(12)Indian Patent Application

(21) Application Number: 202041012537

(22) Filing Date: 23/03/2020 (43) Publication Date: 24/09/2021

(71) Applicant(s): L&T TECHNOLOGY SERVICES LIMITED

(72) Inventor(s): Rao, Nandakumar Anil
Wagh, Hrushikesh Vijay
Mithun, P

(51) International Classifications: F01N 1/08 F01N 13/08 F01N 1/24 F02M 35/108 F28F 27/02

(54) Title: A SYSTEM FOR MUFFLING NOISE FROM A VEHICLE EXHAUST

(57) Abstract: A system (100) for muffling noise from an exhaust is described. The system (100) may include a housing (102) coupled to an exhaust pipe (104). The housing (102) may include a first chamber (106) configured to receive exhaust gases via the exhaust pipe (104), and a second chamber (110). The system (100) may further include a Y-shaped pipe body (112) positioned in the second chamber (110). The Y-shaped pipe body (112) may include a first inlet pipe (112A) and a second inlet pipe (112B) configured to receive exhaust gases from the first chamber (106), and may further include an outlet pipe (112C) coupled to the first inlet pipe (112A) and the second inlet pipe (112B) via a junction (112D). The system (100) may further include a first baffle (202A) and a second baffle (202B) configured to be positioned inside the first inlet pipe (112A) and the second inlet pipe (112B), respectively. Each of the first baffle (202A) and the second baffle (202B) may be convolute shaped to impart a pulsating motion to the exhaust passing through the first inlet pipe (112A) and the second inlet pipe (112B), respectively.

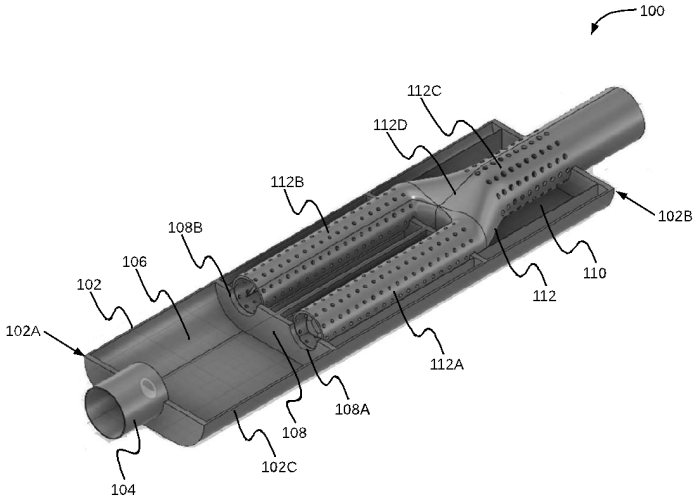


FIG. 1

FORM 2

THE PATENTS ACT 1970
(39 OF 1970)
&
The Patent Rules, 2003
Complete Specification
(See Section 10 and Rule 13)

1. TITLE OF THE INVENTION

A System For Muffling Noise From A Vehicle Exhaust

2. APPLICANT(S)

(a) NAME : **L&T TECHNOLOGY SERVICES LIMITED**
(b) NATIONALITY : **INDIAN**
(c) ADDRESS : **DLF IT SEZ Park, 2nd Floor – Block 3**
1/124, Mount Poonamallee Road
Ramapuram, Chennai – 600 089,
INDIA

3. PREAMBLE TO THE DESCRIPTION

COMPLETE

The following specification particularly describes the invention and the manner in which it is performed**.**

DESCRIPTION

TECHNICAL FIELD

[001] This disclosure relates generally to noise muffling, and more particularly to a system for active cancelling of noise from a vehicle exhaust.

BACKGROUND

[002] Exhaust gases, for example, exhaust gases from vehicles contribute substantially to atmospheric noise pollution. The noise may be caused by hot exhaust gases exiting at high speed. Further, these exhaust gases are also responsible for raising the ambient temperature.

[003] Some noise muffling systems are known which may be installed on the exhaust side, for example on the vehicle exhaust. These noise muffling systems are generally based on acoustic quieting and try to reduce loudness of the sound pressure created by the engine. However, these known noise muffling systems may not be not very effective in controlling the noise produced by the exhaust gases. Further, these known noise muffling systems are expensive and may even affect the engine performance.

[004] Therefore, a cost-effective and high-efficiency system capable of controlling noise and temperature produced by exhaust gases is desired that does not affect engine performance.

SUMMARY OF THE INVENTION

[005] In an embodiment, a system for muffling noise from a vehicle exhaust is disclosed. The system may include a housing having a first end and a second end. The housing may be configured to be coupled to an exhaust pipe via the first end. The housing may include a first chamber towards the first end of the housing, and a second chamber towards the second end of the housing. The first chamber may be configured to receive exhaust gases of an engine via the exhaust pipe. The system may further include a Y-shaped pipe body configured to be positioned in the second chamber of the housing. The Y-shaped pipe body may include a first inlet pipe and a second inlet pipe configured to receive the exhaust gases from the first chamber. The Y-

shaped pipe body may further include an outlet pipe coupled to the first inlet pipe and the second inlet pipe via a junction. The Y-shaped pipe body may further include a first baffle and a second baffle configured to be positioned inside the first inlet pipe and the second inlet pipe, respectively. Each of the first baffle and the second baffle may be convolute-shaped to impart a pulsating motion to the exhaust gases passing through the first inlet pipe and the second inlet pipe, respectively.

BRIEF DESCRIPTION OF THE DRAWINGS

[006] The accompanying drawings, which are incorporated in and constitute a part of this disclosure, illustrate exemplary embodiments and, together with the description, serve to explain the disclosed principles.

[007] **FIG. 1** illustrates a perspective view of a partly assembled system for muffling noise from a vehicle exhaust, in accordance with an embodiment of the present disclosure.

[008] **FIG. 2** illustrates a perspective view of a first baffle and a second baffle, in accordance with an embodiment of the present disclosure.

[009] **FIG. 3** illustrates a perspective view of an unassembled system for muffling noise from a vehicle exhaust, in accordance with another embodiment of the present disclosure.

DETAILED DESCRIPTION

[010] Exemplary embodiments are described with reference to the accompanying drawings. Wherever convenient, the same reference numbers are used throughout the drawings to refer to the same or like parts. While examples and features of disclosed principles are described herein, modifications, adaptations, and other implementations are possible without departing from the spirit and scope of the disclosed embodiments. It is intended that the following detailed description be considered as exemplary only, with the true scope and spirit being indicated by the following claims. Additional illustrative embodiments are listed below.

[011] Referring to FIG. 1, a perspective view of a partly assembled system 100 for muffling noise from a vehicle exhaust is illustrated, in accordance with an embodiment of the present disclosure. The system 100 may include a housing 102 having a first end 102A and a second end 102B. In some embodiments, the housing 102 may be made of 316L stainless steel material. The housing 102 may be configured to be coupled to an exhaust pipe 104 (for example, exhaust pipe 104 of a vehicle leading from an engine of the vehicle) via the first end 102A. In some embodiments, the housing 102 may include a bottom half 102C and a top half (not shown in FIG. 1). It may be noted that the system 100 may be assembled by fixing the top half on the bottom half 102C of the housing 102.

[012] In some embodiments, the housing 102 may include a first chamber 106. The first chamber 106 may be positioned towards the first end 102A of the housing 102. As shown in FIG. 1, the first chamber 106 may include an opening via which the exhaust pipe 104 may be coupled to the first chamber 106. As such, the first chamber may receive exhaust gases emanating from the engine of the vehicle via the exhaust pipe 104. The first chamber 106 may further include a plate 108 which may be positioned opposite to the opening. As such, the exhaust gases entering through the opening 10C inside the first chamber 106 may expand and strike the plate 108. As a result of the exhaust gases striking the plate, exhaust gas waves may interfere with each other and resonate. By way of this interference and resonating of the exhaust gases, a part muffling of the noise due to the exhaust gases may be achieved.

[013] In some embodiments, the housing 102 may further include a second chamber 110 towards the second end 102B of the housing 102. In particular, the plate 108 may divide the housing 102 into the first chamber 106 and the second chamber 110. As shown in FIG. 1, the plate 108 may include a first hole 108A and a second hole 108B.

[014] The system 100 may further include a Y-shaped pipe body 112. This Y-shaped pipe body 112 may be configured to be positioned inside the second chamber 110 of the housing 102. The Y-shaped pipe body 112 may include a first inlet pipe 112A and a second inlet pipe 112B. The Y-shaped pipe body 112 may further include an outlet pipe 112C coupled to the first inlet pipe 112A and the second inlet 112B pipe via a junction 112D. One end of the first inlet pipe 112A and one end of the second inlet pipe 112B may be positioned along the first hole 108A and the second hole 108B, respectively of the plate 108.

[015] The first inlet pipe 112A and the second inlet pipe 112B may be configured to receive the exhaust gases from the first chamber 106. In particular, the first inlet pipe 112A and the second inlet pipe 112B may receive a part of exhaust gases directly from the exhaust pipe 104 via the first chamber 106. Further, the first inlet pipe 112A and the second inlet pipe 112B may receive another part of exhaust gases that have gone through interference and resonating inside the first chamber 106.

[016] The outlet pipe 112C may be coupled to the first inlet pipe 112A and the second inlet pipe 112B via the junction 112D. As shown in FIG. 1, the inlet pipe 112A and the second inlet pipe 112B may converge into one pipe i.e. the outlet pipe 112C at the junction 112D. By way of an example, each of the first inlet pipe 112A, the second inlet pipe 112B, and outlet pipe 112C may be manufactured individually as separate components and later be joined together, for example, by welding. Further, in some embodiments, the junction 112D may also be manufactured as a separate component and may be joined to the first inlet pipe 112A, the second inlet pipe 112B, and the outlet pipe 112C to form the Y-shaped pipe body 112.

[017] The system 100 may further include a first baffle and a second baffle (not shown in FIG. 1) configured to be positioned inside the first inlet pipe 112A and the second inlet pipe 112B, respectively. Each of the first baffle and the second baffle may have a convolute shape which may impart a pulsating motion to the exhaust passing through the first inlet pipe 112A and the second inlet pipe 112B, respectively. The first baffle and the second baffle are further explained in conjunction with FIG. 2 and FIG. 3.

[018] Referring now to FIG. 2, a first baffle 202A and a second baffle 202B is shown. As mentioned above, the first baffle 202A and a second baffle 202B may be convolute-shaped. Further, the first baffle 202A and the second baffle 202B may be positioned inside the first inlet pipe 112A and the second inlet pipe 112B, respectively. Due to the convolute shape, each of the first baffle 202A and the second baffle 202B may impart a pulsating motion to the exhaust passing through the first inlet pipe 112A and the second inlet pipe 112B, respectively.

[019] Referring back to FIG. 1, it may be noted that the exhaust gases exiting the first inlet pipe 112A and the exhaust gases exiting the second inlet pipe 112B may be out of phase. In some embodiments, the exhaust gases exiting the first inlet pipe 112A and the exhaust gases

exiting the second inlet pipe 112B may have a phase difference of 180 degrees. It may be understood that the phase difference may be introduced by the shape and positioning of the first baffle 202A with respect to the second baffle 202B.

[020] It may be further noted that the out-of-phase exhaust gases exiting the first inlet pipe 112A and the exhaust gases exiting the second inlet pipe 112B are received at the junction 112D. Due to the phase difference, the exhaust gases exiting the first inlet pipe 112A and the exhaust gases exiting the second inlet pipe 112B may cancel each other. It may be noted that by way of cancelling, a reactive-type muffling of the noise due to the exhaust gases may be achieved. The convolute profile of the first baffle 202A and the second baffle 202B may cause interference of two out of phase high frequency waves, thereby nullifying their noise effects.

[021] In some embodiments, each of the first inlet pipe 112A, the second inlet pipe 112B, and outlet pipe 112C may be perforated, as shown in FIG. 1. In other words, the first inlet pipe 112A, the second inlet pipe 112B, and the outlet pipe 112C may include a plurality of holes on at least a portion of the first inlet pipe 112A, the second inlet pipe 112B, and the outlet pipe 112C. Further, in such embodiments, the second chamber 110 may include an absorbing material which may surround the first inlet pipe 112A, the second inlet pipe 112B, and the outlet pipe 112C. The high frequency exhaust gas waves may seep through the perforated tubes, and the absorbing material may absorb heat and noise from the exhaust gases flowing through the first inlet pipe 112A, the second inlet pipe 112B, and the outlet pipe 112C, to provide an absorptive-type noise muffling. By way of an example, the absorbing material may include a thermal insulating material like glass wool.

[022] In some embodiments, the diameter of the outlet pipe 112C may vary along the length of the outlet pipe 112C. The diameter of the outlet pipe 112C may vary away from the junction 112D. For example, the diameter of the outlet pipe 112C may decrease along the length of the outlet pipe 112C. As such, due to the diameter of the outlet pipe 112C decreasing, the speed of the exhaust gases flowing thorough the outlet pipe 112C may increase. In other words, velocity of the exhaust gases at the terminal point of the system 100 may be increased using nozzle effect of the outlet pipe 112C. The increase in the speed of the exhaust gases may further contribute towards achieving muffling of the noise due to the exhaust gases.

[023] Referring now to FIG. 3, a perspective view of an unassembled system 100 for muffling noise from a vehicle exhaust is illustrated, in accordance with another embodiment of the present disclosure. As mentioned earlier, the system 100 may include the housing 102 having the first end 102A and the second end 102B, and coupled to the exhaust pipe 104 via the first end 102A. The housing 102 may include the bottom half 102C and a top half 102D, such that the system 100 may be assembled by fixing the top half on the bottom half 102C of the housing 102. The housing 102 may include the first chamber 106 towards the first end 102A that may receive exhaust gases via the exhaust pipe 104. The first chamber 106 may further include a plate 108 positioned opposite to the opening, such that exhaust gases entering inside the first chamber 106 may strike the plate 108. As a result of this, exhaust gas waves may interfere with each other and resonate, to thereby provide a part muffling of the noise due to the exhaust gases.

[024] The housing 102 may further include the second chamber 110 towards the second end 102B. The system 100 may further include the Y-shaped pipe body 112 configured to be positioned inside the second chamber 110. The Y-shaped pipe body 112 may include the first inlet pipe 112A and the second inlet pipe 112B that may receive the exhaust gases from the first chamber 106. The Y-shaped pipe body 112 may further include the outlet pipe 112C coupled to the first inlet pipe 112A and the second inlet 112B pipe via the junction 112D. The system 100 may further include the first baffle 202A and the second baffle 202B configured to be positioned inside the first inlet pipe 112A and the second inlet pipe 112B, respectively. Each of the first baffle 202A and the second baffle 202B may have a convolute shape which may impart a pulsating motion to the exhaust gases passing through the first inlet pipe 112A and the second inlet pipe 112B, respectively. The exhaust gases exiting the first inlet pipe 112A and the exhaust gases exiting the second inlet pipe 112B may have a phase difference of 180 degrees. Due to this phase difference, the exhaust gases exiting the first inlet pipe 112A and the second inlet pipe 112B may cancel each other in the junction 112D thereby muffling the noise due to the exhaust gases.

[025] Further, as mentioned above, in some embodiments, the first inlet pipe 112A, the second inlet pipe 112B, and the outlet pipe 112C may be perforated, and the second chamber 110 may include an absorbing material, for example, glass wool which may surround the first

inlet pipe 112A, the second inlet pipe 112B, and the outlet pipe 112C. This absorbing material may absorb heat and noise from the exhaust gases flowing through the first inlet pipe 112A, the second inlet pipe 112B, and the outlet pipe 112C. In some embodiments, the diameter of the outlet pipe 112C may decrease along the length of the outlet pipe 112C, causing the speed of the exhaust gases exiting from the outlet pipe 112C to increase that may further contribute towards muffling of the noise due to the exhaust gases.

[026] The techniques described above relate to a system for muffling noise from a vehicle exhaust. The above techniques provide a cost-effective solution for reducing noise and temperature of exhaust gases while maintaining the engine performance, by using reactive type muffling and absorptive type muffling. It may be noted that the reactive type muffling is achieved by destructive interference of sound waves produced by the engine that causes the sound waves to partially cancel themselves. The absorptive type muffling is achieved with the perforated pipe encased in a layer of sound absorptive material that absorbs pressure pulses. Furthermore, the techniques provide for improving engine performance by increasing the velocity of exit gases. Moreover, the system provides a quicker and an efficient path for exhaust gases to escape thereby provisioning better engine breathability, while having no adverse environmental effects.

[027] It is intended that the disclosure and examples be considered as exemplary only, with a true scope and spirit of disclosed embodiments being indicated by the following claims.

We claim:

1. A system (100) for muffling noise from a vehicle exhaust, the system (100) comprising:

a housing (102) having a first end (102A) and a second end (102B), the housing (102) configured to be coupled to an exhaust pipe (104) via the first end (102A), wherein the housing (102) comprises;

a first chamber (106) towards the first end (102A) of the housing (102), wherein the first chamber (106) is configured to receive exhaust gases of an engine via the exhaust pipe (104); and

a second chamber (110) towards the second end (102B) of the housing (102);

a Y-shaped pipe body (112) configured to be positioned in the second chamber (110) of the housing (102), wherein the Y-shaped pipe body (112) comprises:

a first inlet pipe (112A) and a second inlet pipe (112B) configured to receive the exhaust gases from the first chamber (106); and

an outlet pipe (112C) coupled to the first inlet pipe (112A) and the second inlet pipe (112B) via a junction (112D); and

a first baffle (202A) and a second baffle (202B) configured to be positioned inside the first inlet pipe (112A) and the second inlet pipe (112B), respectively, wherein each of the first baffle (202A) and the second baffle (202B) is convolute-shaped to impart a pulsating motion to the exhaust gases passing through the first inlet pipe (112A) and the second inlet pipe (112B), respectively.

2. The system (100) as claimed in claim 1, wherein each of the first inlet pipe (112A), the second inlet pipe (112B), and outlet pipe (112C) is perforated.

3. The system (100) as claimed in claim 2, wherein the second chamber (110) comprises an absorbing material surrounding the first inlet pipe (112A), the second inlet pipe (112B), and the outlet pipe (112C), to absorb heat and noise from the exhaust gases flowing through the first inlet pipe (112A), the second inlet pipe (112B), and the outlet pipe (112C).

4. The system (100) as claimed in claim 1, wherein diameter of the outlet pipe (112C) varies along the length of the outlet pipe (112C) away from the junction (112D) to increase speed of the exhaust gases exiting from the outlet pipe (112C).

5. The system (100) as claimed in claim 1, wherein the exhaust gases exiting the first inlet pipe (112A) and the exhaust gases exiting the second inlet pipe (112B) are out of phase.

6. A Y-shaped pipe body (112) for muffling noise from a vehicle exhaust, the Y-shaped pipe body (112) comprising:

a first inlet pipe (112A) and a second inlet pipe (112B) configured to receive the exhaust gases from an engine;

an outlet pipe (112C) coupled to the first inlet pipe (112A) and the second inlet pipe (112B) via a junction (112C); and

a first baffle (202A) and a second baffle (202B) positioned inside the first inlet pipe (112A) and the second inlet pipe (112B), respectively, wherein each of the first baffle (202A) and the second baffle (202B) is convolute-shaped to impart a pulsating motion to the exhaust passing through the first inlet pipe (112A) and the second inlet pipe (112B), respectively.

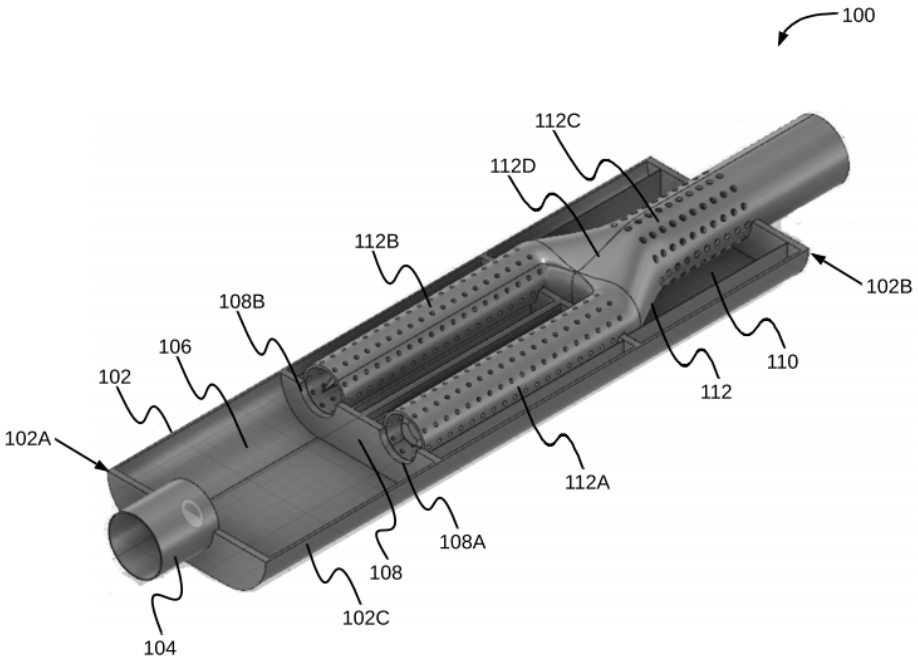
Dated this 23rd day of March 2020

Mohammed Faisal (INPA No: 1941)
Head, IPR Dept.
L&T Technology Services Limited
DLF 3rd Block, 2nd Floor,
Manapakkam, Chennai, TN, 600089

ABSTRACT

A SYSTEM FOR MUFFLING NOISE FROM A VEHICLE EXHAUST

A system (100) for muffling noise from an exhaust is described. The system (100) may include a housing (102) coupled to an exhaust pipe (104). The housing (102) may include a first chamber (106) configured to receive exhaust gases via the exhaust pipe (104), and a second chamber (110). The system (100) may further include a Y-shaped pipe body (112) positioned in the second chamber (110). The Y-shaped pipe body (112) may include a first inlet pipe (112A) and a second inlet pipe (112B) configured to receive exhaust gases from the first chamber (106), and may further include an outlet pipe (112C) coupled to the first inlet pipe (112A) and the second inlet pipe (112B) via a junction (112D). The system (100) may further include a first baffle (202A) and a second baffle (202B) configured to be positioned inside the first inlet pipe (112A) and the second inlet pipe (112B), respectively. Each of the first baffle (202A) and the second baffle (202B) may be convolute-shaped to impart a pulsating motion to the exhaust passing through the first inlet pipe (112A) and the second inlet pipe (112B), respectively.



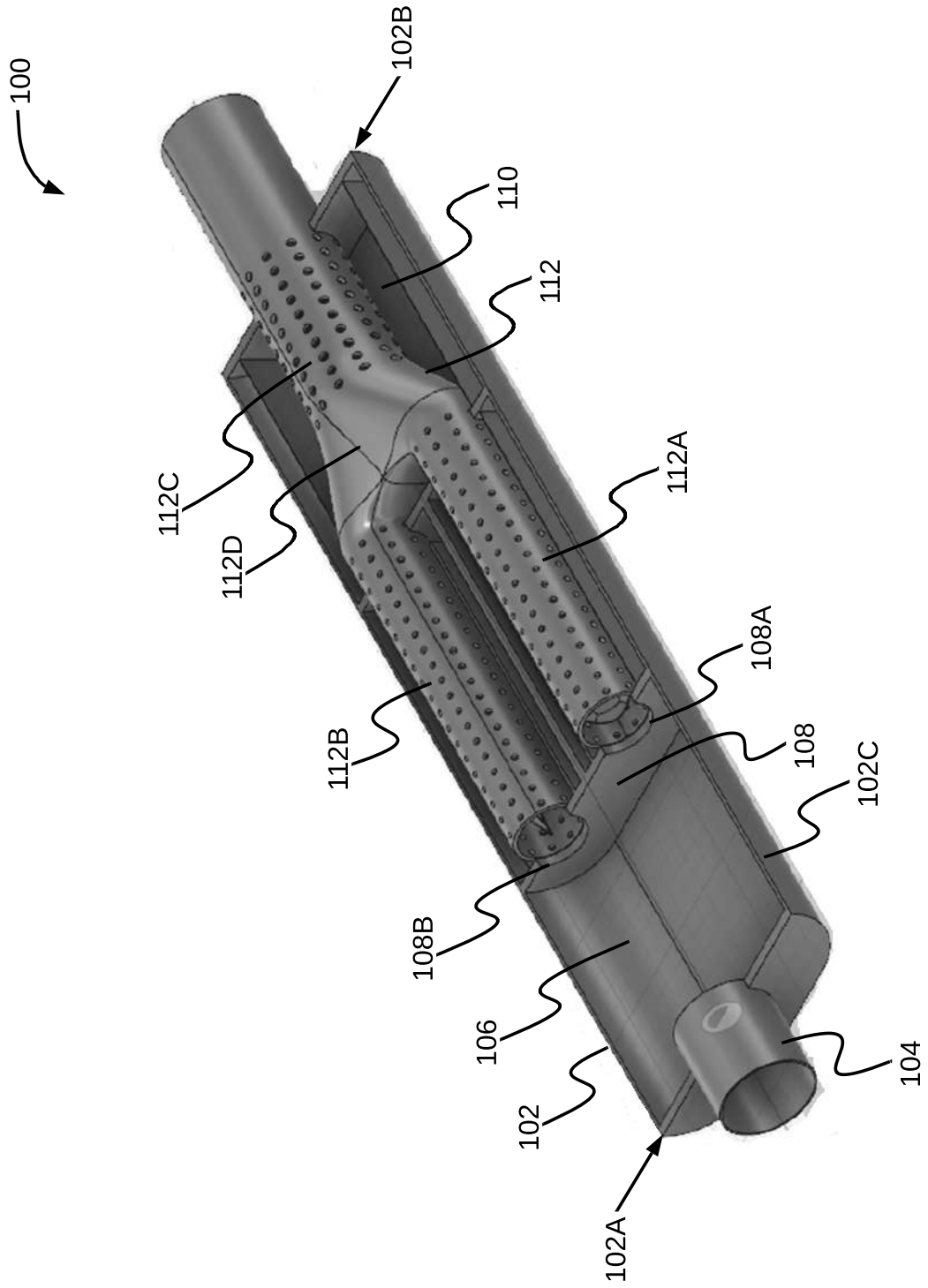


FIG. 1

Mohammed Faisal (INPA No: 1941)
Head, IPR Dept.,
L&T Technology Services Limited,
DLF 3rd Block, 2nd Floor,
Manapakkam, Chennai - 600089.

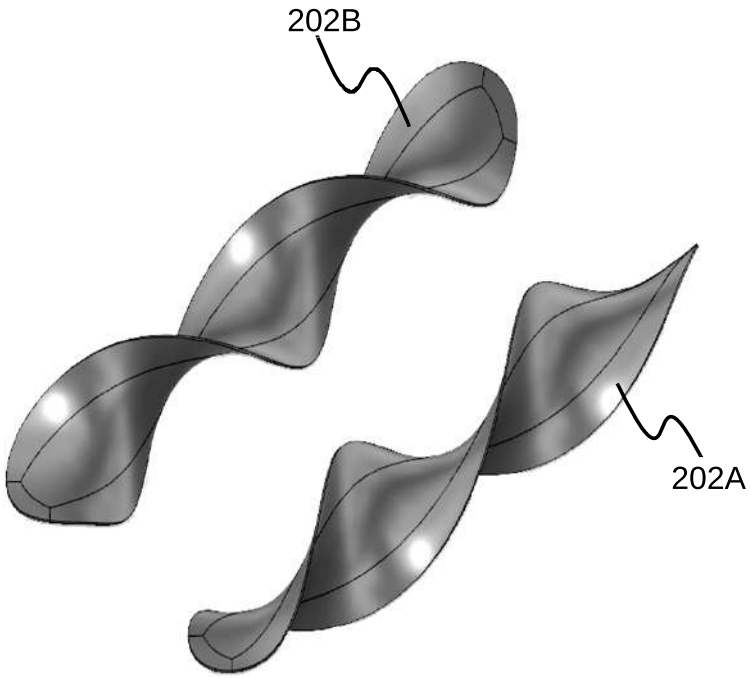


FIG. 2

Mohammed Faisal (INPA No: 1941)
Head, IPR Dept.,
L&T Technology Services Limited,
DLF 3rd Block, 2nd Floor,
Manapakkam, Chennai - 600089.

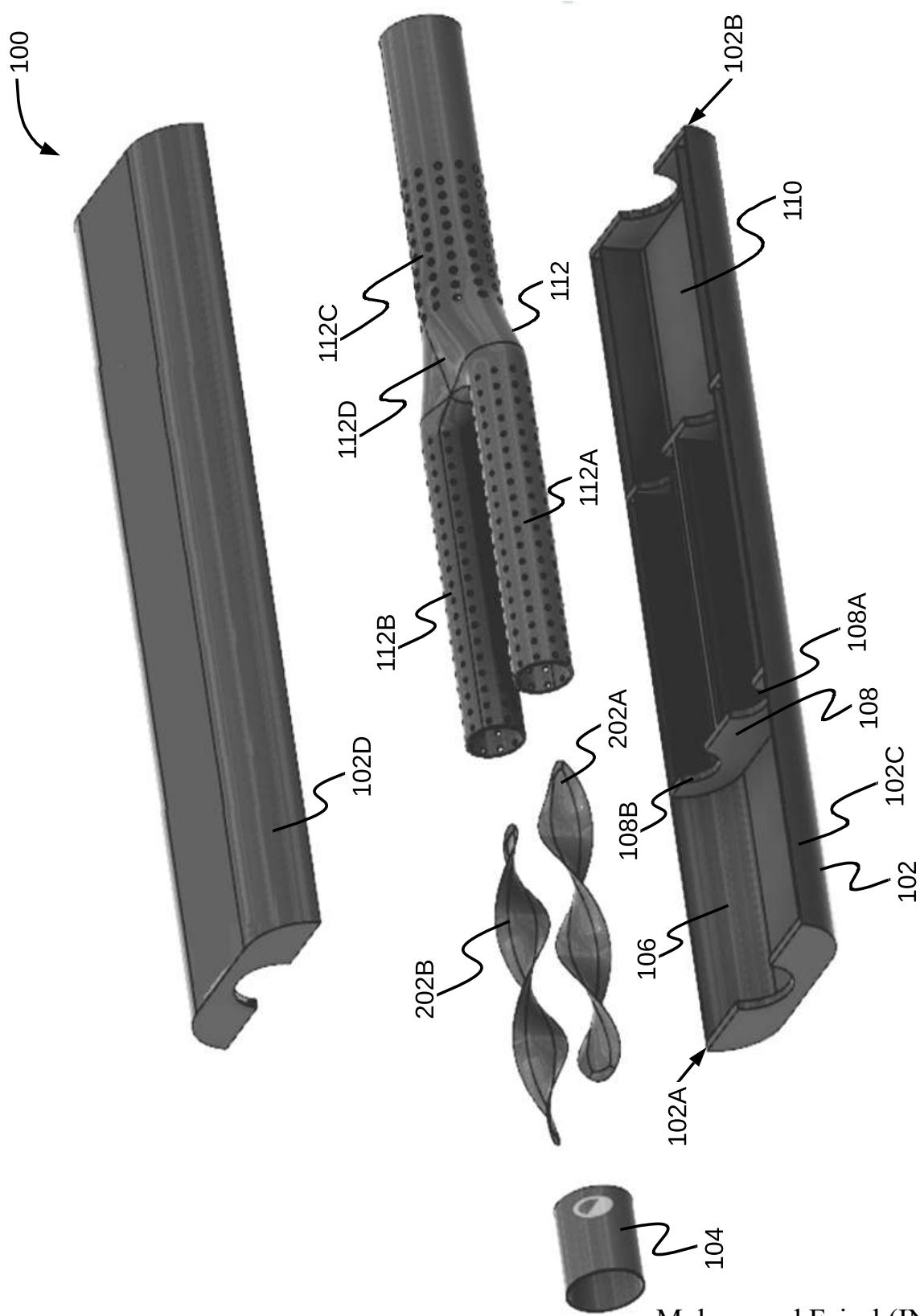


FIG. 3

Mohammed Faisal (INPA No: 1941)
Head, IPR Dept.,
L&T Technology Services Limited,
DLF 3rd Block, 2nd Floor,
Manapakkam, Chennai - 600089.