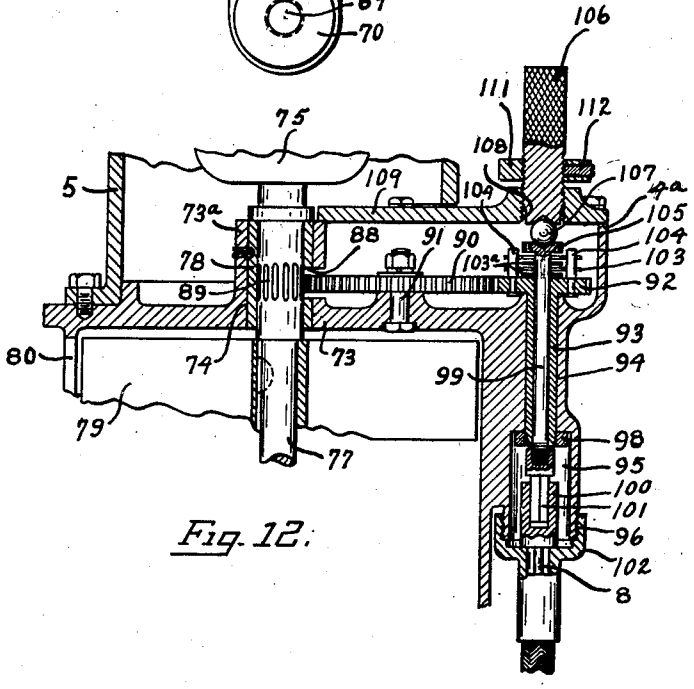


Fig. 12.

Witnesses

Charles E. Greene

F. G. Hardeman

Inventor

Ralph L. Lee

By J. Ralph Fehr

His Attorney

Patented Oct. 13, 1931 1,826,798

UNITED STATES PATENT OFFICE

RALPH L. LEE, OF DAYTON, OHIO, ASSIGNOR TO DELCO-LIGHT COMPANY, OF DAYTON, OHIO, A CORPORATION OF DELAWARE

DOMESTIC APPLIANCE

Application filed April 30, 1923. Serial No. 635,460.

This invention relates to portable cleaning apparatus adapted to travel over a surface to be cleaned and remove particles of dirt in a current of air. More particularly the invention relates to cleaning apparatus comprising a nozzle, a suction pump, and a dust separator of the centrifugal type.

One of the objects of the invention is to provide for the convenient removal of the dust container from the apparatus for emptying the same.

A further object is to provide for conveniently connecting a mechanical cleaning device located within the nozzle with the electric motor which operates the suction pump.

The invention lies in the combination of elements and structure of parts more particularly described hereinafter.

In the accompanying drawings which illustrate a preferred embodiment of the invention and in which like parts are indicated by like reference characters throughout the several views,

Fig. 1 is a side elevation of a vacuum cleaner, forming the subject of this application, disposed in operative position;

Fig. 2 is a similar view with the handle and attached parts inclined forward with respect to the cleaner head or nozzle, the dust collector having been removed and a portion of the handle broken away;

Fig. 3 is an elevation of a dust collecting receptacle detached from the machine;

Fig. 4 is a front view of the machine showing the dust collecting receptacle, prime mover, air pump and impeller casings in longitudinal section;

Fig. 5 is a vertical longitudinal section through the cleaner head or nozzle on the line 5—5 of Fig. 4;

Fig. 6 is a transverse vertical section on the line 6—6 of Fig. 5;

Fig. 7 is a bottom plan view of the cleaner head or nozzle showing a mechanical cleaning device and a part of the transmission train for operating it, the housing for parts of the transmission train being partly broken away to disclose the mechanism within;

Fig. 8 is a top plan view of the cleaner head or nozzle detached from the remainder of the mechanism;

Fig. 9 is a vertical section on the line 9—9 of Fig. 8;

Fig. 10 is a vertical transverse section on the line 10—10 of Fig. 8;

Fig. 11 is a transverse section on the line 11—11 of Fig. 2;

Fig. 12 is a vertical section on the line 12—12 of Fig. 4 through a fragment of the apparatus;

Fig. 13 is a view showing the form of a centrifugal fan constituting an air pump for creating a suction through the cleaner head or nozzle and dust collector, and

Fig. 14 is a detailed view of an impeller adapted to impart whirling motion to air and dust passing through the separator.

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

In the embodiment illustrated 1 indicates as an entirety a hollow cleaner head, nozzle, casing or housing, which encloses a suction chamber communicating with the exterior by an elongated air inlet or slot in its under surface through which air may be drawn, said head 1 also encloses a mechanical cleaning device and supports parts of a transmission train by which said device may be operated. Numeral 2 indicates a flexible tubular conduit communicating with the interior of the cleaner head 1; 3 indicates an impervious dust collecting receptacle adapted to be detachably seated between the upper end of the conduit 2 and the casing 4, which constitutes a housing for a centrifugal air pump, an impeller, and certain elements of the transmission train for operating the mechanical cleaning device. Numeral 5 indicates a housing for a prime mover adapted to operate the pump, impeller and mechanical cleaning device. Numeral 6 indicates the hand-hold portion of a frame by which the machine may be moved across the floor or other surface to be cleaned. Numeral 7 indi-

cates rods by which the housing 4 is connected to a member 9 pivoted to the cleaner head 1 in such manner as to allow said housing 4, the motor casing 5 and the hand-hold 6 to be moved longitudinally in order that the dust collecting receptacle 3 may be conveniently removed or attached. Parts 9, 7, 4, 5 and 6 may be considered collectively as constituting a frame for manipulating the cleaner head although some of said parts have additional functions. A strut or supporting leg 10 is pivoted to one of the rods 7, serving as a support to hold the frame at a convenient angle for the operator when desired. The details of the several parts thus generally referred to will be presently described.

The cleaner head 1 is pointed or has a plow-like form, and is preferably triangular in plan and adapted to be moved point foremost over a surface to be cleaned. Sides 11 diverge rearward from the forward rounded point 12; said sides 11 may be advantageously at right angles with respect to each other and increase in height from their junction at the point 12 to the rear corners 13. Within said head is a suction chamber 14 generally V-shaped in horizontal section and communicating with the exterior air by a correspondingly V-shaped air inlet or orifice 15 in the under side of said head. The outer and front sides of the chamber are formed by the inner surface of the side walls 11 and rounded point 12. Rear walls 16, connected at their front ends by a transverse partition 16*a*, extend substantially parallel with 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 housing. The space between the side walls is completely covered by a triangular top plate 18 sloping in general rearward and upward from point 12 and preferably cast as a part of the housing. The rearward portions of the two limbs of V-shaped chamber 14 communicate with a chamber or passage 21 disposed midway between the corners 13, by means of lateral passages 21*a* of equal capacity, the lower walls of which slope downward to the inner edge of the V-shaped slot. The chamber or passage 21 is formed in the upper part of the rear portion of the head or housing 1 and terminates in a port 20 with which the flexible conduit 2 before referred to communicates. Surrounding port 20 is a flange 19 formed on the housing to which the flexible conduit 2 is secured.

The under side of housing or cleaner head 1, rearward of the wall 16*a*, is formed with a recess 22 within which is mounted a detachable housing for a portion of the transmission mechanism by which the mechanical cleaning device referred to is operated. Said detachable housing comprises a casing 23 having its front end closed by a flange 24 forming part of an elongated shaft bearing 25. Projecting from the rear of casing 23 is a bearing 26 through which passes a driving shaft section 27 suitably connected to the flexible shaft indicated as a whole by 8 and consisting of an inner rotatable shaft inclosed within a non-rotary flexible tube. The front end of shaft section 27 carries a crank 28 the pin of which engages a slot in a lever 29. A beater shaft 30 extends through the elongated bearing 25, said lever 29 being pinned to the rear end thereof.

The front end of beater shaft 30 is tapered as indicated at 31 in Fig. 5 to receive a mechanical cleaning device in the form of a beater. Engaging the tapered end 31 is a yoke 32, the rear end of the hub of which is notched as at 33, the notches being interlocked with a pin 34 on shaft 30. Said yoke is securely confined upon the tapered shaft with pin 34 engaging with said notches 33 by means of a nut 35 screwed on to the front end of said shaft and pressing a washer 36 against the front end of the yoke. Secured to the underside of said yoke is a member 37 comprising two arms arranged at an angle with respect to each other, each arm terminating in a socket 38 adapted to receive one end of a flexible beater arm 39 which may be, and preferably is, an elastic strip of bamboo. It will be observed that rotation of the crank 27 will oscillate the lever 29 and impart vibratory movement to the beater arms 39.

As in operation the movement of the beaters is extremely rapid, it is desirable to mount the means for supporting the beating device and its transmission mechanism from the cleaner head or housing in such manner as to absorb vibrations. Casing 23 is provided at the top on opposite sides with perforated ears 40: and the wall 41, which constitutes a partition between said recess 22 and passage 21 is perforated as shown at 42. Vibration absorbing washers 43, which may be of rubber, are disposed above and below the partition 41 covering the openings 42; and bolts 44 introduced through port 20, are passed through the washers 43, perforations 42 and perforated ears 40 of casing 23 and secured firmly in place by nuts 45. Thus, casing 23 is secured firmly to the main housing or cleaner head without having any metallic parts in contact with said head, the rubber or other vibration absorbing washers preventing such contact and acting to absorb vibrations and deaden sound.

As shown in Fig. 5, the front end of elongated bearing 25 is reduced as at 46, forming a shoulder 47. Said reduced end 46 is centered within an opening 48 in partition 16*a* by means of one or several vibration absorbing bodies 49, which may be of rubber. A hard washer 50 of slightly less diameter than the orifice 48 is sleeved over the reduced end

of shaft bearing 25 and rests against the shoulder 47. Another hard washer 51 is sleeved over said reduced end 46 of said elongated bearing. Between said washers 50 and 51 the body or bodies 49 are confined. The front end of reduced portion 46 is threaded and a nut 52 engages said threaded end and, when screwed tightly thereon, compresses the body or bodies 49 between the washers 50 and 51, thus causing said bodies to expand radially into firm engagement with the perimeter of orifice 48. Nut 52 is engaged by an oil retaining cap 53 supporting within it an oil absorbent ring 54.

From the foregoing description read in connection with Fig. 5, it will be apprehended that the housing and bearings that support the mechanical cleaning device and parts of the transmission train are supported by the cleaner head or housing 1 so that no metallic parts of the supporting means are in contact with metallic parts of the head. The supporting means or housing for said cleaning mechanism and transmission train are bridged across the space between the partition 16*a* and the partition 41, sustained at quite widely separated points by vibration absorbing and sound deadening material. The transmission mechanism and supporting means therefor that are mounted on the head are concealed from view in the normal position of the machine within the recess in the under side of the head. By removing the mechanical cleaning or beating device from the end of shaft 30 and loosening the securing nuts and bolts, the beater operating mechanism may be removed as a unit from the cleaner head.

The cleaner head or housing is supported when in operation upon the floor or other surface to be cleaned with the edges of the air inlet orifice 15 parallel with said surface and spaced slightly therefrom by means of a plurality of supporting devices. The supporting devices referred to consist of two pairs of rollers or wheels. One pair of said rollers 55 is housed within the recess 22, suitably pivoted on a U-shaped bracket 56 bolted to the upper wall of said recess, the two limbs of the U-shaped bracket embracing the elongated shaft bearing 25, which extends fore and aft between the two branches of the V-shaped suction chamber making an equal angle with each of said branches. A second pair of supporting rollers or wheels 57, widely spaced from each other and disposed adjacent to opposite rear corners 13 of the head or main housing 1, are mounted in brackets 58 projecting rearward from the rear side of the housing. These wheels or rollers are so disposed as to rotate in parallel planes and in planes parallel with the axis of elongated bearing 25 so that the cleaner may be moved freely backward or forward along lines parallel with the fore and aft center line corresponding with the axis of bearing 25.

The type of cleaner head, nozzle or main housing heretofore described is that disclosed and claimed in application of Ralph L. Lee 630,629, filed April 27, 1923, and differs therefrom only in minor particulars which adapt it to be used in combination with the mechanism to be hereafter described.

The flexible tube or conduit 2 before referred to may be of leather, thin sheet metal or other suitable impervious material. It is shown formed with circular circumferential corrugations or pleats making a bellows-like conduit which may be freely flexed as illustrated in Fig. 2. The lower end of said conduit is extended or flanged, as indicated in Fig. 5, and clamped to the flange 19 of the cleaner head or casing between it and a ring 59 of metal or other suitable material, and said flange 19 is provided with screw threaded perforations registering with correspondingly spaced holes in ring 59 so that headed bolts 60 may be passed through the holes in the ring and screwed into the threaded perforations of flange 19, thus clamping the flexible tube or conduit 2 to the head or casing and forming an air tight joint.

As shown particularly in Fig. 4, pivotal connections between the cleaner head 1 and the frame is effected by means of a member 9 previously mentioned. Said member 9 comprises a disk-like body 61 having diametrically spaced arms 62, the ends of which are perforated and connected by pivot pins to bearing lugs 63 on the head or casing 1, said bearing lugs 63 being disposed symmetrically on each side of the fore and aft center line of the machine. The body 61 is perforated at 64. The upper end of flexible tube 2 is flanged in the same way as the lower end thereof, and is clamped to the under side of body 61 between it and a ring similar to ring 59, which is secured in place by bolts 65. By the means described a flexible air tight conduit is provided between the outlet opening in the cleaner head or casing and the hole 64 in the body 61 of member 9.

Symmetrically arranged, one on each side of the hole 64, are the rods or bars 7, the upper portions of which extend parallel with each other on opposite sides of the axis of casing 4. The lower ends of said rods incline toward each other, as shown at 66. The lower extremities of said rods 7 are screw threaded into correspondingly threaded openings entering obliquely into said body 61 from the upper side. At 68 are shoulders on said rods 7 and from these shoulders the rods continue parallel to their upper extremities 69 which are threaded and adapted to be engaged by thumb nuts 70. Rods or bars 7 and member 9 constitute one section of the pivoted frame previously referred to.

The housing or casing 4 is provided with

elongated bearing members 71 through which the upper portions of said rods 7 extend; and said housing 4 and the motor casing 5 and hand-hold 6, which are rigidly connected together, are secured upon rods 7 by thumb nuts 70 which engage the threaded ends 69 of the rods. The members 4, 5, and 6 constitute another section of the frame, which it will be perceived telescopes with the other section. It will be clear that the housing 4 and parts secured to it may be moved longitudinally on rods 7 and may be removed therefrom after unscrewing the thumb nuts 70.

The housing 4 comprises a cylindrical portion 72 having an upper end or head 73 provided with a central perforation 74 serving as a bearing opening for a motor shaft; the lower end of the cylindrical portion 72 of said housing is so constructed that it may form an air tight joint between it and the detachable dust collecting receptacle 3 to be presently described. As shown clearly in Fig. 4 the lower end of said portion 72 is exteriorly conoidal, as shown at 72*a*, to engage with a corresponding internally conoidal surface in the outflaring upper end of the dust collector 3.

Secured to the upper side of the head 73 and properly centered thereon is a motor casing 5 to the upper end of which is bolted or otherwise secured the lower end of the hand-hold 6. Within the motor casing 5 there is an electric motor 75 of any suitable type. In the side of casing 5 there is a suitable switch 76 for starting or stopping the motor. The armature or prime mover shaft 77 of the motor projects through the central opening 74 which is formed through an elevated boss 73*a* in the head 72 and is lined with a bushing 78. Driven by the armature shaft immediately beneath the head 73 is an air pump, preferably in the form of a centrifugal fan 79, which is adapted to discharge air from the interior of the casing through air exit ports 80. Beneath fan 79 is a partition 81 having a relatively small opening 82 concentric with the armature shaft. Below the partition 81 an impeller 83, preferably with radial blades, is keyed to the armature shaft. The impeller 83 and centrifugal fan 79 are prevented from moving longitudinally of the shaft by nut 84 on the lower end of said shaft.

The dust collecting receptacle or container 3, in the embodiment illustrated, consists of a non-flexible, impervious container having a pivoted bail or handle 3*a*. The upper part of the receptacle is of cylindrical form while the lower part may taper in the form of the frustum of a cone to its lower extremity. This container 3 may be made of light metal having a smooth interior finish, its lower extremity is curved inwardly as at 3*b* and fastened to a pipe 85 that extends upward within the container and terminates, as shown in Fig. 4, a little above the connecting zone between the cylindrical and conoidal parts of the receptacle. The lower extremity of the pipe 85 extends a short distance below the lower end of the receptacle as indicated at 85*a*, said extremity being of such size as to fit snugly within hole 64 in body 61. The joint between said tube 85 and the dust container 3 is of course air tight and suitable packing is provided around the end 85*a* so that when said end is received by body 61, no air can escape to the exterior atmosphere around the pipe end 85*a*. As hereinbefore indicated, the upper end of the container 3 flares outward in conoidal form as clearly shown in Figs. 3 and 4 and is therefore adapted to make an air tight joint with the corresponding conoidal extremity 72*a* of the casing 4. The exit end of tube 85, within the receptacle 3 is equipped with a conical air spreader or baffle 87, arranged with its apex pointed downwardly and coaxially of said tube. The baffle 37 is adapted to cause the current of air issuing from the upper end of said tube to flare outward toward or against the side wall of the container 3 and cause solid particles to collide with it and the wall.

From what has been stated, it will be apparent that the dust container 3 may be interposed between the member 62 and the casing 4 and secured air tight in that position by screwing the nuts 70 along the threaded ends 69 of the rods 7. Now, if the machine is in operation, for example on a carpeted floor, the centrifugal fan 79 will create a reduced pressure in the entire space between it and the air inlet orifice in the under side of the cleaner head or nozzle 1, so that air and dust rushing into said inlet orifice will pass through the two limbs of the chamber 14, will unite in a single stream within the passage 21, will rush at high velocity through the flexible conduit 2 and pipe 85, and will be diverted by baffle 87 so that the stream of dust laden air will become a conical jet flowing toward the wall of the receptacle. The air within the receptacle is caused to whirl rapidly by the blades of the impeller 83. Owing to the very much greater volume and cross sectional area of the receptacle 3 as compared with the inlet tube 85, the velocity of the air considered with respect to its course toward the relatively small exit orific 82 is very much reduced, although it is given a very high whirling velocity by the impeller. The effect of this construction and relative proportions of air inlet and chamber capacity is to give an abundance of time for centrifugal force to take effect in order to release from the air, which goes toward the central opening 82, the dust and dirt forced by centrifugal action against the side wall of the receptacle whence the dust and dirt fall to the bottom within the conical portion around tube 85 below the current that flows from pipe 85 to orifice 82.

Referring now to Figs. 4, 11 and 12, the

means for transmitting motion from the prime mover to flexible shaft 8 which operates the mechanical cleaning device and the transmission devices mounted on head 1 will now be described. As shown in Fig. 12, the bearing boss 73*a* and bushing 78 within which the armature shaft of the motor rotates are cut away at the rear side as indicated particularly at 88. In said armature shaft gear teeth 89 are cut, as illustrated in Fig. 12, the ends of the teeth being flush with the circumference of that portion of the shaft that is journaled in the bushing 78 as shown. Formed on the rearward upper side of casing 4 is a gear chamber, the rear side of motor casing 5 having an opening to accommodate it. Within said gear chamber is a relatively large gear 90 bearing upon a pin 91 and engaging with the pinion teeth 89 on said armature shaft, the edge of said gear passing through said opening 88 of said boss and bushing. Mounted within said chamber in an extension 4*a* at the rear side of the cylindrical portion of housing 4 is a pinion 92 having, preferably, an elongated hub 93; said hub passes through a bore 94 formed in said extension and said bore 94 is counterbored as at 95, said counterbored portion terminating in a cylindrical threaded nipple 96. The lower end of hub 94 is threaded and a nut 98 is secured on said threaded end within counterbore 95 holding pinion 92 and its hub 93 from longitudinal movement. A shaft section 99 passes through pinion 92 and hub 94 and is longitudinally movable therein. The lower square end piece 101 screwed to the shaft 99 is received by the square socket 100 of the flexible shaft 8. Thus shaft 99 may move longitudinally within hub 93 of pinion 92 to a limited extent and still remain in driving engagement with shaft 8. The upper end of said shaft 8 is held in position by a coupling member 102 which is threaded upon the nipple 96 and is connected to the envelope of the flexible shaft.

Obviously the pinion 92 may rotate without transmitting movement to the flexible shaft 8. In order that pinion 92 may transmit rotary movement to said shaft 8 a clutch is interposed between the pinion 92 and shaft section 99. The clutch mechanism selected for this purpose is a disk clutch consisting of a plurality of disks 103, 103*a*, the former being slidably connected to pins 104 secured on the pinion 92. The disks 103*a* are splined to the shaft section 99 so that they are compelled to rotate with it, but may move longitudinally thereon. The upper end of shaft section 99 has a head 105, which, when moved toward the gear 92 will cause the clutch plates to be pressed firmly into contact with each other, and a driving connection will be established between the pinion 92 and the shaft section 99. When the head 105 is released the plates may slip upon each other and the driving connection will be broken.

As a means for manually controlling the clutch a screw 106 is used which, when rotated in one direction will press upon the head 105 and actuate shaft section 99 to close the clutch, and when rotated in the other direction will release it. Head 105 preferably has a central depression in its outer surface receiving a ball 107. The screw 106, having a corresponding depression in its inner end, is threaded through an opening 108 in a top plate 109 which covers a gear chamber formed on the upper side of housing 4. In order that the screw 106 may not bear upon shaft 99 too hard and cause excessive friction in the driving connection a stop collar 111 is threaded upon it and held in adjusted position by set screw 112.

If, when operating the suction cleaner it is not desired to operate the mechanical cleaning devices or beaters, the screw 106 is rotated in order to release the clutch mechanism which is interposed between the flexible driving shaft 8 and the motor. Under this condition the beaters remain inactive and the cleaning action is performed entirely by the strong air current, rushing in through the elongated cleaning orifice in the under side of the cleaning head or casing. The dust laden air passes through the passage ways in the head, through the flexible tube 2 and pipe 85 at high velocity and is discharged in a flaring stream within the enlarged dust separating and collecting chamber (formed by the receptacle 3 and housing 4), where it is caused to whirl at high velocity although its onward speed toward the orifice 82 is greatly diminished. The dust particles become separated from the air current owing to centrifugal action, colliding with the baffle 87 and receptacle wall, the dust particles being forced violently outward and sinking under the influence of gravitation into the annular space surrounding the tube 85, while the clean air currents finally converge and pass through orifice 82 to the centrifugal fan casing whence they are thrown through the air ports 80.

Should it be desired to beat the carpet or other surface over which the apparatus is being moved, the screw 106 will be rotated to cause the clutch mechanism to engage and the beaters to be driven. In this event, the dirt and dust will be loosened from the fabric by the beaters in the manner described in said prior application, and the loosened particles will be drawn with the air currents into the separating chamber where the solid particles will be separated from the air currents in the manner described.

After the cleaning operation has been completed and the motor stopped, the machine may be left in the position shown in Fig. 1 with strut 10 resting upon the floor, or the

frame may be tilted forward to bring the apparatus into the position shown in Fig. 2. In either position the thumb nuts 70 may be unscrewed to permit the section consisting of the casing 4 and parts attached to it to be moved longitudinally of the rods 7 sufficiently to permit removal of the receptacle 3. The receptacle may be seized by the bail 3*a* and carried to a place for emptying. After having been emptied the receptacle may be replaced in its former position, the thumb nuts tightened and the machine placed in condition for further cleaning operations.

While the form of mechanism herein shown and described constitutes a preferred embodiment of one form of invention, it is to be understood that other forms might be adopted and various changes and alterations made in the shape, size, and proportion of the elements therein without departing from the spirit and scope of the invention.

What I claim is:

1. In a vacuum cleaner, a cleaner head forming a suction chamber having an air inlet and an air outlet; a frame comprising spaced rods, a centrally perforated member having spaced lugs hinged to said head on opposite sides of the outlet, and connections between said rods and member on opposite sides of the perforation; a non-flexible dust collecting receptacle supported between said rods and having inlet and outlet openings, the inlet end of said receptacle being in communication with the perforation in said member; a flexible tube forming a conduit between the outlet port in said head and the perforation in said member; and means for causing air to flow from said suction chamber to the receptacle.

2. In a vacuum cleaner, a cleaner head forming a suction chamber having an air inlet and an air outlet; a separating chamber comprising a non-flexible detachable receptacle having an inlet and an outlet opening, a frame having sections movable longitudinally with respect to each other and means for damping said receptacle between said sections, one of said sections having an opening connected with the suction chamber and adapted to be placed in communication with the receptacle inlet and means for causing air to flow from said suction chamber to said separating chamber.

3. In a vacuum cleaner, a cleaner head forming a suction chamber having an air inlet and an air outlet; a separating chamber comprising a non-flexible receptacle open at its upper end and having an air inlet; a ported casing having its lower end open and constructed to receive the upper end of the receptacle; a member pivotally connected to the cleaner head and having a passage connected with the outlet of the head, means for securing the casing and member together to clamp the receptacle between them with its inlet connected with said passage, and means for causing air to flow from said suction chamber to said receptacle.

4. In a vacuum cleaner, a cleaner head forming a suction chamber having an air inlet and an air outlet; a separating chamber comprising a non-flexible receptacle having an open upper end and an air inlet; a ported casing having its lower end open and constructed to make a joint with the open upper end of the receptacle; an air pump within said ported casing; a member pivotally connected to the cleaner head; and having a passage connected with the outlet of the head, and means for securing the casing and member together to clamp the receptacle between them with its inlet connected with said passage.

5. In a vacuum cleaner, a cleaner head forming a suction chamber having an air inlet and an air outlet, a ported casing having an open lower end and parallel guides disposed along the exterior thereof; a member comprising a member pivotally connected with the head and having an opening connected with the suction chamber, and spaced rods extending from the member, the upper ends of the rods passing through said guides and longitudinally movable therein; an open ended non-flexible receptacle adapted to be removably clamped between the lower end of said ported casing and said member, said receptacle having an inlet connected with the opening in said member; means to secure said rods and ported casing in adjusted position; and means to cause air to flow from the chamber into the receptacle.

6. In a vacuum cleaner, a cleaner head forming a suction chamber having an air inlet and air outlet; a ported casing having an open lower end and parallel guides disposed along the exterior thereof; a member pivotally connected with the head and having spaced rods, the upper ends of which pass through said guides and are longitudinally movable therein; a member connected with the head and having a passage connected with the chamber outlet; a dust receptacle having an inlet adapted to be connected with said passage and an open end adapted to be received by the ported casing when said receptacle is clamped between said member and ported casing; means to secure said rods and ported casing in adjusted position; and means to cause air to flow from the chamber into the receptacle.

7. In a vacuum cleaner, a cleaner head forming a suction chamber having an air inlet and air outlet; a ported casing having an open lower end; a member connected with the head and having a passage connected with the chamber outlet; a dust receptacle having an inlet adapted to be connected with said passage and an open end adapted to be received by the ported casing when said recep-

tacle is clamped between said member and ported casing; a member pivotally connected with the head, means for securing the receptacle between said member and said ported casing; and means to cause air to flow from the chamber into the receptacle.

8. In a vacuum cleaner, a cleaner head forming a suction chamber having an air inlet and an air outlet; a mechanical cleaning mechanism within said cleaner head; a tubular prime mover casing and a ported fan casing in axial alinement; an air conduit of substantial length between the suction chamber and fan casing; a prime mover located in said prime mover casing and having a shaft which extends into said fan casing; a fan secured to the shaft in said fan casing; a pinion on said prime mover shaft; a pinion at one side of said fan casing; an intermediate gear between said pinions; and transmission mechanism including a flexible shaft extending betwen the pinion at one side of said fan casing and said mechanical cleaning mechanism.

9. In a vacuum cleaner, a cleaner head forming a suction chamber having an air inlet and an air outlet; a mechanical cleaning mechanism within said cleaner head, a tubular prime mover casing and a ported fan casing in axial alinement; an air conduit of substantial length between the suction chamber and the fan casing, a prime mover located in said prime mover casing and having a shaft which extends into said fan casing; a fan secured to the shaft of said prime mover in said fan casing, a bearing boss in said fan casing supporting the prime mover shaft, said boss having a lateral opening; a transmission train between said prime mover and said mechanical cleaner including a pinion provided by the prime mover shaft within the bearing, a pinion at one side of the fan casing, an intermediate gear between the pinions engaging the pinion of the prime mover shaft through said opening in the boss.

10. In a vacuum cleaner, a cleaner head forming a suction chamber having an inlet and an outlet; and mechanism pivotally connected with the head for cleaning the air after it passes through the head, said mechanism including a casing having an inlet and an outlet, means carried by the casing for imparting separating action to dust laden air and for causing air to be drawn through the inlet of the casing and expelled through the outlet of the casing, an impervious dust receptacle having an inlet and an outlet, and means for removably clamping the receptacle between the casing and the head with the inlet and outlet thereof connected with the outlet of the suction chamber and the inlet of the casing respectively.

11. In a vacuum cleaner, a cleaner head forming a hollow chamber having an inlet and an outlet, sections movable with respect to one another, one of said sections being attached to said head, a nonflexible dust collecting receptacle removably connected with said chamber outlet and said sections and means for removably securing the sections together with the dust receptacle removably clamped between the sections, and means for causing separation of air and dust within the receptacle.

12. In a vacuum cleaner, a cleaner head forming a hollow chamber having an inlet and an outlet, sections movable with respect to one another, one of said sections being attached to said head, a nonflexible dust collecting receptacle removably connected with said chamber outlet and means for removably securing the sections together with the dust receptacle removably clamped between the sections, and means carried by one of said sections for moving dust laden air and for causing separation of air and dust within the receptacle.

In testimony whereof I hereto affix my signature.

RALPH L. LEE.