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Collecteur d'admission

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(56) References cited:
DE-A- 19 944 855 **GB-A- 2 299 375**
US-A- 5 636 605 **US-A- 5 992 369**

- **PATENT ABSTRACTS OF JAPAN vol. 1997, no. 11, 28 November 1997 (1997-11-28) & JP 09 195869 A (ASAHI TEC CORP), 29 July 1997 (1997-07-29)**
- **PATENT ABSTRACTS OF JAPAN vol. 1998, no. 08, 30 June 1998 (1998-06-30) & JP 10 077917 A (TOYOTA MOTOR CORP), 24 March 1998 (1998-03-24)**
- **PATENT ABSTRACTS OF JAPAN vol. 1997, no. 09, 30 September 1997 (1997-09-30) & JP 09 125970 A (AISIN SEIKI CO LTD), 13 May 1997 (1997-05-13)**

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an intake manifold formed by vibration-welding a plurality of joining members made of a synthetic resin.

[0002] Conventionally, such an intake manifold is known in, for example, Japanese Utility Model Registration Application Laid-open No. 6-73368. This intake manifold is formed by vibration-welding a first joining member and a second joining member. In the first joining member, a plurality of first intake pipe halves are integrally connected over their whole length, each of the first intake pipe halves forming a part of an intake pipe. In the second joining member, a plurality of second intake pipe halves are integrally connected over their whole length, each of the second intake pipe halves forming the remainder of the corresponding intake pipe.

[0003] In the above-mentioned conventional arrangement, because adjacent intake pipes are integrally connected over their whole length, a comparatively large amount of synthetic resin is required to form the intake manifold. Moreover, this arrangement can only be applied to a case where the distance between adjacent intake pipes is comparatively small, leading to restrictions on the engine layout.

[0004] In order to solve the above-mentioned problems, it could be conceivable to form an intake manifold by vibration-welding a first joining member made of a synthetic resin and a plurality of second joining members, the first joining member being formed by connecting in common at least one end of each of a plurality of intake pipe halves positioned at intervals from each other and each forming a part of an intake pipe, the second joining members being separate from each other and each forming the remainder of the corresponding intake pipe. An intake manifold is constructed in this manner, the second joining members need to be managed individually, so that it is difficult to make the production efficiency high. Moreover, the second joining members may be misaligned relative to the first joining member during vibration welding.

SUMMARY OF THE INVENTION

[0005] The present invention has been achieved in view of the above-mentioned circumstances, and it is an object of the present invention to provide an intake manifold that improves the degree of freedom in the engine layout while suppressing the amount of synthetic resin, and that can be produced efficiently and with high precision.

[0006] In order to accomplish the above-mentioned object, according to the present invention, there is proposed an intake manifold including a first joining member made of a synthetic resin and comprising a plurality of first intake pipe halves disposed at intervals in parallel to each other, each forming a part of one of a plurality of intake pipes, and at least one of the opposite ends of each of the plurality of first intake pipe halves being connected in common; and a second joining member made of a synthetic resin and comprising a plurality of second intake pipe halves, each forming the remainder of the corresponding intake pipe and being connected to each other at a bridging part; the intake manifold being formed by vibration-welding the first joining member and the second joining member, characterized in that the first intake pipe halves are disposed separate from each other and that the bridging parts are positioned in the middle in the longitudinal direction of the intake pipes.

[0007] This arrangement allows comparatively wide gaps to be set between the plurality of intake pipes of the intake manifold, thereby alleviating restrictions on the engine layout. Moreover, because adjacent intake pipes are connected to each other at least one of the opposite ends thereof and at the bridging parts that are in the middle in the longitudinal direction of the intake pipes, the amount of synthetic resin can be reduced in comparison with an intake manifold having a structure in which adjacent intake pipes are integrally connected over their whole length. Moreover, because the first joining member formed from the plurality of first intake pipe halves with their relative positions being fixed and the second joining member formed from the plurality of second intake pipe halves with their relative positions being fixed, are vibration-welded together to form the intake pipes, an intake manifold can be produced efficiently and with high precision.

[0008] In a preferred feature, the intake manifold is arranged such that the bridging part includes a low-rigidity part that has a rigidity lower than that of parts adjacent thereto. In accordance with this arrangement, when warp and distortion that are caused in the second joining member are corrected by means of a backup member of the vibration welding die on the contact surface between the second joining member and the first joining member during vibration welding of the first and second joining members, the warp and distortion can be absorbed by the low-rigidity part to correct the overall shape of the second joining member, thus preventing any displacement being caused in the vibration welded joint face to improve the welding quality.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

FIGS. 1 to 4 show one embodiment of the present invention.

FIG. 1 is a perspective view of a surge tank and an intake manifold.

FIG. 2 is a perspective view of a first joining member.

FIG. 3 is a perspective view of a second joining member.

FIG. 4 is a cross section along line 4-4 in FIG. 1.

DESCRIPTION OF PREFERRED EMBODIMENT

[0010] An embodiment of the present invention is explained below by reference to the attached drawings.

[0011] Referring to FIG. 1, an intake manifold M, which is connected to, for example, a four-cylinder engine (not illustrated), includes a plurality of, for example, four intake pipes 5 disposed in parallel to each other. One end of each of the intake pipes 5 is connected in common to a surge tank 6. Integrally provided on the other ends of the intake pipes 5 is a common engine mounting flange 9 via which the intake manifold M is connected to the engine. The intake pipes 5 are disposed in parallel to each other in a shape such that they curve around, for example, substantially 180 degrees on the way from the surge tank 6 to the engine mounting flange 9.

[0012] The surge tank 6 is formed by vibration-welding an open end of a first tank half 7 made of a synthetic resin and opening upward, and an open end of a second tank half 8 made of a synthetic resin and opening toward the first tank half 7 along the entire periphery thereof. Said one end of each of the intake pipes 5 of the intake manifold M is provided so as to be connected integrally and in common to one side of the first tank half 7. Connected to one end, along the direction in which the intake pipes 5 are arranged, of the first tank half 7 is a conduit 10 for conducting air into the surge tank 6, the flow rate of the air being controlled by a throttle valve (not illustrated).

[0013] Referring to FIGS. 2 to 4, the intake manifold M is formed by vibration-welding first and second joining members 11 and 12 each made of a synthetic resin.

[0014] The first joining member 11 is formed by connecting in common at least one end (both ends in this embodiment) of the opposite ends of each of a plurality of, for example, four first intake pipe halves 13, which each form the main part of the corresponding intake pipe 5. The first joining member 11 includes the first intake pipe halves 13, the first tank half 7, and the engine mounting flange 9. One end of each of the first intake pipe halves 13 is connected integrally and in common to the first tank half 7. The other end of each of the first intake pipe halves 13 is connected integrally to the common engine mounting flange 9.

[0015] The first intake pipes halves 13 are formed so that each has an opening 16 on the outer peripheral side of the curved part. A joining flange 17 is integrally formed on the periphery of each of the openings 16 so as to project outward.

[0016] The second joining member 12 is formed by connecting a plurality of, for example, four second intake pipe halves 14 each forming the remainder of the corresponding intake pipe 5, via three bridging parts 15 positioned in the middle in the longitudinal direction of the intake pipes 5.

[0017] The second intake pipe halves 14 are formed so as to block the openings 16 of the first intake pipe halves 13. Integrally formed on the outer periphery of each of the second intake pipe halves 14 is a joining flange 18 that is joined to the joining flange 17 of the corresponding first intake pipe half 13.

[0018] When forming the intake manifold M by vibration-welding the first and second joining members 11 and 12, the joining flanges 17 and 18 that correspond to each other are vibration-welded.

[0019] The bridging parts 15 are disposed in the curved parts in the middle in the longitudinal direction of the intake pipes 5, and connects together the second intake pipe halves 14. A low-rigidity part 15a is provided in each of the bridging parts 15 in substantially the center along the direction in which the intake pipes 5 are arranged, the low-rigidity part 15a having an outwardly projecting curved shape so that the thickness of the low-rigidity part 15a can be made thinner than that on either side thereof, thereby lowering its rigidity relative to adjacent parts.

[0020] Next, the operation of this embodiment is explained. The intake manifold M is formed by vibration-welding the first joining member 11 and the second joining member 12. The first joining member 11 is formed by connecting in common at least one (both in this embodiment) of the opposite ends of each of the plurality of, for example, four first intake pipe halves 13 disposed at intervals in parallel to each other and forming the main parts of the plurality of, for example, four intake pipes 5. The second joining member 12 is formed by connecting, via the bridging parts 15 positioned in the middle in the longitudinal direction of the intake pipes 5, the plurality of, for example, four second intake pipe halves i4 each forming the remainder of the corresponding intake pipe 5.

[0021] In the intake manifold M having this arrangement, comparatively wide gaps can be set between adjacent intake pipes 5, thereby relaxing the restrictions on the engine layout. Moreover, adjacent intake pipes 5 are only connected to each other at least one (both in this example) of their opposite ends and by the bridging parts 15 that are in the middle in the longitudinal direction of the intake pipes 5. The amount of synthetic resin to form the intake manifold M can therefore be reduced in comparison with an intake manifold having a structure in which adjacent intake pipes are integrally connected over their whole length.

[0022] Moreover, because the first joining member 11 that is formed from the plurality of first intake pipe halves 13 with the relative positions thereof fixed, and the second joining member 12 that is formed from the plurality of second intake pipe halves 14 with the relative positions thereof fixed are vibration welded, the first intake pipe halves 13 and the second intake pipe halves 14 together forming the intake pipes, it is unnecessary to individually manage the first intake pipe halves 13 and the second intake pipe halves 14, and the intake manifold M can be produced efficiently and with good precision.

[0023] Additionally, the low-rigidity parts 15a that have a rigidity lower than that of the adjacent parts are provided in the bridging parts 15. Therefore, when warp and distortion that are caused in the second joining member are corrected by means of a backup member of the vibration welding die on the surface where the second joining member makes contact with the first joining member during vibration welding of the first and second joining members, the warp and distortion can be absorbed by the low-rigidity part so as to correct the overall shape of the second joining member 12, thus preventing any displacement in the vibration welded joint faces to improve the welding quality when producing the intake manifold M.

[0024] Although the present invention is explained in detail above, the present invention should not be limited to the above embodiment, and can be modified in a variety of ways.

[0025] An intake manifold is formed by vibration-welding a first joining member made of a synthetic resin and a second joining member made of a synthetic resin. The first joining member includes a plurality of first intake pipe halves disposed at intervals in parallel to each other, each forming a part of one of a plurality of intake pipes. At least one of the opposite ends of each of the plurality of first intake pipe halves is connected in common. The second joining member includes a plurality of second intake pipe halves, each forming the remainder of the corresponding intake pipe and being connected to each other at a bridging part positioned in the middle in the longitudinal direction of the intake pipes. The bridging part may be provided with a low-rigidity part that has a rigidity lower than that of parts adjacent thereto. Thus, the intake manifold formed by vibration-welding a plurality of joining members made of a synthetic resin can be produced efficiently and with high precision, while suppressing the amount of synthetic resin and improving the degree of freedom in the engine layout.

Claims

1. An intake manifold comprising:

a first joining member (11) made of a synthetic resin and comprising a plurality of first intake pipe halves (13) disposed at intervals in parallel to each other, each forming a part of one of a plurality of intake pipes (5), and at least one of the opposite ends of each of the plurality of first intake pipe halves (13) being connected in common; and

a second joining member (12) made of a synthetic resin and comprising a plurality of second intake pipe halves (14), each forming the remainder of the corresponding intake pipe (5) and being connected to each other at a bridging part (15);

the intake manifold (M) being formed by vibration-welding the first joining member (11) and the second joining member (12),

characterized in that the first intake pipe halves (13) are disposed separate from each other and that the bridging parts (15) are positioned in the middle in the longitudinal direction of the intake pipes (5).

2. The intake manifold according to Claim 1, wherein the bridging part (15) comprises a low-rigidity part (15a) that has a rigidity lower than that of parts adjacent thereto.

Patentansprüche

1. Einlasskrümmer umfassend:

ein erstes Verbindungselement (11) aus einem Kunstharz, das eine Mehrzahl zueinander paralleler, voneinander beabstandeter erster Teile (13) zweigeteilter Einlassrohre umfasst, welche jeweils ein Teilstück eines einer Mehrzahl von Einlassrohren (5) bilden, wobei die Mehrzahl erster Teile (13) zweigeteilter Einlassrohre an mindestens einem ihrer entgegengesetzten Enden miteinander verbunden sind;

und ein zweites Verbindungselement (12) aus einem Kunstharz, das eine Mehrzahl zweiter Teile (14) zweigeteilter Einlassrohre umfasst, welche die Restteilstücke der jeweiligen Einlassrohre (5) bilden und die miteinander durch jeweils ein Brückenelement (15) verbunden sind;

wobei der Einlasskrümmer (M) durch Vibrationsverschweißen des ersten Verbindungselements (11) und des zweiten Verbindungselements (12) gebildet ist, **dadurch gekennzeichnet,**

dass die ersten Teile (13) zweigeteilter Einlassrohre gesondert voneinander angeordnet sind und dass die Brückenelemente (15) mittig in der Längsausrichtung der Einlassrohre (5) liegen.

2. Einlasskrümmer nach Anspruch 1, wobei das Brükkenelement (15) ein Niedrig-Steifigkeits-Teilelement (15a) mit einer niedrigeren Steifigkeit als dazu benachbarte Abschnitte umfasst.

Revendications

1. Collecteur d'admission comprenant :

un premier élément de raccordement (11) fait de résine synthétique et comprenant une pluralité de premières moitiés de pipes d'admission (13) disposées à intervalle et en parallèle les unes par rapport aux autres, chacune formant une partie d'une parmi une pluralité de pipes d'admission (5), et au moins une des extrémités opposées de chacune de la pluralité des premières moitiés de pipes d'admission (13) étant connectées en commun ; et
un deuxième élément de raccordement (12) fait de résine synthétique et comprenant une pluralité de deuxièmes moitiés de pipes d'admissions (14), chacune formant le reste de la pipe d'admission correspondante (5) et étant connectées les unes aux autres en une partie de pontage (15) ;
le collecteur d'admission (M) étant formé en soudant par friction vibratoire le premier élément de raccordement (11) et le deuxième élément de raccordement (12),

caractérisé en ce que les premières moitiés de pipes d'admission (13) sont disposées de manière séparée les unes des autres et que les parties de pontage (15) sont placées au milieu dans la direction longitudinale des pipes d'admission.

2. Collecteur d'admission selon la revendication 1, dans lequel la partie de pontage (15) comprend une partie de faible rigidité (15a), dont la rigidité est inférieure à celle des parties adjacentes à celle-ci.

FIG.1

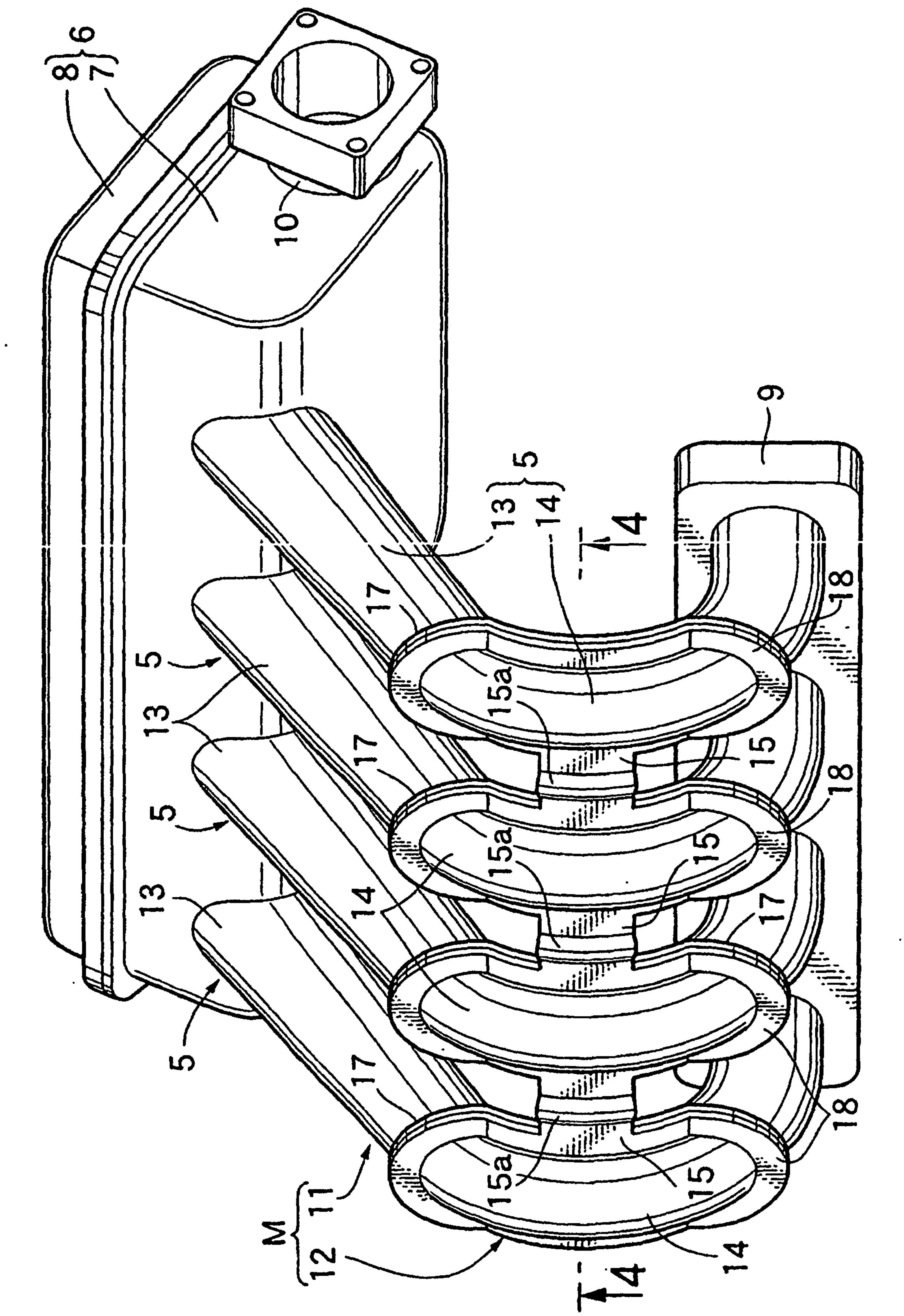


FIG.2

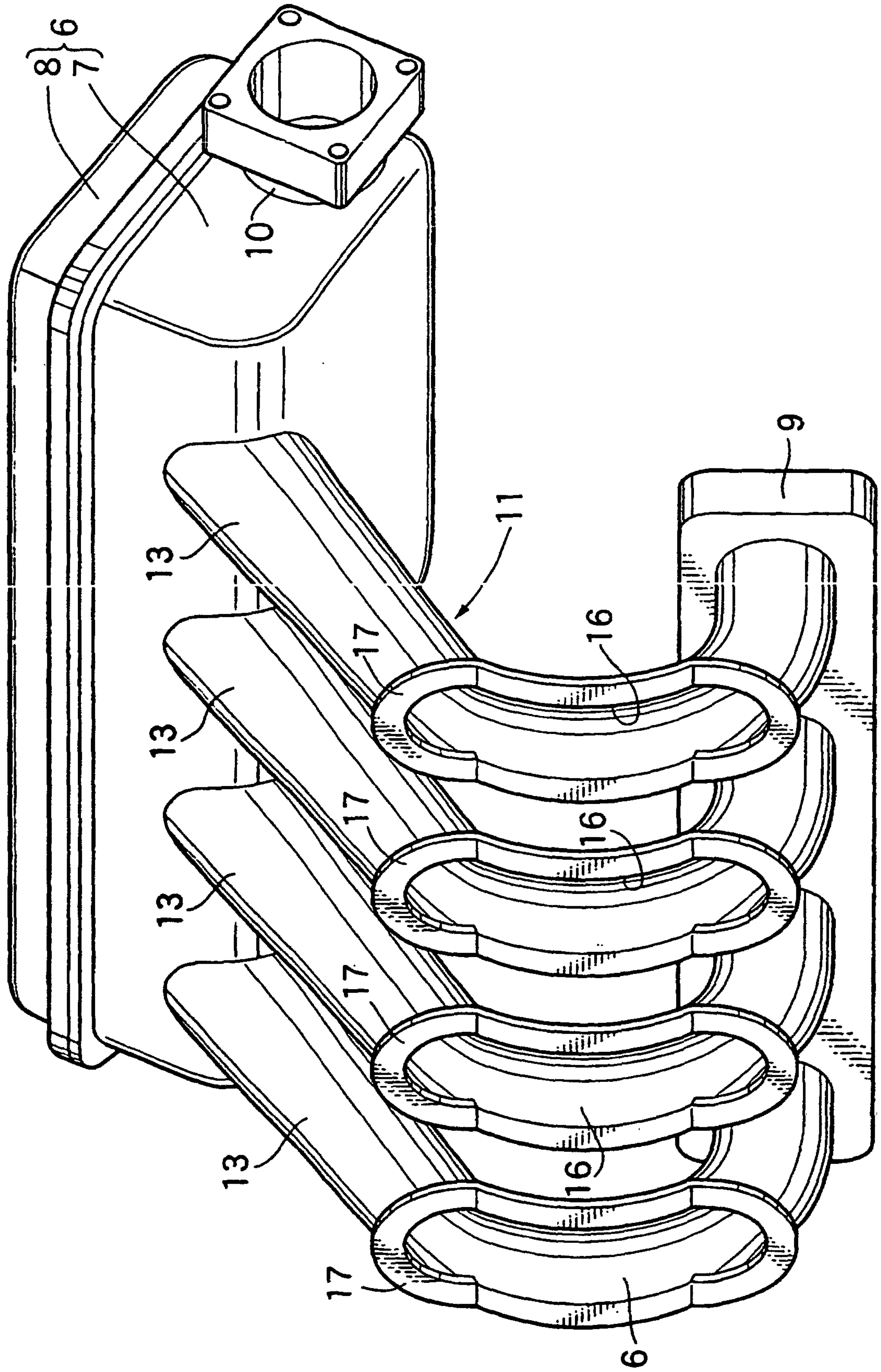


FIG.3

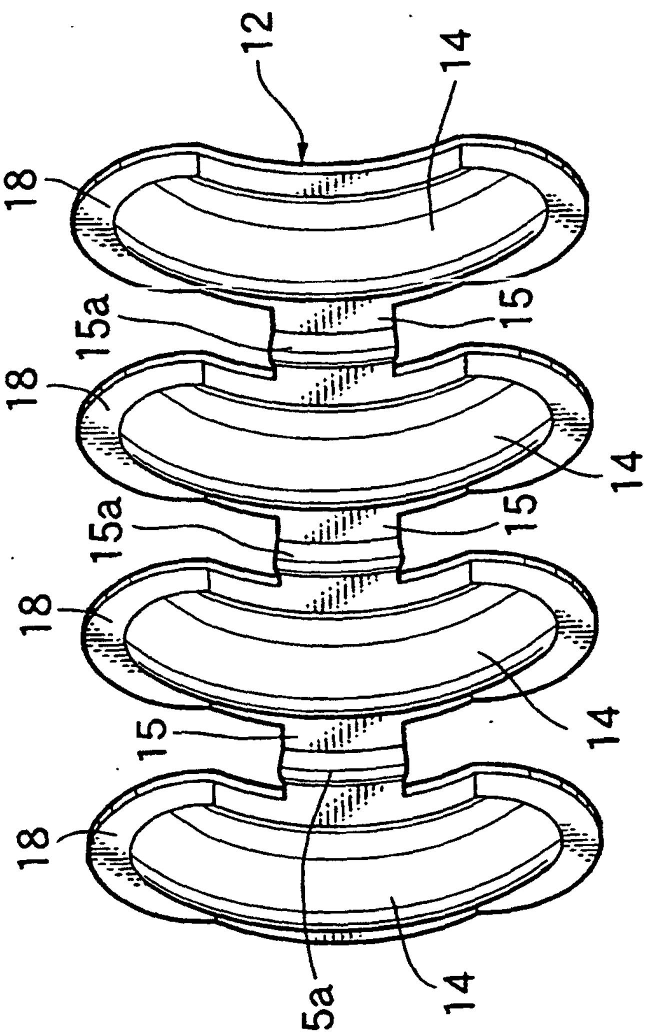
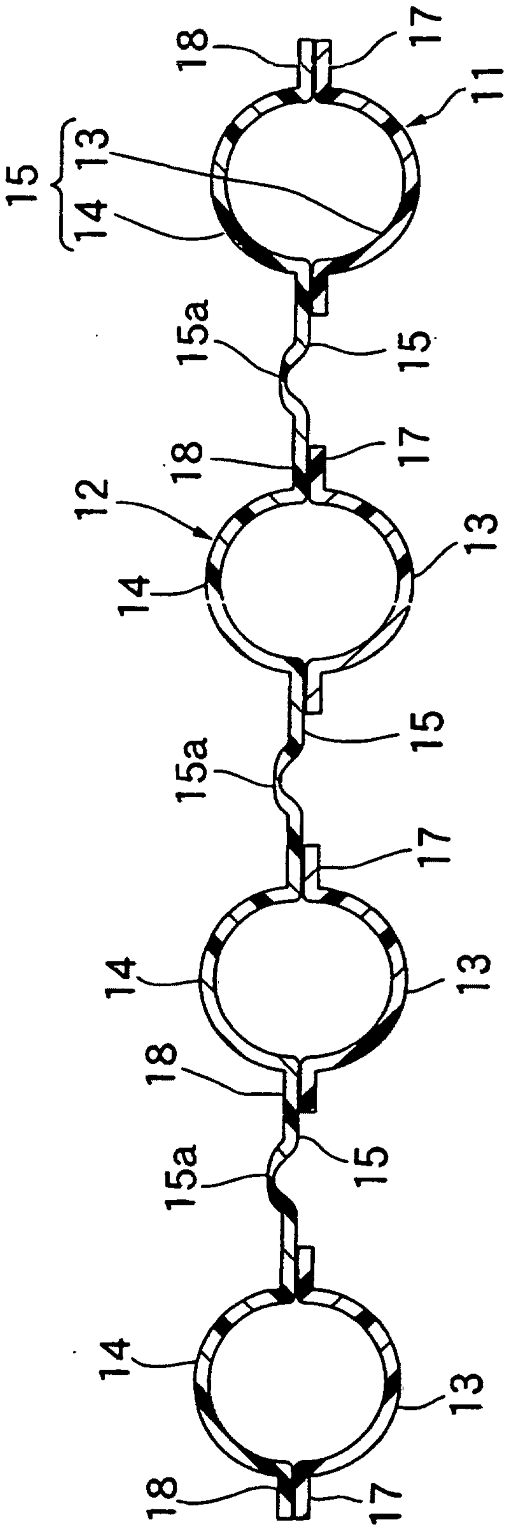


FIG.4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