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(54) **BODY FOR AIR INTAKE SYSTEM, FILTER SYSTEM AND AIR INTAKE SYSTEM**

(57) The invention relates to a body (10) for an air intake system (30), having an air cleaner section (100) and an air intake manifold section (200), the air cleaner section (100) comprising a filter segment (110) covered by at least one air cleaner cover (120, 130), the filter segment (110) including a receptacle for a filter element (108), the air intake manifold section (200) comprising a

first manifold cover (210) and a second manifold cover (220), wherein the filter segment (110) and one of the manifold covers (210, 220) form one integral unit (300) connecting the air cleaner section (100) and the air intake manifold section (200).

Further, the invention relates to a filter system (20) and an air intake system (30).

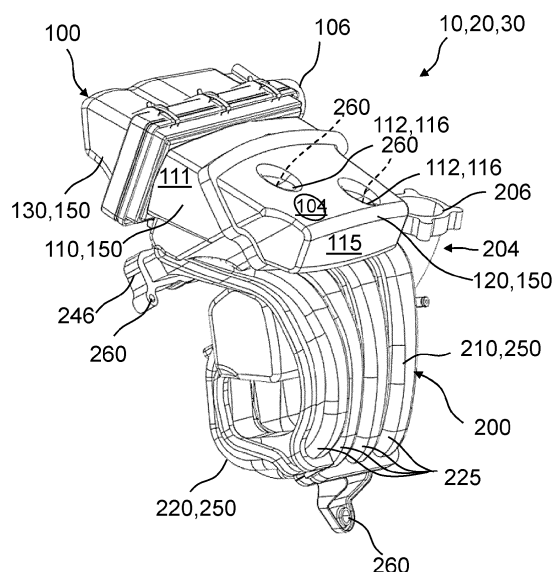


Fig. 1

Description

Technical Field

[0001] The invention relates to a body for an air intake system, a filter system comprising such a body and an air intake system, in particular for an internal combustion engine.

Prior Art

[0002] US 6,024,066 A3 discloses an air intake module for an internal combustion engine, including an air cleaner for cleaning air and manifold pipes for distributing air into each cylinder of the engine, wherein the components are integrated in a single unit. A mounting flange connected to engine side ends of the manifold pipes is fixed to the engine for mounting the air intake module as a whole. The air cleaner and other components of the module are located under the mounting flange and the manifold pipes, so that the mounting of the module is not obstructed by components constituting the module. An air cleaner element for filtering the intake air is slidably inserted into the air cleaner at a position where the element can be easily serviced from the outside of the module without dismounting any components of the module.

Disclosure of the Invention

[0003] It is an object of the invention to provide a body in particular for an air intake system with reduced mounting space.

[0004] Another object is to provide an improved filter system with such a body.

[0005] Another object is to provide an improved air intake system with such a body.

[0006] One object is achieved by a body having an air cleaner section and an air intake manifold section, the air cleaner section comprising a filter segment covered by at least one air cleaner cover, the filter segment including a receptacle for a filter element, the air intake manifold section comprising a first manifold cover and a second manifold cover, wherein the filter segment and one of the manifold covers form one integral unit connecting the air cleaner section and the air intake manifold section.

[0007] Another of the objects is achieved by a filter system comprising a body having an air cleaner section and an air intake manifold section, the air cleaner section comprising a filter segment covered by at least one air cleaner cover, the filter segment enclosing a receptacle for a filter element, the air intake manifold section comprising a first manifold cover and a second manifold cover, wherein the filter segment and one of the manifold covers form one integral unit connecting the air cleaner section and the air intake manifold section.

[0008] Another of the objects is achieved by an air intake system, in particular for an internal combustion en-

gine, with a filter system and/or a body, having an air cleaner section and an air intake manifold section, the air cleaner section comprising a filter segment covered by at least one air cleaner cover, the air intake manifold section comprising a first manifold cover and a second manifold cover, wherein the filter segment and one of the manifold covers form one integral unit connecting the air cleaner section and the air intake manifold section.

[0009] The other claims, the description and the drawings describe advantageous embodiments of the invention.

[0010] According to one aspect of the invention a body is proposed having an air cleaner section and an air intake manifold section. The air cleaner section comprises a filter segment covered by at least one air cleaner cover, the filter segment including a receptacle for a filter element. The air intake manifold section comprises a first manifold cover and a second manifold cover, wherein the filter segment and one of the manifold covers form one integral unit connecting the air cleaner section and the air intake manifold section.

[0011] Advantageously, no gap is between filter segment and the cover of the air intake manifold. This allows to reduce the number of interfaces, reduce acoustic, vibration and durability issues that may occur with decoupling devices where the air cleaner and the air intake manifold are separate devices. The invention also provides additional space in order to improve the performance of the whole air intake system such as air cleaner volume, air intake manifold runner length and plenum volume. Favorably, these features can lead to CO₂ emission reductions.

[0012] The inventive solution also allows to reduce the weight and costs of an air intake system. Because a portion of the air cleaner is integral with a portion of the air intake manifold forming the integral unit, the air cleaner and the manifold are virtually the same part. There is no need to separate the air cleaner from the air intake manifold.

[0013] This allows to avoid additional fixation devices such as screws, decoupling devices, etc. and offers a very compact solution due to the fact that there is no gap between the filter segment and the air inlet cover.

[0014] The integral unit may be without a fluid connection between the air cleaner section and the air intake manifold section. A fluid connection between the air cleaner section and the air intake manifold section may be established by a tube mounted externally to the body between an air outlet of the air cleaner section for clean air and an inlet of the air intake manifold section.

[0015] Favorably, the body may be a plastics body manufactured by injection molding.

[0016] According to an advantageous embodiment of the body, the air intake manifold section may comprise at least one mounting part, wherein the at least one mounting part is at least partially concealed by the filter segment and/or one of the air cleaner covers. The mounting part may be a lug for a screw or the like.

[0017] According to an advantageous embodiment of the body, the air cleaner section may provide at least one access element to a corresponding at least partially concealed mounting part, to allow a tool to access the mounting part. In the prior art, the access to the air intake manifold mounting parts, for instance an access for screw drivers, can be a problem as they need to go through the air cleaner. To solve this, the integral unit of the air cleaner section and the air intake manifold section allows an access for a screw driver or a hexagon wrench. For instance, the air cleaner housing may be split in several housing parts or it may be adapted in shape to keep the access to the air intake manifold mounting parts.

[0018] Advantageously, at least one access element may be designed as a tube element with open ends, which may protrude through an interior space of the air cleaner section, in particular through the filter segment. The access element may be configured as a feedthrough tube through the air cleaner housing, thus giving access from the outside to mounting parts of the air intake manifold behind the integral unit of the air cleaner section and the air intake manifold section.

[0019] According to an advantageous embodiment of the body, at least one access element may be arranged at the raw side of the air cleaner section. This facilitates sealing between the access element and the cleaner housing.

[0020] According to an advantageous embodiment of the body, a housing of the air cleaner section may be formed by of a front side air cleaner cover, an outer shell of the filter segment and a back side air cleaner cover. Advantageously, the integral unit of the air cleaner section and the air intake manifold section allows the access to one or more mounting parts otherwise hidden by the integral unit for a tool such as a screw driver. The air cleaner housing may be composed of several housing parts or, alternatively, it may be adapted in shape to keep the access to the air intake manifold mounting parts.

[0021] According to an advantageous embodiment of the body, the air intake manifold section may comprise an inlay element being positioned between the air manifold covers and providing air intake manifold channels. The inlay element can be adapted in shape and /or contour to provide space for the access element.

[0022] Advantageously the air intake manifold channels may be formed by one of the manifold covers and/or the inlay element and/or filter segment and/or the air cleaner covers. In particular, the channels can be formed in an assembled state of the inlay element and the covers.

[0023] According to another aspect of the invention, a filter system is proposed comprising a body having an air cleaner section and an air intake manifold section, the air cleaner section comprising a filter segment covered by at least one air cleaner cover, the filter segment enclosing a receptacle for a filter element, the air intake manifold section comprising a first manifold cover and a second manifold cover, wherein the filter segment and one of the manifold covers form one integral unit con-

necting the air cleaner section and the air intake manifold section.

[0024] A compact filter system, in particular an air cleaner system, can be provided which allows for a reduced mounting space, providing advantages in weight and cost as well as acoustic, vibration and duration issues. The filter system is particularly useful in an air cleaner system for combustion engines.

[0025] According to another aspect of the invention, an air intake system is proposed, particularly for an internal combustion engine, with a filter system and/or a body having an air cleaner section and an air intake manifold section, the air cleaner section comprising a filter segment covered by at least one air cleaner cover, the air intake manifold section comprising a first manifold cover and a second manifold cover, wherein the filter segment and one of the manifold covers form one integral unit connecting the air cleaner section and the air intake manifold section.

[0026] The integral unit may be without a fluid connection between the air cleaner section and the air intake manifold section. A fluid connection between the air cleaner section and the air intake manifold section may be established by a tube mounted externally to the body between an air outlet of the air cleaner section for clean air and an inlet of the air intake manifold section.

[0027] According to an advantageous embodiment of the air intake system, the filter segment and the at least one air cleaner cover may form an air cleaner housing comprising an interior space, a fluid inlet, a fluid outlet and a receptacle for a filter element. The filter element may preferably be exchangeable so that the filter element may be replaced by a clean filter element after a certain operation time of the filter element.

[0028] According to an advantageous embodiment of the air intake system, at least the first manifold cover and a second manifold cover may form air intake channels, wherein the air intake channels may be fluidly connected to an air inlet tube and a corresponding outlet. Usually, the access to the air intake manifold mounting parts for tools such as screw drivers or hexagon wrenches is obstructed as they would need to go through the air cleaner. Advantageously, at least one access element may be designed as a tube element with open ends, which may protrude through an interior space of the air cleaner section, in particular through the filter segment. The access element may be configured as a feedthrough tube through the air cleaner housing, thus giving access from the outside to mounting parts of the air intake manifold behind the integral unit of air cleaner section and air intake manifold section.

[0029] According to an advantageous embodiment of the air intake system, the air intake manifold section may comprise at least one mounting part, in particular wherein the at least one mounting part is at least partially concealed by the filter segment and/or one of the air cleaner covers. The mounting part may by a lug for a screw or the like. At least one access element to a corresponding

at least partially concealed mounting part may be provided to allow a tool to access the mounting part. In the prior art, the access to the air intake manifold mounting parts, for instance an access for screw drivers, is obstructed as they would need to go through the air cleaner. To solve this, the integral unit of the air cleaner section and the air intake manifold section allows the screw driver access. For instance, the air cleaner housing may be split in several housing parts or it may be adapted in shape to keep the access to the air intake manifold mounting parts.

[0030] According to an advantageous embodiment of the air intake system, the filter system and/or the body may be mounted to a combustion engine. Mounting space in a usually restricted packaging ambient can be reduced as well as acoustic, vibration and durability issues that may occur with decoupling devices where the air cleaner and the air intake manifold are separate devices.

Brief Description of the Drawings

[0031] The present invention together with the above-mentioned and other objects and advantages may best be understood from the following detailed description of the embodiments, but not restricted to the embodiments, wherein is shown in:

- Figure 1 in a perspective view a body such as for a filter system or an air intake system according to an embodiment of the invention;
- Figure 2 in an exploded view the components of the body of Figure 1;
- Figure 3 in front view the body of Figure 1 in an assembled state;
- Figure 4 in a perspective view the body of Figure 1 featuring tools attached to mounting parts.

Detailed Description of the Drawings

[0032] In the drawings, like elements are referred to with equal reference numerals. The drawings are merely schematic representations, not intended to portray specific parameters of the invention. Moreover, the drawings are intended to depict only typical embodiments of the invention and therefore should not be considered as limiting the scope of the invention.

[0033] Figure 1 depicts in a perspective view a body 10 such as for a filter system 20 or an air intake system 30 according to an embodiment of the invention. Figure 2 shows in an exploded view components of the body 10 of Figure 1 and Figure 3 shows in a front view the body 10 of Figure 1 in an assembled state.

[0034] The body 10 comprises an air cleaner section 100 and an air intake manifold section 200. The air cleaner section 100 comprises a housing 150 which includes

a filter segment 110 covered by a front side air cleaner cover 120 and a back side air cleaner cover 130. The filter segment 110 includes a receptacle for a filter element 108.

[0035] The front side air cleaner cover 120 of the filter segment 110 comprises a raw fluid inlet 104 and two openings 112 arranged in an outer shell 115 of the air cleaner cover 120. The openings 112 give access to access elements 116 through the filter segment 110 to mounting parts 260, e.g. lugs for attaching screws, of the air intake manifold section 200. The access elements 116 may be configured as feedthrough tubes which allows the interior space 102 of the filter segment 110 to be sealed against the outside of the body 10. The interior space 102 of the filter segment 110 and hence the access elements 116 are arranged at the raw side of the filter segment 110. The interior space 102 is surrounded by an outer shell 111 of the filter segment 110 and the filter element 108 at one side and the outer shell 115 of the front side air cleaner cover 120.

[0036] The backside cover 130 covers the clean side of the filter segment 110. Clean air leaves the air cleaner section 100 through a fluid outlet 106 in the backside cover 130 of the housing 150.

[0037] Clean air enters the air intake manifold section 200 through an inlet tube 206, is distributed into parallel air intake manifold channels 225 of the air intake manifold section 200 and exhausted through parallel orifices of an outlet 246 of the air intake manifold section 200. The portion of the outlet 246 is attached to a combustion engine (not shown). The inlet tube 206 is formed by an element 204. The element 204 is connected to a manifold housing 250. A fluid connection between the air outlet 106 of the air cleaner section 100 and the air inlet tube 206 of the air intake manifold section 200 can be established by a tube 160 mounted externally to the body 10.

[0038] The air intake manifold section 200 comprises the housing 250 with a first manifold cover 210 and a second manifold cover 220 between which an inlay element 230 is arranged. In an assembled state, the troughs 224 in the inlay 230 and the first and second manifold covers 210, 220 form the air intake channels 225 for the clean air. The air intake channels 225 are formed of troughs 224 as parts of the air intake channel walls covered in one region by the first manifold cover 210 and in another region by the second manifold cover 220 of the air intake manifold section 200.

[0039] The filter segment 110 and one of the manifold covers 210 form one integral unit 300 which connects the air cleaner section 100 and the air intake manifold section 200. Advantageously, there is no gap between the air cleaner segment 100 and the air intake manifold cover 210, thus allowing to reduce the number of interfaces, as well as to reduce the acoustic, vibration and durability issues that could occur with decoupled devices.

[0040] The air cleaner section 100 provides at least one access element 116 to a corresponding at least partially concealed mounting part 260, to allow a tool 400 to

access the mounting part 260. This is schematically shown in Figure 4. Favorably, the access element 116 can be attached to the integral unit 300. The outer shell 111 of the filter segment 110 and the outer shell 115 of the air cleaner cover 120 can be adapted in shape and/or contour to allow the tool 400 to access the mounting part 260.

[0041] While in the prior art the access of the air intake manifold mounting part 260 to, e.g. a combustion engine, is obstructed as the tool 400 would need to go through the air cleaner housing 150, the inventive solution allows access for the tool 400 through the filter segment 110.

[0042] The tool 400 may be a screw driver or the like and is indicated in Figure 4 as a rod attached to several mounting parts 260 of the air intake manifold section 200. While some mounting parts 260 are easily accessible from the outside, some mounting parts 260 have to be accessed through the filter segment 110, in particular through the integral unit 300.

[0043] The housing 150 of the air cleaner section 100 is split into several housing parts, the front side air cleaner cover 120, the outer shell of the filter segment 110 and the back side air cleaner cover 130.

[0044] As can be seen in Figure 2, the front side air cleaner cover 120 comprises openings 112 which give access to the access element 116 in the interior space 102 of the filter segment 110. The access element 116 can be sealed against the front side air cleaner cover 120.

[0045] The front side air cleaner cover 120 has an inner wall 114 which extends from the interface between the filter segment 110 and the front side air cleaner cover 120 to the outside shell 115 of the front side air cleaner cover 120. The inner wall 114 comprises openings 113 which correspond to the openings 112 in the outer shell 115 of the front side air cleaner cover 120.

[0046] The access elements 116 in interior space 102 of the filter segment 110 are designed as tube elements with open ends and protrude from the mounting part 260 through the interior space 102 through openings 113 in the inner wall 114 to the openings 112 in the outer shell 115 of the front side air cleaner cover 120.

[0047] The access elements 116 can be connected to the integral unit 300 by welding, gluing or the like.

Reference numerals

[0048]

10 body
20 filter system
30 air intake system
100 Air cleaner section
102 interior space
104 raw fluid inlet
106 clean fluid outlet to the air intake tube
108 filter element
110 filter segment
111 outer shell

112 opening
113 opening
114 inner wall
115 outer shell
5 116 access elements
120 front side air cleaner cover
130 back side air cleaner cover
150 cleaner housing
160 tube
10 200 air intake manifold section
204 element
206 air inlet tube
210 first air manifold cover
220 second air manifold cover
15 224 trough
225 air intake manifold channel
230 inlay element
246 outlet
250 manifold housing
20 260 mounting part
300 integral unit
400 tool

25 Claims

1. A body (10) having an air cleaner section (100) and an air intake manifold section (200),

30 the air cleaner section (100) comprising a filter segment (110) covered by at least one air cleaner cover (120, 130), the filter segment (110) including a receptacle for a filter element (108), the air intake manifold section (200) comprising a first manifold cover (210) and a second manifold cover (220),
35 wherein the filter segment (110) and one of the manifold covers (210, 220) form one integral unit (300) connecting the air cleaner section (100) and the air intake manifold section (200).

2. The body according to claim 1, wherein the air intake manifold section (200) comprises at least one mounting part (260), wherein the at least one mounting part (260) is at least partially concealed by the filter segment (110) and/or one of the air cleaner covers (210, 220).

3. The body according to claim 1 or 2, wherein the air cleaner section (100) provides at least one access element (116) to a corresponding at least partially concealed mounting part (260), to allow a tool (400) to access the mounting part (260).

4. The body according to claim 3, wherein at least one access element (116) is designed as a tube element with open ends, which protrudes through an interior space (102) of the air cleaner section (100), in par-

ticalar through the filter segment (110).

5. The body according to claim 3 or 4, wherein at least one access element (116) is arranged at the raw side of the air cleaner section (100).

6. The body according to any one of the preceding claims, wherein a housing (150) of the air cleaner section (100) is formed by a front side air cleaner cover (120), an outer shell (111) of the filter segment (110) and a back side air cleaner cover (130).

7. The body according to any one of the preceding claims, wherein the air intake manifold section (200) comprises an inlay element (230) being positioned between the manifold covers (210, 220) and providing at least a part of air intake manifold channels (225).

8. The body according to according to claim 7, wherein the air intake manifold channels (225) are formed by one of the manifold covers (210, 220) and/or the inlay element (230) and/or the filter segment (110) and/or one of the air cleaner covers (120, 130).

9. A filter system (20) comprising a body (10) according to any one of the preceding claims having an air cleaner section (100) and an air intake manifold section (200),

the air cleaner section (100) comprising a filter segment (110) covered by at least one air cleaner cover (120, 130), the filter segment (100) enclosing a receptacle for a filter element (108), the air intake manifold section (200) comprising a first manifold cover (210) and a second manifold cover (220), wherein the filter segment (110) and one of the manifold covers (210, 220) form one integral unit (300) connecting the air cleaner section (100) and the air intake manifold section (200).

10. An air intake system (30), in particular for an internal combustion engine, with a filter system (20) according to claim 9 and/or a body (10) according to any one of the claims 1 to 8 having an air cleaner section (100) and an air intake manifold section (200), the air cleaner section (100) comprising a filter segment (110) covered by at least one air cleaner cover (120, 130),

the air intake manifold section (200) comprising a first manifold cover (210) and a second manifold cover (220), wherein the filter segment (110) and one of the manifold covers (210, 220) form one integral unit (300) connecting the air cleaner section (100) and the air intake manifold section (200).

11. The air intake system according to claim 10, wherein the filter segment (110) and the at least one air cleaner cover (120, 130) form an air cleaner housing (150) comprising an interior space (102), a fluid inlet (104), a fluid outlet (106) and a receptacle for a filter element (108).

12. The air intake system according to claim 10 or 11, wherein at least the first manifold cover (210) and the second manifold cover (220) form air intake channels (225), wherein the air intake channels (225) are fluidly connected to an air inlet tube (206) and a corresponding outlet (246).

13. The air intake system according to any one of the claims 10 to 12, wherein the air intake manifold section (200) comprises at least one mounting part (260), in particular, wherein the at least one mounting part (260) is at least partially concealed by the filter segment (110) and/or one of the air cleaner covers (120, 130).

14. The air intake system according to any one of the claims 10 to 13, wherein the filter system (20) and/or the body (10) are mounted to a combustion engine.

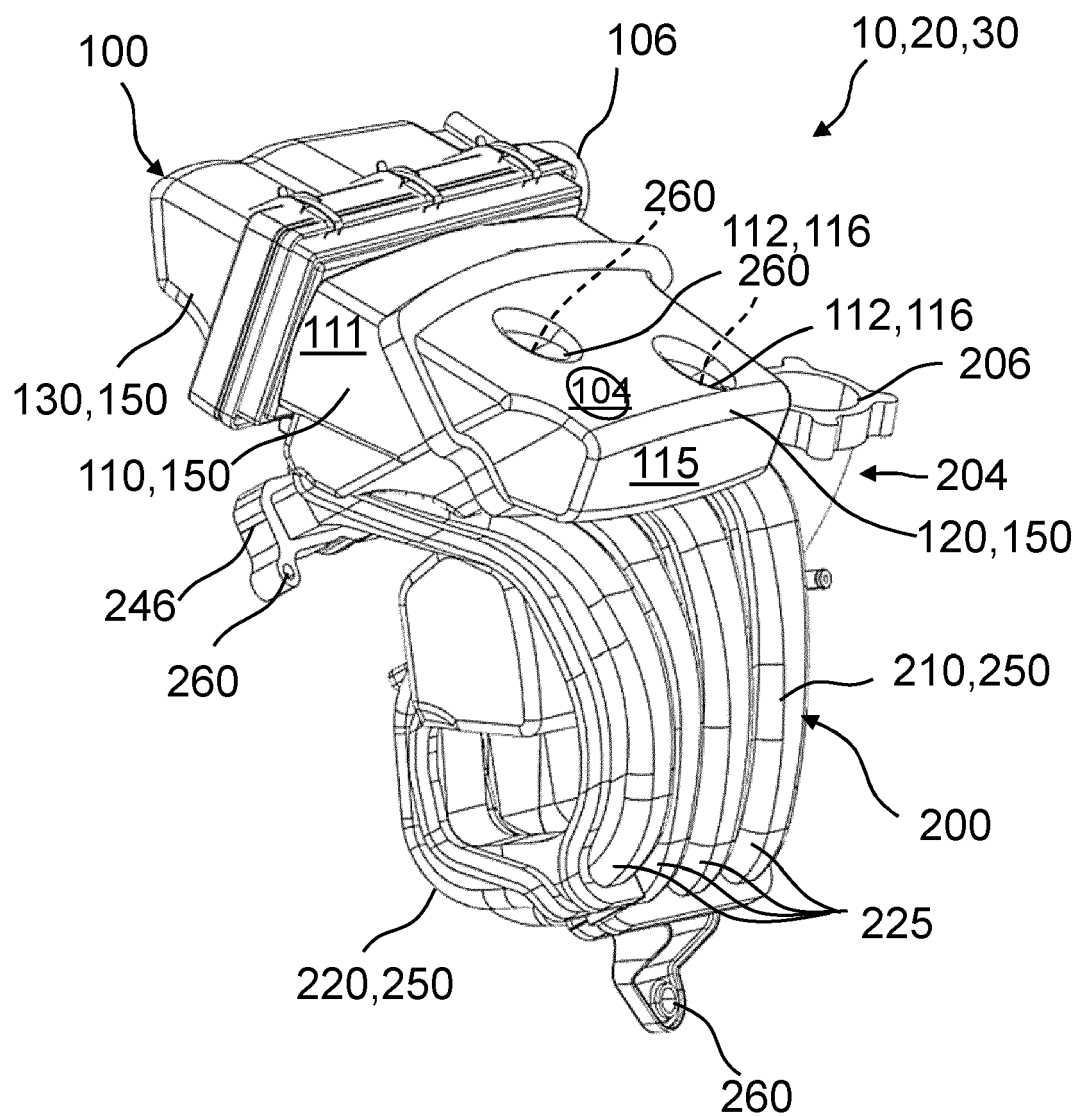


Fig. 1

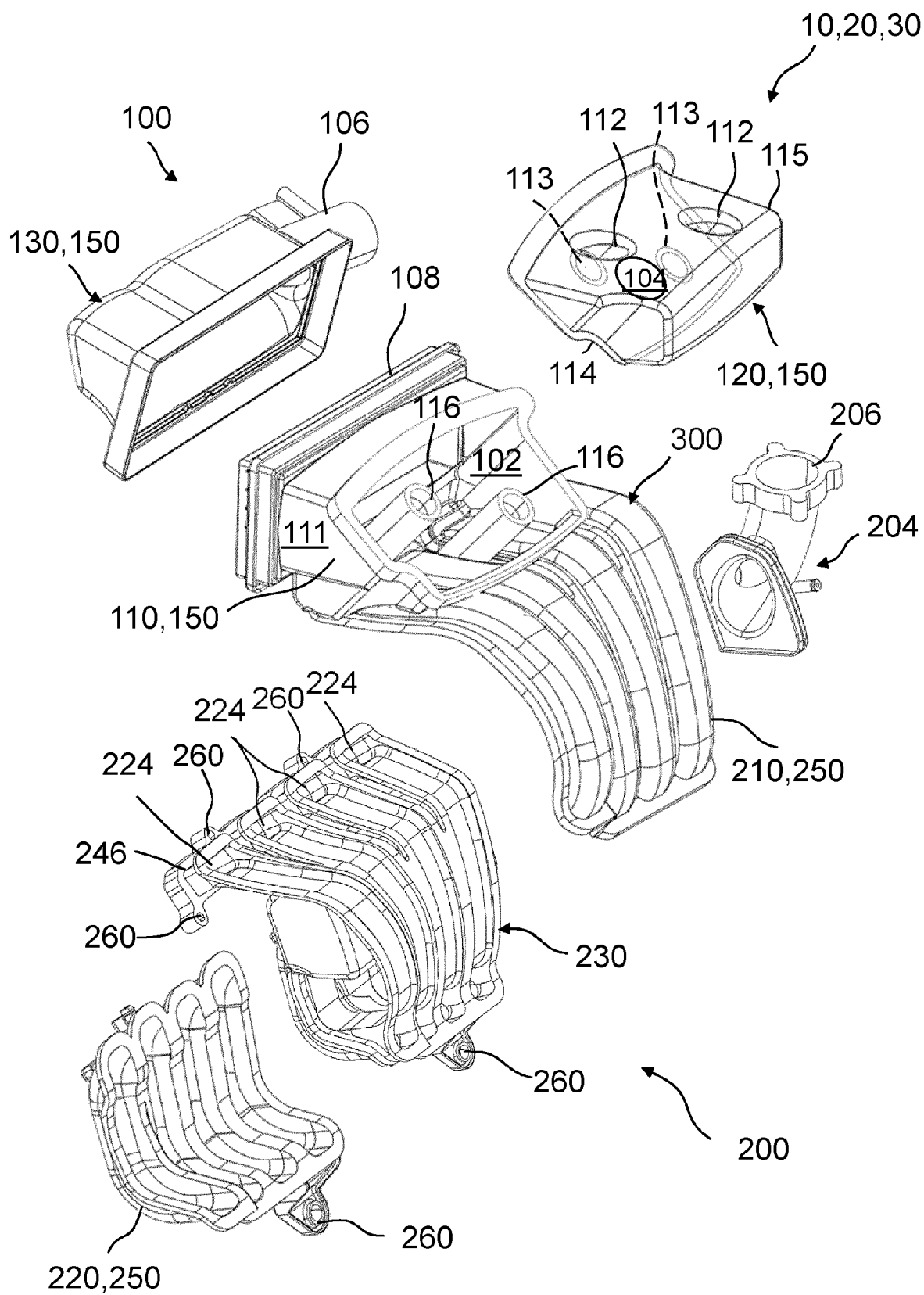


Fig. 2

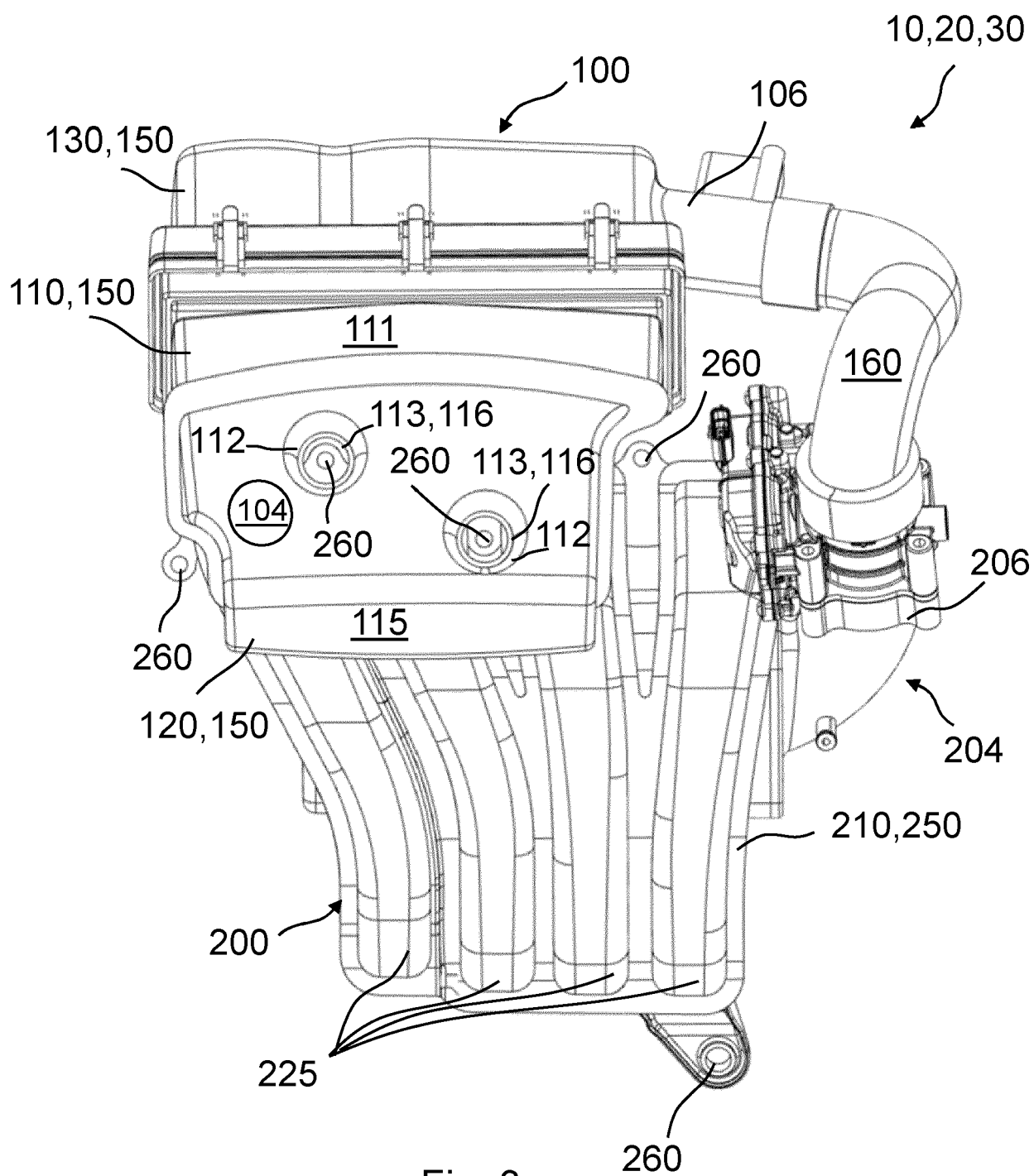


Fig. 3

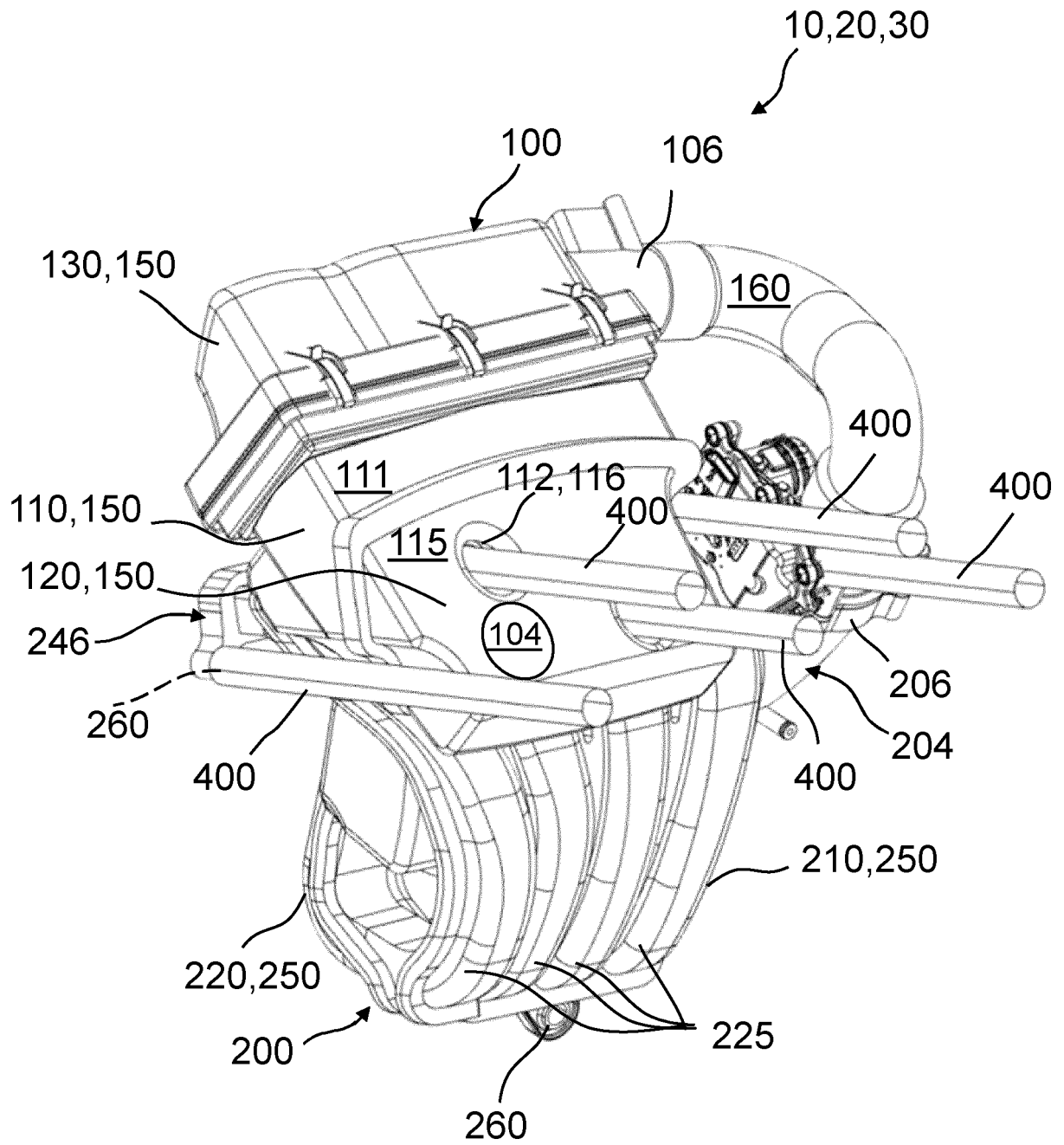


Fig. 4



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Application Number

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Place of search Munich		Date of completion of the search 4 July 2022	Examiner Rauch, Vincent
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