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(54) Exhaust assembly

(57) The present invention discloses an exhaust assembly for optimizing flow of a fluid. The exhaust assembly includes a housing (24). A treatment device (42) is disposed within the housing. A conduit (56) is in fluid communication with the housing. A bracket (66) is coupled to the conduit and defines at least one aperture (76). A flow modifier (78) comprising a mounting portion (80) is coupled to the bracket. The mounting portion and the bracket divide the flow of the fluid into a first stream and a second stream. The flow modifier further includes a body portion (88) extending from the mounting portion. The body portion is disposed in the housing. The mounting and body portions define an inner chamber (102) and an outer surface (104). The first stream flows through the inner chamber and the second stream flows through the aperture and over the outer surface for dispersing the fluid across the upstream face of the treatment device.

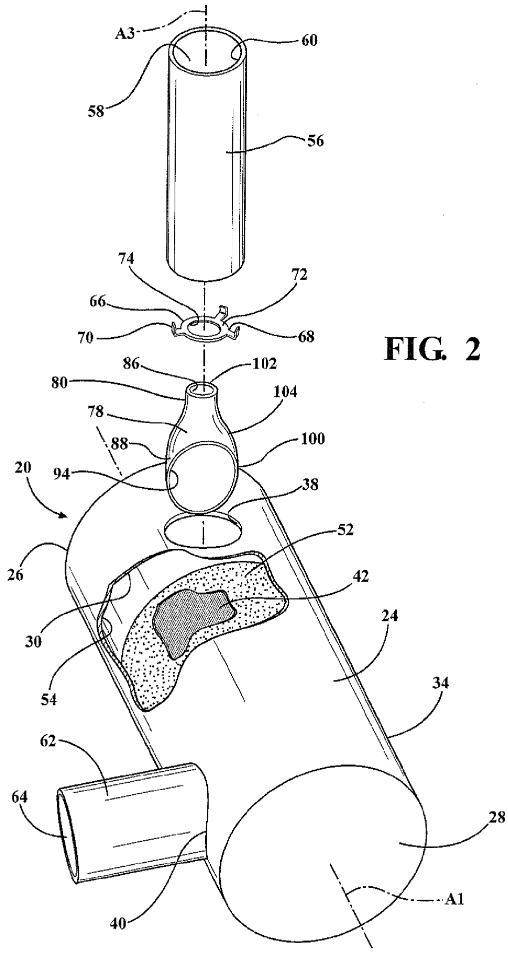

FIG. 2

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to an exhaust assembly for a vehicle.

BACKGROUND

[0002] Various exhaust assemblies are known in the industry for optimizing flow of a fluid through the exhaust assembly. Flow optimization is preferred to achieve even disbursement across a treatment device to increase the efficiency and the longevity of treatment devices. If the fluid is not evenly disbursed, the efficiency is decreased because portions of the treatment device are not used to the full potential. The longevity of the treatment device may be reduced if an area receives more concentrated flow than designed which could lead to the treatment device deteriorating quicker than intended.

[0003] Many exhaust assemblies rely on the natural turbulent flow created in the exhaust assembly to disperse the fluid flow across the treatment device. Furthermore, the industry has added various flow modifiers to exhaust assemblies to optimizing fluid flow. However, these require flow modifiers to be coaxial with the treatment device. Therefore, there remains an opportunity to develop an exhaust assembly with a flow modifier that can be coaxial, angled, or transverse to the treatment device to optimize the fluid flow for more even disbursement across a treatment device.

SUMMARY OF THE INVENTION AND ADVANTAGES

[0004] The present invention provides an exhaust assembly for optimizing flow of a fluid, said assembly comprising:

a housing having an end wall and a circumferential wall at least partially defining a forward cavity and an outlet spaced from said forward cavity;
a treatment device defining a central axis and having an upstream face with said treatment device disposed within said housing between said forward cavity and said outlet;
a conduit in fluid communication with said forward cavity of said housing;
a bracket coupled to said conduit and defining at least one aperture between said conduit
and said bracket; and
a flow modifier comprising:

a mounting portion coupled to said bracket and defining a first diameter with said mounting portion and said bracket dividing the flow of the fluid into a first stream and a second stream, and
a body portion extending from said mounting portion and disposed in said forward cavity with said body portion defining a second diameter greater than said first diameter with said mounting portion and said body portion together defining an inner chamber and an outer surface spaced from said inner chamber spanning said mounting portion and said body portion with said first stream flowing through said inner chamber and said second stream flowing through said aperture and over said outer surface for dispersing the fluid across said upstream face of said treatment device.

[0005] Accordingly, the present invention provides an exhaust assembly for optimizing fluid dispersion in a forward cavity and across a treatment device utilizing a flow modifier that is not required to be coaxial with the treatment device. Furthermore, the compact size and the multiple possible placements of the flow modifier allows for versatile routing and positioning of the exhaust assembly in relationship to other components of the vehicle.

[0006] Preferably, said outer surface expands in diameter from said first diameter of said mounting portion to said second diameter of said body portion along a curvilinear path for dispersing the fluid across said upstream face of said treatment device.

[0007] Said bracket can include at least one arm for coupling said flow modifier to said conduit.

[0008] Preferably, said bracket has a body defining a hole for receiving the mounting portion of said flow modifier with said arms extending outward from said body.

[0009] Preferably, said conduit defines a second axis transverse to said central axis with said flow modifier positioned along said second axis and configured to disperse the fluid across said upstream face of said treatment device.

[0010] Preferably, said body portion of said flow modifier defines an angled surface directed toward said upstream face of said treatment device.

[0011] Preferably, said outer surface is configured to spread fluid flow within said forward cavity toward said upstream face.

[0012] Said inner chamber and said outer surface can be configured to spread fluid flow within said forward cavity toward said end wall and said circumferential wall to deflect the fluid toward said upstream face.

[0013] Preferably, said body portion of said flow modifier defines an end surface parallel with said upstream face of said treatment device.

[0014] Preferably, said conduit defines a third axis angled relative to said central axis with said flow modifier positioned along said third axis and configured to disperse the fluid across said upstream face of said treatment device.

[0015] Said inner chamber and said outer surface can be configured to spread fluid flow within said forward cavity toward said upstream face.

[0016] Preferably, said outer surface is configured to spread fluid flow within said forward cavity toward said circumferential wall to deflect the fluid toward said upstream face.

[0017] Said flow modifier can be positioned along said central axis and configured to disperse the fluid across said upstream face of said treatment device.

[0018] Said inner chamber and said outer surface can be configured to deflect fluid flow within said forward cavity toward said upstream face.

[0019] Said outer surface can be configured to spread fluid flow within said forward cavity toward said circumferential wall to deflect the fluid toward said upstream face.

[0020] Preferably, said body portion of said flow modifier defines a plurality of perforations for allowing the fluid to flow through said perforations to disperse the fluid in said forward cavity and across said upstream face of said treatment device.

[0021] Preferably, said body portion of said flow modifier defines a plurality of slots for allowing the fluid to flow through said slots to disperse the fluid in said forward cavity and across said upstream face of said treatment device..

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Other advantages of the present invention will be readily appreciated, as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings. The description is provided by way of example only and not in any limitative sense.

[0023] Figure 1 is a perspective view of an internal combustion engine and an exhaust assembly.

[0024] Figure 2 is an exploded view of the exhaust assembly.

[0025] Figure 3 is a perspective view of the exhaust assembly with certain components in phantom.

[0026] Figure 4 is a fragmented cross-sectional side view of the exhaust assembly;

[0027] Figure 5 is a fragmented perspective view of the exhaust assembly.

[0028] Figure 6 is a perspective side view of a flow modifier.

[0029] Figure 7 is a front view of the flow modifier.

[0030] Figure 8 is a side view of the flow modifier.

[0031] Figure 9 is a perspective view of a second embodiment of the exhaust assembly.

[0032] Figure 10 is a fragmented cross-sectional partially side view of the second embodiment of the exhaust assembly.

[0033] Figure 11 is a perspective view of a second embodiment of the flow modifier.

[0034] Figure 12 is a partially cross-sectional perspective view of a third embodiment of the exhaust assembly.

[0035] Figure 13 is a perspective view of the flow modifier from the third embodiment of the exhaust assembly.

[0036] Figure 14 is a perspective view of the flow modifier of the first embodiment having a plurality of perforations.

[0037] Figure 15 is a perspective view of the flow modifier of the first embodiment having a plurality of slots.

DETAILED DESCRIPTION OF THE INVENTION

[0038] Referring to the Figures wherein like numerals indicate like or corresponding parts throughout the several views, an exhaust assembly 20 for optimizing flow of exhaust gases as generally shown in Figure 1. The exhaust assembly 20 is in communication with an internal combustion engine 22. Referring also to Figure 2 and 3, the exhaust assembly 20 includes a housing 24 having a longitudinal axis A1 with the housing 24 extending along the longitudinal axis A1. The housing 24 has a substantially cylindrical configuration. The housing 24 has a first end 26 and a second end 28. The housing 24 defines a housing chamber 30 between the first end 26 and second end 28.

[0039] Turning to Figure 4, the housing 24 has an end wall 32 disposed at the first end 26. The housing 24 further includes a circumferential wall 34. Furthermore, the housing 24 has an inner surface 36 disposed within the housing chamber 30 along the circumferential wall 34. It is to be appreciated that the housing 24 can be any suitable configuration for conveying exhaust gas flow.

[0040] Referring back to Figure 2, the housing 24 defines an inlet 38 and an outlet 40. The inlet 38 is spaced from the outlet 40 such that the inlet 38 is adjacent to the first end 26 and the outlet 40 is adjacent to the second end 28. The inlet 38 and the outlet 40 extend through the housing 24 into the housing chamber 30. More specifically, the inlet 38 extends into the housing chamber 30 transverse to the longitudinal axis A1. The outlet 40 extends into the housing chamber 30 transverse to the longitudinal axis A1.

[0041] The exhaust assembly 20 includes a treatment device 42 having a substantially cylindrical configuration. Turning to Figure 4, the treatment device 42 further defines a central axis A2. the treatment device 42 has an entry end 44 and an exit end 46 (shown in Figure 3) disposed along the central axis A2 with the entry and exit ends 44, 46 opposing each other. The treatment device 42 includes an upstream face 48 disposed at the entry end 44. The treatment device 42 defines a plurality of treatment chambers 50 that extend through the treatment device 42 from the entry end 44 to the exit end 46. More specifically, each of the treatment chambers 50 of the treatment device 42 have a hexagonal configuration. However, it is to be appreciated that the treatment device 42 may be of any suitable type and the treatment chambers 50 can be any suitable configuration for conveying exhaust gas flow.

[0042] The exhaust assembly 20 includes a mat 52 disposed around the treatment device 42 between the treatment device 42 and the housing 24. More specifically, the mat 52 surrounds the treatment device 42 relative to the central axis A2. As appreciated by those skilled in the art, the mat 52 may be of any suitable type or configuration.

[0043] The treatment device 42 is disposed in the housing 24 between the inlet 38 and the outlet 40. More specifically, the treatment device 42 and the mat 52 are disposed within the housing chamber 30 of the housing 24 such that the central axis A2 of the treatment device 42 and the longitudinal axis A1 of the housing 24 are coaxial. The mat 52 abuts the inner surface 36 of the housing 24 to secure the treatment device 42 in the housing chamber 30 between the inlet 38 and the outlet 40. The end wall 32 and the circumferential wall 34 at least partially define a forward cavity 54 in the housing 24. More specifically the end wall 32 and the circumferential wall 34 of the housing 24 and the upstream face 48 of the treatment device 42 define a forward cavity 54 in the housing chamber 30. As stated above, the outlet 40 is adjacent to the second end 28 such that the outlet 40 is spaced from the forward cavity 54. As further stated above, the treatment device 42 is disposed within housing 24 such that the treatment device 42 is disposed between the forward cavity 54 and the outlet 40.

[0044] As best shown in Figures 2 and 3, the exhaust assembly 20 includes a conduit 56 in fluid communication with the forward cavity 54 of the housing 24. Furthermore, the conduit 56 has a conduit surface 58 defining an inlet passageway 60. The conduit 56 is coupled to the circumferential wall 34 of the housing 24. More specifically, the conduit 56 surrounds the inlet 38 of the housing 24 such that the inlet passageway 60 of the conduit 56 and the forward cavity 54 of the housing 24 are in fluid communication through the inlet 38. The conduit 56 defines a second axis A3 transverse to the central axis A2 such that the conduit 56 extending along the second axis A3.

[0045] The exhaust assembly 20 includes a tube 62 in fluid communication with the housing chamber 30 of the housing 24. Furthermore, the tube 62 defines an outlet passageway 64. The tube 62 is coupled to the circumferential wall 34 of the housing 24. More specially, the tube 62 surrounds the outlet 40 of the housing 24 such that the outlet passageway 64 of the tube 62 and the housing chamber 30 of the housing 24 are in fluid communication through the outlet 40.

[0046] As best shown in Figures 2-5, the exhaust assembly 20 includes a bracket 66 coupled to the conduit 56. More specifically, the bracket 66 is disposed in the inlet passageway 60 of the conduit 56 near the inlet 38 of the housing 24. The bracket 66 includes at least one arm 68. More specifically, the bracket 66 includes three arms 68 with each arm 68 having a flange 70. The flanges 70 of the bracket 66 abut and are coupled to conduit surface 58 of the conduit 56. It is to be appreciated that the bracket 66 could include a single arm 68 or a plurality of arms 68 for coupling the bracket 66 to the conduit 56. The bracket 66 has a body 72 defining a hole 74 with the arms 68 outward from the body 72 such that the body 72 of the bracket 66 has a substantially circular configuration. The arms 68 are spaced radially about the bracket 66 and the second axis A3.

[0047] Referring specifically to Figure 5, the bracket 66 further defines at least one aperture 76 between the conduit 56 and the bracket 66. More specifically, the body 72 and the arms 68 of the bracket 66 and the conduit surface 58 of the conduit 56 define three apertures 76. The apertures 76 are spaced radially about the bracket 66 and the second axis A3.

[0048] As best shown in Figures 2-5, the exhaust assembly 20 includes a flow modifier 78 comprising a mounting portion 80 coupled to the bracket 66. As stated above, the bracket 66 has a body 72 defining a hole 74 such that the hole 74 of bracket 66 receives the mounting portion 80 of the flow modifier 78. More specifically, the mounting portion 80 of the flow modifier 78 is disposed in the hole 74 of the bracket 66.

[0049] As mentioned above, the bracket 66 includes the at least one arm 68 for coupling the flow modifier 78 to the conduit 56. The bracket 66 is coupled to the conduit 56 in the inlet passageway 60 of the conduit 56 such that the flow modifier 78 is positioned along the second axis A3. Furthermore, the mounting portion 80 extends through the inlet 38 of the housing 24 into the forward cavity 54 of the housing 24 along the second axis A3.

[0050] Turning to Figures 6-8, the mounting portion 80 of the flow modifier 78 defines a first diameter D1 such that the mounting portion 80 has a substantially cylindrical configuration. The mounting portion 80 further has a mounting end 84 defining a mounting opening 86.

[0051] Referring back to Figures 2-5, the flow modifier 78 further comprises a body portion 88 extending from the mounting portion 80 and disposed in the forward cavity 54. More specifically, the body portion 88 extends from the mounting portion 80 along the second axis A3 in the forward cavity 54 of the housing 24. Turning back to Figures 6-8, the body portion 88 defines a second diameter D2 such that the body portion 88 has a substantially cylindrical shape along the second axis A3. Furthermore, the body portion 88 has body end 92 defining a body opening 94.

[0052] The second diameter D2 of the body portion 88 is greater than the first diameter D1 of the mounting portion 80 such that the flow modifier 78 expands in diameter from the first diameter D1 of the mounting portion 80 to the second diameter D2 of the body portion 88 along a curvilinear path. More specifically, the diameter of the flow modifier 78 expands from the mounting portion 80 to the diameter of the body portion 88 along the second axis A3 in a bottle-shaped configuration. It is to be appreciated that the expansion configuration of the flow modifier 78 could be any suitable configuration for dispersing exhaust gas flow.

[0053] As generally shown in Figures 14 and 15, an embodiment of the body portion 88 of the flow modifier 78 defines a plurality of perforations 96 for allowing the exhaust gases to flow through the perforations 96 to disperse the exhaust gases in the forward cavity 54 of the housing 24 and across the upstream face 48 of the treatment device 42. Another embodiment of the body portion 88 of the flow modifier 78 defines a plurality of slots 98 for allowing the exhaust gases to flow through the slots 98 to disperse the exhaust gases in the forward cavity 54 of the housing 24 and across the upstream face 48 of the treatment device 42. Although the different embodiments of the body portion 88 are disclosed and discussed with first embodiment, it is to be appreciated that the different body portion 88 embodiments could be used with any of the flow modifier 78, 108, and 112 embodiments disclosed. It is also to be appreciated that the openings defined in the body portion 88 can be any suitable configuration for conveying and disbursing exhaust gas flow.

[0054] As best shown in Figure 5, the body portion 88 of the flow modifier 78 defines an angled surface 100 directed toward the upstream face 48 of the treatment device 42. More specifically, the body portion 88 of the flow modifier 78 has an angled surface 100 defined on the body end 92. Furthermore, the angled surface 100 of the flow modifier 78 is directed toward the upstream face 48 of the treatment device 42 to improve disbursement of the exhaust gases in the forward cavity 54 of the housing 24. It is to be appreciated that the mounting portion 80 and body portion 88 can be any suitable configuration for dispersing exhaust gas flow.

[0055] As best shown in Figure 4, the mounting portion 80 and the body portion 88 together define an inner chamber 102. More specifically, the inner chamber 102 extends through the mounting portion 80 and the body portion 88 along the second axis A3 from the mounting opening 86 to the body opening 94. The mounting portion 80 and the body portion 88 together define an outer surface 104 spaced from the inner chamber 102 spanning the mounting portion 80 and the body portion 88. More specifically, the outer surface 104 extends along the body portion 88 and the mounting portion 80 about the second axis A3 from the mounting end 84 to the body end 92.

[0056] Referring to Figures 4 and 5, the exhaust gases flow through the inlet passageway 60 of the conduit 56 from the internal combustion engine 22 to the bracket 66 and the flow modifier 78. The mounting portion 80 of the flow modifier 78 and the bracket 66 divide the flow of the exhaust gases into a first stream F1 and a second stream F2 to disperse the fluid across the upstream face 48 of the treatment device 42. The first stream F1 flows through the inner chamber 102 of the flow modifier 78. More specifically, the first stream F1 flows through the mounting opening 86 of the mounting portion 80 and into the inner chamber 102 of the flow modifier 78.

[0057] The inner chamber 102 is configured to spread the exhaust gases within the forward cavity 54 of the housing 24 toward the end wall 32 and the circumferential wall 34 of the housing 24. More specifically, as the exhaust gases of the first stream F1 flow through the mounting portion 80 and subsequently the body portion 88, the exhaust gases of the first stream F1 expand and spread from the first diameter D1 of the mounting portion 80 to the second diameter D2 of the body portion 88. The exhaust gases of the first stream F1 further expand and spread upon flowing through the body opening 94 and over the angled surface 100 of the body portion 88 into the forward cavity 54 of the housing 24. The exhaust gases of the first stream F1 are directed toward the circumferential wall 34 of the housing 24 by the body opening 94 and the angled surface 100 of the body portion 88.

[0058] The exhausts gases of the first stream F1 are deflected from the end wall 32 and the circumferential wall 34 of the housing 24 towards the upstream face 48 of the treatment device 42. More specifically, the exhaust gases of the first stream F1 are deflected from the end wall 32 and the circumferential wall 34 within the forward cavity 54 such that the exhaust gases are directed toward and disbursed across the upstream face 48 of the treatment device 42.

[0059] As best shown Figure 5, the second stream F2 flows through the apertures 76 between the bracket 66 and the conduit 56. More specifically, the exhaust gases of the second stream F2 flow through the three apertures 76 defined between the body 72 and the arms 68 of the bracket 66 and the conduit surface 58 of the conduit 56 into the forward cavity 54. The second stream F2 further flows over the outer surface 104 of the flow modifier 78. The outer surface 104 is configured to deflect the second stream F2 within the forward cavity 54 toward the upstream face 48 of the treatment device 42. More specifically, a segment of the second stream F2 is deflected from the outer surface 104 of the body portion 88 and the mounting portion 80 within the forward cavity 54 of the housing 24 such that the exhaust gases are directed toward and disbursed across the upstream face 48 of the treatment device 42 from the flow modifier 78.

[0060] Turning back to Figure 4, the outer surface 104 is configured to spread fluid flow within the forward cavity 54 toward the end wall 32 and the circumferential wall 34 to deflect the fluid toward the upstream face 48. More specifically, a remainder of the second stream F2 is deflected from the outer surface 104 of the body portion 88 and the mounting portion 80 in the forward cavity 54 of the housing 24 such that the exhaust gases are direct toward and disbursed across the end wall 32 and the circumferential wall 34 of the housing 24. Furthermore, the remainder of second stream F2 is deflected from the end wall 32 and the circumferential wall 34 of the housing 24 toward the upstream face 48 of the treatment device 42 such that the exhaust gases are disbursed across the upstream face 48 of the treatment device 42.

[0061] The exhaust gases flow through the treatment chambers 50 of the treatment device 42. The treatment device 42 converts pollutants in the exhaust gases such as carbon monoxide and unburned hydrocarbons into less harmful substances such as carbon dioxide, nitrogen, and water. The exhaust gases flow out of the housing 24 through the outlet 40 and into the tube 62. The redirection and deflection of the first stream F1 and the second stream F2 by the flow modifier 78 more evenly disburse the exhaust gases across the upstream face 48 of the treatment device 42. The more even disbursement of the exhaust gases allows more of the treatment device 42 to be used and increases the efficiency of the treatment device 42. It should be appreciated that a small portion of the exhaust gases may not act as described in the above embodiment.

[0062] Referring to Figures 9-11, another embodiment of an exhaust assembly 106 is disclosed for optimizing flow of exhaust gases, wherein like reference numerals indicate like or corresponding parts throughout the several views, is generally shown. Identical or similar components discussed in the first embodiment of the exhaust assembly 20 have the same reference numerals in this embodiment and additional or different components of this embodiment have different reference numerals.

[0063] In this embodiment of the exhaust assembly 106, and as similarly discussed in the first embodiment of the exhaust assembly 20, the treatment device 42 and the mat 52 are disposed in the housing 24 between the inlet 38 and the outlet 40. Further, as similarly discussed in the first embodiment of the exhaust assembly 20, the housing 24 and the treatment device 42 define a forward cavity 54. Moreover, as similarly discussed in the first embodiment of the exhaust assembly 20, the conduit 56 is coupled to and in fluid communication with the forward cavity 54 of the housing 24. Additionally, as similarly discussed in the first embodiment of the exhaust assembly 20, the bracket 66 is disposed in the conduit 56.

[0064] The primary distinction between the first embodiment of the exhaust assembly 20 and this embodiment of the exhaust assembly 106 is that the conduit 56 defines a third axis A4 angled relative to the central axis A2. Further, the inlet 38 is defined on the end wall 32 of the housing 24. Moreover, the conduit 56 is coupled to the end wall 32 of the housing 24. More specifically, the conduit 56 surrounds the inlet 38 of the housing 24 such that the inlet passageway 60 of the conduit 56 and the forward cavity 54 of the housing 24 are in fluid communication through the inlet 38. Additionally, the exhaust assembly 106 includes another embodiment of a flow modifier 108.

[0065] In this embodiment of the flow modifier 108 and as similarly discussed in the first embodiment of the flow modifier 78, the flow modifier 108 is configured to disperse the fluid across the upstream face 48 of the treatment device 42. The flow modifier 108 of this embodiment includes similar features as the first embodiment of the flow modifier 78. The primary distinction between the first embodiment of the flow modifier 78 and the embodiment flow modifier 108 is that the flow modifier 108 is positioned along the third axis A4. The flow modifier 108 extends along the third axis A4 such that the flow modifier has cylindrical configuration. Furthermore, the flow modifier 108 defines an end surface 110 on the body end 92. The end surface is parallel with the upstream face 48 of said treatment device 42 and improves the disbursement of exhaust gases in the forward cavity 54 of the housing 24.

[0066] As best shown in Figure 10, the exhaust gases flow through the inlet passageway 60 of the conduit 56 from the internal combustion engine 22 to the bracket 66 and flow modifier 108. The mounting portion 80 of the flow modifier 108 and the bracket 66 divide the flow of the exhaust gases into a first stream F3 and a second stream F4 to disperse the fluid across the upstream face 48 of the treatment device 42. The first stream F3 flows through the inner chamber 102 of the flow modifier 108. More specifically, the first stream F3 flows through the mounting opening 86 of the mounting portion 80 and into the inner chamber 102 of the flow modifier 108.

[0067] The inner chamber 102 is configured to spread the exhaust gases within the forward cavity 54 of the housing 24 toward upstream face 48 of the treatment device 42. More specifically, as the exhaust gases of the first stream F3 flow through the mounting portion 80 and subsequently the body portion 88, the exhaust gases of the first stream F1 expand and spread from the first diameter D3 of the mounting portion 80 to the second diameter D4 of the body portion 88. The exhaust gases of the first stream F3 further expand and spread upon flowing through the body opening 94 and over the end surface 110 of the body portion 88 into the forward cavity 54 of the housing 24. The exhaust gases of the first stream F3 are directed toward the circumferential wall 34 of the housing 24 by the body opening 94 and the end surface 110 of the body portion 88.

[0068] The second stream F4 flows through the aperture 76 between the bracket 66 and the conduit 56. More specifically, the exhaust gases of the second stream F4 flow through the three apertures 76 defined between the body 72 and the arms 68 of the bracket 66 and the conduit surface 58 of the conduit 56 into the forward cavity 54. The second stream F4 further flows over the outer surface 104 of the flow modifier 108. The outer surface 104 is configured to deflect the second stream F4 within the forward cavity 54 toward the upstream face 48 of the treatment device 42. More specifically, a segment of the second stream F4 is deflected from the outer surface 104 of the body portion 88 and the mounting portions 80 within the forward cavity 54 of the housing 24 such that the exhaust gases are directed toward and disbursed across the upstream face 48 of the treatment device 42 from the flow modifier 108. The outer surface 104 is configured to spread fluid flow within the forward cavity 54 toward the circumferential wall 34 to deflect the fluid toward the upstream face 48. More specifically, a remainder of the second stream F4 is deflected from the outer surface 104 of the body portion 88 and the mounting portion 80 in the forward cavity 54 of the housing 24 such that the exhaust gases are direct toward and disbursed across the circumferential wall 34 of the housing 24. Furthermore, the remainder of second stream F4 is deflected from the circumferential wall 34 of the housing 24 toward the upstream face 48 of the treatment device 42 such that the exhaust gases are disbursed across the upstream face

48 of the treatment device 42.

[0069] Referring to Figures 12-13, another embodiment of an exhaust assembly 112 is disclosed for optimizing flow of exhaust gases, wherein like reference numerals indicate like or corresponding parts throughout the several views, is generally shown. Identical or similar components discussed in the first embodiment of the exhaust assembly 20 have the same reference numerals in this embodiment and additional or different components of this embodiment have different reference numerals.

[0070] In this embodiment of the exhaust assembly 112 and as similarly discussed in the first embodiment of the exhaust assembly 20, the treatment device 42 and the mat 52 are disposed in the housing 24 between the inlet 38 and the outlet 40. Further, as similarly discussed in the first embodiment of the exhaust assembly 20, the housing 24 and the treatment device 42 define a forward cavity 54. Moreover, as similarly discussed in the first embodiment of the exhaust assembly 20, the conduit 56 is coupled to and in fluid communication with the forward cavity 54 of the housing 24. Additionally, as similarly discussed in the first embodiment of the exhaust assembly 20, the bracket 66 is disposed in the conduit 56.

[0071] The primary distinction between the first embodiment of the exhaust assembly 20 and this embodiment of the exhaust assembly 112 is that the conduit 56 is positioned along the central axis A2. Further, the inlet 38 is defined on the end wall 32 of the housing 24. Moreover, the conduit 56 is coupled to the end wall 32 of the housing 24. More specifically, the conduit 56 surrounds the inlet 38 of the housing 24 such that the inlet passageway 60 of the conduit 56 and the forward cavity 54 of the housing 24 are in fluid communication through the inlet 38. Additionally, the exhaust assembly 112 includes another embodiment of a flow modifier 114.

[0072] In this embodiment of the flow modifier 114 and as similarly discussed in the first embodiment of the flow modifier 78, the flow modifier 114 is configured to disperse the fluid across the upstream face 48 of the treatment device 42. The flow modifier 114 of this embodiment includes similar features as the first embodiment of the flow modifier 78. The primary distinction between the first embodiment of the flow modifier 78 and the embodiment flow modifier 114 is that the flow modifier 114 is positioned along the central axis A2. The flow modifier 108 extends along the central axis A2 such that the flow modifier has cylindrical configuration. Furthermore, the flow modifier 114 defines an exit surface 116 on the body end 92. The exit surface 116 is parallel with the upstream face 48 of said treatment device 42 and improves the disbursement of exhaust gases in the forward cavity 54 of the housing 24.

[0073] As best shown in Figure 12, the exhaust gases flow through the inlet passageway 60 of the conduit 56 from the internal combustion engine 22 to the bracket 66 and flow modifier 114. The mounting portion 80 of the flow modifier 114 and the bracket 66 divide the flow of the exhaust gases into a first stream F5 and a second stream F6 to disperse the fluid across the upstream face 48 of the treatment device 42. The first stream F5 flows through the inner chamber 102 of the flow modifier 114. More specifically, the first stream F5 flows through the mounting opening 86 of the mounting portion 80 and into the inner chamber 102 of the flow modifier 114.

[0074] The inner chamber 102 is configured to spread the exhaust gases within the forward cavity 54 of the housing 24 toward upstream face 48 of the treatment device 42. More specifically, as the exhaust gases of the first stream F5 flow through the mounting portion 80 and subsequently the body portion 88, the exhaust gases of the first stream F5 expand and spread from the first diameter D5 of the mounting portion 80 to the second diameter D6 of the body portion 88. The exhaust gases of the first stream F5 further expand and spread upon flowing through the body opening 94 and over the angled surface 100 of the body portion 88 into the forward cavity 54 of the housing 24. The exhaust gases of the first stream F5 are directed toward the circumferential wall 34 of the housing 24 by the body opening 94 and the angled surface 100 of the body portion 88.

[0075] The second stream F6 flows through the aperture 76 between the bracket 66 and the conduit 56. More specifically, the exhaust gases of the second stream F6 flow through the three apertures 76 defined between the body 72 and the arms 68 of the bracket 66 and the conduit surface 58 of the conduit 56 into the forward cavity 54. The second stream F6 further flows over the outer surface 104 of the flow modifier 114. The outer surface 104 is configured to deflect the second stream F6 within the forward cavity 54 toward the upstream face 48 of the treatment device 42. More specifically, a segment of the second stream F6 is deflected from the outer surface 104 of the body portion 88 and the mounting portion 80 within the forward cavity 54 of the housing 24 such that the exhaust gases are directed toward and disbursed across the upstream face 48 of the treatment device 42 from the flow modifier 114.

[0076] The outer surface 104 is configured to spread fluid flow within the forward cavity 54 toward the circumferential wall 34 to deflect the fluid toward the upstream face 48. More specifically, a remainder of the second stream F6 is deflected from the outer surface 104 of the body portion 88 and the mounting portion 80 in the forward cavity 54 of the housing 24 such that the exhaust gases are direct toward and disbursed across the circumferential wall 34 of the housing 24. Furthermore, the remainder of second stream F6 is deflected from the circumferential wall 34 of the housing 24 toward the upstream face 48 of the treatment device 42 such that the exhaust gases are disbursed across the upstream face 48 of the treatment device 42.

[0077] The different embodiments can optimize exhaust gas dispersion across the upstream face of a treatment device in multiple configurations. For example, the flow modifier of the first embodiment can be positioned transverse relative to the treatment device. Furthermore, the flow modifier of the second embodiment can be positioned angled relative to the treatment device. Finally, the flow modifier of the third embodiment can be positioned co-axial relative to the treatment device.

[0078] The present invention has been described in an illustrative manner, and it is to be understood that the terminology which has been used in intended to be in the nature of words of description rather than of limitation. Obviously, many modifications and variations of the present invention are possible in light of the above teachings. The inventions may be practiced otherwise than as specifically described within the scope of the appended claims

Claims

1. An exhaust assembly for optimizing flow of a fluid, said assembly comprising:

a housing having an end wall and a circumferential wall at least partially defining a forward cavity and an outlet spaced from said forward cavity;
a treatment device defining a central axis and having an upstream face with said treatment device disposed within said housing between said forward cavity and said outlet;
a conduit in fluid communication with said forward cavity of said housing;
a bracket coupled to said conduit and defining at least one aperture between said conduit and said bracket; and
a flow modifier comprising:

a mounting portion coupled to said bracket and defining a first diameter with said mounting portion and said bracket dividing the flow of the fluid into a first stream and a second stream, and
a body portion extending from said mounting portion and disposed in said forward cavity with said body portion defining a second diameter greater than said first diameter with said mounting portion and said body portion together defining an inner chamber and an outer surface spaced from said inner chamber spanning said mounting portion and said body portion with said first stream flowing through said inner chamber and said second stream flowing through said aperture and over said outer surface for dispersing the fluid across said upstream face of said treatment device.

2. An exhaust assembly as claimed in claim 1 wherein said outer surface expands in diameter from said first diameter of said mounting portion to said second diameter of said body portion along a curvilinear path for dispersing the fluid across said upstream face of said treatment device.

3. An exhaust assembly as claimed in either of claims 1 or 2, wherein said bracket includes at least one arm for coupling said flow modifier to said conduit.

4. An exhaust assembly as claimed in claim 3 wherein said bracket has a body defining a hole for receiving the mounting portion of said flow modifier with said arms extending outward from said body.

5. An exhaust assembly as claimed in any one of claims 1 to 4, wherein said conduit defines a second axis transverse to said central axis with said flow modifier positioned along said second axis and configured to disperse the fluid across said upstream face of said treatment device.

6. An exhaust assembly as claimed in claim 5 wherein said body portion of said flow modifier defines an angled surface directed toward said upstream face of said treatment device.

7. An exhaust assembly as claimed in either of claims 5 or 6, wherein said outer surface is configured to spread fluid flow within said forward cavity toward said upstream face.

8. An exhaust assembly as claimed in any one of claims 5 to 7, wherein said inner chamber and said outer surface are configured to spread fluid flow within said forward cavity toward said end wall and said circumferential wall to deflect the fluid toward said upstream face.

9. An exhaust assembly as claimed in any one of claims 1 to 8, wherein said body portion of said flow modifier defines an end surface parallel with said upstream face of said treatment device.

10. An exhaust assembly as claimed in any one of claims 1 to 9, wherein said conduit defines a third axis angled relative to said central axis with said flow modifier positioned along said third axis and configured to disperse the fluid across said upstream face of said treatment device.

11. An exhaust assembly claimed in claim 10 wherein said inner chamber and said outer surface are configured to spread fluid flow within said forward cavity toward said upstream face.

12. An exhaust assembly as claimed in either of claims 10 or 11, wherein said outer surface is configured to spread fluid flow within said forward cavity toward said circumferential wall to deflect the fluid toward said upstream face.

13. An exhaust assembly as claimed in any one of claims 1 to 12, wherein said flow modifier is positioned along said central axis and configured to disperse the fluid across said upstream face of said treatment device.

14. An exhaust assembly as claimed in claim 13 wherein said inner chamber and said outer surface are configured to deflect fluid flow within said forward cavity toward said upstream face.

15. An exhaust assembly as claimed in either of claims 13 or 14, wherein said outer surface is configured to spread fluid flow within said forward cavity toward said circumferential wall to deflect the fluid toward said upstream face.

16. An exhaust assembly as claimed in any one of claims 1 to 15, wherein said body portion of said flow modifier defines a plurality of perforations for allowing the fluid to flow through said perforations to disperse the fluid in said forward cavity and across said upstream face of said treatment device.

17. An exhaust assembly as claimed in any one of claims 1 to 16, wherein said body portion of said flow modifier defines a plurality of slots for allowing the fluid to flow through said slots to disperse the fluid in said forward cavity and across said upstream face of said treatment device.

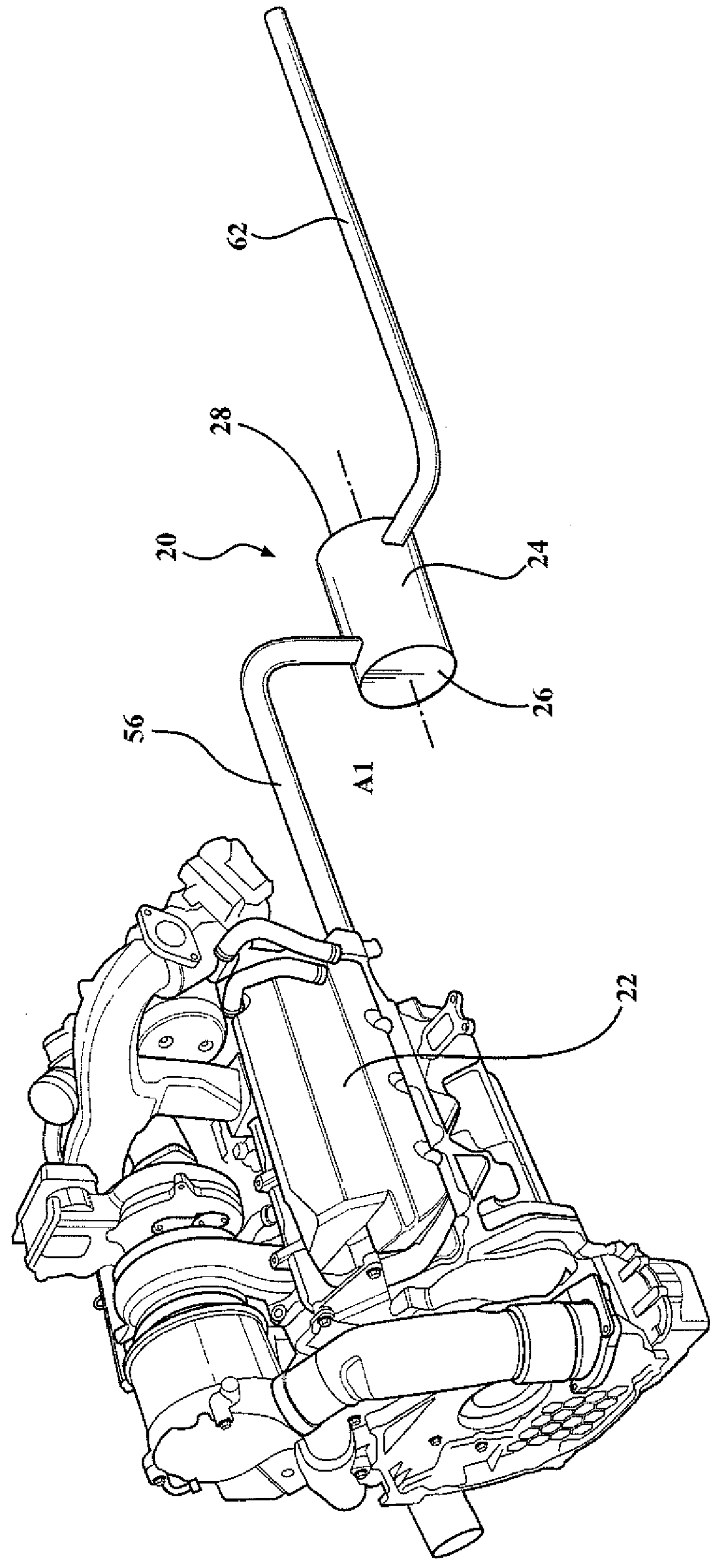

FIG. 1

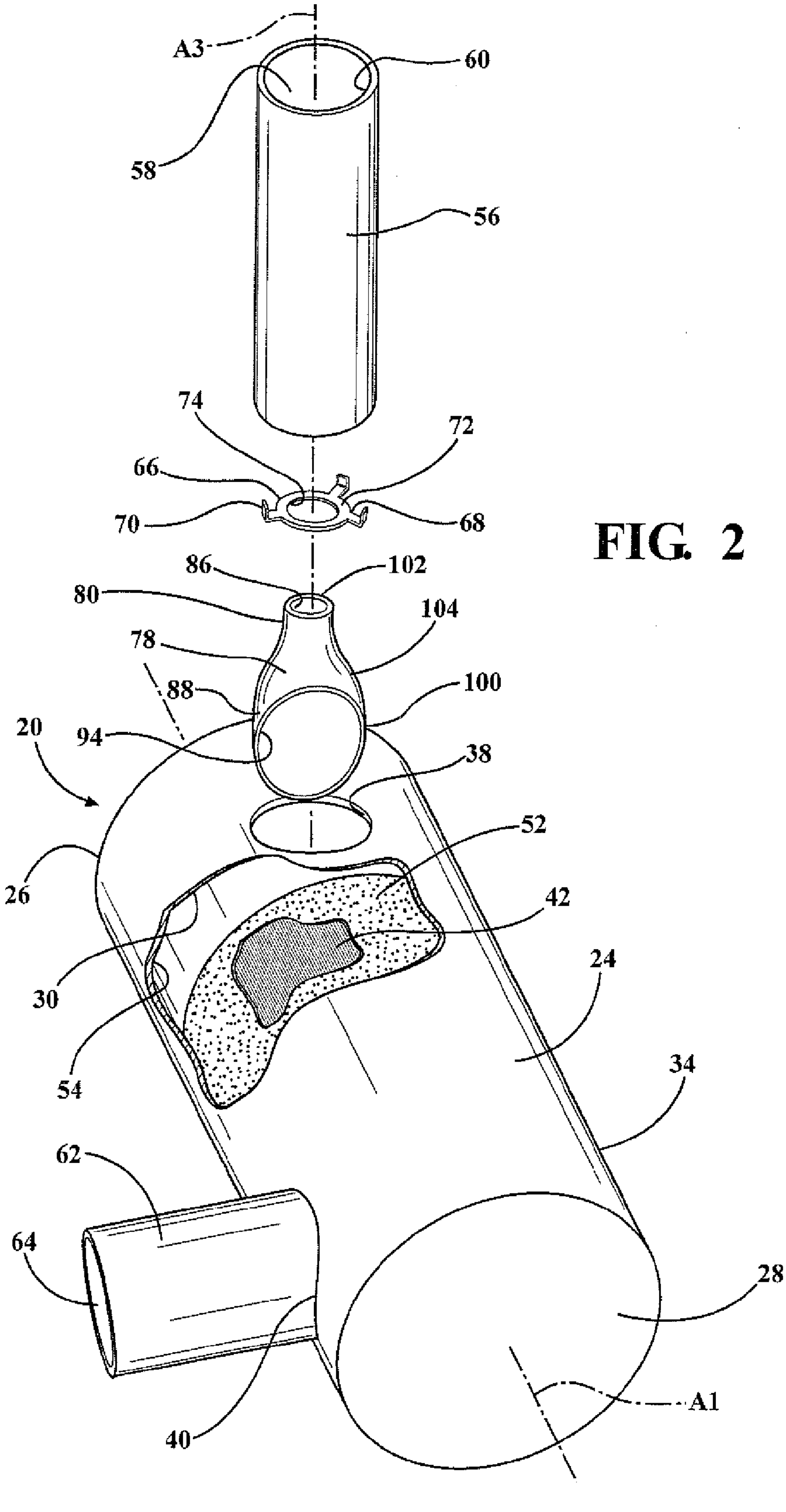
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FIG. 2

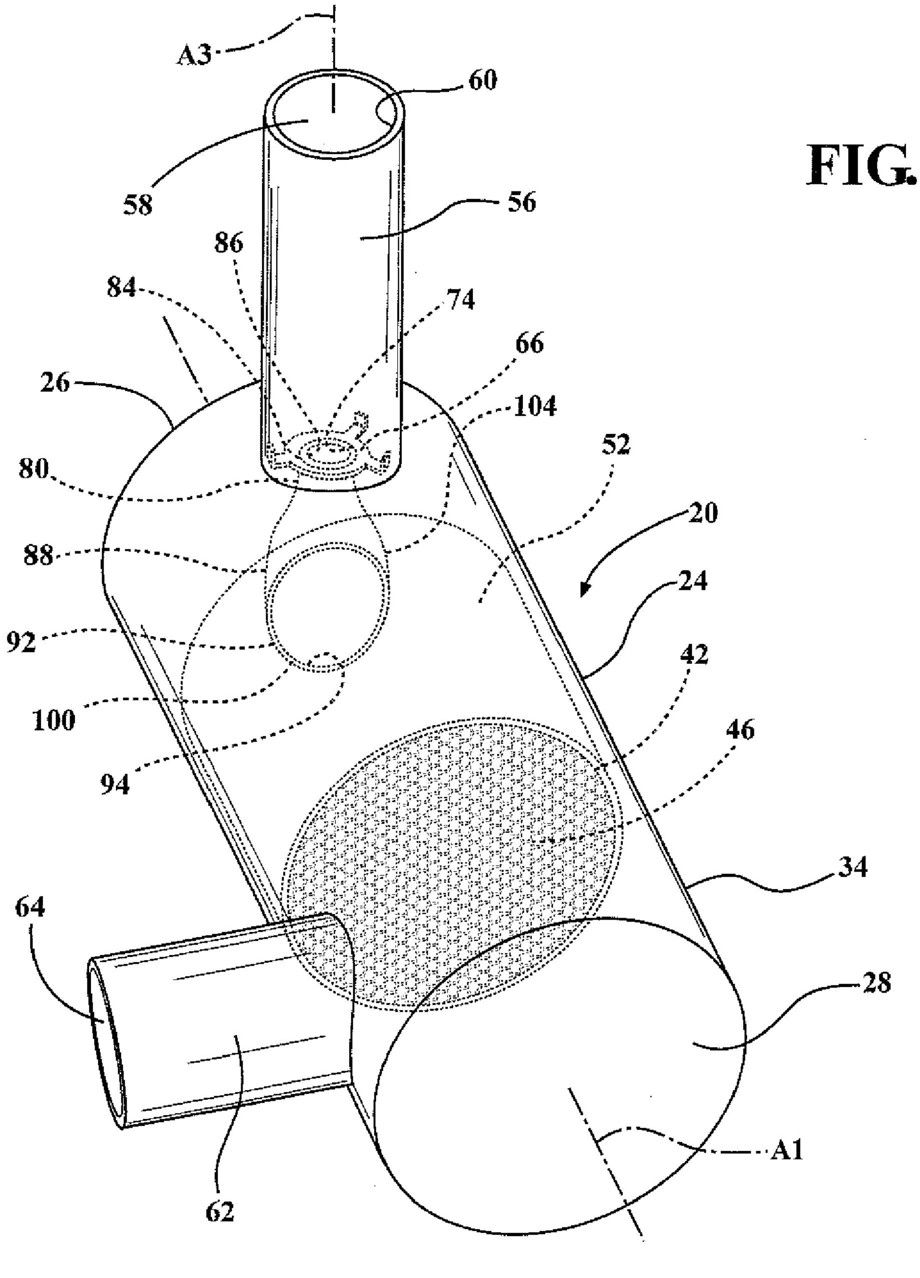
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FIG. 3

FIG. 4

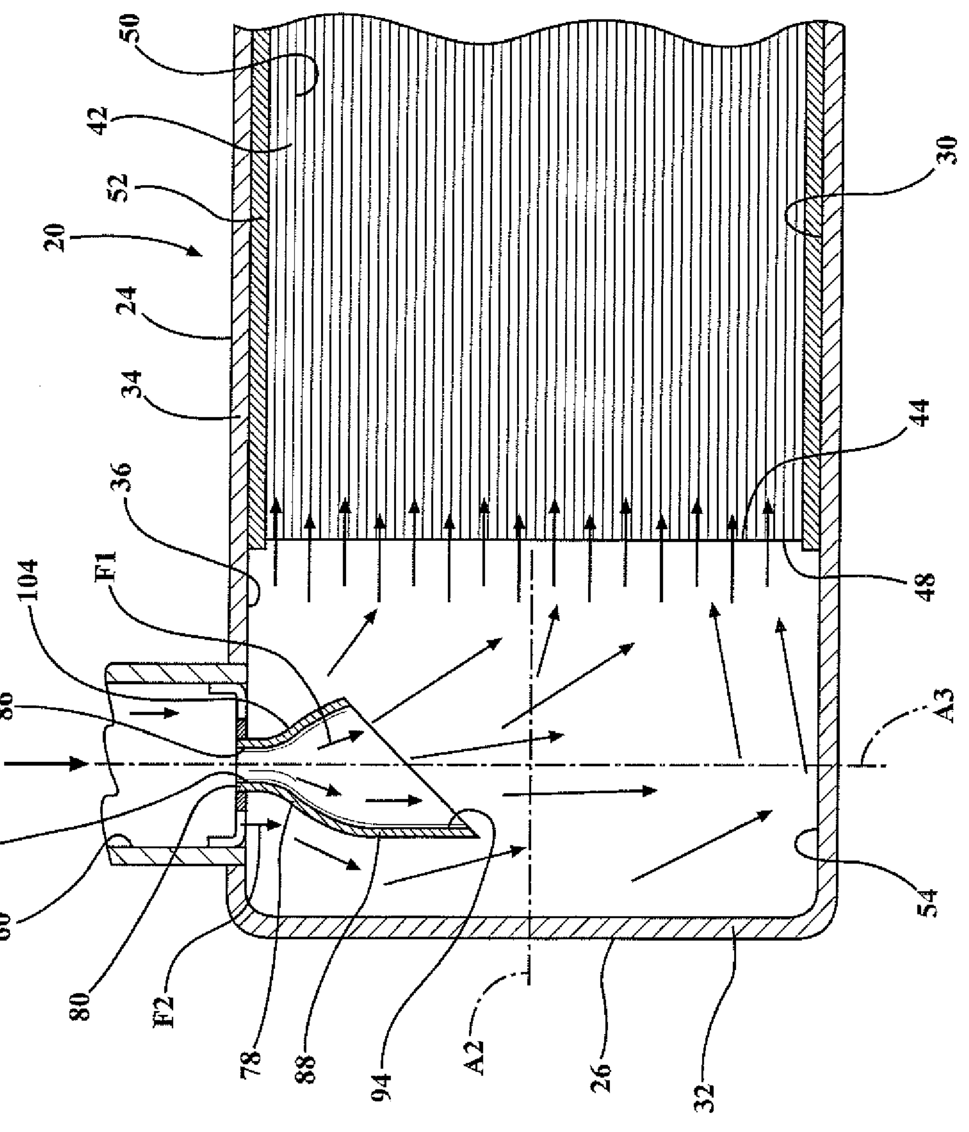
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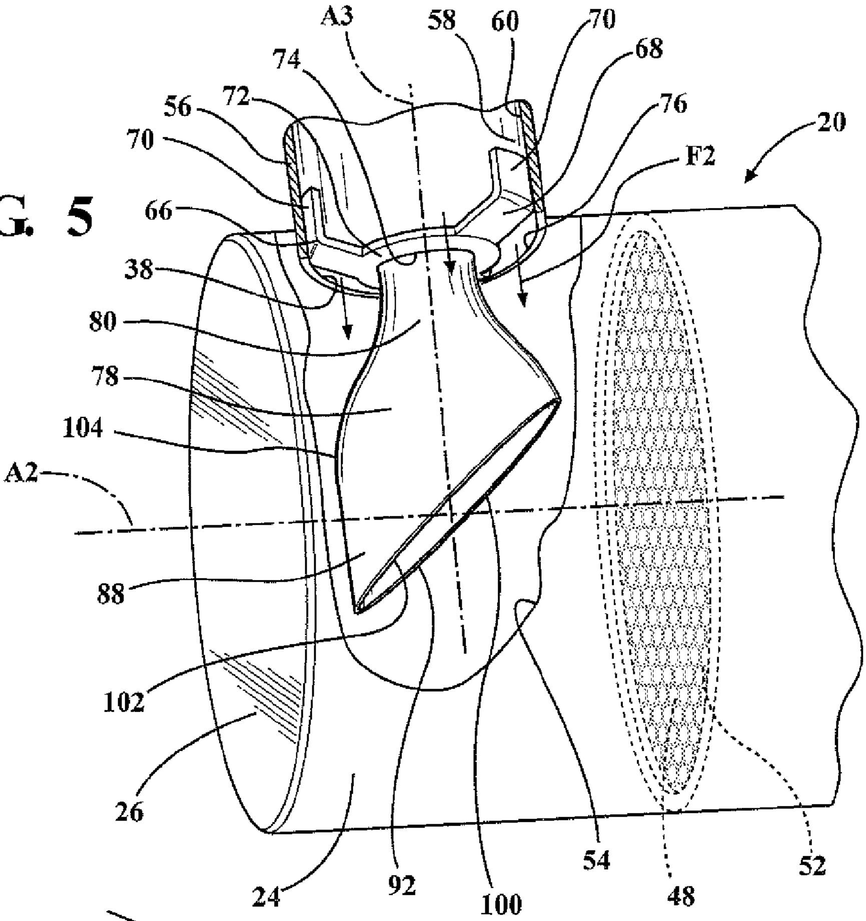
FIG. 5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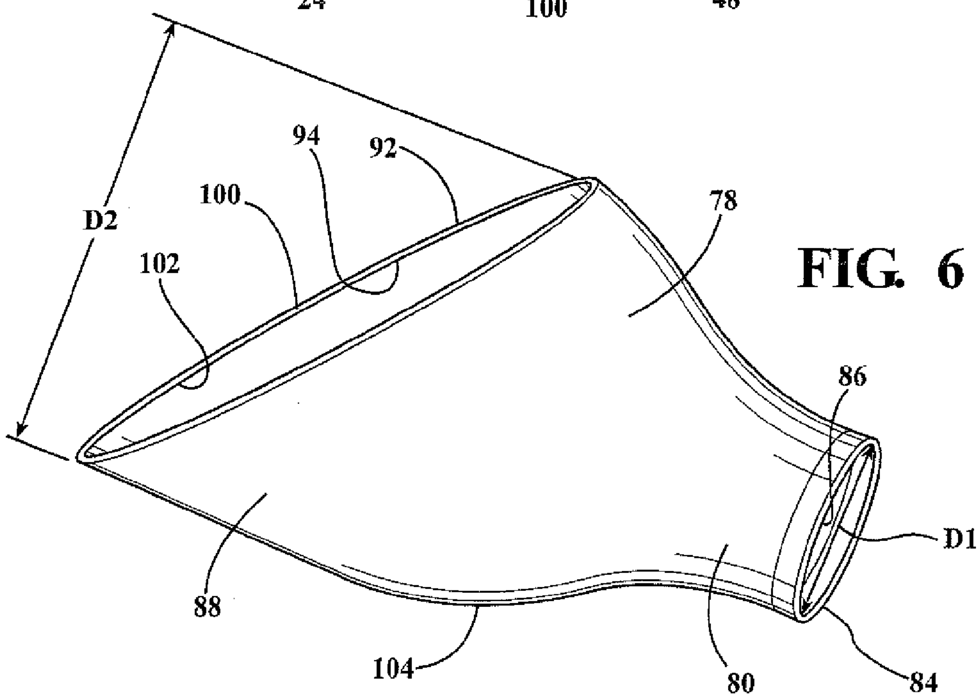
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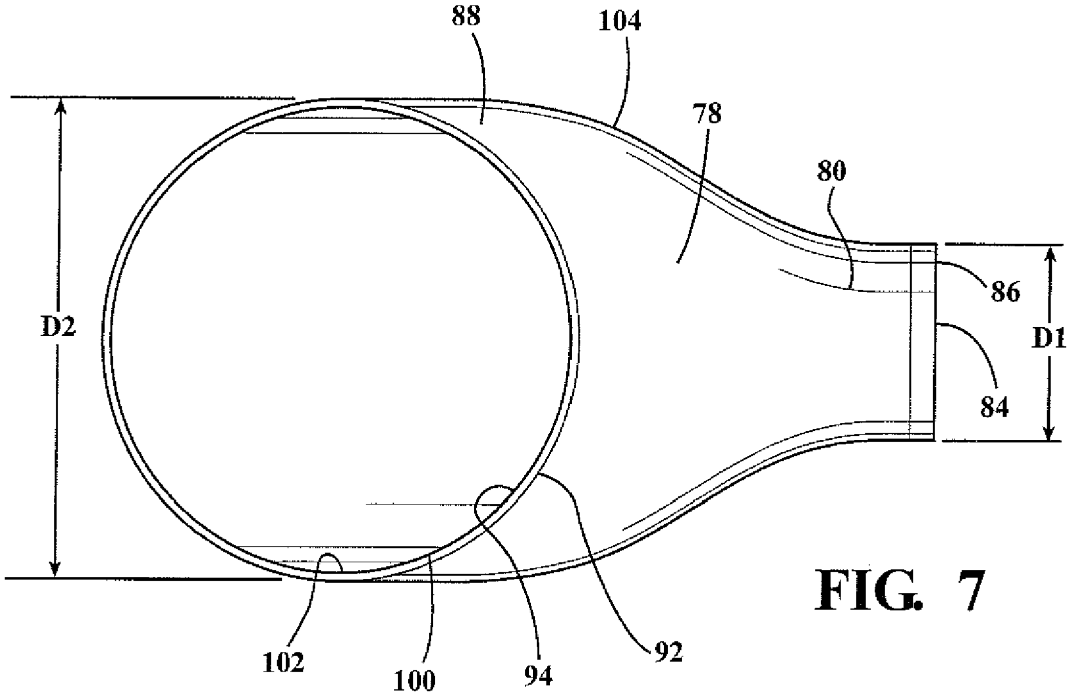
FIG. 6



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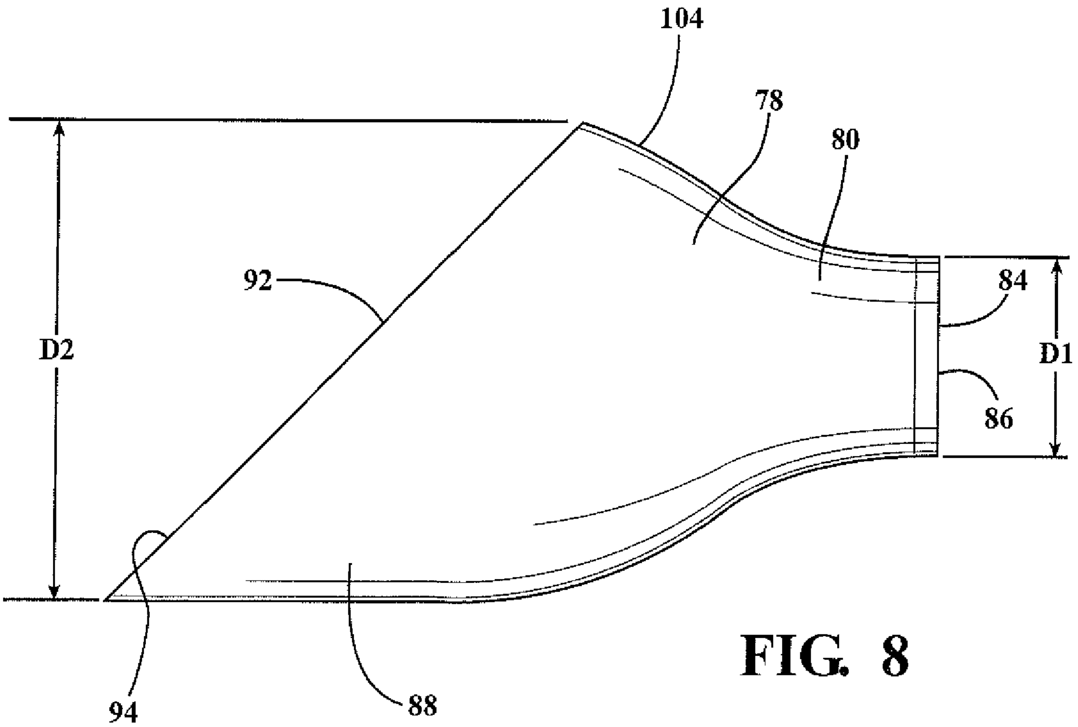

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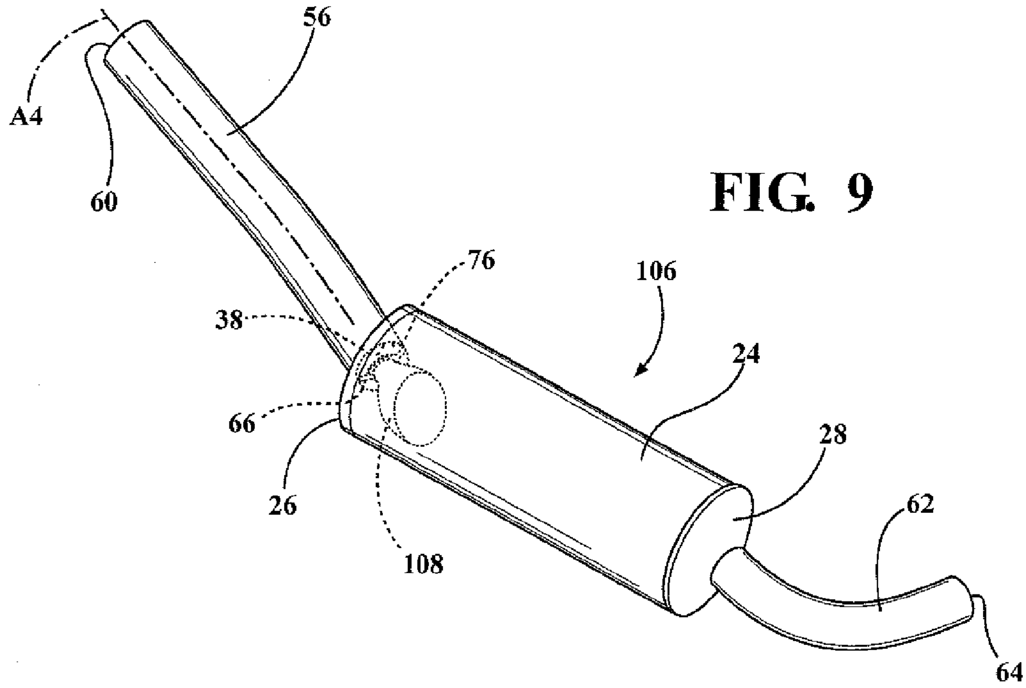
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FIG. 9

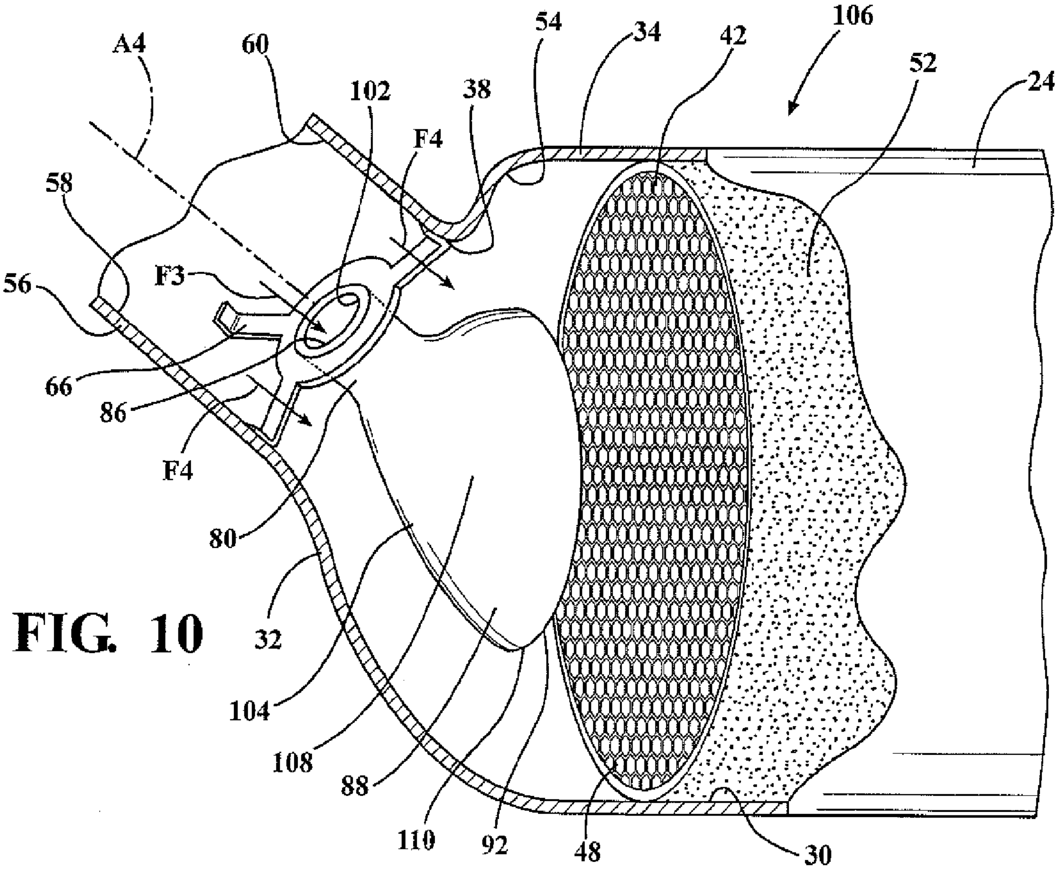
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FIG. 10

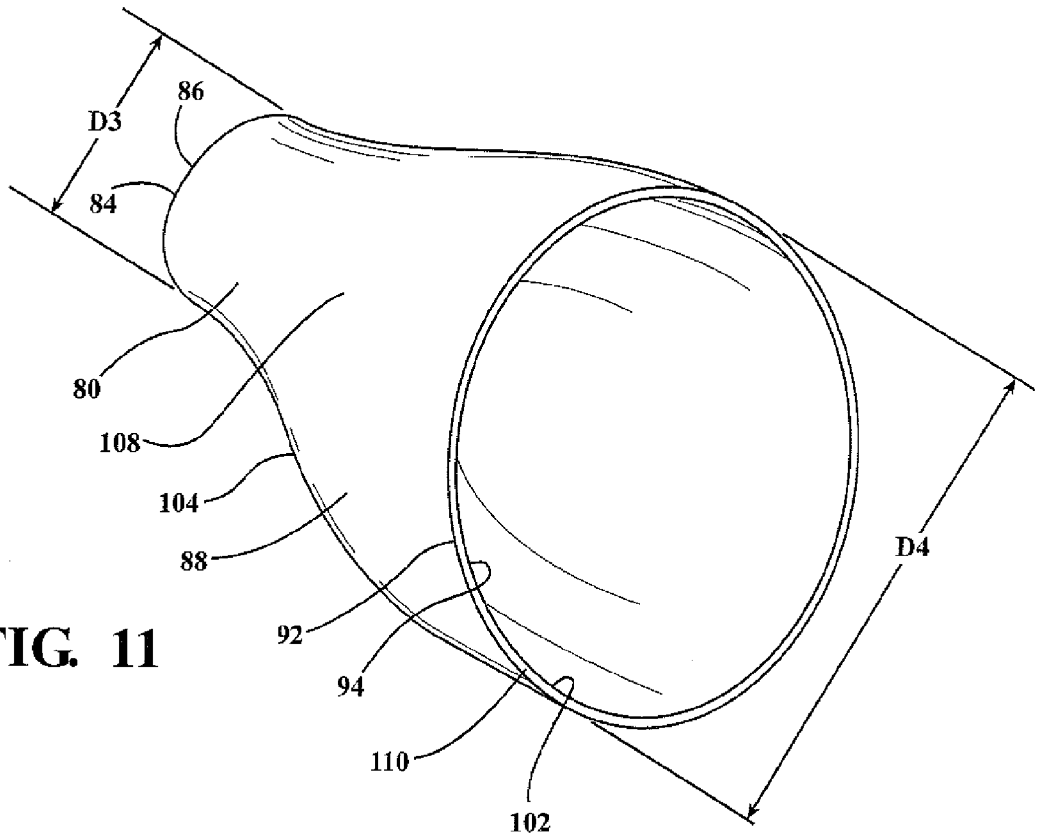
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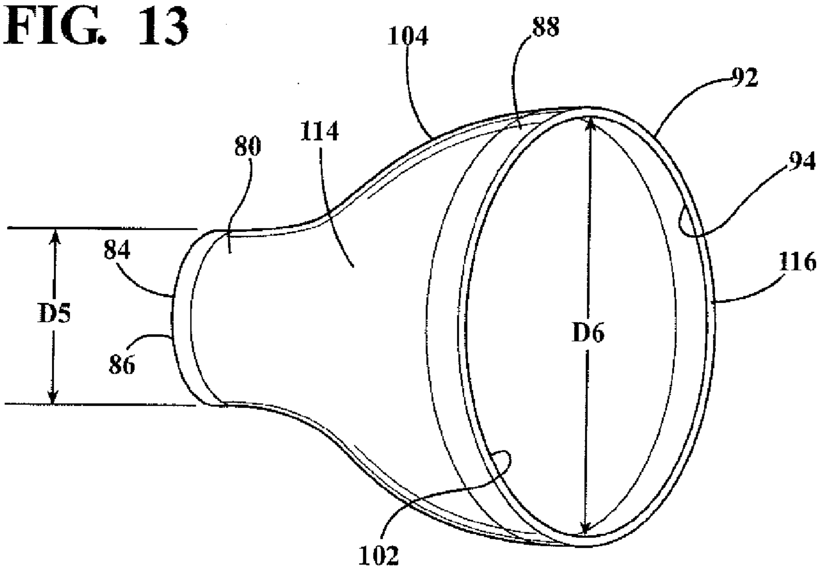
FIG. 11

FIG. 13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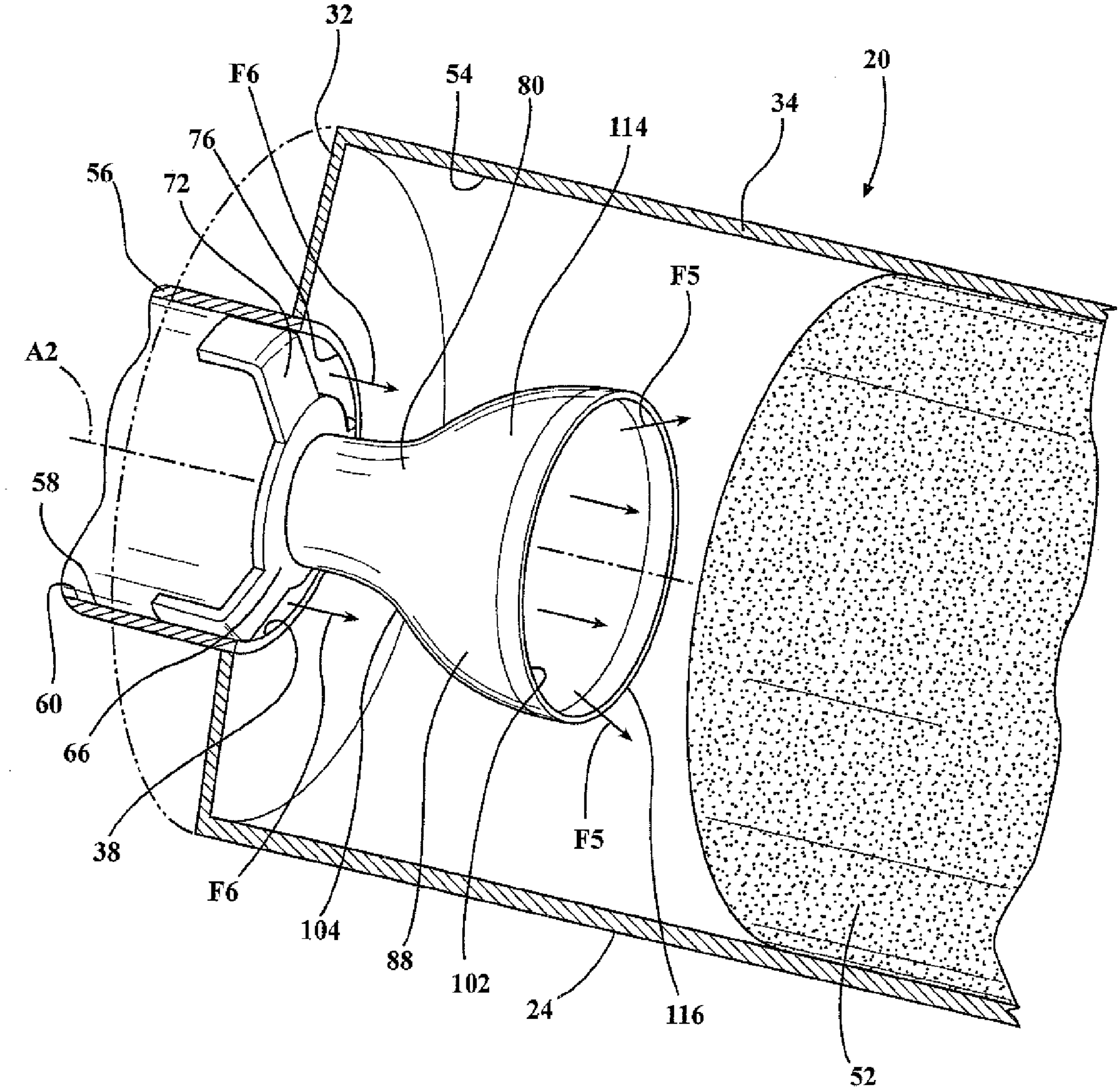
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FIG. 12

FIG. 14

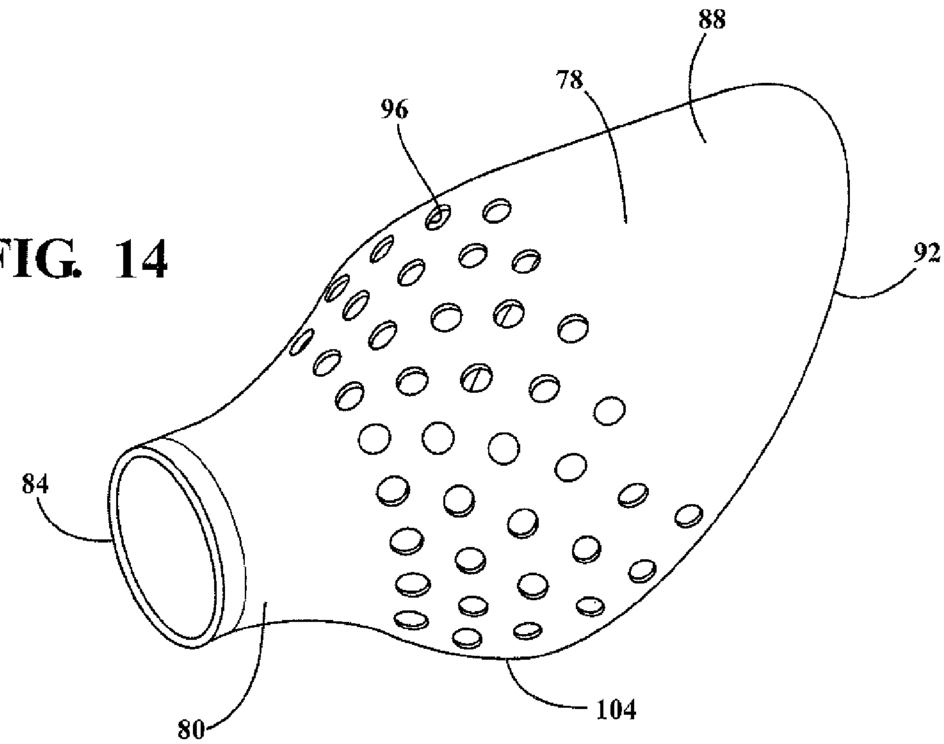
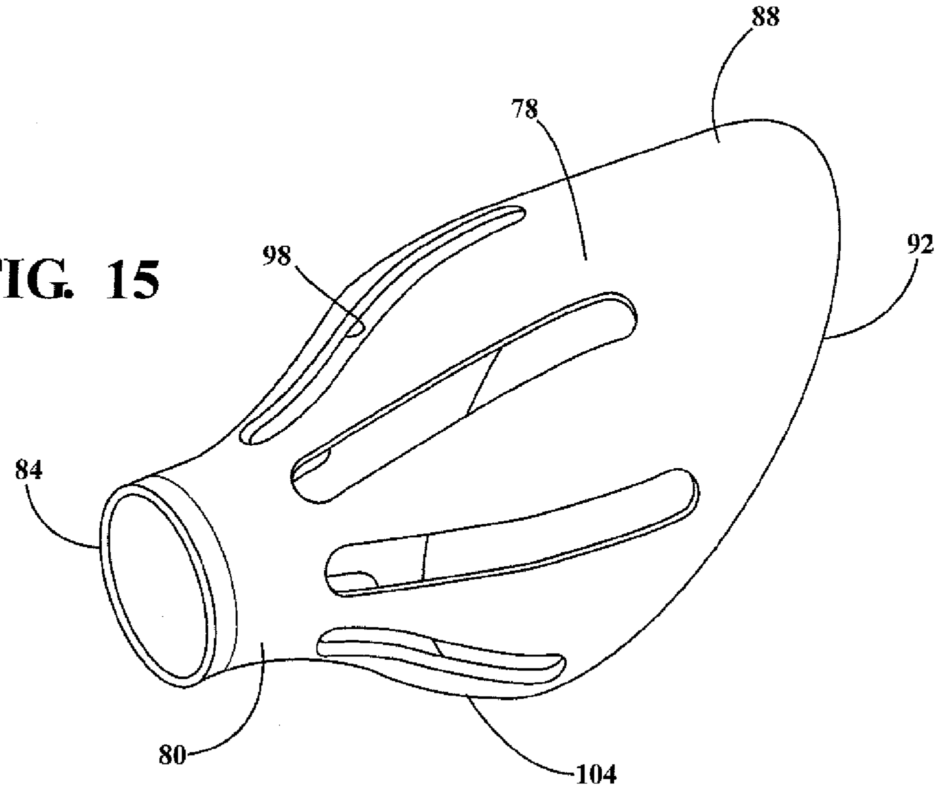


FIG. 15



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EUROPEAN SEARCH REPORT

Application Number
EP 12 18 6643

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Y	DE 24 29 002 A1 (BOSCH GMBH ROBERT) 8 January 1976 (1976-01-08) * figure 1 *	2	
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F01N

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
Munich	19 February 2013	Torle, Erik

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19-02-2013

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