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(54) **Vacuum cleaner.**

(57) A portable stick-type vacuum cleaner includes an elongated housing (10) and a substantially triangular nozzle (40) which is selectively securable to the housing. A V-shaped suction opening (48, 50) is located on the bottom surface of the nozzle. The nozzle also has a plurality of casters (62) located on its bottom surface. An air outlet member (70) is in fluid connection with the suction opening (48, 50). The air outlet member (70) includes a sleeve (71) pivotally mounted to the nozzle and a coupling (74) for selective fluid connection with the housing (10). The coupling (74) is connected to a first fan shell section (20). A second fan shell section (22) is secured to the first fan shell section such that a fan chamber is defined between them. An air outlet tube (30) is integral with the second fan shell section. A motor (26) is mounted on the air outlet tube for driving a fan (24) positioned in the fan chamber.

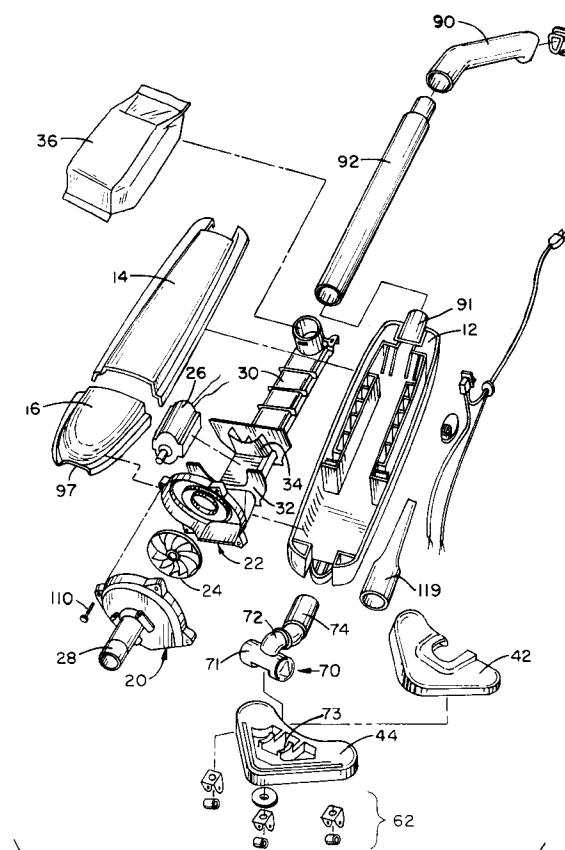


FIG.1

The invention relates to vacuum cleaners, such as small portable lightweight vacuum cleaners adapted to be hand carried.

The invention is particularly adapted for use with an elongated stick-type or broom-type vacuum cleaner. However, it should be appreciated by those of average skill in the art that the invention could also be utilized on a variety of other types of vacuum cleaner products.

Elongated stick or broom-type vacuum cleaners generally comprise an upstanding dust collecting assembly having a nozzle mounted on the lower end thereof. The nozzle generally comprises a housing which is rotatable in relation to the dust collecting assembly so that the dust collecting assembly can be manipulated relative to the nozzle. In this way, the nozzle can be moved under or around furniture in confined spaces and the like.

The ease of manipulation and maneuverability afforded by stick type vacuum cleaners has resulted in widespread use of such products. However, with conventional stick type vacuum cleaners, certain problems were faced either from the standpoint of efficiency in cleaning or from the standpoint of expense of manufacture. One problem has been that the nozzles of such stick vacuums could not successfully clean corners. Another problem has been the difficulty of pushing the nozzle back and forth on a carpeted surface. Still another problem has been that broom type vacuum cleaners are fairly small in size which by itself limits the size of the filter means that can be provided in such vacuum cleaners to trap and hold dirt. The size of the filter means is further limited by the space in the housing required for the air passages to direct the air from a suction stub of the vacuum cleaner to the filter means. In addition, in conventional stick type vacuum cleaners, numerous air path defining elements are required and this increases manufacturing and assembly costs.

Accordingly, it is desirable to develop a new and improved stick type vacuum cleaner which would overcome some or all of the foregoing difficulties and others while providing better and more advantageous overall results.

According to the present invention, a new and improved nozzle for a vacuum cleaner is provided.

More particularly in accordance with one aspect of the invention, the nozzle comprises a housing having a bottom surface and a top surface with the housing having a substantially triangular shape. A V-shaped suction opening, comprising a pair of linear openings, is located on the bottom surface of the housing. A pair of rear casters are located on the housing bottom surface, one adjacent a respective rear corner of the triangular housing. A means for pivotally mounting the pair of casters on the bottom surface of the housing is provided whereby the casters are capable of rotating 360 degrees around a vertical axis so as

to provide a swivelling action. This enables the nozzle to be used for cleaning along one of the linear openings and at an acute angle to another of the linear openings.

According to another aspect of the present invention, a new and improved air path for a vacuum cleaner is provided.

More particularly, in accordance with this aspect of the invention, the air path comprises a first fan shell section having a first end, at which is located a suction opening, and a second end and a second fan shell section having a first end and a second end, at which is located an outlet opening. An air outlet tube is located at the outlet opening and is of one piece with the second fan shell section. A means is provided for securing the first fan shell section second end to the second fan shell section first end in order to define a chamber between the first and second fan shells. A suction fan is located in the chamber for drawing a suction at the suction opening and directing air through the air outlet tube.

According to still another aspect of the present invention, a portable vacuum cleaner is provided.

More particularly in accordance with this aspect of the invention, the vacuum cleaner comprises a housing which is hollow and has first and second ends. Also provided are a first fan shell section, having a first end in which is located a suction opening, and a second end and a second fan shell section having a first end and a second end, at which is located an outlet opening. An air outlet tube located at the outlet opening, and is of one piece with the second fan shell section. A means is provided for securing the first fan shell second end to the second fan shell first end in order to define a fan chamber between the first and second fan shell sections. A suction fan is located in the chamber for drawing a suction at the suction opening and directing air through the air outlet tube. A means is provided for mounting the first and second fan shell sections and the air tube in the housing, wherein the first fan shell section is located at the first end of the housing and the air tube extends towards the second end of the housing. A motor is mounted in the housing and is connected to the suction fan for effecting a rotation of same. A nozzle is selectively securable to the housing first end.

One advantage of the present invention is the provision of a new and improved vacuum cleaner.

Another advantage of the present invention is the provision of a vacuum cleaner having a selectively detachable nozzle which is V-shaped and has a V-shaped suction opening on its bottom surface. This enables the nozzle to successfully clean corners, baseboards and the like.

Still another advantage of the present invention is the provision of a vacuum cleaner having a nozzle which is rotatably supported on a plurality of casters. The casters can be swiveling if desired. This enables

the nozzle to be smoothly moved in any direction over both carpeted and non-carpeted surfaces. Preferably, three such casters are provided in a triangular relationship on the bottom surface of a triangular nozzle.

Yet another advantage of the present invention is the provision of a stick type vacuum cleaner which has a selectively detachable hollow handle extension member. This member can be selectively secured between the handle and the housing or can be secured to a suction stem of the housing so as to extend the reach of the vacuum cleaner when it is used in a hand held manner for vacuuming, e.g. curtains, ceiling corners for cobwebs and the like.

Yet still another advantage of the present invention is the provision of a stick type vacuum cleaner which has a double pivoting system for a nozzle so as to provide the nozzle with 2 degrees of freedom.

A further advantage of the present invention is the provision of a stick type vacuum cleaner which has two separate handle means. A top handle is useful when the stick type vacuum cleaner is used for on-the-floor cleaning. Both handles can be utilized when the stick type vacuum cleaner is lifted for cleaning above-the-floor articles such as couches, curtains and the like.

A still further advantage of the present invention is the provision of a stick type vacuum cleaner having a nozzle that has a stepped front surface along its bottom face. This improves the air flow into the unit and also helps to reduce the effort needed to push the nozzle over carpeted surfaces.

A yet further advantage of the present invention is the provision of a stick type vacuum cleaner having a nozzle with an elongated opening, preferably in the shape of a V. Each leg of the nozzle opening has an inner section which is directly open to a hollow interior of the nozzle and a second outer section defined by a sloping wall surface. The sloping surface increases the velocity of air being sucked in from the end of the outer section toward the hollow nozzle interior thereby increasing the overall cleaning efficiency of the nozzle.

An additional advantage of the present invention is the provision of a stick type vacuum cleaner with a suction stub to which one can attach tools, a hose or a nozzle as desired.

Another advantage of the present invention is the provision of a stick type vacuum cleaner having a simplified air path which is more compact thereby allowing a larger filter bag capacity for the stick type vacuum cleaner.

Still another advantage of the present invention is the provision of a stick type vacuum cleaner which employs only a pair of fan shell sections. Integral with a first fan shell section is a suction stub. An air outlet tube is of one piece with a second fan shell section. This simplified construction allows for economies of

manufacture and assembly for the vacuum cleaner.

Yet another advantage of the present invention is the provision of a stick type vacuum cleaner having an air tube which is integral with a fan shell section with the air tube comprising at least one motor mounting wall for supporting the suction motor.

Still yet another advantage of the present invention is the provision of a stick type vacuum cleaner having an air tube which is integral with a motor shell half with the air tube including a transversely extending wall. This wall cooperates with a housing of the vacuum cleaner in order to define a filter chamber and a motor chamber in the housing.

Yet still another advantage of the present invention is the provision of a stick type vacuum cleaner having an air path which employs only a pair of fan shell sections. This provides a simplified duct design which is advantageous because it only requires one sealing joint in the air path, that being at the fan housing.

Still other benefits and advantages of the invention will become apparent to those skilled in the art upon a reading and understanding of the following detailed specification.

The invention may take form in certain components and structures, and a preferred embodiment will be described in detail in this specification and illustrated in the accompanying drawings wherein:

Figure 1 is an exploded perspective view of a vacuum cleaner according to the present invention; Figure 2 is an enlarged bottom plan view of a nozzle of the vacuum cleaner of Figure 1;

Figure 3 is a side elevational view in cross section of the nozzle of Figure 2;

Figure 4 is a side elevational view partially in cross section of a tubular handle extension of the vacuum cleaner of Figure 1;

Figure 5 is an enlarged side elevational view partially in cross section of a lower portion of the vacuum cleaner of Figure 1 in an assembled condition;

Figure 6 is a side elevational view of the vacuum cleaner of Figure 1 in an assembled condition as used for on-the-floor cleaning;

Figure 7 is a side elevational view of the vacuum cleaner of Figure 1 in an assembled condition as used for above-the-floor cleaning;

Figure 8 is an enlarged cross-sectional view through one linear suction opening of the nozzle of Figure 2;

Figure 9 is an enlarged perspective view of a first fan shell section of the vacuum cleaner of Figure 1; and,

Figure 10 is an enlarged perspective view of a second fan shell section of the vacuum cleaner of Figure 1.

Referring now to the drawings, wherein the showings are for purposes of illustrating a preferred

embodiment of the invention only and not for purposes of limiting same, Figure 6 shows a stick type vacuum cleaner A as it is used for on-the-floor cleaning whereas Figure 7 illustrates the vacuum cleaner when it has been reconfigured for use in off-the-floor cleaning. While the invention is primarily designed for and will hereinafter be described in connection with a stick type vacuum cleaner or broom type vacuum cleaner, it should be appreciated by those of average skill in the art that the invention could also be applied to various other types of vacuum cleaners.

Figure 6 illustrates that the vacuum cleaner A comprises an elongated housing 10. With reference now also to Figure 1, the housing 10 comprises a back housing half 12, a front housing half upper section or panel 14 and a front housing half lower section or motor cover 16. These are all secured together by conventional means.

Also provided is a fan shell first half 20 and a fan shell second half 22 which cooperate to together enclose a suction fan 24 powered by a motor 26. The fan shell first half 20 includes an integral suction stub 28. The fan shell second half 22 includes an integral air tube 30 and a pair of motor mounts 32, 34 for supporting the motor 26. The air tube 30 leads to a filter bag 36 that is positioned in the housing.

Figure 6 also shows a nozzle 40 that is secured to a lower end of the housing 10. With reference now again to Figure 1, the nozzle comprises a cover 42 and a base 44. With reference to Figure 2, the nozzle base includes a lower face 46. Located on the lower face are two suction openings 48 and 50 which together define a substantially V-shaped opening. As shown in Figure 3, the lower face 46 has a stepped appearance adjacent the nozzle openings 48 and 50, the step being identified by the numeral 51. The stepped lower surface improves air flow into the unit, i.e. into the suction openings 48 and 50. In addition, the stepped opening helps reduce the effort necessary to push the vacuum cleaner over carpeted surfaces and the like.

A V-shaped suction opening is advantageous for vacuuming corners, baseboards and the like. The V-shape of the suction opening on a V-shaped nozzle 40 enables one to successfully clean corners. In addition, the elongated suction opening provided along two side edges of the V-shaped nozzle 40 enables one to provide maximum cleaning efficiency adjacent baseboards and the like in a room. The openings communicate with a hollow interior 52 of the nozzle housing as illustrated in Figure 5.

With reference now to Figure 8, the suction openings, such as the suction opening 50 illustrated, each include first and second portions 53 and 54. The first portion 53 is directly open to the hollow interior 52 of the nozzle housing. In contrast, the second section 54 is defined by a sloping top wall 55 formed integral with the base 44. The wall 55 slopes so as to provide

a tapered passage. It is evident that the wall slope is such as to increase the depth of the section 54 towards the hollow interior 52. This construction has been found advantageous in that it promotes an increase in the velocity of the air which is sucked in from the section 54. This in turn promotes the cleaning efficiency of the nozzle.

Also provided on the lower face 46 are a pair of spaced brushes 56 and 58 that are located immediately behind the suction openings 48 and 50. These are useful to brush up dirt to be vacuumed. As shown in Figure 5, an integral bumper 60 encircles the substantially triangular front face of the nozzle 40. The bumper may be part of nozzle base 44.

Rotatably supporting the nozzle on a subjacent surface such as the floor surface 61, illustrated, e.g., in Figure 3, are a plurality of casters 62. As shown in Figure 2, preferably three such casters are provided. These are preferably spaced in a substantially triangular or V-shaped arrangement on the lower face 46 of the nozzle 40. Securing each of the casters 62 to the nozzle 40 is a suitable fastener 64 as perhaps can be best seen in Figure 3. It is preferred that the casters be located in indented sections 66 formed in the nozzle base lower face 46 so as to bring the suction openings 48 and 50 close to the subjacent surface 61 and to reduce the overall height of the nozzle so that it can glide under furniture. Therefore, three such indented sections 66 are provided one for each of the respective casters as can best be seen in Figure 2. The casters 62 can be swiveling casters if desired, or they can be rigidly mounted. Swiveling casters may be advantageous for certain applications.

With reference again to Figure 5, communicating with the hollow interior 52 of the nozzle 40 is a pivot assembly comprising a first, T-shaped, tube section 70 having a barrel 71 and a stem 72. The barrel is rotatably mounted in the nozzle 40 by a suitable first mounting means 73. Rotatably secured to the stem 72 of the first tube section 70 is a first end of a second, elbow-shaped, tube section 74 as by second mounting means 76. It is noted that the first and second mounting means 72 and 76 provide the housing 10 with two degrees of freedom in relation to the nozzle 40 because the first tube section 70 rotates in relation to the nozzle 40 in the plane of Figure 5 and the second tube section 74 rotates around the first tube section 70.

Located near a second end of the second tube section 74 in a manner spaced from the second mounting means 76 is an aperture 78 extending through the wall of the tube section. The suction stub 28 extends out of the housing 10 and into the second tube section 74 adjacent the aperture 78. A fastening means comprising a resiliently mounted fastening pin 82 is secured to the suction stub 28. The fastening pin 82 extends through a suitable aperture 84 in the stub and the mating aperture 78 in the second tube sec-

tion to selectively secure the second tube section 74 and hence the first tube section 70 and the nozzle 40 to the housing 10. It is noted that the first and second tube sections 70, 74 are permanently secured to each other in a rotatable manner and that the first tube section 70 is permanently secured in the nozzle 40 in a rotatable manner.

With reference again to Figure 1, the vacuum cleaner A also includes a first handle 90 that is secured normally to an extender 92 which, in turn, is secured to a handle stub 91 of the housing back half 12.

With reference now to Figure 4, the extender 92 is hollow and includes a first end 93 in which is secured a resiliently biased fastening pin 94. The extender 92 also has a second end 95 which is provided with a transverse aperture 96. It is evident that the extender 92 is hollow so as to provide an air path. Also provided on the housing is a second handle or hand grip portion 97 which is located on the front housing half lower section or motor cover 16.

Figure 6 illustrates an air vent opening 98 to allow cooling air to flow to the motor and exhaust air to flow therefrom. Also illustrated is an exhaust slot 99 through which filtered air from the filter bag 36 is exhausted.

In the normal configuration of the stick type vacuum cleaner, the extender 92 is positioned between the stub 91 and the first handle 90 as shown in Figure 6. This allows the vacuum cleaner to be used for conventional on-the-floor cleaning. However, by removing the extender 92, the first handle 90 can be secured directly to the handle stub 91 as the stub is also provided with the same kind of resiliently biased fastening pin as is illustrated by the numeral 94 in Figure 4 for the extender 92 and by the numeral 82 in Figure 5 for the suction stub 28. When this is done, the extender 92 can be secured to the stub 28 on the lower end of the housing 10 as is illustrated in Figure 7. Obviously, the extender 92 can only be secured to the suction stub 28 after the nozzle 40 is removed.

When this is accomplished, a suitable wand 119 can be secured to the first end 96 of the extender 92. This allows the user to employ the stick vacuum cleaner for above-the-floor cleaning such as the removal of cobwebs at ceiling corners or for the cleaning of curtains or the like. If desired, the wand 119 can be secured in a tool housing (not illustrated) provided on a rear side of the back housing half 12.

It should be appreciated that although the wand 119 is shown as being secured to the first end of the extender 92 in Figure 7, the nozzle 40 could be secured in that position if desired. Also, any other conventional vacuum cleaner tool, such as a conventional suction brush (not illustrated), can be suitably secured to the extender 92.

With reference now to Figure 9, the first fan shell section 20 is somewhat cup-shaped and has an end wall 100 from which the suction stub 28 extends in a

transverse manner. Provided on the end wall 100 are a pair of suitable fastener receiving housing elements 102 to which fasteners can be secured for holding the fan shell in the housing 10. Provided on the outer periphery of the end wall 100 is a skirt section 104 which extends away from the suction stub 28. Extending radially outwardly from the skirt 104 are a plurality of ears 106. Each of the ears has a through bore 108 for accommodating a suitable fastener 110 (see Fig. 1).

The fasteners serve to secure the first fan shell section 20 to the second fan shell section 22. With reference now to Figure 10, this is accomplished by way of aligned ears 120 having apertures 122 that are aligned with the apertures 108 on the ears 106 in order to allow the fastener to secure the two fan shell sections together. The ears 120 are located on a skirt 124 extending downwardly from an end wall 126. The end wall 126 of the second fan shell section 22 is parallel to the end wall 100 of the first fan shell section 20. The two end walls 100 and 126 together with the two skirts 104 and 124 cooperate to define a chamber 128 for housing the fan 24. Extending through the second end wall 126 is an aperture 130 for accommodating an end 132 of the motor 26 as can best be seen in Figure 5 of the drawings.

As mentioned, the motor 26 is supported by a pair of mounting walls 32 and 34 which are located on the air tube 30. To this end, each of the mounting walls includes a suitable cutout 136, 138 sized to support the motor 26. Located adjacent the second mounting wall 34 is a chamber-defining end wall 140 which separates the motor chamber of the vacuum cleaner from the filter containing chamber.

The second fan shell section 22 also includes a radially outwardly positioned aperture 142 that leads to a through bore 144 in the air tube 30. The through bore in turn terminates in a transversely oriented opening 146 defined by a collar 148. The collar 148 is adapted to cooperate with the dust bag 36 illustrated in Figure 1 of the drawings. Located adjacent the collar 148 is an ear 150 having a suitable bore 152 extending therethrough for accommodating a suitable fastener in order to secure the air tube to the back housing section 12.

The provision of a pair of fan shell sections 20 and 22 which, respectively, include the suction stub 28 and the air tube 30 is advantageous from the standpoint that it provides economies of manufacture for the vacuum cleaner. More specifically, the suction stub 28 is of one piece with the first fan shell section 20 and the air tube 30 is of one piece with the second fan shell section 22. Preferably, these components are made from a suitable thermoplastic material which can be, e.g., injection molded into the correct shape for use in the housing 10.

In addition, the provision of an air tube 30 immediately adjacent the second fan shell section at the radially outer periphery thereof makes for a more com-

pact vacuum cleaner suction path leading to the filter bag 36. This enables the provision of a more compact air path system which results in larger bag capacity for the stick type vacuum cleaner. Also, the provision of such an efficient air path allows the use of a smaller motor 26 to power the fan 24 and yet still allows the necessary suction to be drawn at the nozzle 40 of the vacuum cleaner.

Further, the provision of a two piece fan housing, i.e. the fan shell sections 20 and 22 which respectively include an integral suction stub 28 and an integral air tube 30 is advantageous from the standpoint that the air path now requires only one sealing joint, i.e. at the fan housing. Thus there is likely to be less leakage of air from the air path. A higher level of suction is thus more likely to be drawn by the suction fan 24.

The invention has been described with reference to a preferred embodiment. Obviously, modifications and alterations will occur to others upon a reading and understanding of this specification. It is intended to include all such modifications and alterations insofar as they come within the scope of the appended claims.

Claims

1. A nozzle for a vacuum cleaner, comprising:
 - a housing having a bottom surface and a top surface, said housing having a V-shaped leading edge; and
 - a V-shaped suction opening located on said bottom surface of said housing, said V-shaped suction opening comprising a pair of linear openings.
2. The nozzle of claim 1, further comprising:
 - first and second casters located on said bottom surface of said housing adjacent respective free ends of said V-shaped suction opening; and
 - means for pivotally mounting said casters on said bottom surface of said housing whereby each caster is capable of rotating 360 degrees around a vertical axis;
 - wherein each caster is preferably located in a respective indented section of said bottom surface.
3. The nozzle of claim 1 or 2, wherein each linear opening includes a first section which communicates with a hollow interior of said housing and a second section defined by an angled wall of said housing bottom surface.
4. The nozzle of any of claims 1 to 3, further comprising a stepped area located on said bottom surface of said housing in front of said suction

opening.

5. An air path assembly for a vacuum cleaner, comprising:
 - a first fan shell section having a first end, at which is located a suction opening, and a second end;
 - a second fan shell section having a first end and a second end at which is located an outlet opening;
 - an air outlet tube located at said outlet opening and integral with said second fan shell section;
 - means for securing said second end of said first fan shell section to said first end of said second fan shell section in order to define a chamber between said first and second fan shell sections; and
 - a suction fan located in said chamber for creating suction at said suction opening and directing air through said air outlet tube.
6. The air path assembly of claim 5, wherein said outlet opening of said second fan shell section is located at a radially outer periphery of said second fan shell section.
7. The air path assembly of claim 5 or 6, further comprising a suction stub located at said suction opening and integral with said first fan shell section.
8. The air path assembly of any of claims 5 to 7, wherein said air outlet tube further comprises a mounting wall for accommodating a motor which drives said suction fan.
9. The air path assembly of any of claims 5 to 8, wherein said means for securing said first and second fan shell sections together comprises cooperating ears located on said first and second fan shell sections and a fastener for securing said ears together.
10. A portable vacuum cleaner comprising:
 - a housing, said housing being hollow and having first and second ends;
 - the air path assembly of any of claims 5 to 9;
 - means for mounting said first and second fan shell sections and said air outlet tube in said housing, wherein said first fan shell section is located at said first end of said housing and said air outlet tube extends towards said second end of said housing;
 - a motor mounted in said housing and connected to said suction fan; and
 - a nozzle which is selectively securable to

said housing first end.

11. The vacuum cleaner of claim 10, wherein said nozzle comprises:

a nozzle body comprising a base having a top surface and a bottom surface and a cover having a top surface and a bottom surface, said base and cover defining a hollow interior therebetween; and

a V-shaped suction opening located on said base bottom surface, wherein said V-shaped suction opening comprises a pair of linear openings each including a first section which communicates with said hollow interior and a second section defined by an angled wall of said base bottom surface.

12. The vacuum cleaner of claim 11, wherein said nozzle further comprises an air outlet pivot assembly, said air outlet pivot assembly comprising:

a first tubular section pivotally mounted between said base top surface and said cover bottom surface; and

a second tubular section rotatably mounted on said first tubular section and extending through said cover, wherein said second tubular section is selectively securable to said first end of said first fan shell section.

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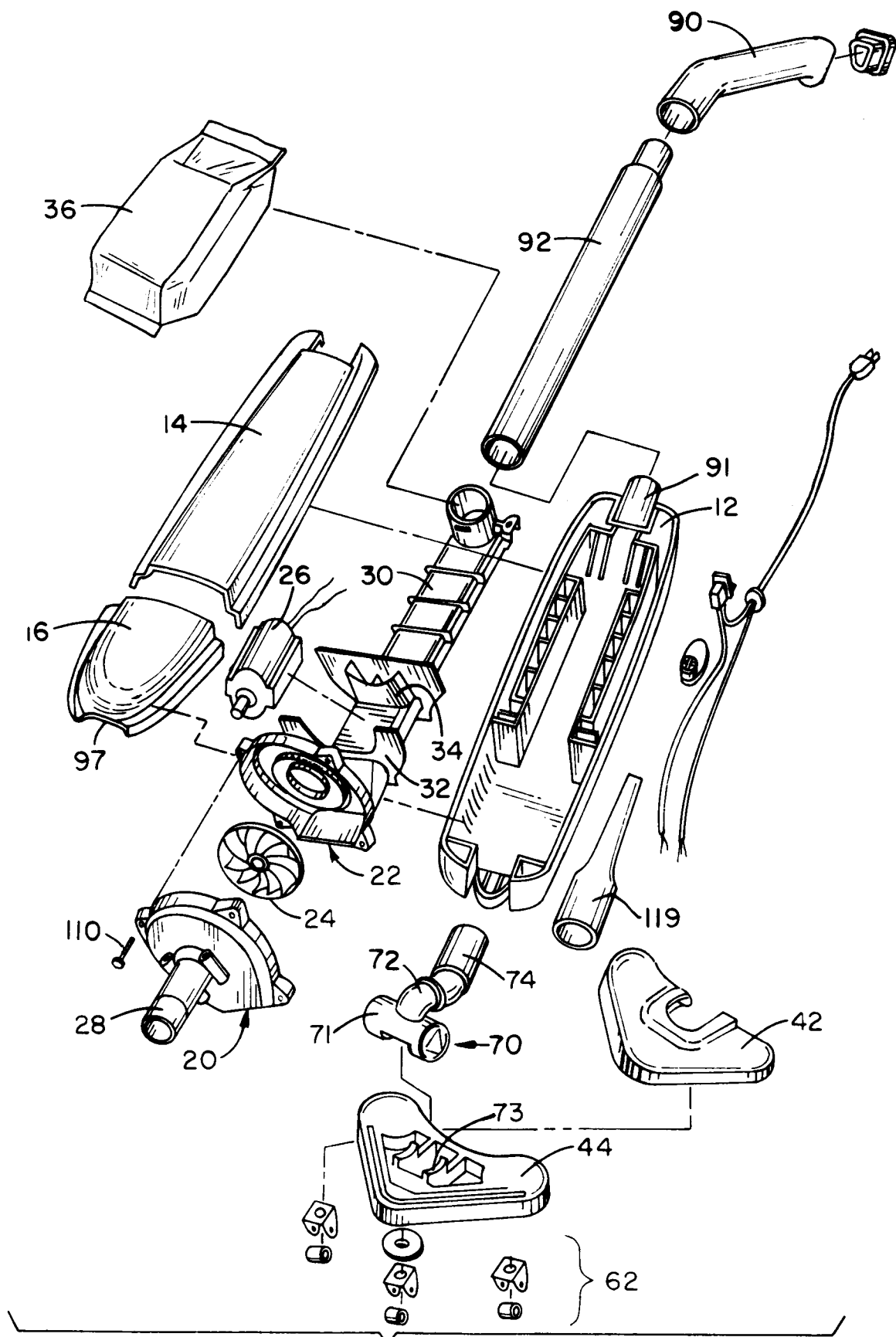
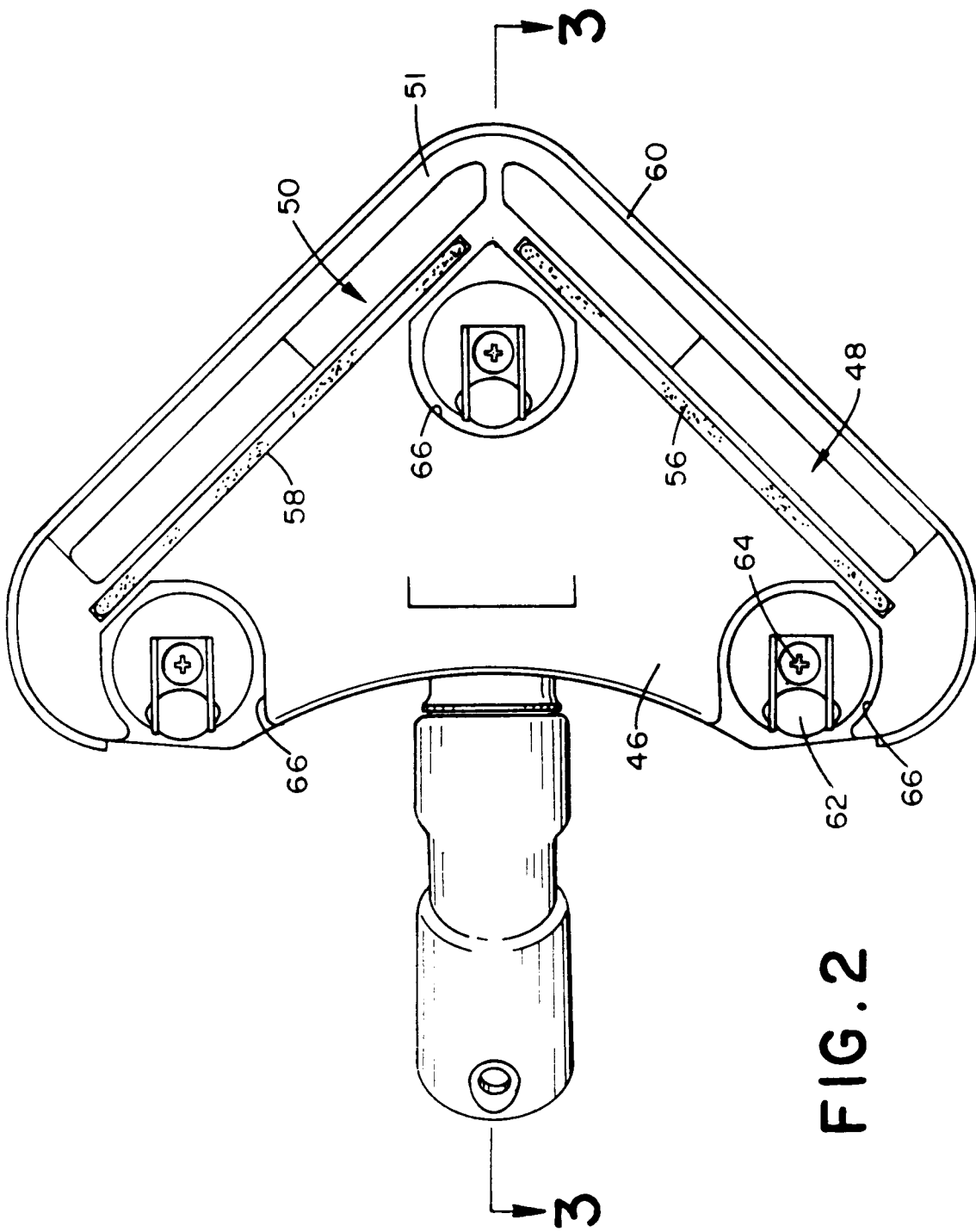


FIG.1



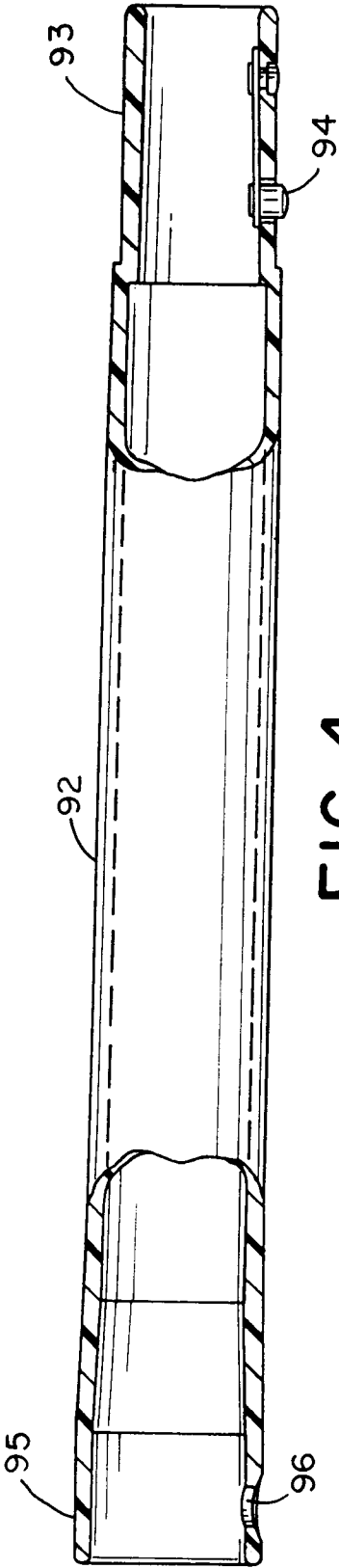
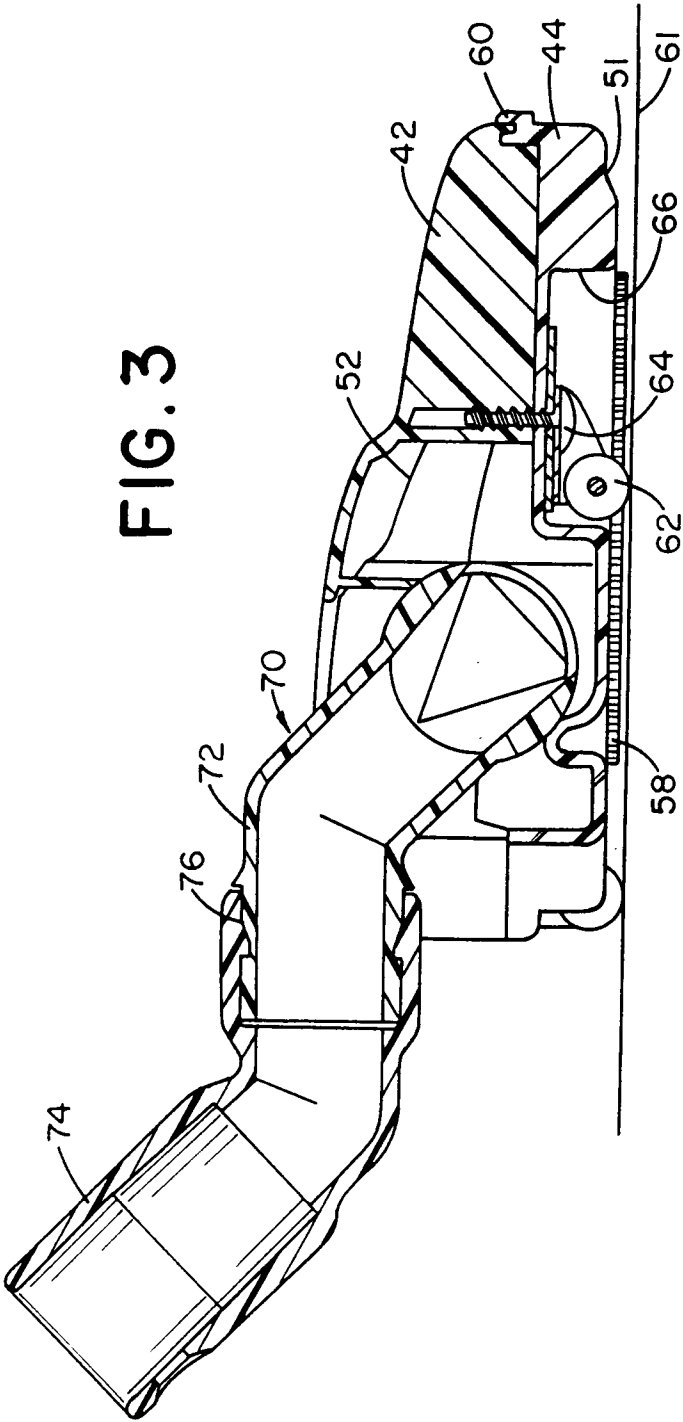


FIG. 5

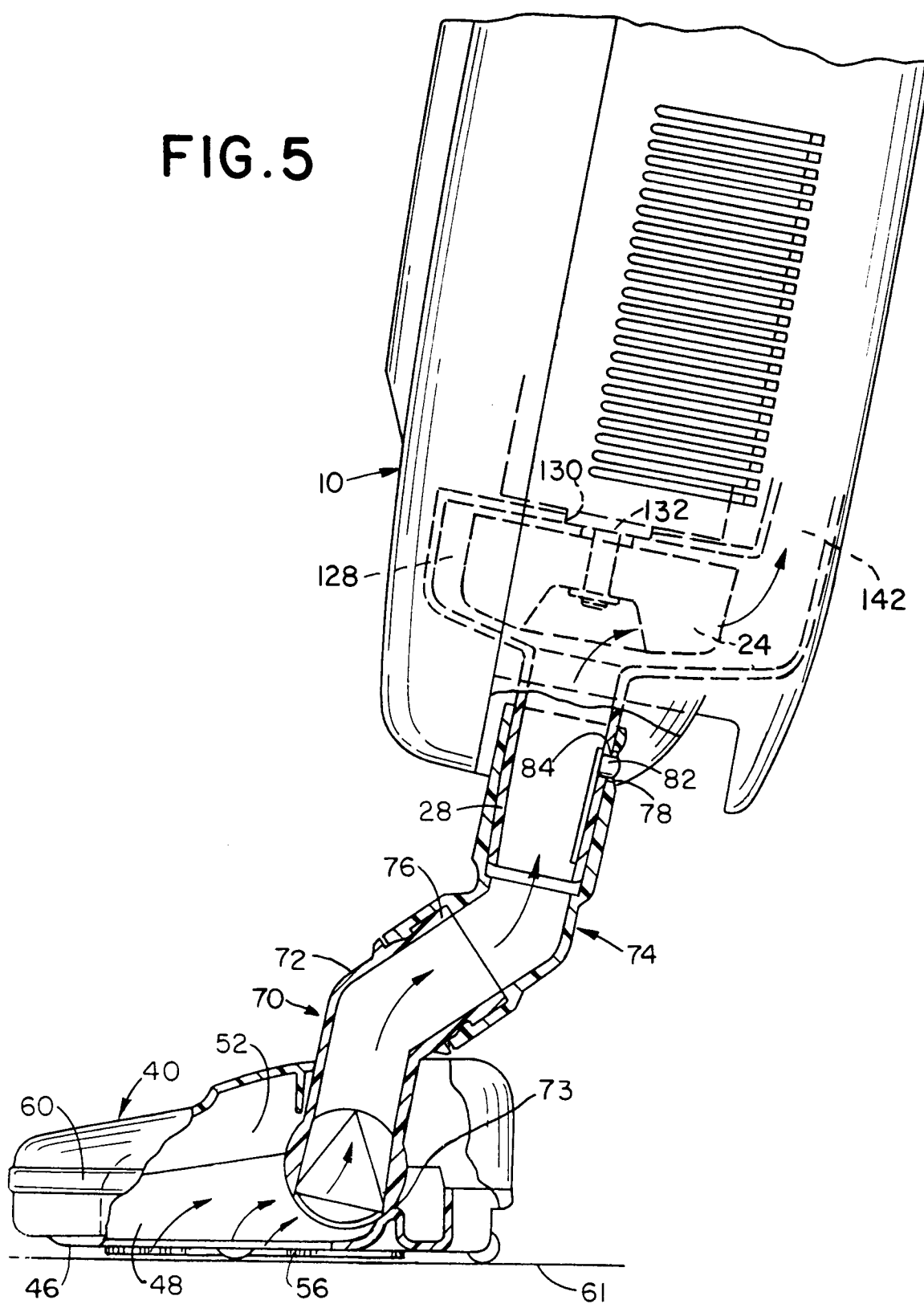
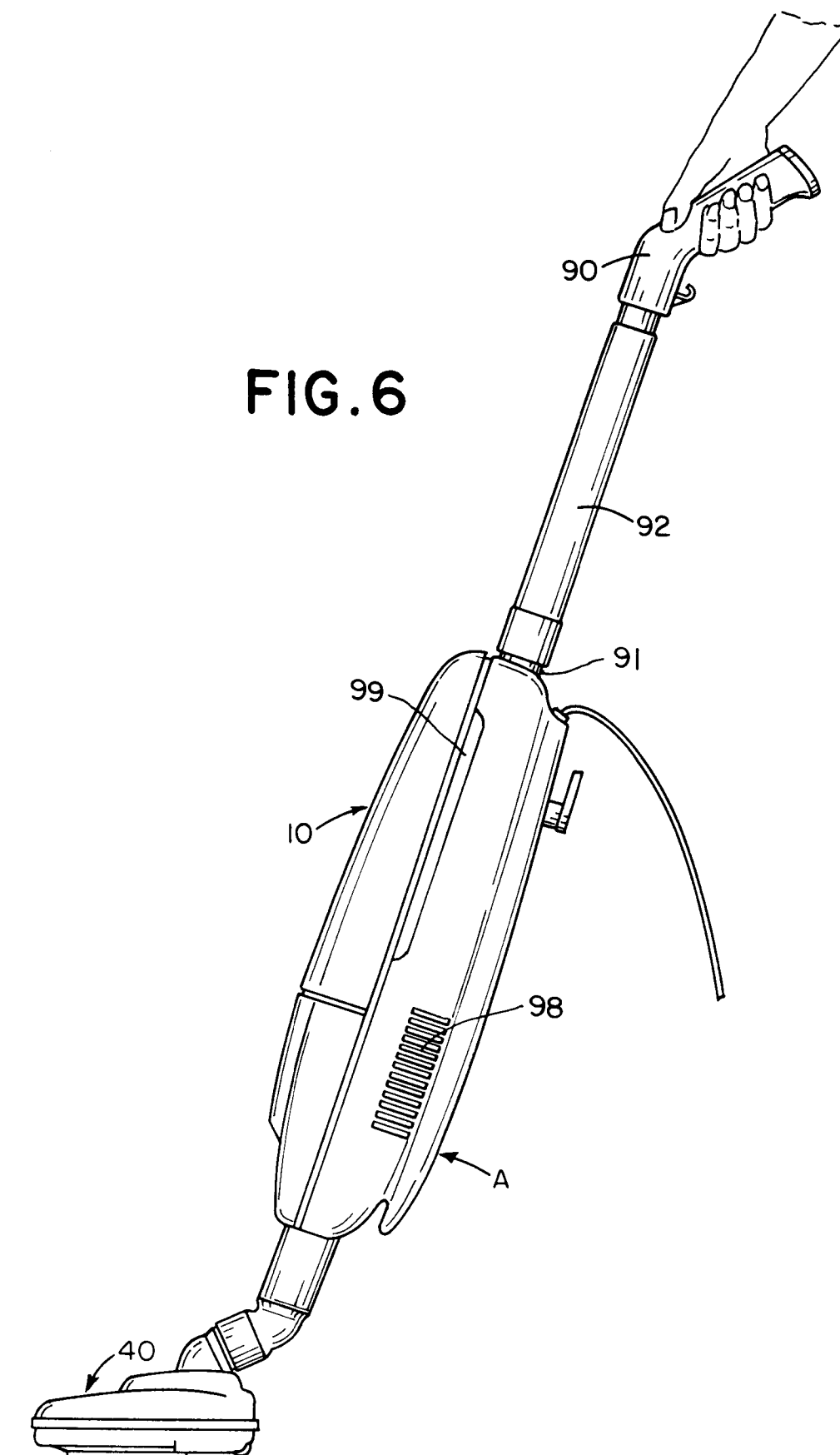
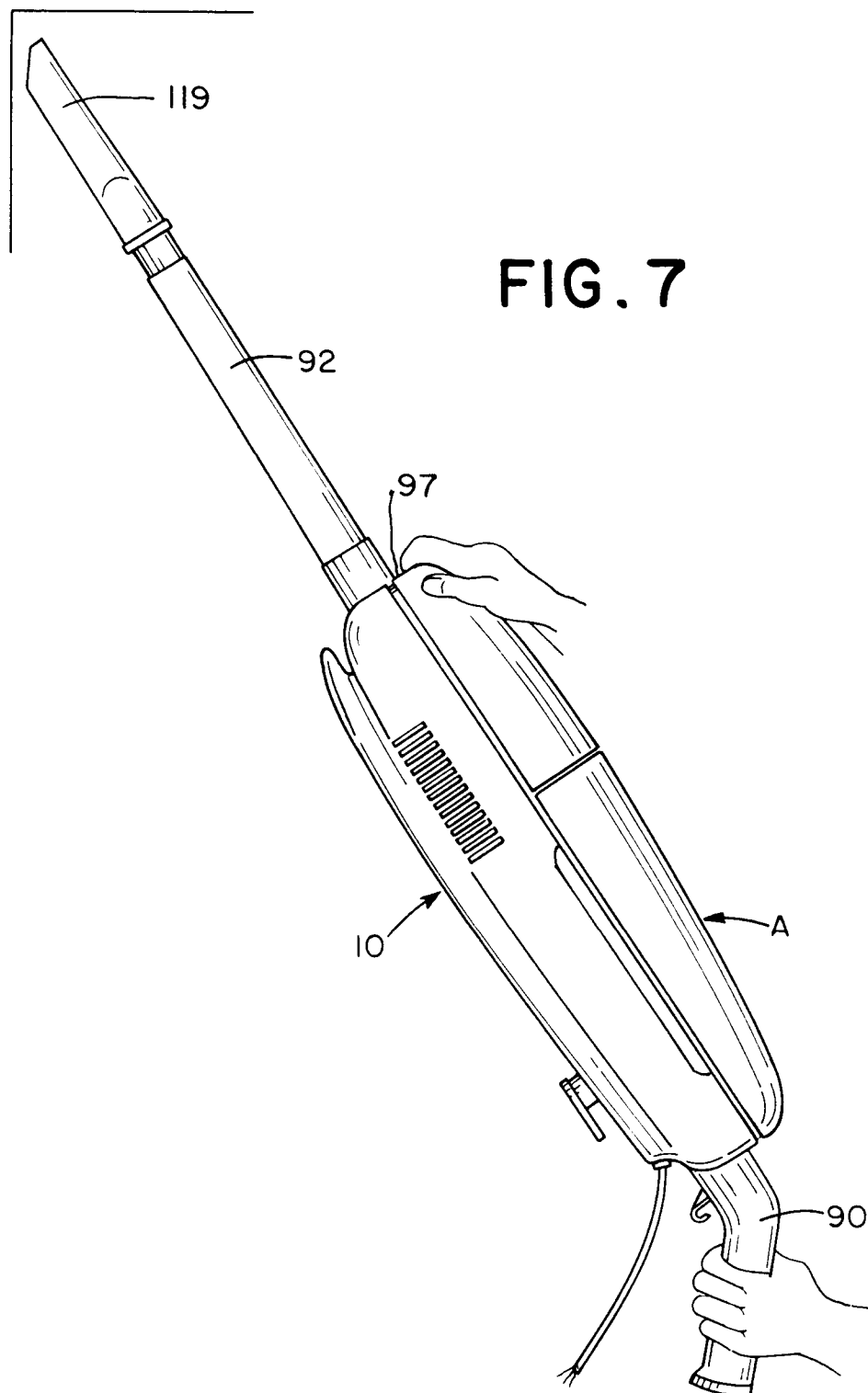


FIG. 6





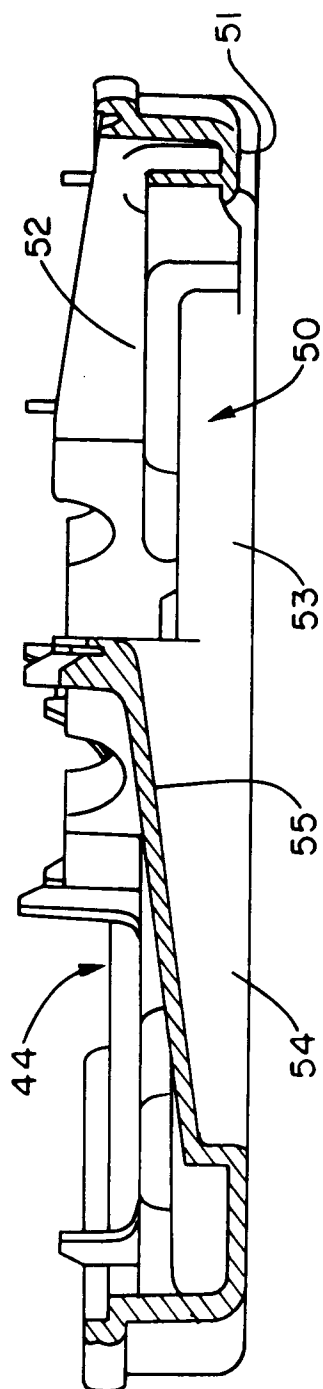


FIG. 8

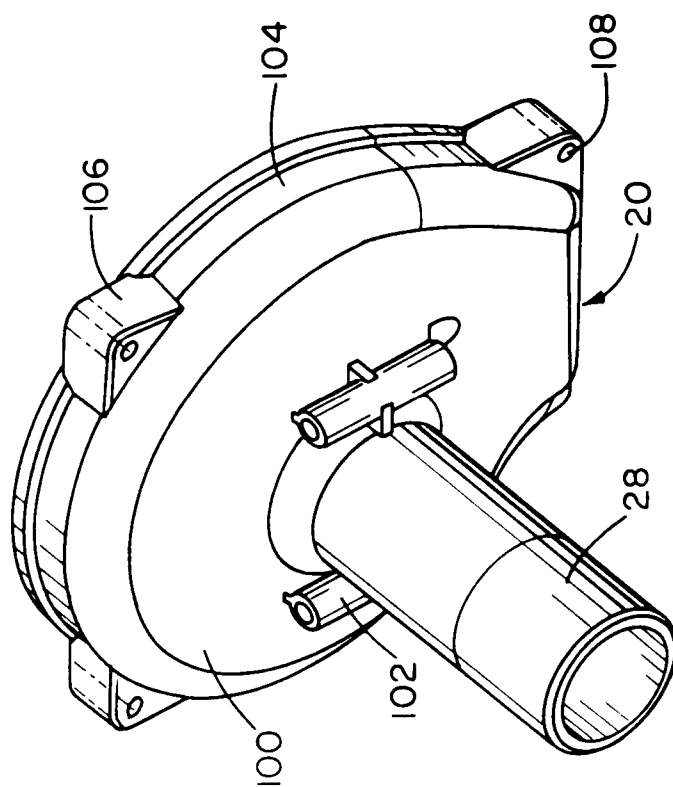


FIG. 9

FIG. 10

