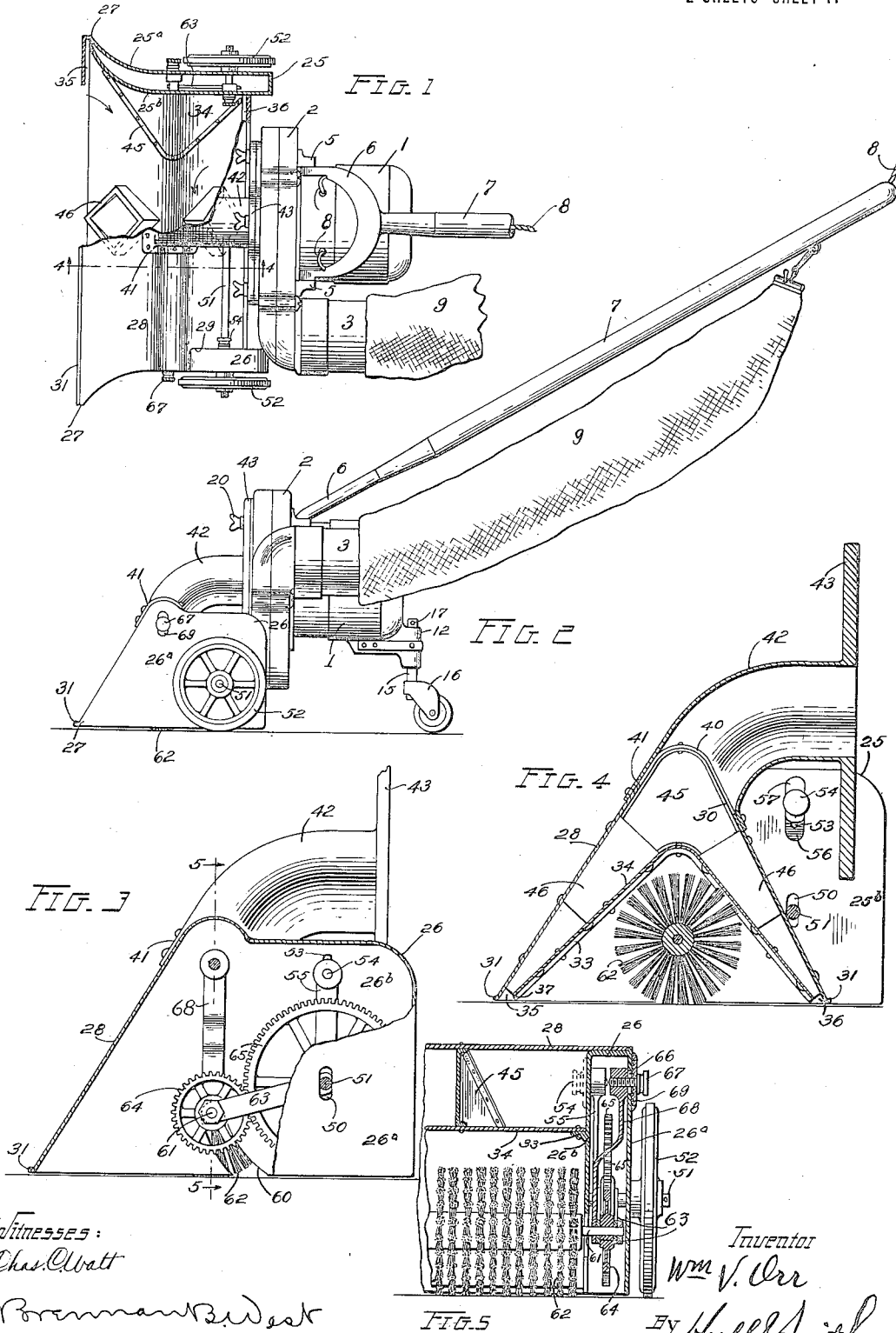


W. V. ORR.
VACUUM CLEANING DEVICE.
APPLICATION FILED APR. 19, 1912.

1,210,522.

Patented Jan. 2, 1917.

2 SHEETS—SHEET 1.



Witnesses:

Chas. Watt

Brennan B. West

Inventor

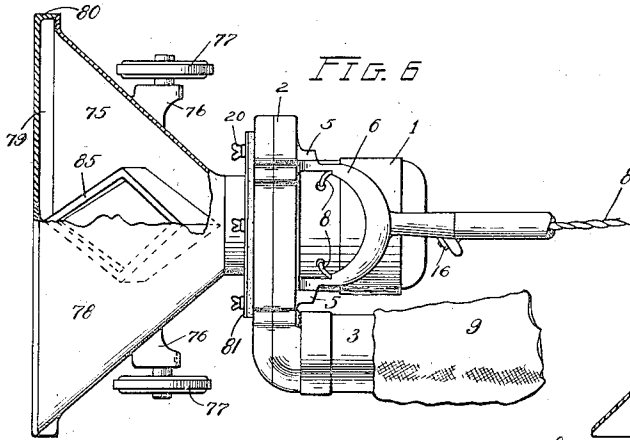
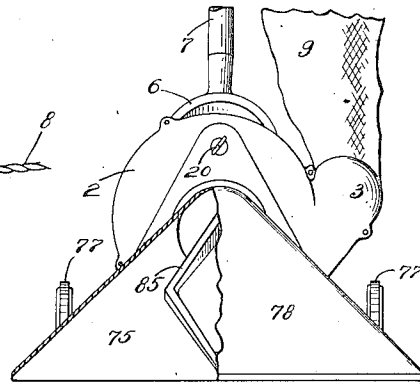
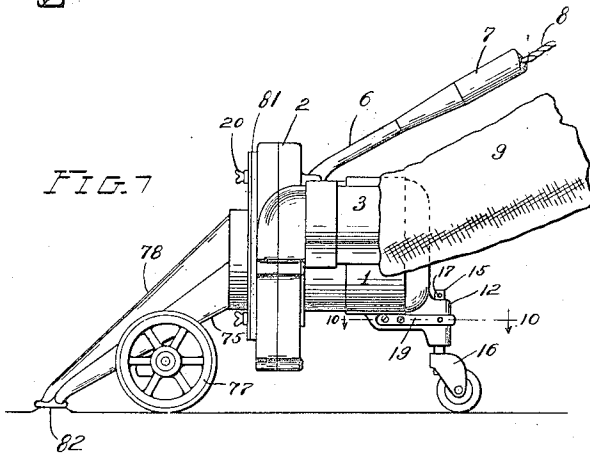
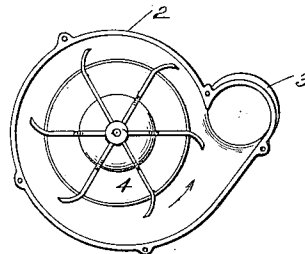
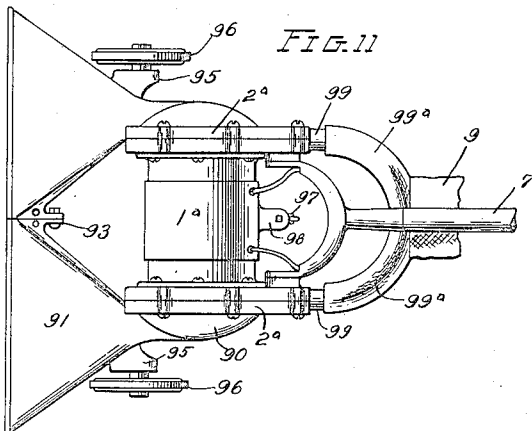
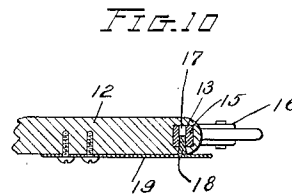
Wm. V. Orr

By *Hull & Smith*
Attys.

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Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM V. ORR, OF CLEVELAND, OHIO.

VACUUM CLEANING DEVICE.

1,210,522.

Specification of Letters Patent.

Patented Jan. 2, 1917.

Application filed April 19, 1912. Serial No. 691,966.

To all whom it may concern:

Be it known that I, WILLIAM V. ORR, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Vacuum Cleaning Devices, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to vacuum cleaning devices and has for its object the provision of an apparatus of this nature of simple and compact form, efficient operation, and wide usefulness; the provision of a device of this type having straight and unimpeded air passages whereby the maximum efficiency is secured; the provision of means in a device of this character, whereby the air suction is rendered substantially uniform throughout the whole working portion of the device; the provision of an improved brushing apparatus whereby the dirt particles may be loosened from a textile surface the better to be acted upon by the air current and without becoming entangled in the brush; the provision of new and improved means for adjusting the operating parts with reference to the surface on which they are used; while further objects and advantages will become apparent in the course of the following description and claims.

Generally speaking, my invention may be defined as consisting of the combinations of elements recited in the claims hereto annexed and illustrated in the drawings accompanying and forming a part of this application, wherein:

Figure 1 is a plan view of a vacuum cleaner constructed in accordance with my invention, a portion of the casing being broken away to show the arrangement of air passages, and a part of the bag and handle being omitted; Fig. 2 is a side elevation of a complete vacuum cleaner made in accordance with my invention; Fig. 3 is a side elevational view of a portion of the brushing head illustrated in Figs. 1 and 2, part of the gear casing being broken away so as to show the method of driving the brush; Fig. 4 is a vertical transverse cross-sectional view through the brushing head taken on the line 4-4 of Fig. 1 and looking in the direction of the arrows; Fig. 5 is a detail cross-sectional view taken on the line 5-5 of Fig. 3 and disclosing the manner of supporting

and adjusting the gears; Fig. 6 is a plan view of a modified form of cleaner embodying my improvements, a part of the casing being broken away as in Fig. 1; Fig. 7 is a side-elevational view of the device shown in Fig. 6; Fig. 8 represents a front elevation of the device shown in Fig. 6 the same parts being broken away; Fig. 9 is a detail view of the fan illustrated in preceding figures; Fig. 10 is a detail cross-sectional view taken upon the line 10-10 of Fig. 7 and showing the method of adjusting the device with respect to the surface upon which it is used; and Fig. 11 is a plan view of a modified form of cleaner wherein certain of my improvements are embodied.

Describing the parts by reference characters, 1 represents the motor and 2 the fan casing of my improved vacuum cleaner, said motor being preferably supported with its shaft substantially horizontal and said fan casing being attached directly to the forward end of the motor so that a direct-connected fan may be employed. Referring to Fig. 9 it will be seen that this casing is of slightly spiral shape, the outer or larger end of the spiral merging with a substantially horizontal discharge pipe 3, and the inner or smaller convolution of this spiral lying closely adjacent to the curved extremities of the vanes of the fan 4, which is arranged to revolve in the direction indicated by the curved arrow. Carried by the rear end of the fan casing are suitable brackets 5-5, to which are pivoted the arms 6 of the handle 7 whereby the device is operated, said handle also preferably serving as a conduit for the wires 8 whereby energy is conveyed to the motor. Secured to the outlet pipe 3 is the lower end of the porous dust bag 9, the upper end of which is suspended from the handle 7 in any convenient manner. The motor casing is formed at its lower side with a rearwardly extending bracket 12 having therein a vertical aperture 13 intersected by a lateral aperture. Mounted in the aperture 13 is the vertically adjustable stem 15 of a swiveled caster 16, said stem being formed with a plurality of spaced recesses 17 for the reception of a finger 18 carried by a spring 19 rigidly secured to the side of the bracket 12. The forward face of the fan casing is provided with a substantially central aperture for the admission of air to the fan and with spaced threaded apertures for

the reception of thumb screws 20 by which the various nozzles or collecting attachments may be affixed thereto.

In Figs. 1 to 5 inclusive I have illustrated what I call the brushing head which will now be described. In its preferred embodiment this head comprises a pair of vertical boxes 25 and 26 having closed tops and open bottoms as shown in Fig. 5. The outer walls of these boxes are represented at 25^a and 26^a respectively and their inner walls at 25^b and 26^b respectively. The rear edges of these walls are preferably substantially vertical as shown in Figs. 2, 3 and 4, but their forward edges are inclined at the angle which is to be given to the forward side of the cleaner head. These walls are parallel to each other and to the motor axis at their rear portion but are bent outwardly at their forward ends so as to converge to a point at 27. The boxes 25 and 26 are secured together by means of a casing plate 28 of sheet metal having an inverted V-shape, the forward side of this plate being secured to the forward edges of the walls 25^a and 26^a. The rear side of said plate is notched as at 29 so as to fit between the walls 25^b and 26^b, which are formed with flanges 30 to which the plate is secured. This construction provides an inverted trough-shaped casing having at each end a vertical, rearwardly-projecting ear the outer face of which is substantially flush with the end of the casing. The edges of the plate 28 are horizontal and are preferably rolled as at 31 both for the sake of stiffness and for the purpose of preventing their catching in the carpet or other fabric upon which the device is used. The inner faces of the walls 25^b and 26^b are also formed with flanges 33 spaced from the plate 28 but converging toward the same as they approach the lower edges of the walls, and to these flanges is rigidly secured, as by riveting, a second V-shaped metallic plate 34. As will be seen by reference to Fig. 4, the apices of these plates are spaced apart a considerable distance, while their free edges approach very closely together so as to define the narrow slits 35 and 36 at the forward and rear sides of the casing respectively. By reference to Fig. 1 it will be seen that the length of the slit 35 is greater than the length of the slit 36 from the fact that the slit 35 extends between the outturned ends 27 of the boxes 25 and 26, whereas the slit 36 is limited to the space between the inner walls of these boxes. Furthermore, the edges of the plate 34 are terminated at a point slightly above the edges of the plate 28 as shown at 37, (Fig. 4) for a purpose that will be hereafter explained. The upper or apex portion of the plate 28 is formed with an aperture 40 around which is secured the flange 41 of an elbow 42, the horizontal arm of which is formed with a plate 43

adapted to be secured to the forward face of the fan-casing 2 by means of the thumb screws 20, above mentioned.

In order to prevent the formation of dead air spaces at the ends of the chamber defined by the plates 28 and 34, I secure between these plates at each side of the aperture 40 an angular deflecting web or partition 45 the ends of which lie closely adjacent to the ends of the slits 35 and 36, and the middle or apex portions of which lie closely adjacent to the sides of the aperture 40. It is also apparent that under normal conditions the suction would be more pronounced at the middle portions of the slits 35 and 36 than at the end portions thereof owing to their greater proximity to the aperture 40. To overcome this difficulty I introduce between the plates 28 and 34 at each side of the apex a diamond-shaped or other quadrilateral deflector 46, said deflectors being preferably made of sheet-metal secured in place in any suitable or convenient manner, as by riveting or welding. The horizontal distance across each of these deflectors is preferably somewhat greater than the width of the outlet so that no direct passage from the middle of the slit to the outlet passage is possible. The result is that the air entering through each slit is broken up into two currents which tend to distribute the suction more uniformly throughout these slits. The divergence of the plates 28 and 34 is so related to the convergence of the plates 45 and 46 as to afford a maximum of suction at the inlet mouth and a maximum of carrying capacity in the air stream. Choking or strangling of the air passage is thus avoided, the pressure is made substantially uniform throughout the whole of these passages and the formation of bends or sudden eddies which would decrease the carrying power of the air are avoided.

Formed in the walls of the boxes 25 and 26 are a row of aligned vertical slots 50 through which is projected a shaft 51 having at its ends the floor-wheels 52 preferably rubber tired in the usual manner. Formed in the inner walls 25^b and 26^b of the boxes at points vertically above the slots 50 are other vertical slots 53 each of which receives the shank of a thumb screw 54 to the inner end of which is secured the upper end of a vertical link 55 the lower end of which surrounds the shaft 51. The surface of the plate adjacent to the slot 53 is preferably ribbed or corrugated as at 56 and the thumb screw provided with a similarly corrugated washer 57 whereby the link can be firmly secured in position and the brush head secured at a fixed distance above the floor as will be obvious. Formed in the walls 25^b and 26^b upon arcs having centers coinciding substantially with the centers of the slots

50 are other slots 60 through which extends the horizontal shaft 61. The portion of this shaft between the plates 25^b and 26^b carries the cylindrical brush 62, while the portions thereof included within the limits of the boxes 25 and 26 are journaled in links 63, the other ends whereof surround the shaft 51. Inside one of these boxes as 26, the shaft 61 is provided with a pinion 64 which meshes with the gear wheel 65 carried by the shaft 51. In Fig. 5 I have illustrated two links 63 one at each side of the pinion 64 although it is probable that one of these links will frequently be omitted. The upper portion of each of the walls 25^a and 26^a is formed with a vertical slot 66 above the adjacent end of the shaft 61 and through this slot is projected a thumb screw 67, the inner end of which engages a vertical link 68, the lower end whereof is apertured for the reception of the shaft 61. This slot is preferably covered by a corrugated washer 69 similar to the washer 57 above mentioned and serving to permit the adjustment of the height of the brush 62.

With this construction it will be seen that the head as a whole can be raised or lowered as regards the surface with which it is used and that the brush can be adjusted to bear more or less strongly upon the surface. The interconnection of the shafts 51 and 61 keeps the same always parallel and at a fixed distance apart insuring the easy and noiseless running of the gears, while the inclosure of the gearing prevents the same from catching upon furniture, clothes or fingers or from becoming clogged with the dirt passing through the device. This method of gearing also effects the rotation of the brush 62 in the direction opposite to the motion of the device and thus throws the dirt particles forward. The air rushing through the slits 35 and 36 picks up these particles and carries them to the bag 9, while if any particles are not caught up by the air the first time they are lifted by the brush, they are promptly recovered by the brush a second time and delivered to the air stream. The edges of the plate 34 are terminated at a point above those of the plate 28 so that the dirt particles agitated by the brush may be thrown directly into the path of the air stream. The function of the casing 34 is two-fold, in that it prevents the dirt and dust from being drawn directly into and through the brush, thus avoiding the clogging and fouling of the brush, and that it also increases the effectiveness of the device by concentrating the suction upon the two narrow slits 35 and 36 instead of distributing the same over a large area.

While I do not restrict myself to the use of uncurved plates at 28 and 34, I prefer to employ the construction shown because of the greater effectiveness of the air stream

due to its freedom from curves and to the greater ease of making and because of the fact that it removes the slots 35 and 36 farther from the brush. If the slots be unduly close to the brush, the velocity imparted to the dirt particles may carry them entirely beyond the slot and past the edge of the casing 28, whereas this difficulty is avoided if the slots be removed a sufficient distance from the brush to permit the particles to lose their force. In adjusting the device shown in Figs. 1 to 5 it is preferable to adjust the wheels 52 and the caster 16 simultaneously so that the bottom of the casing or head may always be parallel with the floor.

In Figs. 6 to 8 inclusive I have illustrated my motor and fan as provided with a simple collecting or dust-removing head without any brushing device. In this modification I employ a flat triangular plate 75 having at each side a bracket 76 for the reception of a wheel 77. Secured above this plate is a second plate 78 of similar shape having its forward edge closely adjacent to the edge of the plate 75 so as to form the slit 79 and having its rearward portion spaced a greater distance from the plate 75, as shown in Fig. 7. The edges of one of these plates as 79 is illustrated as formed with flanges adapted to meet the edges of the other plate or to meet suitable flanges carried by the other plate, whereby a substantially closed chamber is formed. By reference to Fig. 6 it will be seen that this chamber is constricted from the front to the rear in a horizontal sense, while reference to Fig. 7 will show that it is similarly expanded from front to rear in a vertical sense. The rearward end of this chamber communicates with an aperture in a flange 81 adapted to be secured by the thumb screws 20 or other suitable means to the face of the fan casing 2. The forward edges of the plates 75 and 78 are turned downwardly as shown at 82 so as to form a substantially horizontal mouth and the edges of this mouth are rounded so as not to tear the carpet which will be drawn up away from the floor by the suction of the air in case a motor and fan of the proper strength be used. This mouth is adjusted toward and from the floor solely by adjusting the caster 16 in the bracket 12, no adjustment of the wheels 77 being necessary.

In order to distribute the suction throughout the length of the slot 79 with substantial uniformity I interpose between the plates 75 and 78 a diamond shaped deflector similar to that already described. This deflector is illustrated at 85 and is made either from sheet metal or cast metal, being secured in place by riveting, welding, or brazing as may be most convenient. The plates 75 and 78 are preferably made straight from front

to back as in the previous device, both for the purpose of affording for the air a free straight passage and of facilitating the construction and application of the deflector 85.

5 In each of the modifications above described, I have contemplated the use of a single fan secured to one end of the motor shaft, and have illustrated that motor shaft as horizontally supported in a fore and aft
10 direction, although it is obvious that the shaft could be otherwise arranged without departing from the scope of my invention. At the same time the horizontal arrangement is preferred from the fact that the
15 motor will operate more satisfactorily.

In Fig. 11, I have illustrated a modified form of sweeper in which the motor 1^a is supported with its shaft horizontal and transverse to the machine, a fan casing 2^a
20 being secured to each end of the motor. In this embodiment inlet apertures of the fan casings are formed in their outer walls so as to prevent the fouling of the shafts by the dirt and lint drawn therethrough, and
25 these apertures communicate with the shanks 90 of flaring nozzles 91 which have at their forward ends downturned mouths similar to the mouth 82. The adjacent portions of the nozzles are formed with ears
30 93 whereby they may be secured together and their other sides are formed with brackets 95 adapted for the reception of wheels 96, the rear end of the device being carried by a caster 97 supported in a bracket
35 98 as before. The outlet pipes 99 of the fan casings communicate with the branches of a collector tube 99^a which, in turn, discharge into the dust bag 9, the handle 7 being pivoted to the casings as before. In this
40 embodiment the air is necessarily drawn through separate passages and is thereby largely distributed throughout the length of the slit so it is not absolutely necessary to employ the diamond shaped deflectors which
45 I have above described, although the same could obviously be used if desired.

It is obvious that all of the operative features of my invention are independent of the material employed in construction,
50 and further, that the advantages of my invention may be attained in varying degree by the use of constructions, combinations, and arrangements of parts differing materially from those herein disclosed. While
55 I have necessarily described my invention in detail I do not, therefore, propose to limit myself to such details except as the same may be positively included in the claims

hereto annexed or may be rendered necessary by the prior state of the art.

Having thus described my invention, what I claim is:

1. In a suction sweeper, the combination, of a pair of end plates, a metallic casing plate of inverted V shape in cross section
65 connecting said end plates and having an outlet opening at its top, an inner casing plate secured to the inner faces of said end plates and having its edges extending adjacent to the edges of said first casing plate so
70 as to define a pair of narrow slits and diverging from said outer casing plate in the direction of said outlet to form passages from said slits to said opening, and deflecting
75 casing plates secured in the space between said deflecting plates extending approximately from said slit to said outlet.

2. In a suction sweeper, in combination, a metallic casing plate of inverted V shape in
80 cross section and having an outlet opening substantially midway of its top, an inner casing plate secured within and beneath said first plate and having its edges extending
85 adjacent to the edges of said first plate so as to define a pair of narrow slits and diverging from said outer casing plate in the direction of said outlet to form passages from said slits to said opening, the ends of
90 said passages being closed, and deflecting plates located in the space between said casing plates, each of said deflecting plates extending approximately from said slit to
said outlet.

3. In a suction cleaner, a pair of end
95 plates, a casing plate connecting said end plates, a second casing plate spaced from said first casing plate and having one of its edges closely adjacent to the edge of the first casing plate so as to define a narrow
100 slit, and the rest of its surface spaced from said first casing plate by an amount varying directly with the distance from said slit to form a passage, said plates together forming a head and said head having an outlet
105 opening at a point removed from said slit, and a quadrilateral deflector located in the space between said casing plates substantially opposite to said outlet opening and dividing the air passageway.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

WILLIAM V. ORR.

Witnesses:

HAROLD E. SMITH,
BRENNAN B. WEST.