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(54) **PET VACUUM**

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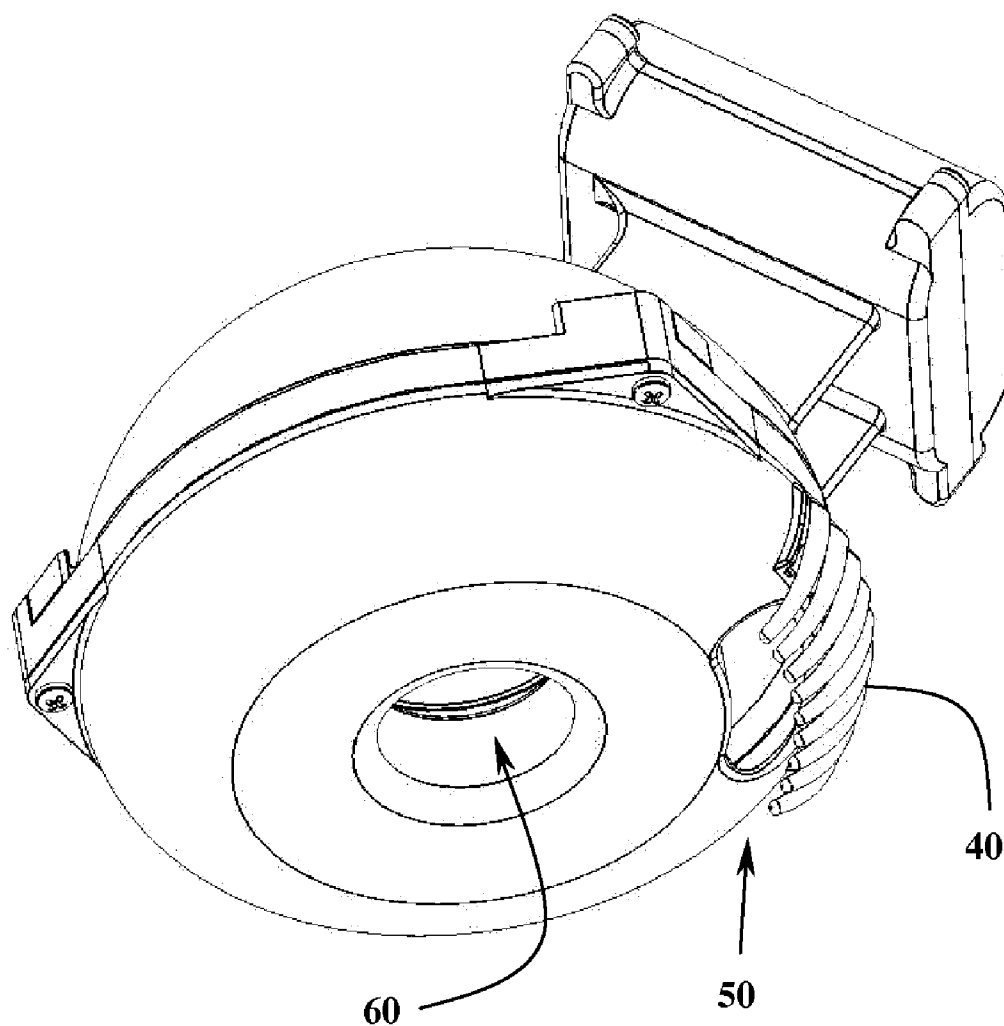
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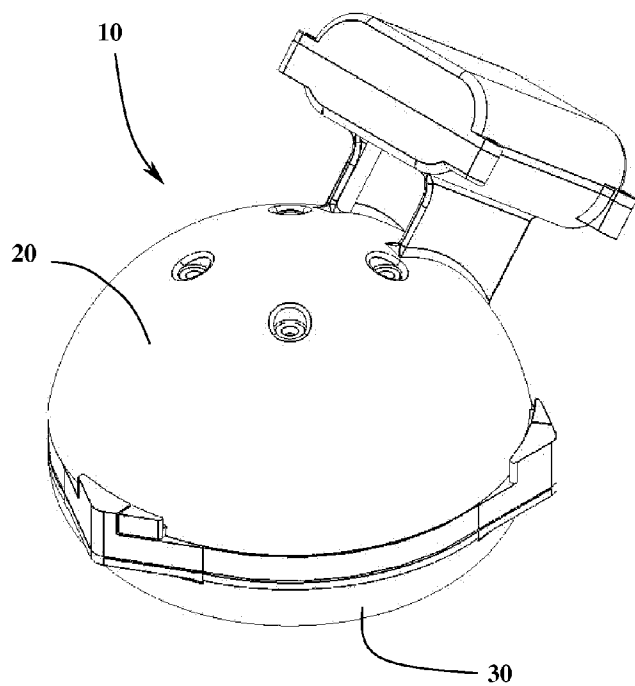
(57) **ABSTRACT**

Disclosed is a an apparatus for the grooming and removal of animal hair, dust, and dander with emphasis on miniaturization, portability, maximizing power, and minimizing noise by using the Bernoulli Principle venturi effect and active noise cancellation instead of vacuum methods known and practiced in the industry.

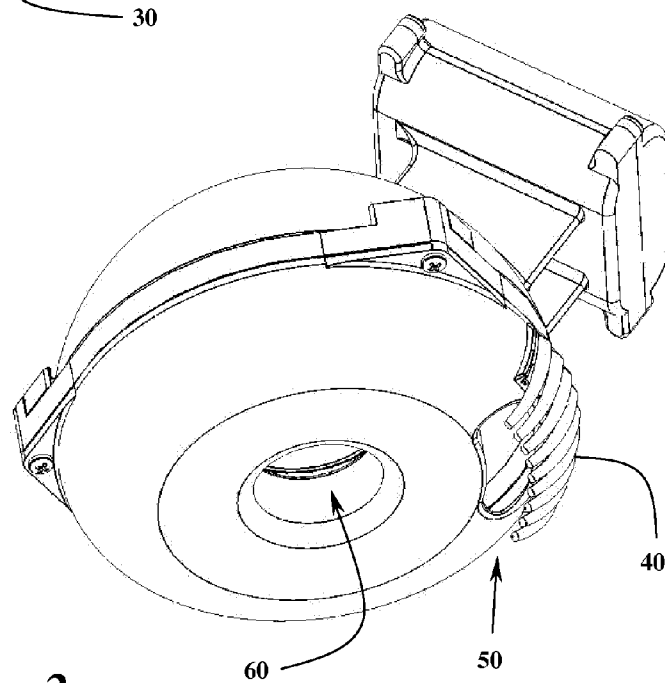
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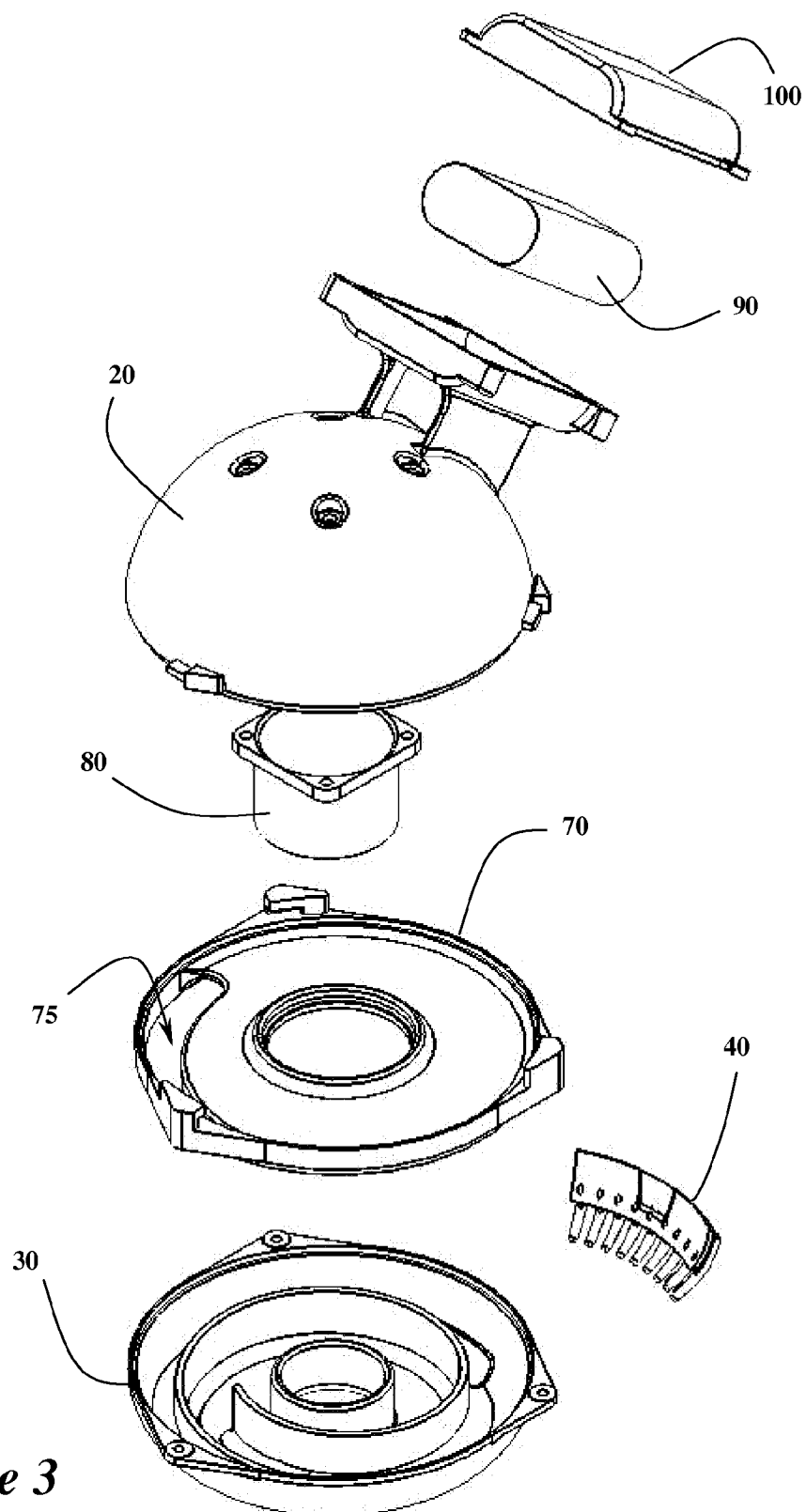




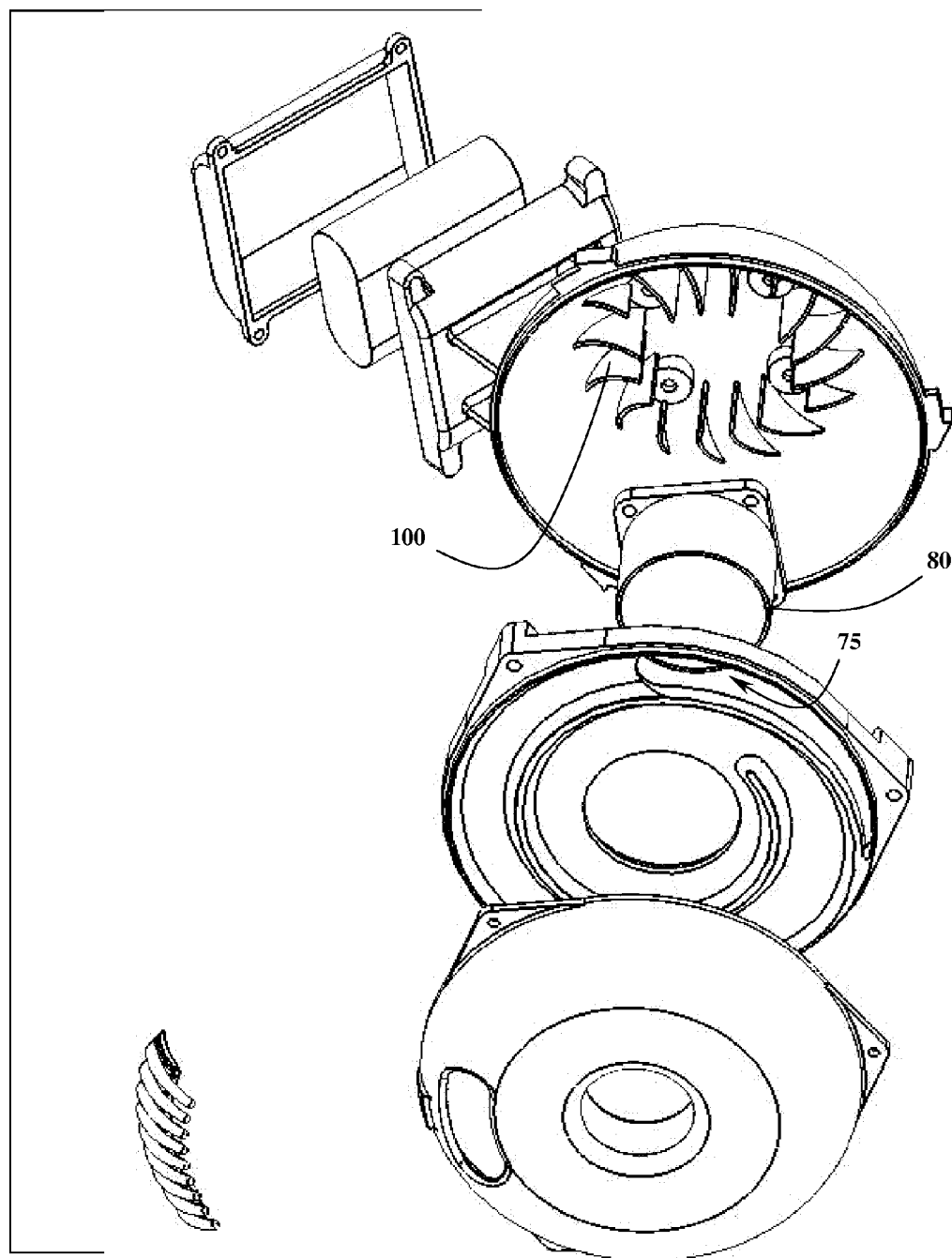
*Figure 1*



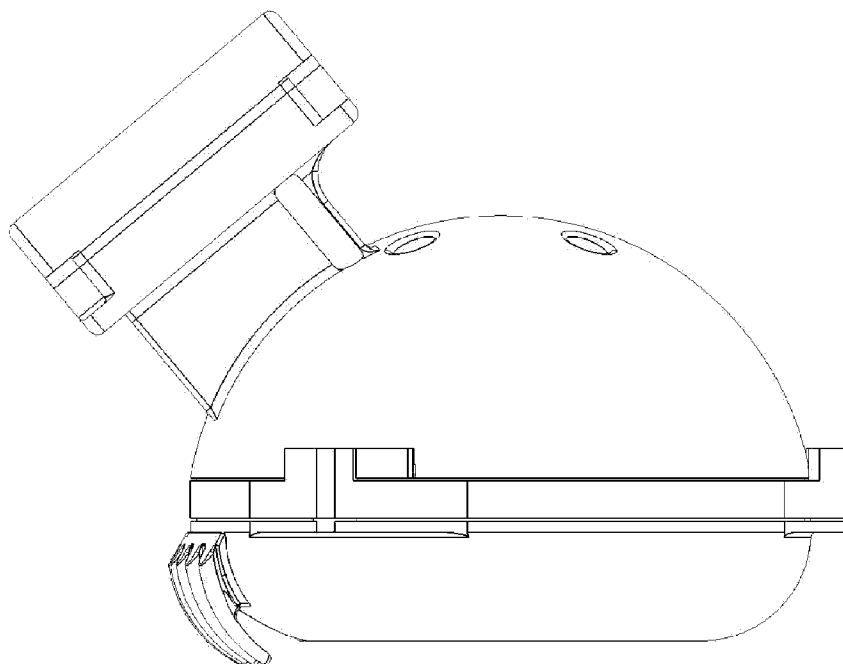
*Figure 2*



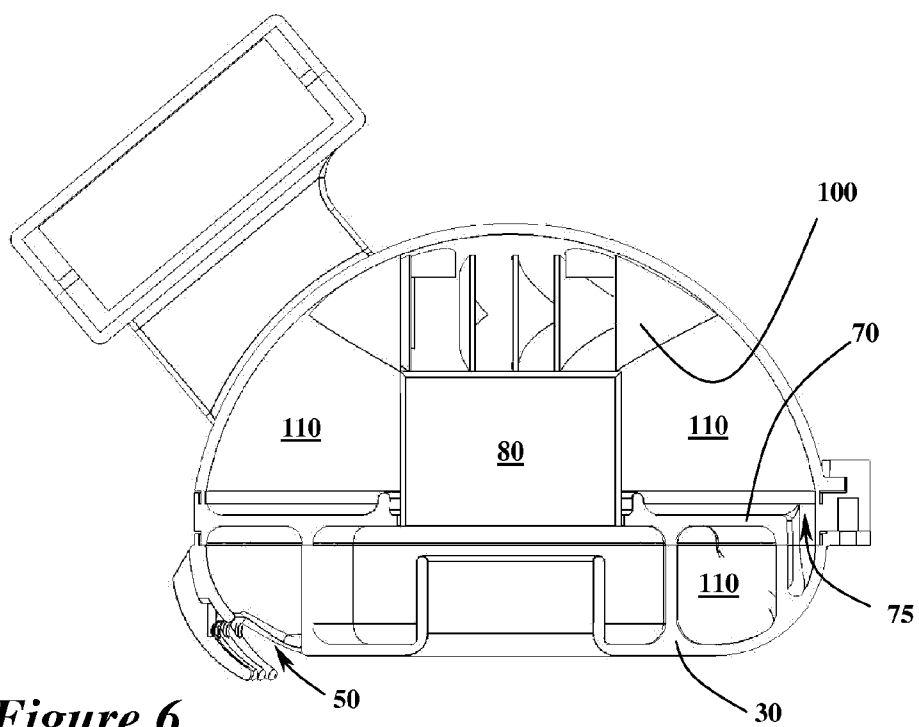
**Figure 3**



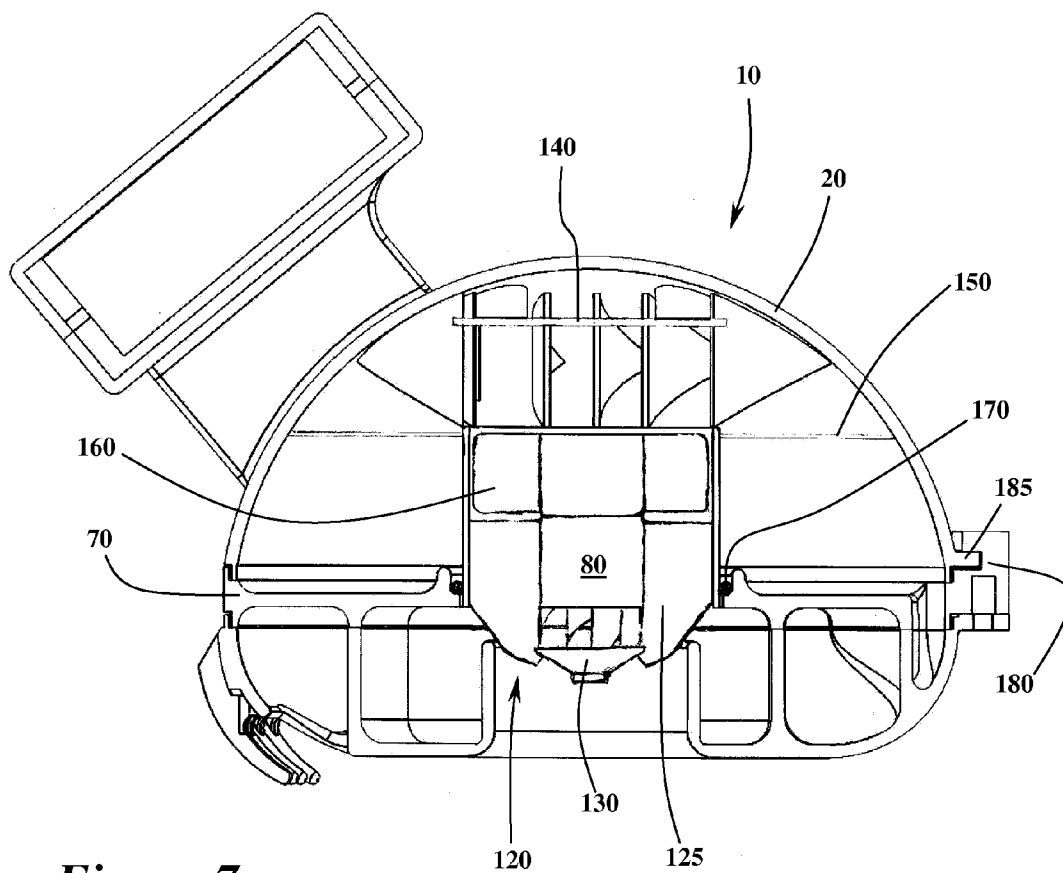
**Figure 4**



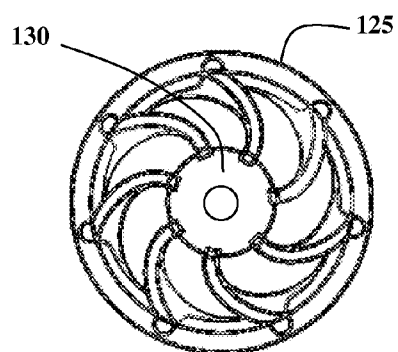
**Figure 5**



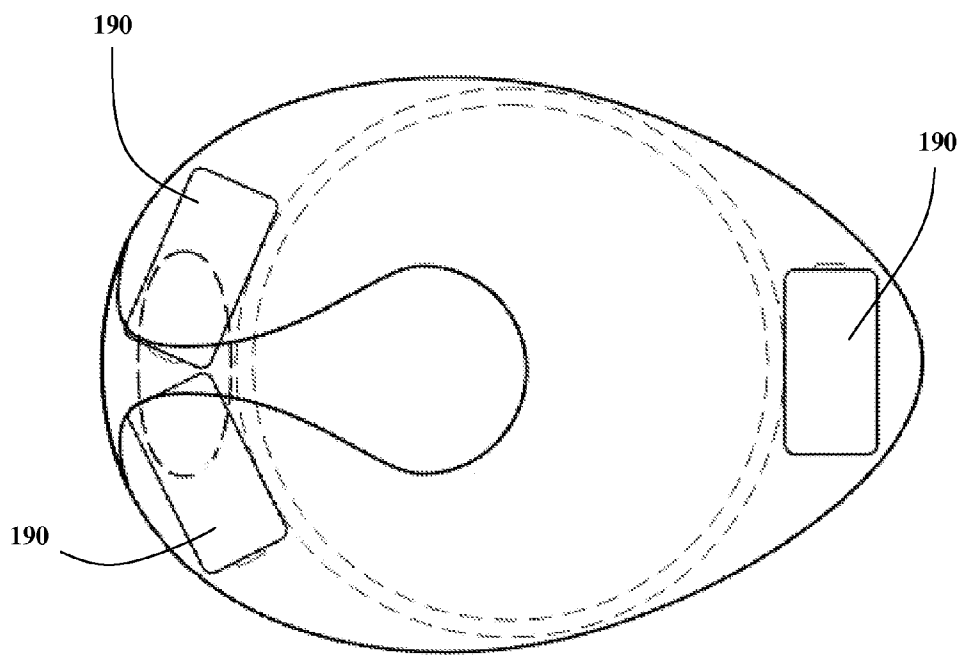
**Figure 6**



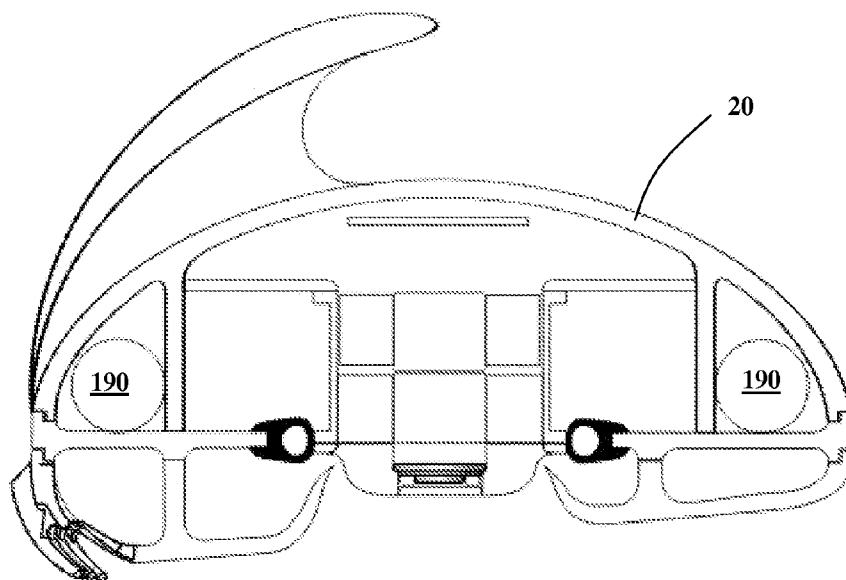
**Figure 7**



**Figure 8**



**Figure 9**



**Figure 10**

## PET VACUUM

### BACKGROUND

**[0001]** There have been many designs for a pet vacuum in the past. Some have been designed to work with an available vacuum hose, and some have been made to be self-contained. Some have been run on A/C electricity, and some have been designed to be cordless and rechargeable. Most, if not all, of them have serious drawbacks, which have undoubtedly kept many them off the market.

**[0002]** The design claimed in U.S. Pat. No. 2,159,096 is a good example of a device that tends to cause hair to get caught up in the bristle area, before it has a chance to get drawn through the vacuum hose, and into the collection area (a bag, filter, etc.). The bristles in the Mitchell design are pointed away from the vacuum port and act as hooks, around which hair can get entangled.

**[0003]** U.S. Pat. No. D332,159 to Arnold discloses a variation of Mitchell's Vacuum Comb. In this variation, the teeth do appear to be angled in the direction of the opening. But a closer inspection reveals the ends of the teeth extend beyond the vacuum port, making them very likely to cause a buildup of hair outside of the opening.

**[0004]** In U.S. Pat. No. 3,574,885, Jones claims a brush having flexible plastic bristles and adapted for connection with a vacuum cleaner to remove loose hair dislodged in brushing an animal. Yet, her device appears to be bulky and cumbersome. In fact, it looks quite intimidating, especially to either a smaller pet or one that is prone to react. The appearance of this design alone could make cleaning an uncomfortable experience. The configuration also tends to cause hair to build up at some or all of the bristles' perimeter.

**[0005]** U.S. Pat. No. 4,799,460 by Kuhl calls for a lightweight, battery operated, portable unit which is primarily useful as a vacuum cleaner for pets [where] a screen apparatus disposed within the housing prevents material from being drawn into the fan. Although this device has the useful quality of being battery operated (cordless), it relies on a screen to intercept debris. This way of capturing debris will cause the screen to often get covered with hair. This will continually restrict the airflow, in turn, thereby reducing utility and overworking the motor, in the process.

**[0006]** The item in U.S. Pat. No. 5,074,006 is an improvement to the Kuhl design, in that it provides a larger filtered container. This allows the vacuum to be operated for a longer period, before the filter has to be emptied or replaced. But, in terms of convenience and operating costs, it can do no better than any other vacuum cleaner that uses a some sort of filter or bag to collect debris.

**[0007]** The vacuum device claimed in U.S. Pat. No. 4,729,147 went so far as to electrocute small insects as they are drawn into the contraption. Although the idea of killing parasites is noble, the device in this reference is quite complex and bulky, as it is described in the text. The bulk is a drawback to any convenience or function that the unit may provide.

**[0008]** All of these designs offered an advantage, at the time they were issued. Though, no cordless, hand-held, palm-sized device has ever employed a cyclonic debris separation method. Nor has any incorporated a venturi effect to compound the vacuum force while preserving the directional air flow. Nor has any vacuum device in general used a comb that was designed to minimize additional, manual hair removal. Nor has anyone suggested using the fan itself to generate air flow, while mincing insects (into tiny bits of debris) at the

same time. And, certainly none has suggested the use of two or more cyclonic chambers to produce ample centrifugal action, in as many stages.

### SUMMARY

**[0009]** The present invention is a palm-sized noiseless cyclone vacuum apparatus. That is—a cyclonic vacuum apparatus reduced in size and parts, which fits comfortably in the user's hand, and which houses an active noise cancellation (ANC) component, two cyclone chambers, a venturi-assisted intake port, a unique comb attachment, a powerful motor with dampening mounts, a rechargeable battery pack, fasteners, and some wiring . . . nothing more, nothing less. The entire assembly fits in the palm of one's hand, for good reason.

**[0010]** The invention itself is intended for use with pets. It is so inconspicuous, and so quiet, that it actually tends to avoid frightening domestic animals. It conveniently allows the owners of even the most skittish pets to maintain a clean home, without having to disturb the pet's peace-of-mind, and without the trouble of replacing vacuum bags or dealing with power cords. And, unlike many vacuum devices, this one kills fleas and other pests mechanically.

**[0011]** The idea of noise-cancelling vacuum cleaners is not new. The use of cyclonic airflow to capture debris without a filter is not new. Using a venturi-effect correctly, however, to maintain cyclone airspeed is new. Using the motor compartment, itself, as one of the cyclone chambers is new. Using a comb attachment whose teeth converge substantially into the vacuum port, which makes loose hair easy to draw within the air stream, is new. Using a fan within a cyclonic chamber to mince parasitic pests to shreds is new. And, ergonomically configuring a powerfully efficient device, in such a way that the configuration itself becomes a psychological advantage, is indeed new.

**[0012]** The device is designed to take up no more volume than is physically required to house the bare essentials. There is only one way to configure this device. It is a masterpiece of modern ingenuity. As one reads the following description, one begins to understand the genius required to arrange this combination of features in such a way that it makes the device more compact, more effective, and more useful than anything else before.

### DRAWING FIGURES

**[0013]** FIG. 1 is a perspective top view of the preferred embodiment of the invention.

**[0014]** FIG. 2 is a perspective bottom view of the preferred embodiment of the invention.

**[0015]** FIG. 3 is an exploded top view of the preferred embodiment of the invention.

**[0016]** FIG. 4 is an exploded bottom view of the preferred embodiment of the invention.

**[0017]** FIG. 5 is a left view of the preferred embodiment of the invention.

**[0018]** FIG. 6 is a left simplified section view of the preferred embodiment of the invention.

**[0019]** FIG. 7 is a left detailed section view of the preferred embodiment of the invention.

**[0020]** FIG. 8 is a bottom view of the curved motor hub and speaker support.

**[0021]** FIG. 9 is a top view of an alternate embodiment.



[0022] FIG. 10 is a left side section view of an alternate embodiment.

#### DESCRIPTION

[0023] An object of this invention is a hand-held vacuum device comprising an transparent ergonomic container, which houses a pair of cyclonic airflow chambers in two-way communication with each other, arranged in such a way that a semi-closed loop includes an air intake port, which relies on the Bernoulli Principal Venturi Effect to cause debris to not only be drawn into said chambers, but also to be set into cyclonic motion immediately and tended by centrifugal action to the lateral perimeter of said container.

[0024] Another object is such a vacuum device further comprising a noise-cancellation circuit and speaker system that may be selectively activated to greatly reduce the sound of the fan, which is mounted via an acoustic suspension with an exhaust port directed toward the surface being cleaned by vacuum, further reducing noise, to avoid frightening a pet.

[0025] Another object is such a vacuum device further comprising a fan to generate airflow, which is so carefully engineered with respect to fit, that any fleas which pass by said fan within said airflow are shredded to bits.

[0026] Another object is such a vacuum device further comprising one or more attachments having teeth that curve toward said venturi and facilitate the transfer of animal hair from said teeth to said venturi. These attachments are each easily interchangeable.

[0027] FIG. 1 shows the vacuum device 10 in its assembled state. The device is sized to fit comfortably and ergonomically in the hand of the user. In this view, the most visible features are the upper housing 20 and the lower housing 30.

[0028] FIG. 2 shows the bottom of the assembled device. Here, the comb attachment 40, intake port 50, and exhaust 60 are in plain view.

[0029] FIG. 3 shows many of the component parts of the device, including the comb 40, the lower housing 30, the separator plate 70 (including its plenum 75), a generic representation of the motor/fan assembly 80, then the upper housing 20, the rechargeable battery pack 90, and the battery cover 100.

[0030] FIG. 4 shows the same components seen in FIG. 3, but from a different perspective. Note the directional vanes 100 integrated into the upper interior of the upper housing 20. Also note the motor/fan assembly 80, which can be partially seen through the plenum 75.

[0031] FIG. 5 shows the left side of the device. FIG. 6 shows the left side, in mid-plane cross section. This cross section shows only the parts included in FIGS. 3 and 4. This figure has been simplified to best illustrate the basic workings.

[0032] The device relies on the Venturi Effect, and operates on the Bernoulli Principle. Air is forced into a cyclone by the motor/fan assembly 80. Looking at the device from below (as in FIG. 4) the fan rotates clockwise. This sends a torrent of wind spinning into the lower housing 30 at great speed. As the air passes by the air intake port 50, it draws more air in by vacuum. Immediately, the particles that are introduced into the air stream eventually get thrown to the perimeter of the housings, by the angular acceleration imparted by the outer cyclonic area, and the energy of the airflow itself.

[0033] The cyclone continues along the path within the lower housing, through the plenum 75, and into the upper housing 20. The particles tend to get driven through the ple-

num, into the perimeter of the upper housing by centrifugal force and stay there, while the air continues through the directional vanes 100 and back into the motor/fan assembly 80 (the inner cyclonic area), to repeat the cycle. At all times, particulate matter is thrown as far outward laterally as it can go. This means that the particles will actually get recycled into the air stream within the device, from the inner cyclonic area to the outer cyclonic area, again and again. Only clean air exits through the exhaust port.

[0034] Note that sundry accessories, such as fasteners, acoustic motor mounts, wiring, an electric switch, battery charger, plugs, et cetera are considered mundane to a person having ordinary skill in this art, and are not shown, so as to aid clarity.

[0035] Turning now to FIG. 7, we see the device 10 in more of its complete form. This is a cross section, like FIG. 6, which includes greater detail within the motor/fan assembly 80, which constitutes the inner cyclonic chamber. Here we see an additional set of helical vanes 120 incorporated into the motor's hub 125, and notched to hold a small audio speaker/microphone assembly 130. This speaker/microphone assembly is part of an active noise cancellation [electronic] circuit. The circuit board 140 is shown mounted near the top interior of the upper housing 20.

[0036] Also shown in this figure is a collector screen 150, for trapping hair. Below this screen, within the upper housing, is where all of the debris collects. It is due the fact that this is the zone where the circumference of the device is greatest, and where air is forced from below. Larger particles, such as fleas, may cycle through the entire circuit (both cyclonic areas) several times, where they will get continually minced into smaller and smaller pieces by a set of fan blades 160, until they tend to stay put at the perimeter of the upper housing.

[0037] Additionally, there is an elastomeric seal 170 surrounding the lower portion of the motor assembly, and fitted within the inner lip of the separator plate 70. Along with acoustic mounting fasteners, this seal will sonically dampen the vibration and noise of the motor/fan assembly, and isolate it from the rest of the device. This allows the active noise cancellation to work on a steady acoustic signal.

[0038] This elastomeric seal 170 will allow the motor hub to be removed, along with the rest of the upper housing assembly. The upper housing 20 is designed to unscrew from the lower housing with a quarter-turn counterclockwise. One of three slot features 180 in the lower housing captures one of three tabs 185 in the upper housing, to secure the top portion to the bottom portion, once the upper housing has been replaced. (FIG. 3 indicates this from a better perspective.) The closure means shown is representative of any suitable means for closure, including one that conceals a hinge and latch arrangement within the device itself, for example.

[0039] FIG. 8 shows how the motor's hub 125 appears, when viewed from below. The speaker/microphone assembly 130 obscures the view of the motor itself. The integrated helical vanes direct the air toward the center, and out through the exhaust port, while the debris is allowed to escape centrifugally into the internal air stream.

[0040] FIGS. 9 and 10 each show an alternate arrangement of some of the primary components. Note that the battery pack has been broken out into two or more separate batteries 190, located within the upper housing 20. The upper housing, in this case, is also more ergonomically shaped.

1. A hand-held vacuum device comprising an transparent ergonomic container, which houses a pair of cyclonic airflow chambers in two-way communication with each other,

arranged in such a way that a semi-closed loop includes an air intake port, which relies on the Bernoulli Principal venturi effect to cause debris to not only be drawn into said chambers, but also set into cyclonic motion immediately and tended by centrifugal action to the lateral perimeter of said container.

2. The vacuum device in claim 1 further comprising a noise-cancellation circuit and speaker system that may be selectively activated to greatly reduce the sound of the fan, which is mounted via an acoustic suspension with an exhaust port directed toward the surface being cleaned by vacuum, further reducing noise, to avoid frightening a pet.

3. The vacuum device in claim 1 further comprising a fan to generate airflow, which is so carefully engineered with respect to fit, that any fleas which pass by said fan within said airflow are shredded to bits.

4. The vacuum device in claim 1 further comprising one or more attachments having teeth that curve toward said venturi and facilitate the transfer of animal hair from said teeth to said venturi, which are each easily interchangeable.

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