



(51) International Patent Classification:  
A47L 9/16 (2006.01)

(21) International Application Number:  
PCT/US2015/015847

(22) International Filing Date:  
13 February 2015 (13.02.2015)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
61/940,191 14 February 2014 (14.02.2014) US

(71) Applicant: **TECHTRONIC INDUSTRIES CO. LTD.**  
[—/CN]; 24/f CDW Building, 388 Castle Peak Road,  
Tsuen Wan, New Territories, Hong Kong (CN).

(72) Inventor; and

(71) Applicant (for US only): **ANDRIKANISH, Justin**  
[US/US]; 32327 Hamilton Ct. Apt. 104, Solon, OH 44139  
(US).

(74) Agent: **SWANSON, Elias, R.**; Michael Best & Friedrich  
LLP, 100 East Wisconsin Avenue, Suite 3300, Milwaukee,  
WI 53202-4108 (US).

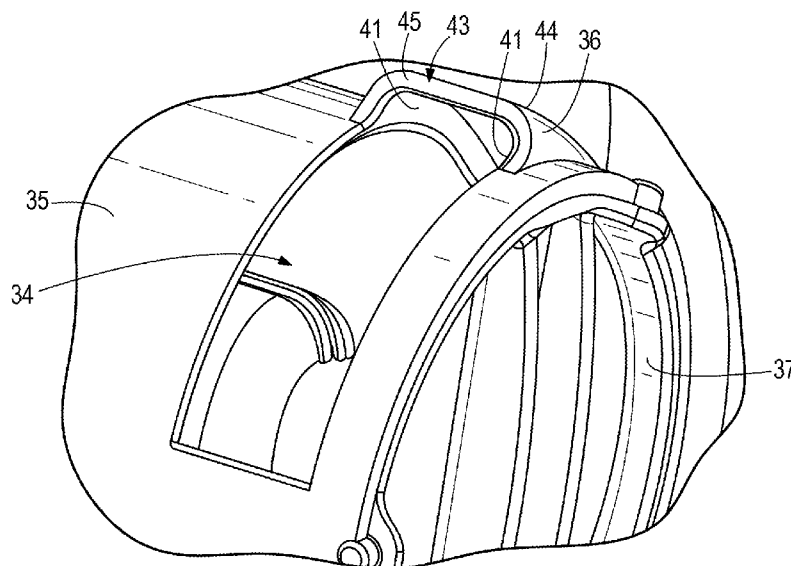
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report (Rule 48.2(g))

(54) Title: GUIDE CHANNEL FOR A VACUUM CLEANER DUST SEPARATOR



**FIG. 7**

(57) Abstract: A vacuum cleaner includes a cyclone separator having a cylindrical outer wall defining a radius. A dust discharge aperture is provided in a portion of the outer wall. An arcuate guide channel is defined by a portion of the outer wall, the guide channel being disposed radially outwardly from the outer wall.

## GUIDE CHANNEL FOR A VACUUM CLEANER DUST SEPARATOR

### CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of and priority to U.S. Provisional Patent Application No. 61/940,191, filed February 14, 2014, and entitled GUIDE CHANNEL FOR A VACUUM CLEANER DUST SEPARATOR, the entire contents of which is herein incorporated by reference.

### FIELD OF THE INVENTION

[0002] The present invention relates to a vacuum cleaner. More specifically, the present invention relates to a guide channel for a vacuum cleaner dust separator.

### BACKGROUND OF THE INVENTION

[0003] A vacuum cleaner is generally known in the art. A vacuum cleaner is a cleaning device that creates a partial vacuum using air to suction dust, dirt, or other debris from a surface. The vacuum cleaner typically draws air containing dust, dirt, or other debris into the cleaner. This “dirty air” typically enters a dust separator in the vacuum that separates the dust, dirt, or debris from the air. The dust, dirt, or debris is typically collected in a bin or bag for later disposal. The resulting exhaust air exits the dust separator to be discharged from the vacuum cleaner.

[0004] Dust separators, like those used in cyclonic cleaners, may include a housing provided to facilitate formation of a dirty air vortex. Dirty air enters an inlet and rotates within the dust separator in a helical pattern, separating dust, dirt, and debris from the air by centrifugal force. The dust, dirt, and debris are forced toward the housing wall, eventually exiting the dust separator through a discharge opening in the housing wall at one end of the dust separator. Upon exiting the dust separator, dust, dirt, and debris typically collects in a dust cup for later disposal. Air exits through a central exhaust channel provided at either end of the dust separator.

[0005] The discharge opening for dust, dirt, and debris is typically a slot or aperture provided in the wall of the dust separator housing. While providing an exit point for dust, dirt, and debris, known exit holes have certain undesirable characteristics. For example, not all dust, dirt, and debris readily exits the dust separator after separation. This residual dust, dirt, and debris can decrease separation efficiency within the dust separator, and can ultimately result in dust separator clogging.

#### SUMMARY OF THE INVENTION

[0006] The invention provides, in one aspect, a cyclonic dust separator. A vacuum cleaner includes a cyclone separator having a cylindrical outer wall defining a radius. A dust discharge aperture is provided in a portion of the outer wall. An arcuate guide channel is defined by a portion of the outer wall, the guide channel being disposed radially outwardly from the outer wall.

[0007] The invention provides, in another aspect, a vacuum cleaner that includes a separator having a cylindrical outer wall. A dust discharge aperture is defined by an arcuate slot provided through a portion of the outer wall. A guide channel extends away from the outer wall to the dust discharge aperture.

[0008] The invention provides, in another aspect, a vacuum cleaner that includes a dust separation chamber having an outer wall. A dust discharge aperture is provided through a portion of the outer wall. A guide channel is defined by a portion of the outer wall and has opposing sides, the outer wall is provided along each of the opposing sides of the guide channel.

[0009] Other features and aspects of the invention will become apparent by consideration of the following detailed description and accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 is an isometric view of a vacuum cleaner in accordance with an embodiment of the invention, illustrating a portion of a body of the vacuum cleaner in broken lines along a dust cup housing for reference.

[0011] FIG. 2 is a cross-sectional view of the vacuum cleaner of FIG. 1, taken along line 2-2 of FIG. 1, illustrating a portion of the air stream inlet leading to the dust separation chamber provided in the dust cup housing, the air stream inlet and dust separation chamber inlet shown with portions removed for purposes of illustration.

[0012] FIG. 3 is a partial side view of the vacuum cleaner of FIG. 1, taken along line 3-3 of FIG. 2, depicting the dust cup housing as transparent to illustrate the dust separation chamber, depicting a portion of the dust separation chamber inlet removed for purposes of illustration, and showing the nozzle with the suction wand removed.

[0013] FIG. 4 is a partial side view of the vacuum cleaner of FIG. 1, taken along line 4-4 of FIG. 2, depicting the dust cup housing as transparent and the dust cup lid as removed to illustrate aspects of the dust separation chamber.

[0014] FIG. 5 is an isometric view of the dust separation chamber for use in the vacuum cleaner of FIG. 1, showing a portion of the dust separation chamber inlet for purposes of illustration.

[0015] FIG. 6 is an isometric view of the dust separation chamber of FIG. 5 with the cover removed to illustrate internal components of the dust separation chamber.

[0016] FIG. 7 is a partial elevation view of the dust separation chamber of FIG. 5, taken along line 7-7 of FIG. 6.

[0017] FIG. 8 is an isometric view of a portion of the dust separation chamber of FIG. 5 that illustrates a portion of the dust separation chamber inlet and having the cover removed to illustrate internal components of the dust separation chamber.

[0018] FIG. 9 is a side view of the dust separation chamber of FIG. 5 taken along line 9-9 of FIG. 8, showing a portion of the dust separation chamber inlet for purposes of illustration.

[0019] FIG. 10 is an end view of the dust separation chamber of FIG. 5 taken along line 10-10 of FIG. 9, showing a portion of the dust separation chamber inlet and the cover removed to illustrate internal components of the dust separation chamber.

[0020] FIG. 11 is a cross-sectional view of the dust separation chamber of FIG. 5 taken along line 11-11 of FIG. 9.

[0021] Before any embodiments of the present invention are explained in detail, it should be understood that the invention is not limited in its application to the details or construction and the arrangement of components as set forth in the following description or as illustrated in the drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. It should be understood that the description of specific embodiments is not intended to limit the disclosure from covering all modifications, equivalents and alternatives falling within the spirit and scope of the disclosure. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.

#### DETAILED DESCRIPTION

[0022] The invention illustrated in the Figures and disclosed herein is generally directed to a vacuum cleaner having an improved dust separation chamber. With reference to FIGS. 4 and 5, a dust separation chamber 30 includes a guide channel 36 leading to a dust discharge aperture 34. The guide channel 36 assists in channeling dust through the dust discharge aperture 34, out of the dust separation chamber 30, and into a dust cup 50 for retention until later disposal. The guide channel 36 advantageously facilitates improved dust removal from the dust separation chamber 30, leading to a decrease in residual dust buildup within the dust separation chamber 30 and reducing the risk of clogging.

[0023] For ease of discussion and understanding, the following detailed description will refer to a vacuum cleaner 10, but illustrates the vacuum cleaner as a hand-held vacuum. It should be appreciated that the hand-held vacuum is provided for purposes of illustration. The features described herein in association with the hand-held vacuum are applicable to any suitable vacuum cleaner. It should be appreciated that aspects of the present invention are not limited to a specific vacuum technology. Accordingly, a vacuum cleaner 10 may include, but is not limited to, a hand-held

vacuum, an upright vacuum, a canister vacuum, a drum vacuum, a wet/dry vacuum, a pneumatic vacuum, a cyclonic vacuum, or any other suitable device that uses air to remove dust from a surface, for example by suction. In addition, it should be appreciated that the invention should not be limited to any specific orientation of the cyclonic separator. Rather, the cyclone separator can be oriented horizontally (as illustrated), vertically, or in any other suitable or desired orientation.

[0024] It should also be appreciated that the term “dust” is directed to dust, dirt, particulate, debris, or any other material that may be drawn into the vacuum cleaner 10. In addition, the term “surface” may include carpeting, flooring, concrete, or any other material from which the vacuum cleaner 10 removes dust.

[0025] Referring now to the Figures, FIG. 1 illustrates a vacuum cleaner 10 providing an air flow path from a dust inlet 19 to a clean air outlet 21. A motor-fan assembly (not shown) and a dust separator (described further below with reference to FIGS. 2-3) are provided along the air flow path. The vacuum cleaner 10 includes a cleaner body 12 having a motor housing 14 and a dust cup housing 16. In the illustrated embodiment, a first portion 17 of the dust cup housing 16 engages the motor housing 14, while a second portion 18 of the dust cup housing 16 engages the cleaner body 12. A lid 62 is pivotally connected to the dust cup housing 16. A latching assembly 64 is provided to selectively retain the lid 62 against the dust cup housing 16. Thus, a user may actuate the latching assembly 64 to release the lid 62, allowing the lid 62 to open about the dust cup housing 16. In the open position, a user may empty any dust retained in the dust cup housing 16. After emptying, the user may close the lid 62, engaging the lid 62 with the latching assembly 64, and creating an effective seal between the lid 62 and dust cup housing 16 to facilitate retention of dust within the dust cup housing 16. Optionally, the lid 62 may be opened via the latching assembly 64 while the dust cup housing 16 remains engaged with the cleaner body 12.

[0026] The cleaner body 12 may further include a handle 20 to facilitate use of the vacuum cleaner 10 by providing a location for a user to hold and operate the cleaner 10. The handle 20 may include a trigger or switch 22 to selectively power the cleaner 10 on and off. The cleaner body 12 also includes a nozzle 24. The nozzle 24 may

receive a removable suction wand 26. The suction wand 26 is illustrated as a narrow nozzle tool having an angled end. However, the suction wand 26 may include any suitable attachment or accessory to facilitate vacuuming, such as a dusting brush, an extension hose or tube, or a wide nozzle tool.

[0027] Referring to FIGS. 2-3, the cleaner body 12 may define an air stream inlet 28. The air stream inlet 28 is a duct that extends from the nozzle 24 to a dust separation chamber or separator 30. The air stream inlet 28 creates a fluid connection or fluidly couples the nozzle 24 and the dust separation chamber 30. Thus the air stream inlet 28 facilitates the transport of dust and air from a surface, through the nozzle 24, and into an inlet or dirty air inlet 31 of the dust separation chamber 30.

[0028] As illustrated in FIGS. 3-4, the dust separation chamber 30 is disposed in a portion of the dust cup housing 16. In the illustrated embodiment, the dust cup housing 16 substantially surrounds the dust separation chamber 30. The dust cup housing 16 further defines a dust cup 50 for the collection and retention of dust discharged by the dust separation chamber 30. The dust cup 50 and the dust cup housing 16 may be the same part, or the dust cup housing 50 may be a portion of the dust cup housing 16, or may be two parts integrated together, or may be separate parts. In the illustrated embodiment, the dust separation chamber 30 is connected to the motor housing 14 by an end member 32. The end member 32 closes the first portion 17 of the dust cup housing 16 and mates with the motor housing 14. A motor fan assembly (not shown) is positioned in the motor housing 14 and is in fluid connection with the dust separation chamber 30 through a duct (not shown) extending from a shroud or exhaust grill 33, through the end member 32, and into the motor housing 14. Thus, an air flow path is provided between the motor housing 14 and dust cup housing 16, allowing air to travel from the dust separation chamber 30, through the end member 32, and into the motor housing 14. A filter (not shown) may be provided between the end member 32 and motor housing 14 to restrict dust retained in the dust cup 50 from traveling into the motor housing 14.

[0029] Referring now to FIGS. 5 and 9, the dust separation chamber 30 includes an outer wall 35. The outer wall 35 is cylindrical in shape. The inlet 31 is coupled to a

first end 37 of the outer wall 35. A second end 38 of the outer wall 35 is provided opposite the first end 37. A cover 39 (shown in FIG. 5) is coupled to the second end 38, for example by an interference fit, snap fit, or other suitable connection. To facilitate the snap fit, one or more projections on the cover 39 may be received by one or more corresponding slots (shown in FIG. 9) to retain the projection. A dust discharge aperture or dust outlet 34 is provided through a portion of the outer wall 35. The dust discharge aperture 34 may be provided in the same surface as the outer wall 35 (i.e., the dust discharge aperture 34 shares the same radius as the outer wall 35) to define an arcuate or curved slot 34 through the outer wall 35. A guide channel 36 radially extends away from and about a portion of the outer wall 35. The guide channel 36 is generally curved or arcuate and is defined by a portion of the outer wall 35. In the illustrated embodiment, the guide channel 36 is offset from or separated from or spaced from the dust discharge aperture 34. For example, the guide channel 36 is circumferentially offset, or is radially offset, from the dust discharge aperture 34 about or along a portion of the circumference of the dust separation chamber 30. In addition, the guide channel 36 is in alignment with the dust discharge aperture 34 about or along a portion of the circumference of the dust separation chamber 30. Stated otherwise, the guide channel 36 is in radial alignment or circumferential alignment with the dust discharge aperture 34. The guide channel 36 leads to the dust discharge aperture 34 and assists in directing dust out of the dust separation chamber 30 by providing a leading path for dust to exit the outer wall 35 toward the dust discharge aperture 34.

**[0030]** As illustrated in FIGS. 6-8, the guide channel 36 may include a pair of opposing guide channel sides or edges or ribs 41. The sides or edges 41 may be parallel to one another, and provided in a plane perpendicular to a longitudinal axis of the dust separation chamber 30. An outside wall 44 extends between the sides or edges 41. As shown specifically in FIGS. 6 and 8, the sides or edges 41 may extend radially away or outward from the outer wall 35 from a guide channel entrance 42 to a guide channel exit 43. Thus, the guide channel 36 is disposed radially outwardly from the outer wall 35. The outer wall 35 is also provided along or beside each of the opposing sides or edges 41 of the guide channel. The guide channel entrance 42 is

adjacent the outer wall 35, to define an outer wall end 42 of the guide channel 36. The guide channel exit 43 is adjacent the dust discharge aperture 34, to define a discharge aperture end 43 of the guide channel. In the illustrated embodiment, the guide channel 36 terminates at an edge or first edge of the discharge aperture 34. Thus, the guide channel 36 may define a portion of the discharge aperture 34. The guide channel exit 43 may also define a portion of the discharge aperture 34. The guide channel 36 and/or guide channel exit 43 may also define a portion of the perimeter or an edge of the discharge aperture 34.

**[0031]** The sides or edges 41 may extend an increasing distance radially away or outward from the outer wall 35 beginning at the guide channel entrance 42 to the guide channel exit 43, resulting in the guide channel 36, and associated outside wall 44, having the generally curved or arcuate shape. As shown in FIG. 11, the outer wall 35 has a first radius or outer wall radius R1, while the guide channel 36 has a second dimension or guide channel dimension or radial dimension or radius of curvature R2. The first radius R1 and second dimension R2 share the same center of origin C. The second dimension R2 increases in length or distance along the guide channel 36 from the guide channel entrance 42 to the guide channel exit 43. To illustrate the increasing length or distance of second dimension R2 along the guide channel 36, the second dimension R2-A and R2-B, both shown in broken lines, are examples of the second dimension R2. Second dimension R2-A is taken closer to the guide channel entrance 42 than second dimension R2-B. Second dimension R2-A is less than second dimension R2-B, while both second dimensions R2-A and R2-B are greater than the first radius R1. Thus, at any point along the guide channel 36, the second dimension R2 is greater than the first radius R1. The second dimension R2 may be referred to as having an increasing radius or an increasing radius of curvature along the guide channel 36. In other embodiments, the guide channel 36 may have a uniform curve or arcuate shape defined by a constant radius along the guide channel 36. However, the constant radius of the guide channel 36 would not share the same center of origin C as the first radius R1.

**[0032]** Referring to FIG. 7, the guide channel exit 43 may include an edge or lip 45. As illustrated, the lip 45 defines an outer surface of the guide channel exit 43, and

may be generally U-shaped. The lip 45 may be provided at an angle or slope to the outer wall 35, leading to the dust discharge aperture 34 to facilitate discharge of dust through the discharge aperture 34. In addition, the lip 45 may define a portion of the discharge aperture 34, and further a portion of the perimeter or an edge of the discharge aperture 34.

[0033] In other embodiments, the guide channel 36 may follow a helical path along the outer wall 35 such that the guide channel entrance 42 is closer to the inlet 31 than the guide channel exit 43. In addition, a helical guide channel 36 could include parallel edges 41 such that the guide channel maintains a generally constant dimension between the edges 41 along its length. In other constructions, the edge 41 closer to the inlet can follow a helical path while the other edge could follow a path that is perpendicular to the longitudinal axis of the dust separation chamber resulting in a narrowing guide channel 36 as it leads toward the dust discharge aperture 34.

[0034] Referring now to FIGS. 6 and 10, the shroud 33 includes a plurality of exhaust apertures 40. The exhaust apertures 40 are radially provided about a portion of the circumference of the shroud 33. The exhaust apertures 40 provide an opening to allow air or cleaned air to exit the dust separation chamber 30.

[0035] In the illustrated embodiment, the shroud 33 includes exhaust apertures 40 around a portion of the circumference of the shroud 33. The exhaust apertures 40 are provided around the circumference of the shroud 33 except for a portion of the exhaust grill 33 opposed to the dust discharge aperture 34. In the illustrated embodiment, the dust discharge aperture 34 defines an angle of approximately 90 degrees and the shroud 33 excludes exhaust apertures 40 over a corresponding angular segment. In other embodiments, the angle defined by the dust discharge aperture 34 can be larger or smaller than 90 degrees, and similarly the angle of the corresponding blocked portion of the shroud 33 can also be larger or smaller than 90 degrees.

[0036] In operation of the vacuum cleaner 10, a user may power the vacuum on, for example by actuating the trigger 22. The motor (not shown) in the motor housing 14 will produce suction. The suction draws air and dust into the cleaner 10 through the

nozzle 24 and any attached suction wand 26. The air and dust will travel through the air stream inlet 28 into the inlet 31 of the dust separation chamber 30. The combined air and dust exits the inlet 31 and travels within the dust separator 30 in a helical pattern. Centrifugal force separates dust from the air by moving the dust toward the outer wall 35 of the dust separator. The dust continues to travel along the outer wall 35 and eventually enters the guide channel 36 at the guide channel entrance 42. The dust travels about the guide channel 36 along chute 44 until it reaches the guide channel exit 43. The dust then is fed toward the dust discharge aperture 34, exiting the dust separation chamber 30. The dust is then retained in the dust cup 50 until a user empties the dust cup housing 16.

[0037] Air or cleaned air exits the dust separation chamber 30 through the exhaust apertures 40 of the shroud 33. The air then travels through the duct (not shown), through the end member 32, and into the motor housing 14. Once in the motor housing 14, the air may be exhausted directly out of the cleaner 10, or used for motor (not shown) cooling prior to being exhausted.

[0038] The guide channel 36 advantageously provides improved discharge of dust from the dust separation chamber 30. The improved discharge improves the operational efficiency of the dust separation chamber 30, as the improved discharge reduces residual dust within the dust separation chamber 30 and reduces the chance of clogging. This and other advantages may be realized from one or more embodiments of the vacuum cleaner disclosed herein.

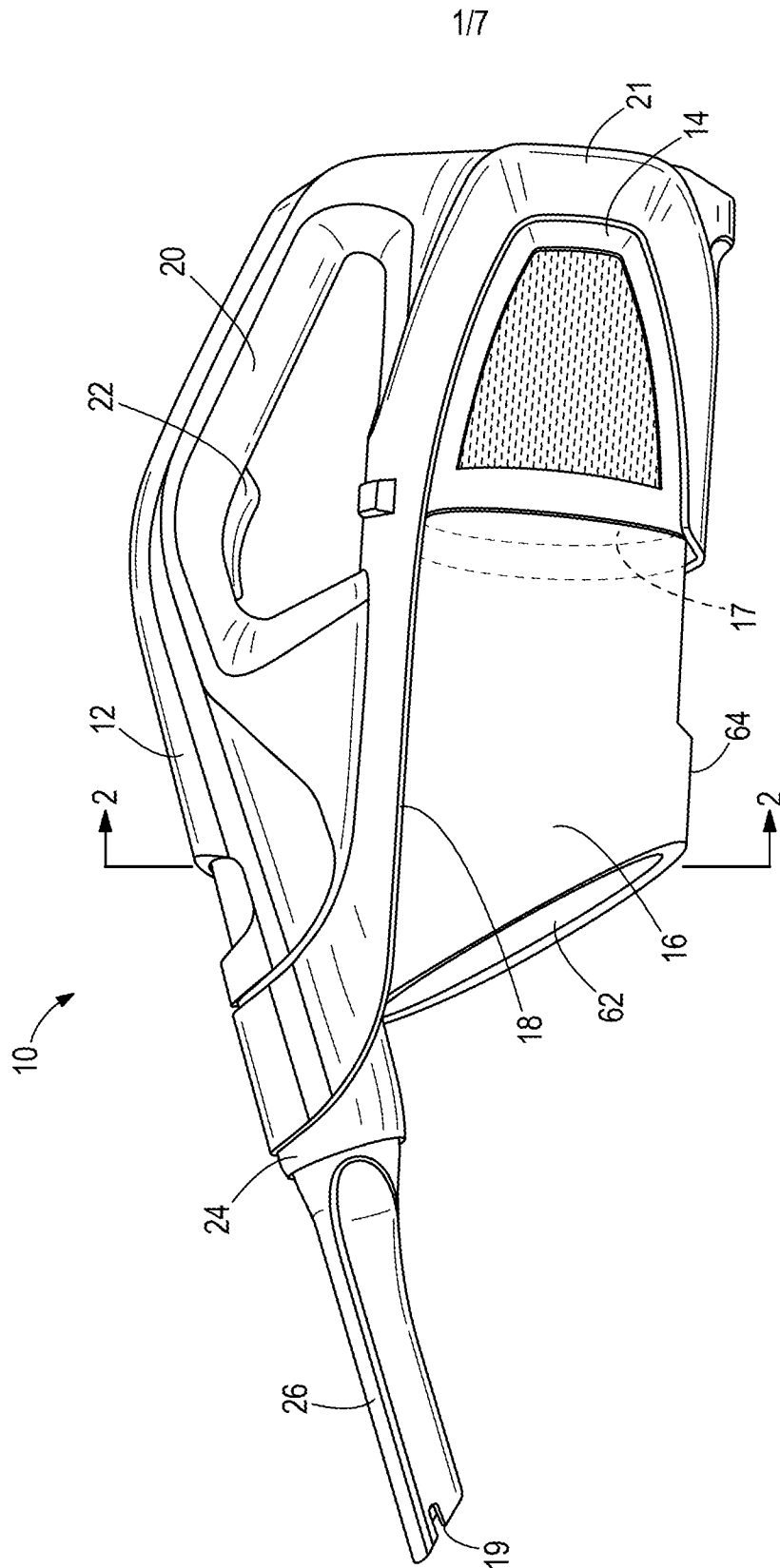
## CLAIMS

What is claimed is:

1. A vacuum cleaner comprising:  
a cyclone separator having a cylindrical outer wall defining a radius;  
a dust discharge aperture provided in a portion of the outer wall; and  
an arcuate guide channel defined by a portion of the outer wall, the guide channel disposed radially outwardly from the outer wall.
2. The vacuum cleaner of claim 1, wherein the dust discharge aperture defines a radius equal to the radius of the cylindrical outer wall.
3. The vacuum cleaner of claim 1, wherein the guide channel terminates at an edge of the dust discharge aperture.
4. The vacuum cleaner of claim 1, wherein the cylindrical outer wall defines a first radius, the guide channel has a second dimension sharing the center of origin of the first radius.
5. The vacuum cleaner of claim 4, wherein the second dimension is greater than the first radius.
6. The vacuum cleaner of claim 1, wherein the guide channel has an increasing radial dimension along the guide channel, the radial dimension along the guide channel is greater than the radius of the cylindrical outer wall.
7. The vacuum cleaner of claim 6, wherein the increasing radial dimension of the guide channel and the radius of the cylindrical outer wall share a center of origin.
8. The vacuum cleaner of claim 1, wherein the guide channel has an increasing radial dimension from the outer wall to the dust discharge aperture.
9. The vacuum cleaner of claim 1, wherein the dust discharge aperture is in fluid connection with a dust cup.

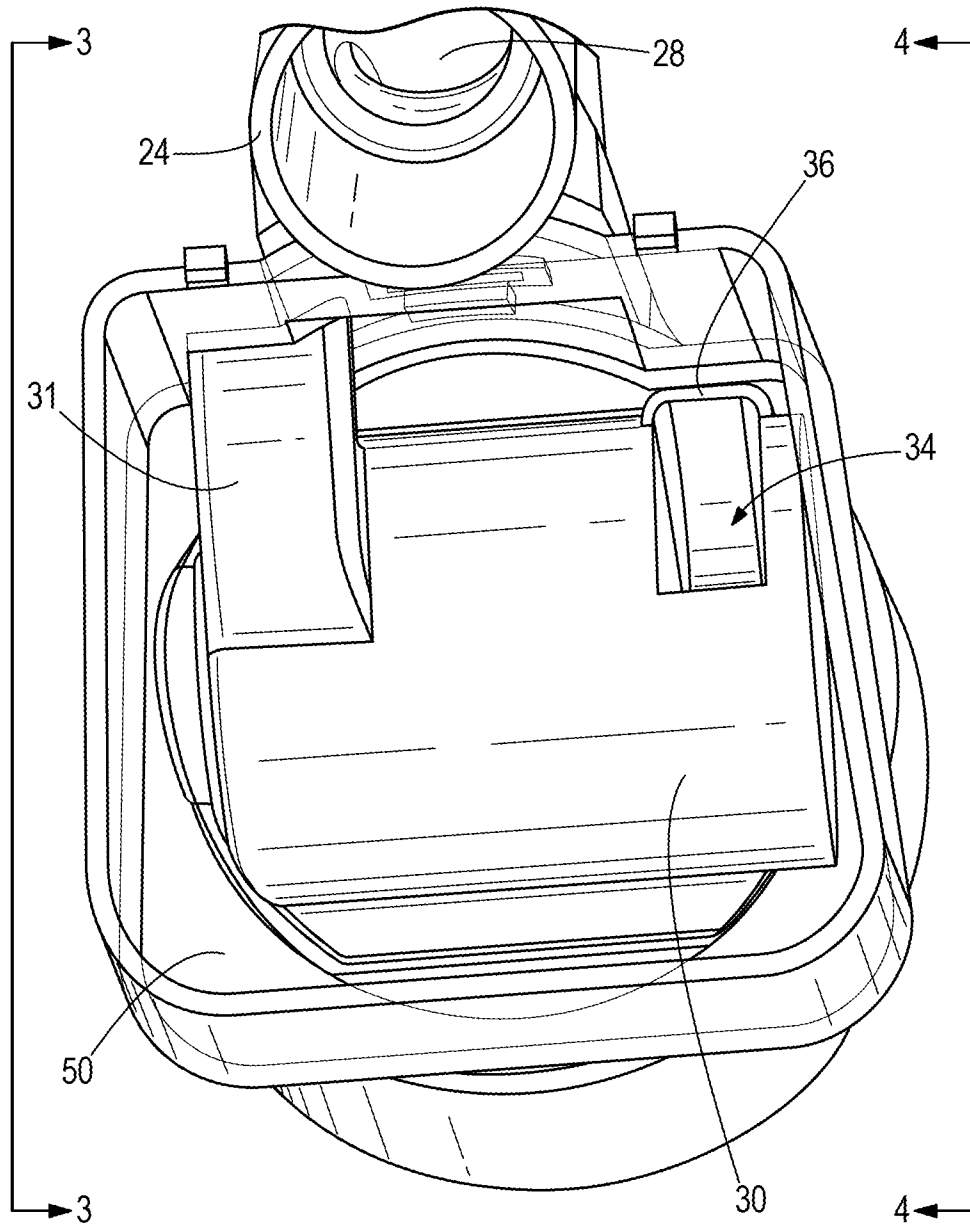
10. The vacuum cleaner of claim 1, wherein the guide channel includes an entrance, an exit, and opposing edges that extend an increasing distance radially away from the outer wall from the entrance to the exit.
11. The vacuum cleaner of claim 1, wherein the guide channel defines a portion of the dust discharge aperture.
12. The vacuum cleaner of claim 1, wherein the guide channel and the dust discharge aperture are in circumferential alignment.
13. The vacuum cleaner of claim 1, wherein the guide channel and the dust discharge aperture are offset along a portion of a circumference of the cylindrical outer wall.
14. A vacuum cleaner comprising:
  - a separator having a cylindrical outer wall;
  - a dust discharge aperture defined by an arcuate slot provided through a portion of the outer wall; and
  - a guide channel extends away from the outer wall to the dust discharge aperture.
15. The vacuum cleaner of claim 14, wherein the guide channel is disposed radially outwardly from the outer wall.
16. The vacuum cleaner of claim 14, wherein the outer wall has a first radius and the guide channel has a second dimension, the first radius and the second dimension have a common center of origin, the second dimension being greater than the first radius.
17. The vacuum cleaner of claim 16, wherein the second dimension is greater at a discharge aperture end of the guide channel than an outer wall end of the guide channel.
18. The vacuum cleaner of claim 16, wherein the dust discharge aperture has the first radius.

19. A vacuum cleaner comprising:
  - a dust separation chamber having an outer wall;
  - a dust discharge aperture provided through a portion of the outer wall; and
  - a guide channel defined by a portion of the outer wall and having opposing sides, the outer wall is provided along each of the opposing sides of the guide channel.
20. The vacuum cleaner of claim 19, wherein the guide channel is disposed radially outwardly from the outer wall.
21. The vacuum cleaner of claim 19, wherein the opposing sides project away from the outer wall.
22. The vacuum cleaner of claim 19, wherein the outer wall defines a first radius, and the guide channel defines a second radial dimension, the second radial dimension being greater than the first radius.
23. The vacuum cleaner of claim 19, wherein the guide channel extends from the outer wall to the dust discharge aperture.
24. The vacuum cleaner of claim 19, wherein the guide channel and the dust discharge aperture are in alignment along a portion of a circumference of the dust separation chamber.
25. The vacuum cleaner of claim 19, wherein the dust separation chamber is a cyclonic separator.



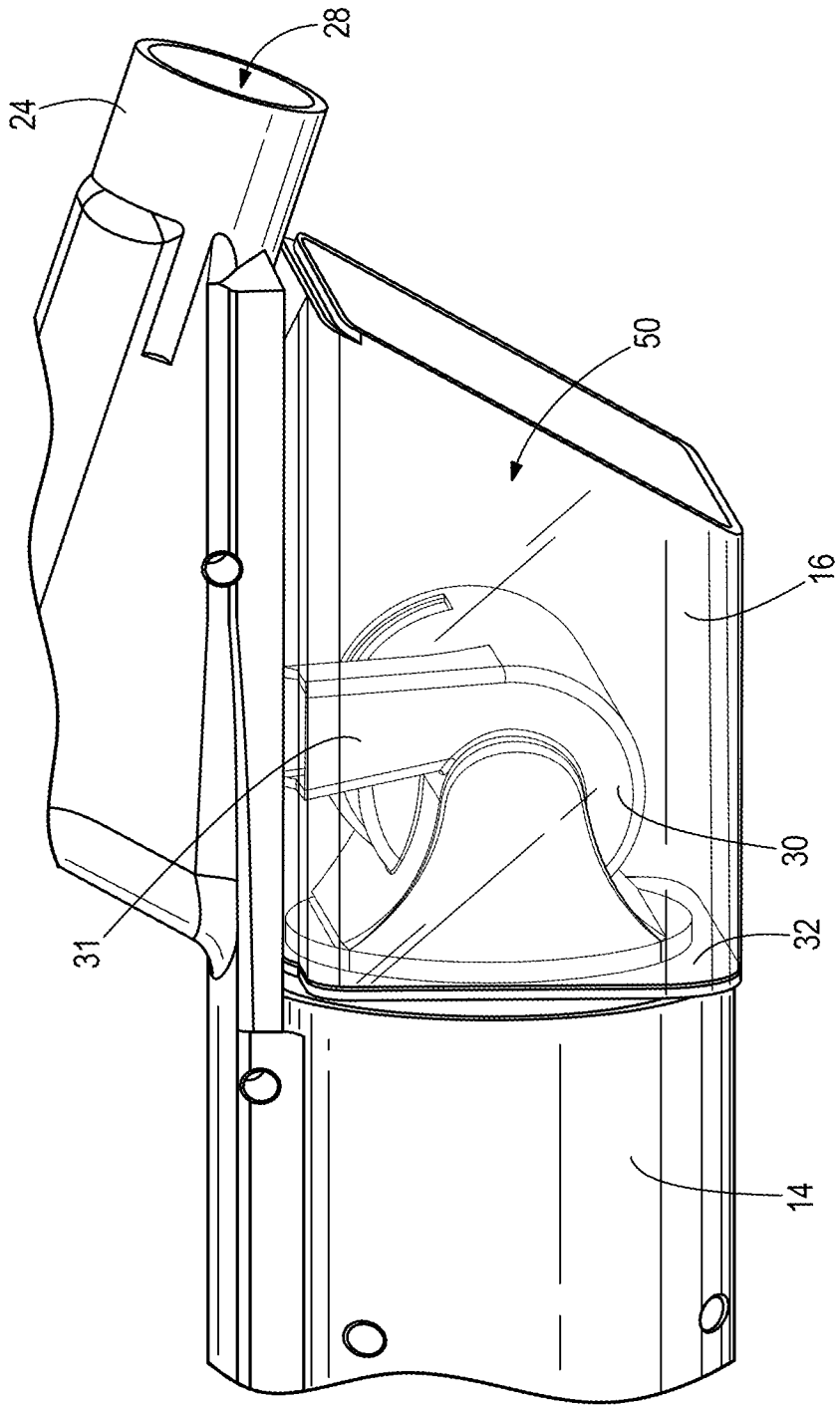
**FIG. 1**

2/7



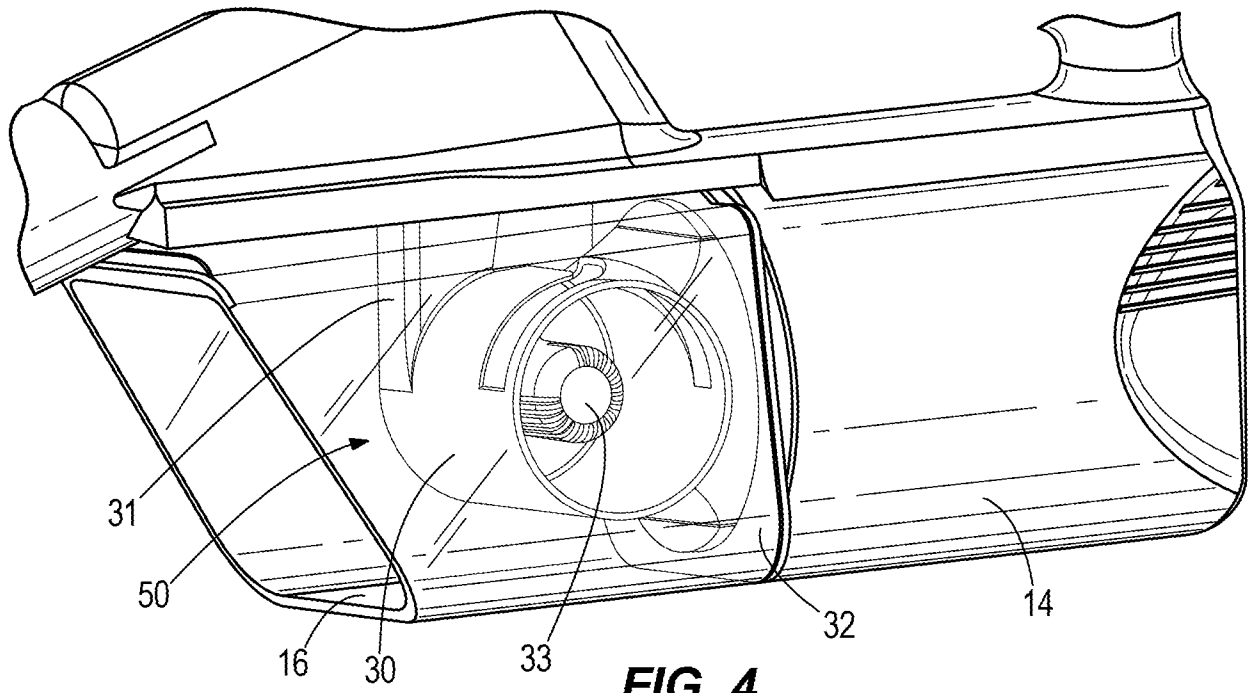
**FIG. 2**

3/7

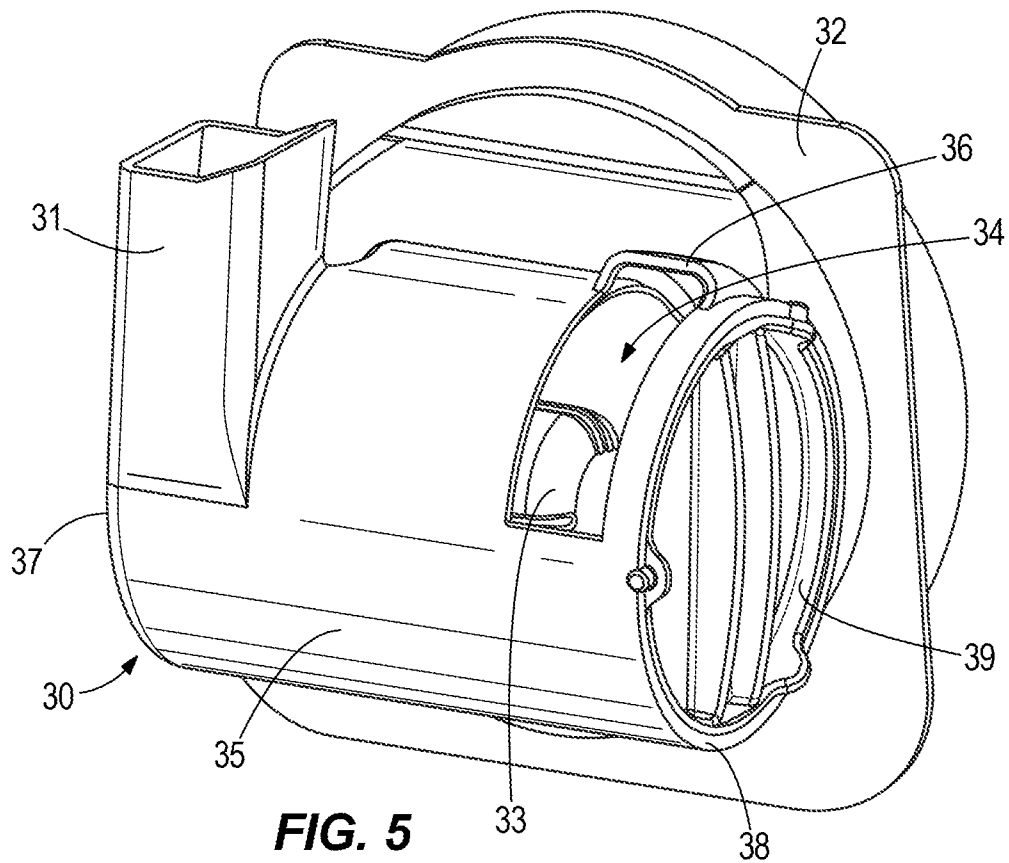


**FIG. 3**

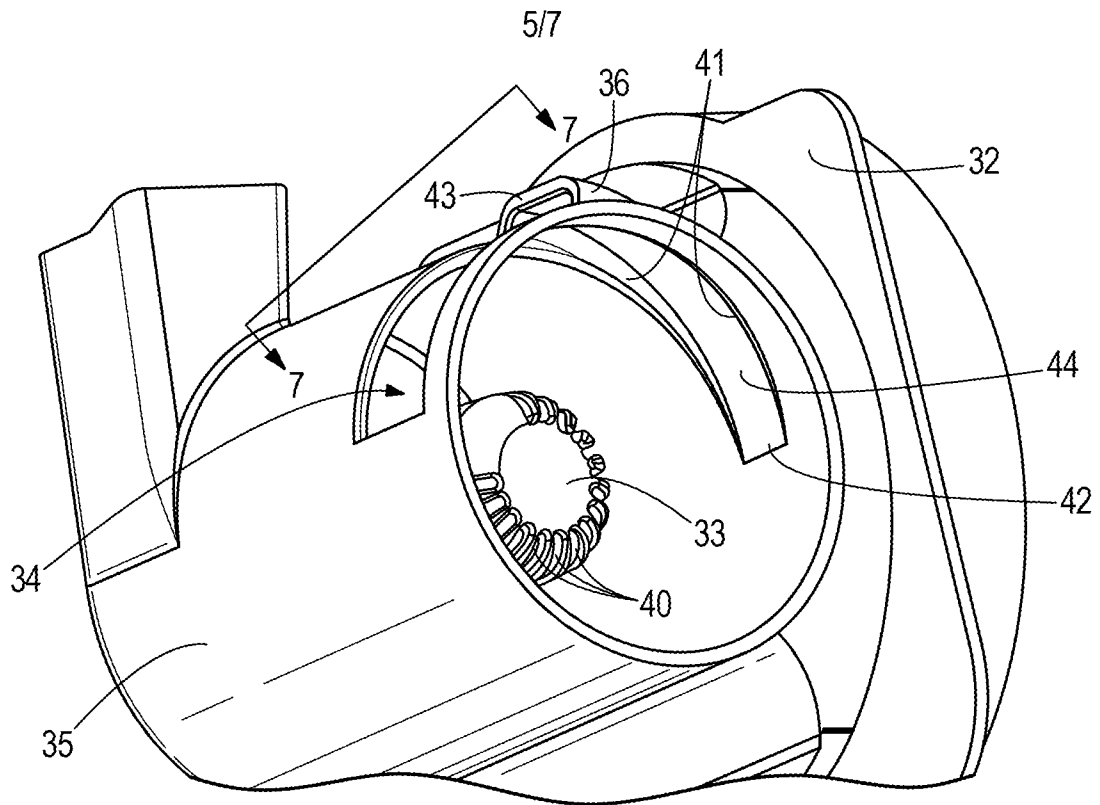
4/7



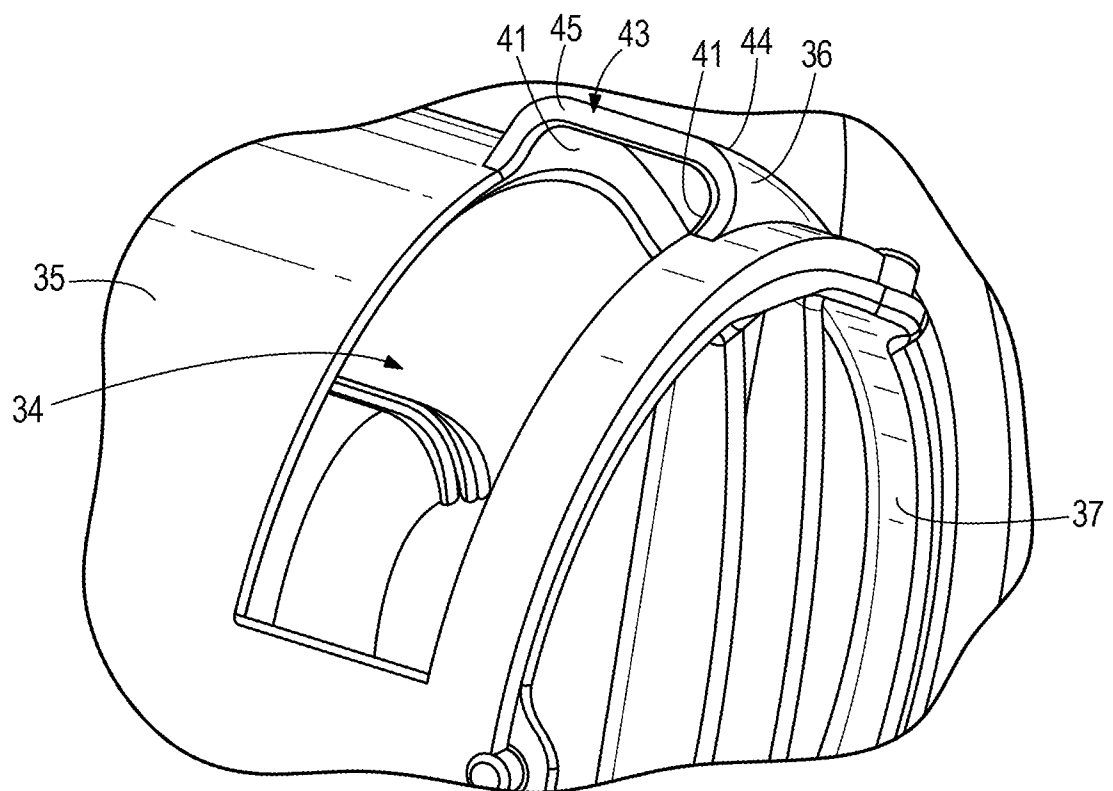
**FIG. 4**



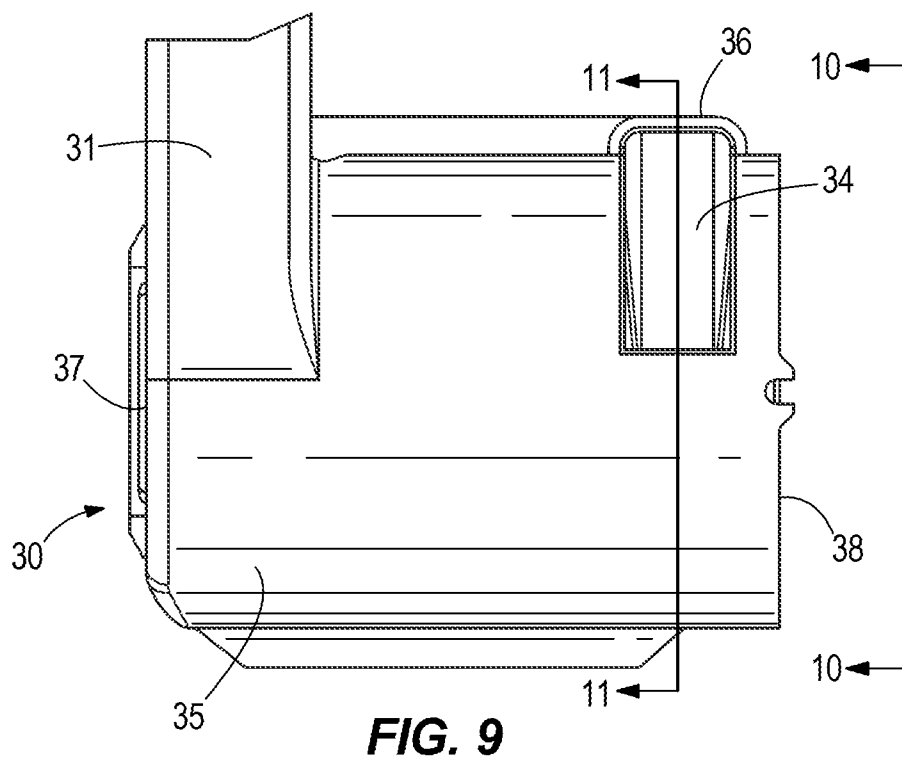
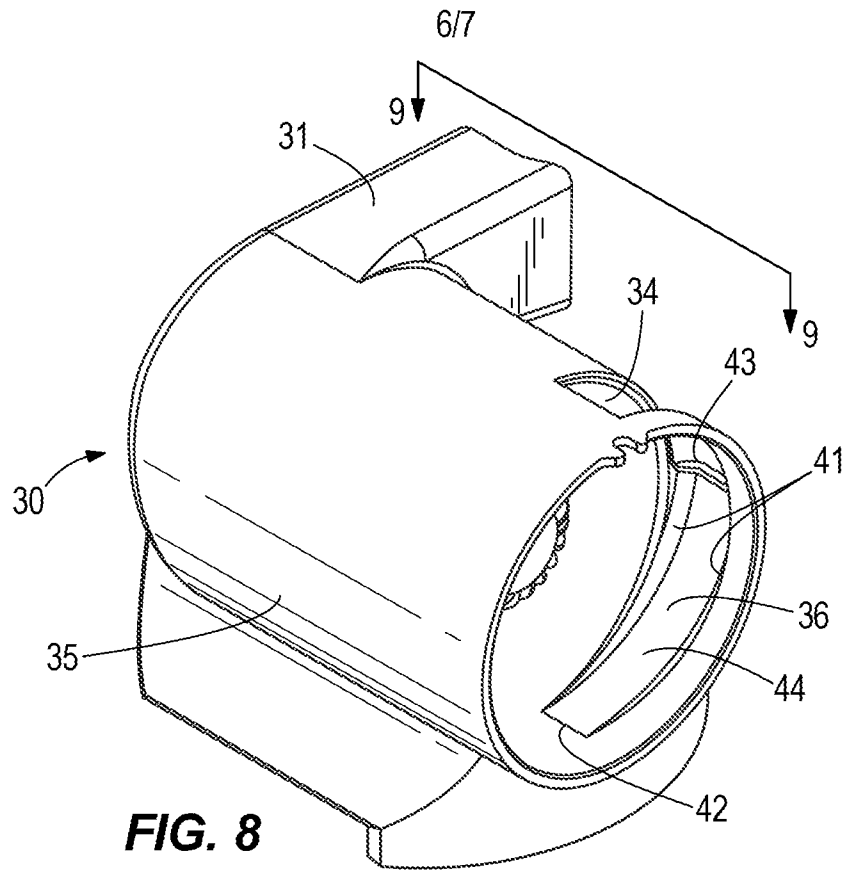
**FIG. 5**



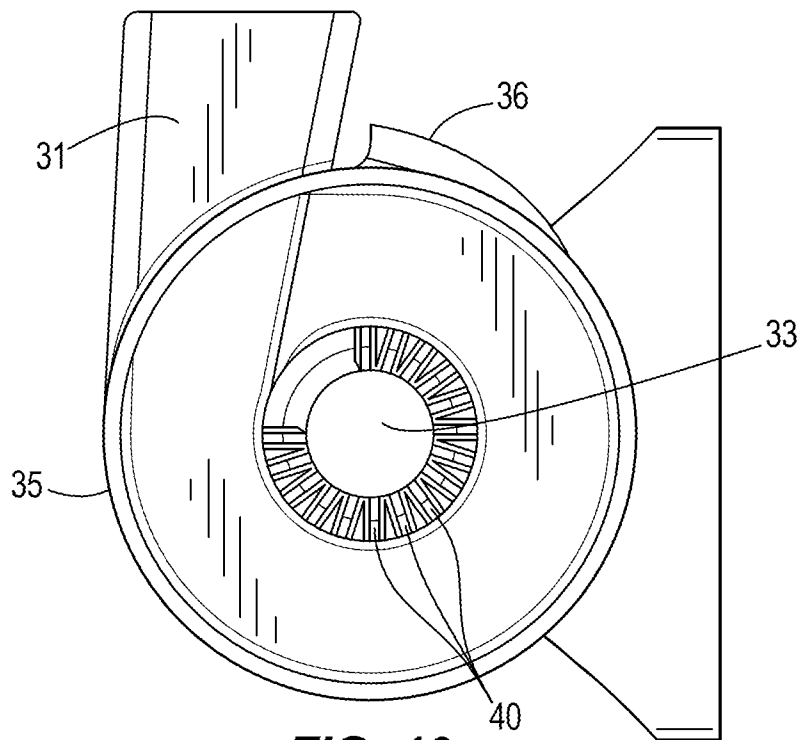
**FIG. 6**



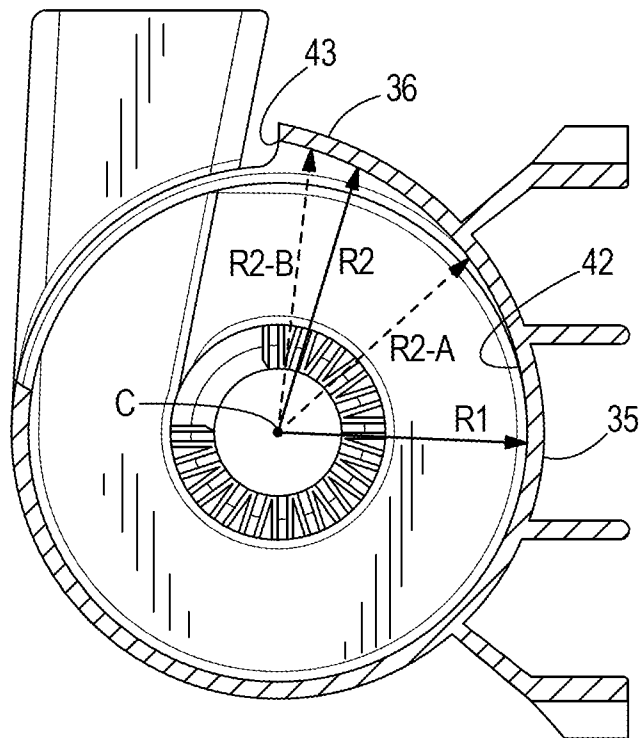
**FIG. 7**



7/7



**FIG. 10**



**FIG. 11**