Aug. 8, 1933. K. KORITTKE 1,921,085

ELECTRICAL VACUUM CLEANER

Filed Sept. 14, 1931 2 Sheets-Sheet 1

Fig. 1

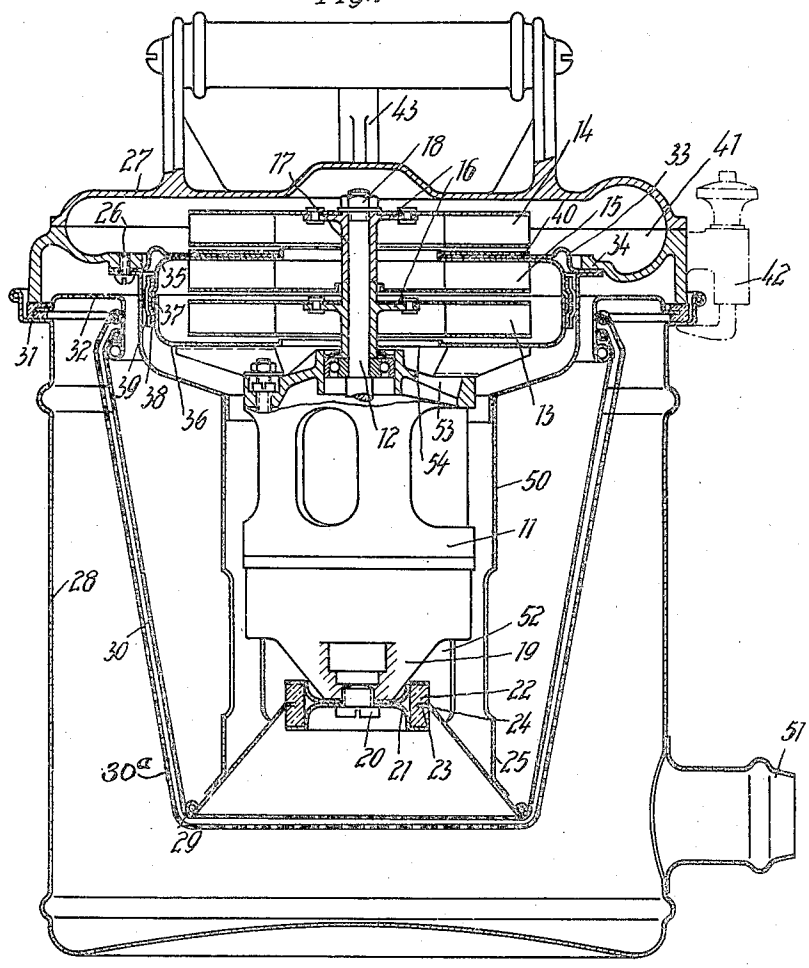



Fig. 2

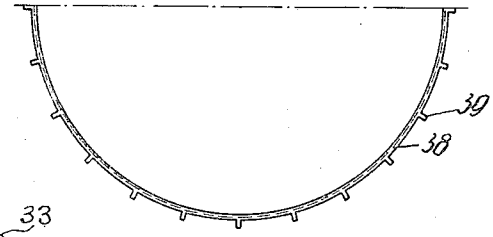
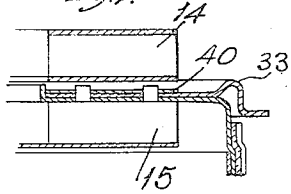



Fig. 1a



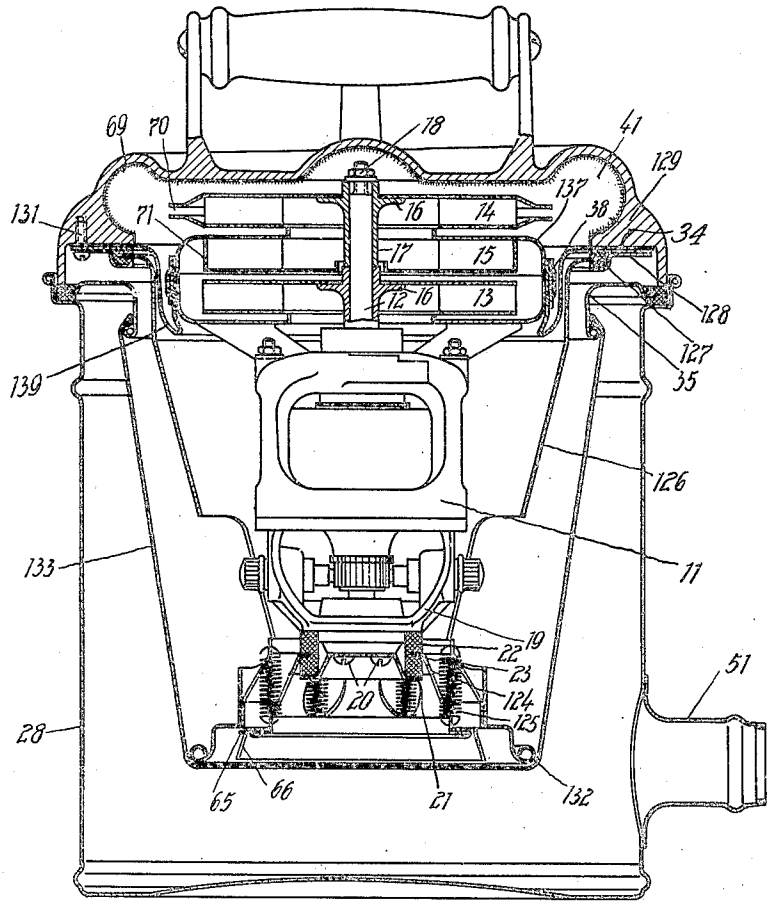

Inventor
Karl Korittke
by Knight Bros
Attorneys

Aug. 8, 1933. K. KORITTKE 1,921,085

ELECTRICAL VACUUM CLEANER

Filed Sept. 14, 1931 2 Sheets-Sheet 2

Fig. 3




Inventor
Karl Korittke
by Knight Bros
Attorneys

Patented Aug. 8, 1933 1,921,085

# UNITED STATES PATENT OFFICE

1,921,085

## ELECTRICAL VACUUM CLEANER

Karl Koritke, Berlin, Germany, assignor to Siemens-Schuckertwerke Aktiengesellschaft, Berlin-Siemensstadt, Germany, a Corporation of Germany

Application September 14, 1931, Serial No. 562,719, and in Germany October 18, 1929

13 Claims. (Cl. 183—37)

My invention relates to electrical vacuum cleaners and contemplates more especially an improved construction, combination, and arrangement of parts in an electrical vacuum cleaner for rendering it substantially noiseless in action. Applications for patents on subject matter included in the present application have been filed in countries foreign to the United States as follows: Germany, October 18, 1929; Germany, October 19, 1929; Germany, April 4, 1930; Germany, May 14, 1930.

Heretofore, attempts to avoid noise in the operation of vacuum cleaners by the use of elastic or resilient means for damping the vibrations and noises have failed due to the fact that the vibrations caused by the motor and suction fan have not been completely cut-off from the casing which acts as a noise-producing medium.

My invention is shown in a preferred embodiment in the accompanying drawings and in a modified form thereof.

Fig. 1 is a longitudinal sectional view through the vacuum cleaner.

Fig. 1ª is a fragmentary section of parts shown in the upper right-hand portion of Fig. 1.

Fig. 2 is a view of half the rubber ring serving as a sealing member.

Fig. 3 is a sectional view through a modification of the vacuum celaner.

In the drawings, like and corresponding parts are indicated by like numerals of reference.

In the vacuum cleaner illustrated in Fig. 1, the vertically disposed motor 11 carries on the upper end of its shaft 12 two sets of vanes 13 and 14, and between said sets are arranged stationary guide vanes 15. Each set of vanes 13 or 14 is carried by a tubular shaft 17 provided with a flange 16, the tubular shafts being retained in position on the shaft 12 by means of a screw 18. To the lower end shields 19 of the motor housing 11 are fastened, by means of the screw 20, two sheet-metal disks 21 having axially-displaced peripheries adapted to hold a rubber ring 22 between them. This rubber ring 22 is provided with a peripheral slot 23 for the reception of an inwardly-presented annular flange of a hollow frusto-conical base portion 24 of a carriage housing 25, hereinafter called the carrier. The carrier 25 consists of a sheet-metal jacket fastened by means of the screws 26 to the casing 27 of the collecting space 41 of the suction fan. The collecting space 41 is so designed as to form a diffuser. The casing 27 is at the same time the cover of the dust bucket 28, against the edge of which it is pressed by the screws 42. The filtering bag 30, which may consist of two filters of different kinds of fabric or cloth, is suspended by a rubber ring 32 from the upper edge of the dust bucket 28, and is stretched between said ring and the bottom edge 29 of the carrier base. Said filtering bag 30 through which the air flows inwardly, is thus arranged to extend around the motor. A grooved rubber ring 31 is inserted between the rubber ring 32 and the dust bucket 28. The base portion 24 of the carrier 25 serves as a support for the motor 11 and facilitates the removal of said motor from the dust bucket 28.

The upper cylindrical part 50 of the carrier 25 forms a closed annular space around the motor frame. Through this annular space the air drawn in through the suction connection 51 of the dust bucket is conveyed to the suction opening 54 of the vane wheel 13 after having passed through the filter 30. The frame of the motor 11 is open, and the lower part of the carrier 25 is provided with large openings 52. After having passed through the filter 30, the air can, therefore, flow along the surfaces of the motor both on the inside and the outside. The upper end shield 53 of the motor on the side towards the blower is also provided with several openings, so that the air passing through the interior of the motor can enter into the suction opening 54 of suction fan 13 without encountering any great resistance.

The space between the cylindrical sheet-metal jacket 50 and the motor frame is so dimensioned that the air sucked in by the suction fan passes along the motor at a high speed. Hereby an intensive cooling of the interior and exterior of the motor is obtained, so that the load may be substantially higher than would be permissible without the cooling.

The motor 11 and the suction fan driven by same rest solely upon the rubber ring 22. The radial motion of the suction fan is limited by a rubber ring 38, slid over the cylindrical part of the casing 35, 36 and provided, as shown in Fig. 2, with radial ribs 39 on its outer edge. On the casing 35 of the guide vanes 15 is fastened a rubber diaphragm 33, serving to seal the suction space against the pressure space. Its outer edge is held between the upper flanged-out edge of the carrier 25 and the flange 34 of the casing 27 by the screws 26. To facilitate the assemblage and disassemblage of the vacuum or suction cleaner, the casing 35 of the guide

vanes 15 is detachably fastened to the casing 36 of the lower vane wheel 13.

The joint 37 between the two parts of the casing is sealed by the rubber ring 38. As this rubber, owing to its relatively large breadth, grips the edge of the parts 35 and 36 of the suction fan casing tightly, it assists in damping the noise. In cases in which the suction fan oscillates radially, the ribs 39 of the rubber ring 38 come up against the upper cylindrical part of the carrier 25, whereby the metallic parts are prevented from coming directly into contact with one another and transmitting the noise.

The rubber diaphragm 33 is tightly fastened to the casing 35 of the guide vanes 15 by means of a sheet-metal disk 40, which is held by extensions of the guide vanes 15 bent round and passed through the casing 35 and the rubber diaphragm 33. As the diaphragm 33 covers the greater part of the casing 35 of the guide vanes, it also helps to damp the noises. Instead of the rubber diaphragm 33 another elastic material may be employed.

As the motor 11 rests only on the rubber ring 22, which instead of consisting of only one part may be composed of two or more parts, the vibrations produced by the motor are not transmitted to the metallic parts of the vacuum cleaner and the casing, so that the noise of the vacuum cleaner is thereby greatly damped. The further advantage is hereby also obtained that the motor with the blower is electrically completely insulated from the other parts of the vacuum cleaner, so that a safe protection against contact with live parts is ensured.

To suppress still more the noises caused by the motor, a second carrying member may be interposed between the motor and the carrier fastened to the blower casing. Said second carrying member engages the rubber ring fitted at the lower end shield of the motor and is suspended from the carrier through interposed elastic or resilient means. It is advisable to make the elastic means interposed between the two carrying devices consist of a different material than the rubber ring fitted to the motor casing. Particularly suitable for this purpose are springs stressed in tension. The springs suppress the vibrations having large amplitudes produced by the unbalance of the rotating motor and suction fan parts and also by irregularities of the bearings, whereas the rubber rings damp mainly the vibrations with small amplitudes.

Fig. 3 shows an arrangement of that kind.

The parts corresponding to those in Fig. 1 are marked with the same reference numerals. Instead of the carrier 25 in Fig. 1 a funnel-shaped carrier 126 is employed which engages with its upper edge in a rubber ring 127 and is held in a sheet-metal ring 128 fastened by means of the screws 131 to a flat annular surface 34 of the casing 129 for the collecting space 41. At the bottom of the carrying member 126, a foot 132 is fixed which serves for stretching the filtering cloth 133. A plurality of springs 125 connected at their bottom end with a carrying ring 124, engage with the upper edge of the foot 132. The carrying ring 124 has a conical form and engages with its upper edge, which is bent round, into the slit 23 of the rubber ring 22, which, as in Fig. 1 is secured to the lower end shield 19 of the motor 11 by the disk 21 and the screws 20. The suction space is sealed against the pressure space of the suction fan by means of the rubber diaphragm 139, the outer edge of which is fastened to the casing 129 by the sheet-metal ring 128. The diaphragm 139 covers the greater part of the guide vane casing 137, so that it also damps the noise caused by the suction fan, besides forming a good seal between the suction and pressure spaces without impeding the motor in its movements.

The rubber diaphragm has the shape of an annular pocket, placed in such a manner round the cylindrical part of the guide vane casing 137 as to be open towards the collecting space 41 of the suction fan. Owing to the higher pressure obtaining here, this pocket is inflated and forms an elastic cushion between the guide vane casing 137 and the upper part of the carrier 126. The diaphragm is held at the cylindrical part of the guide vane casing by the rubber ring 38, whereby, in the same manner as in Fig. 1, the joint between the guide vane casing 137 and the casing of the lower vane wheel 13 is sealed. Through the diaphragm 139 the upper part of the motor with the suction fan is, besides, held in its position, so that the diaphragm fulfills several objects.

To improve still more the damping of the noise, the interior of the diffuser casing 129 is provided with a lining 69 of sound-damping material, such as felt or the like, through which the noise caused by the blower is suppressed. For the same purpose a contraction 70 is provided at the outer edge of the vane wheel 14, through which means the air leaving the vane wheel is strongly throttled and its sound vibrations thereby suppressed. This sound-damping effect is still further improved by a wire sieve 71 placed at the edge of the guide vanes 15. The wire sieve subdivides the air into small streams before it enters the guide vanes and thus suppresses the noise produced by eddying of the air.

The damping means comprising the parts 22, 125 and 127 which permits a vertical give to the motor and also permits the motor to yield in tangential directions, the result being that only an incomplete reaction can be had, especially when the motor is being started. The motor casing will therefore be under a strong tortional tendency when the motor is switched in. To counteract this tendency, a pin 65 which projects radially from the lower edge of the hollow frusto-conical support 124, is arranged to slide in a vertical slot in a depending flange or wall 66 which is rigidly connected to the downwardly-enlarged base portion of the carrier 126. When the motor is at rest, the several parts above referred to are in their relative positions shown in Figure 3. As soon as the motor is started, however, the reaction of the fans together with the reduction of pressure within the dust bucket, causes a downward displacement of the motor with its support until the pin 65 emerges from the lower end of the slot in the wall or flange 66 and thus provides a floating support for the motor under the yieldable constraint of springs and rubber. Other constructional forms may be employed for this purpose.

The springs 125 are suspended at their upper ends in holes drilled into the carrier 126 and the supporting ring 124 that they only rest in points and form links movable in all directions. With this universal suspension of the springs, the places at which the parts are in contact with one another and might transmit sound waves have a very small area. The resistance offered to the transmission of these waves is, therefore,

large and only very little sound energy can pass.

The employment of a plurality of damping means of different kinds, as shown in Fig. 3, can also be applied to bucket-type vacuum cleaners of different constructions, as it makes no difference whether the suction fan is located above or below the motor. If the motor shaft is disposed horizontally, there is also in that case no difficulty in designing the damping means in such a manner as to obtain a sufficiently noiseless working of the vacuum cleaner.

I claim as my invention:

1. In an electrically driven vacuum cleaner, in combination a dust bucket, a cover for said dust bucket, a motor carrier depending into the dust bucket, resilient motor-supporting means mounted on the lower end of said motor carrier, an electric motor resting endwise on said resilient motor-supporting means, said motor being provided with an upwardly projecting shaft, a suction fan mounted on said shaft, a housing for said suction fan connected to the upper end of the motor, and an annular rubber diaphragm connected around its outer peripheral edge to the upper edge of said motor support and around its inner periphery to the suction fan housing.

2. In an electrically driven vacuum cleaner, in combination a dust bucket, a cover for said dust bucket, a motor carrier depending from the cover of said dust bucket into the dust bucket, resilient motor-supporting means mounted on the lower end of said motor carrier, an electric motor resting endwise on said resilient motor-supporting means, said motor being provided with an upwardly projecting shaft, a suction fan mounted on said shaft, guide vanes arranged in series above said suction fan and around said shaft, a housing for said suction fan and guide vanes, said housing being mounted on the upper end of said motor, an annular rubber diaphragm connected around its outer peripheral edge to the upper end of said motor support and united to said upper part of the suction fan housing.

3. In an electrically driven vacuum cleaner, in combination a dust bucket, a cover for said dust bucket, a motor carrier depending from the cover of said dust bucket into the dust bucket, resilient motor-supporting means mounted on the lower end of said motor carrier, an electric motor resting endwise on said resilient motor-supporting means, said motor being provided with an upwardly projecting shaft, a suction fan mounted on said shaft, guide vanes arranged in series above said suction fan and around said shaft, a housing for said suction fan and guide vanes, said housing comprising an upper part connected to the guide vanes and a lower part connected to the upper end of said motor, an annular rubber diaphragm connected around its outer peripheral edge to the upper edge of said motor support and united to said upper part of the suction fan housing, and a resilient band interposed between the adjoining edges of said housing parts and the upper end of said motor support.

4. In an electrically driven vacuum cleaner, in combination a dust bucket, an electric motor disposed in said dust bucket, a cover for said dust bucket, said cover being provided with an annular flange presented inwardly from the inner wall of said cover, an annular rubber diaphragm attached around its outer periphery to the inner edge of said annular flange and constituting therewith a partition which forms a collecting space above and a suction space below said partition, a carrier for the motor depending from the inner edge of said annular flange, elastic means interposed between said carrier and the lower end of the motor, said motor being provided with a shaft presented upwardly through the central opening in said partition, a suction fan mounted on said motor shaft, and a suction fan housing connected above to said rubber diaphragm and below to said motor.

5. In an electrically driven vacuum cleaner, in combination an electric motor provided with a projecting shaft, axially-spaced suction fans mounted on the projecting end of said motor shaft, guide vanes arranged between said axially-spacer suction fans, a dust bucket, a cover for said dust bucket, a carrier for the motor connected to the cover of said dust bucket, an annular cushion interposed between said carrier and dust bucket, elastic means interposed between said carrier and motor, an annular rubber diaphragm connected around its outer periphery to the upper end of said motor support, said annular rubber diaphragm interposed between said guide vanes and one of said suction fans, and a housing for the guide vanes and the other of said suction fans, said housing being connected to said annular rubber diaphragm and said motor.

6. In an electrically driven vacuum cleaner, in combination an electric motor provided with upper and lower end shields and a shaft projecting vertically above said upper end shield, upper and lower suction fans mounted on the projecting upper end of said motor shaft, guide vanes arranged between said upper and lower suction fans, a dust bucket, a cover for said dust bucket, an annular noise-deadening cushion interposed between said cover and dust bucket, a carrier for the motor depending from the cover of said dust bucket, elastic means interposed between said carrier and the lower end of said motor, an annular rubber diaphragm connected around its outer periphery to the upper end of said motor support and extending between said guide vanes and said upper suction fan, and a housing for the guide vanes and said lower suction fan, said housing being connected above and to the inner edge of said annular rubber diaphragm and below to the upper end of said motor.

7. In an electrically driven vacuum cleaner, in combination an electric motor provided with upper and lower end shields and a shaft projecting vertically above said upper end shield, upper and lower suction fans mounted on the projecting upper end of said motor shaft, guide vanes arranged between said upper and lower suction fans, a dust bucket, a cover for said dust bucket, a resilient cushion interposed between the upper edge of said dust bucket and said cover, a carrier for the motor depending from the cover of said dust bucket, an annular support mounted in said resilient cushion on the upper edge of said dust bucket, a filtering bag depending from said annular support and stretched over said motor carrier, elastic means interposed between said carrier and the lower end shield of said motor, an annular rubber diaphragm interposed between said guide vanes and said upper suction fan, the outer peripheral edge of said annular rubber diaphragm being connected to said cover, and a housing for the guide vanes and said upper suction fan, said housing being connected

above to said annular rubber diaphragm and below to the upper end shield of said motor.

8. In an electrically driven vacuum cleaner, in combination an electric motor, axially-spaced suction fans mounted on the motor shaft, guide vanes interposed between said suction fans, an annular housing for one of said suction fans and said guide vanes, a dust bucket, a cover for said dust bucket, a carrier for the motor depending from the cover of said dust bucket, elastic means interposed between said carrier and the lower end of said motor, and an annular rubber diaphragm having its outer peripheral edge secured to the upper end of said motor carrier and its inner peripheral edge secured to said annular housing, said annular rubber diaphragm constituting a resilient cushion between the upper end of said motor carrier and said annular housing.

9. In an electrically driven vacuum cleaner, in combination an electric motor, a dust bucket, a cover for said dust bucket, a carrier for the motor connected to said cover, elastic means interposed between said motor carrier and the lower end of said motor, a suction fan housing centrally arranged with respect to the axis of said dust bucket and cover, an annular partition extending between the inner wall of said cover and said housing for forming separate suction and pressure spaces, said partition including an annular rubber diaphragm having its inner peripheral edge secured to said housing.

10. In an electrically driven vacuum cleaner, in combination an electric motor provided with a housing, a suction fan mounted on the motor shaft, a suction fan housing connected to said motor housing, a dust bucket, a cover for said dust bucket, a carrier for the motor connected to said dust bucket cover, cushioning means interposed between said carrier and said suction fan housing, and a ring of elastic material arranged between the inner wall of said dust bucket cover and the suction fan housing.

11. In an electrically driven vacuum cleaner, in combination an electric motor, a suction fan mounted on the motor shaft, a suction fan housing, a dust bucket, a cover for said dust bucket, a rubber cushion interposed between said dust bucket and said cover, a carrier for the motor fastened to said cover of the dust bucket, elastic means interposed between said carrier and the housing of said motor and a ring of elastic material extending between the upper end of said motor carrier and said suction fan housing.

12. In an electrically driven vacuum cleaner, in combination an electric motor provided with a housing, a suction fan mounted on the motor shaft, a suction fan housing, said motor housing being suspended from said suction fan housing, a dust bucket, a cover for said dust bucket, a resilient noise-dampening cushion interposed between said dust bucket and said cover, a carrier for the motor depending from said dust bucket cover into said dust bucket, a filtering bag enclosing the motor, means for connecting said filtering bag above to said resilient noise-dampening cushion between the dust bucket and dust bucket cover, noise dampening means interposed between said carrier and said suction fan housing of said motor, and an annular rubber diaphragm connecting the upper end of said motor carrier to said suction fan housing.

13. In an electrically driven vacuum cleaner, in combination, a dust bucket, an electric motor, a suction fan mounted on the motor shaft, guide vanes for said suction fan, a housing for said suction fan and guide vanes, a carrier for the motor suspended from said housing, a resilient cushion interposed between said carrier and the lower end of said motor, and an annular rubber diaphragm connecting said housing to said carrier and forming a yieldable partition between the collecting space and suction space of said suction fan.

KARL KORITTKE.