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Son et al.

(54) **APPARATUS FOR REMOVING EXHAUST GAS PRESSURE AND PREVENTING BACKFLOW OF EXHAUST GAS**

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(57) **ABSTRACT**

An apparatus for removing exhaust gas pressure and preventing backflow of exhaust gas is disclosed. The apparatus of the present invention includes a mounting pipe (**100**), which is fitted over the end of an exhaust gas pipe of an internal combustion engine and has therein backflow gas guide holes (**102**) at positions adjacent to the exhaust gas pipe, and a secondary exhaust gas pipe (**110**), which surrounds the mounting pipe. In the apparatus, a backflow passage (**120**) is defined between the mounting pipe and the secondary exhaust gas pipe, so that a backflowing portion of exhaust gas, which is discharged from the mounting pipe, is drawn into the backflow passage and is guided into the mounting pipe through the backflow gas guide holes, and the guided backflow gas is discharged outside again. Therefore, the present invention prevents backflow gas from being drawn into the exhaust gas pipe, thus enhancing the performance of the internal combustion engine.

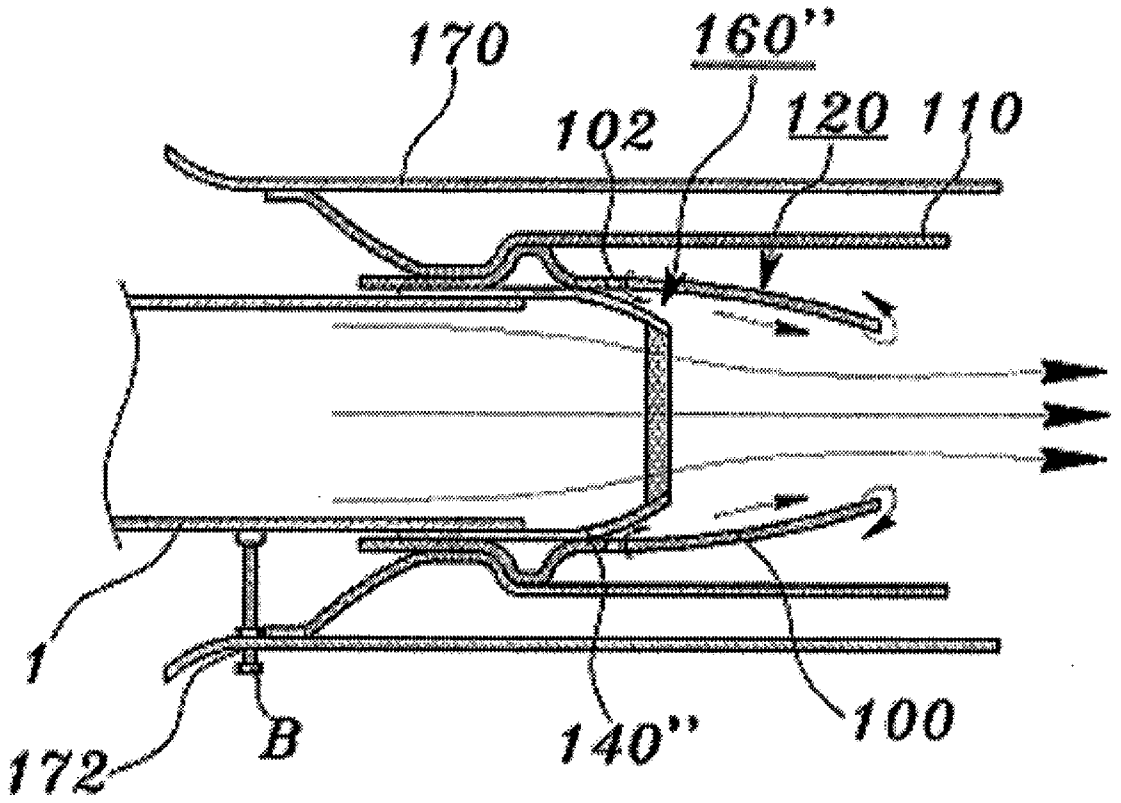


FIG. 1

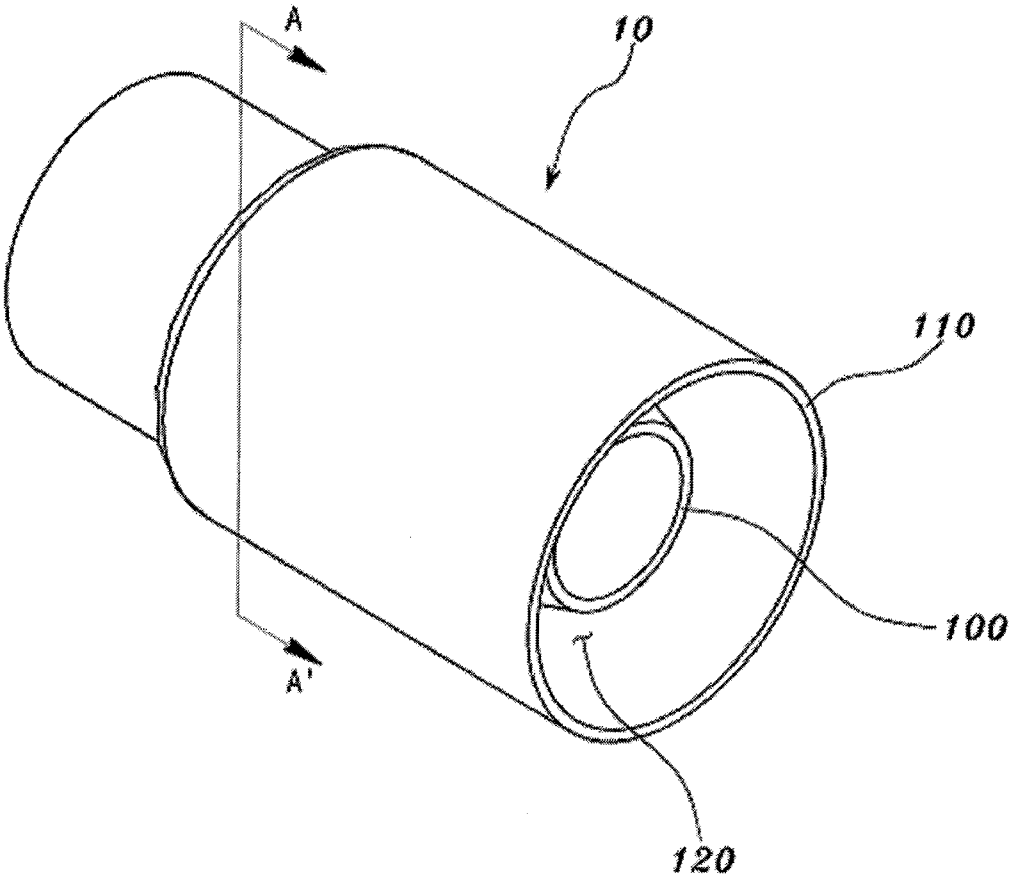


FIG. 2

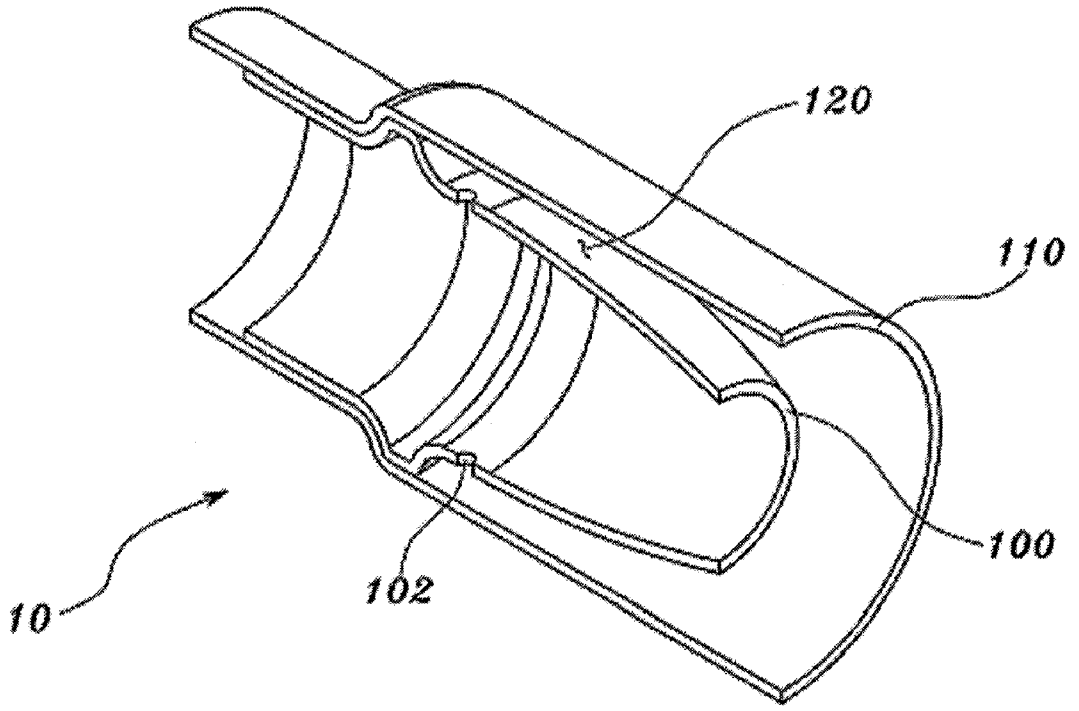


FIG. 3

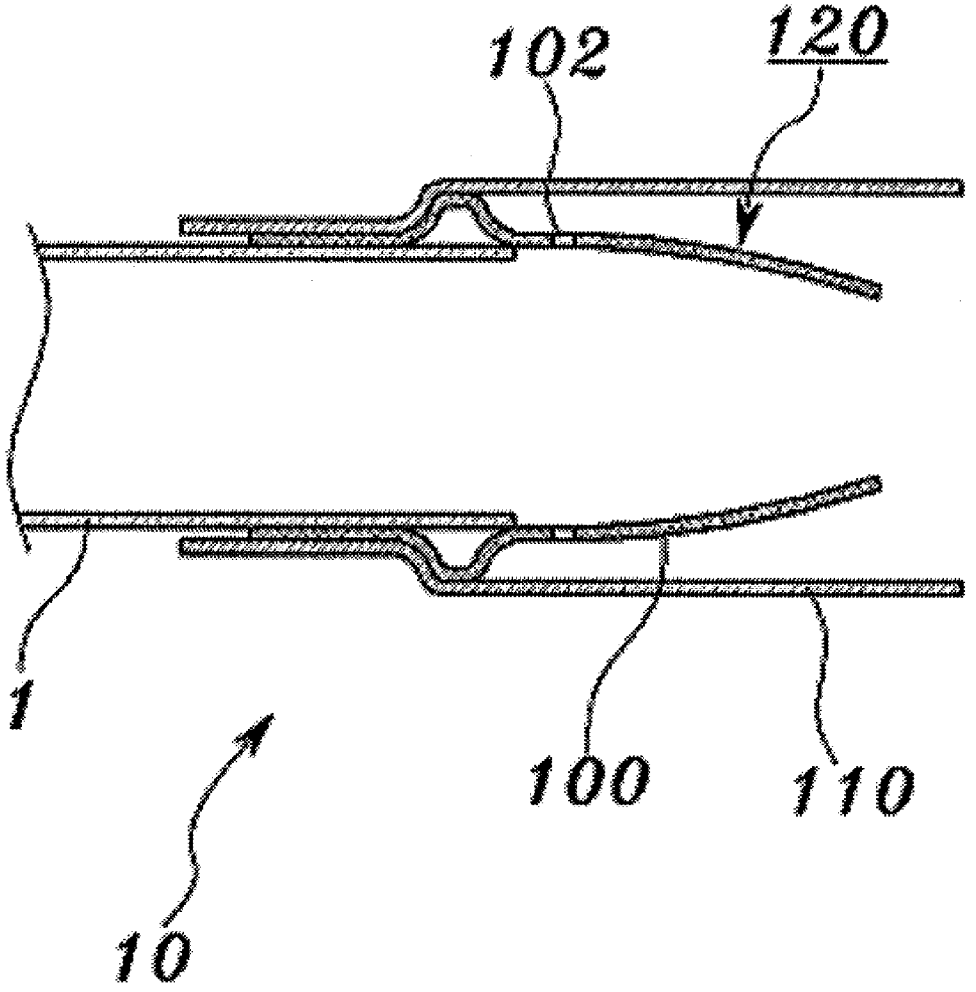


FIG. 4

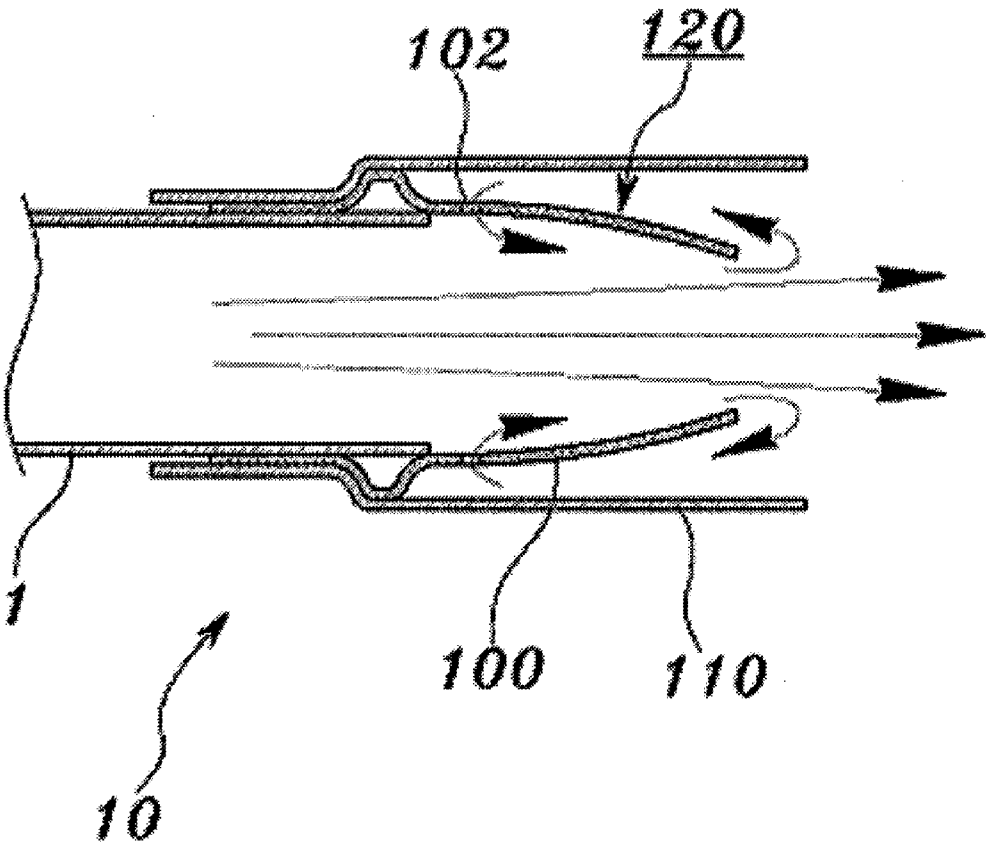


FIG. 5

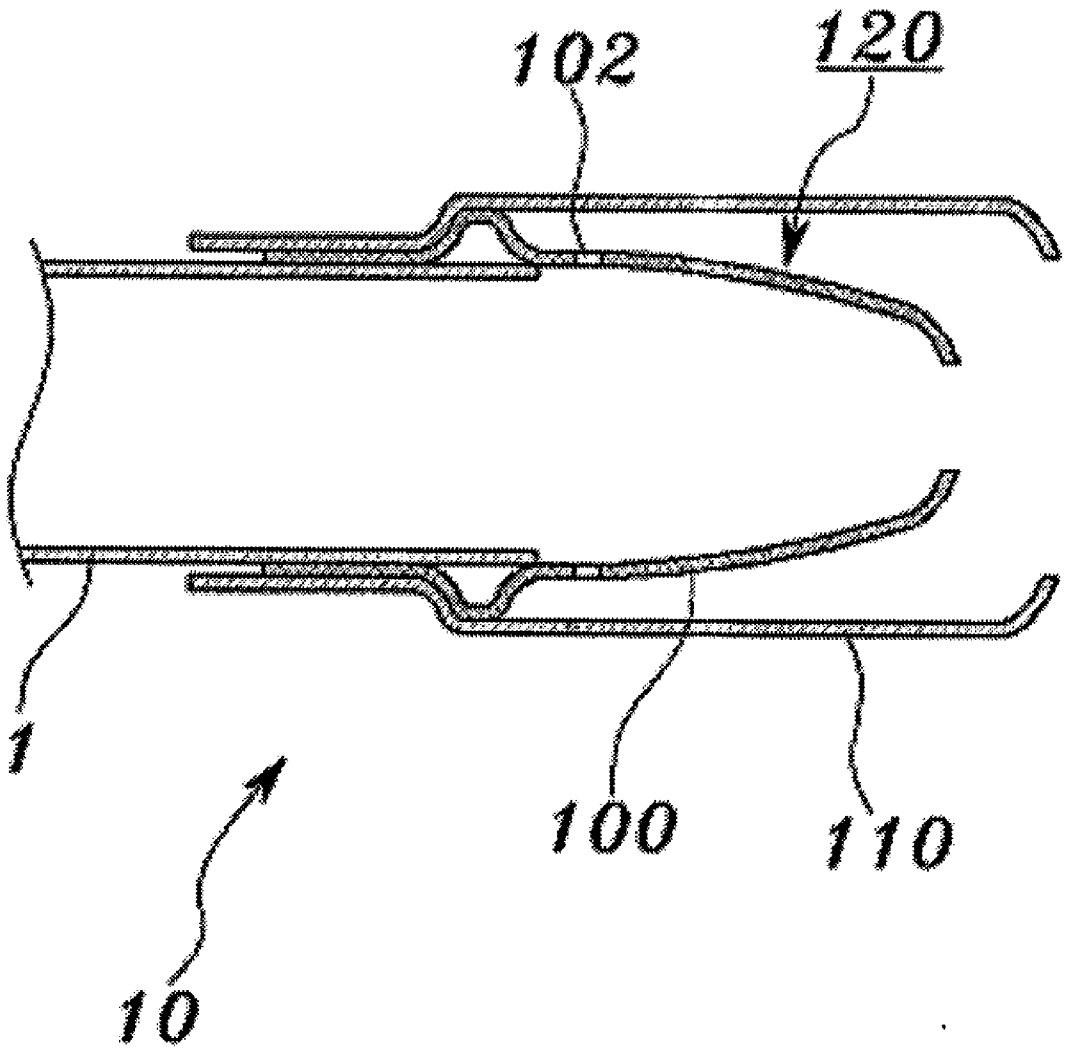


FIG. 6

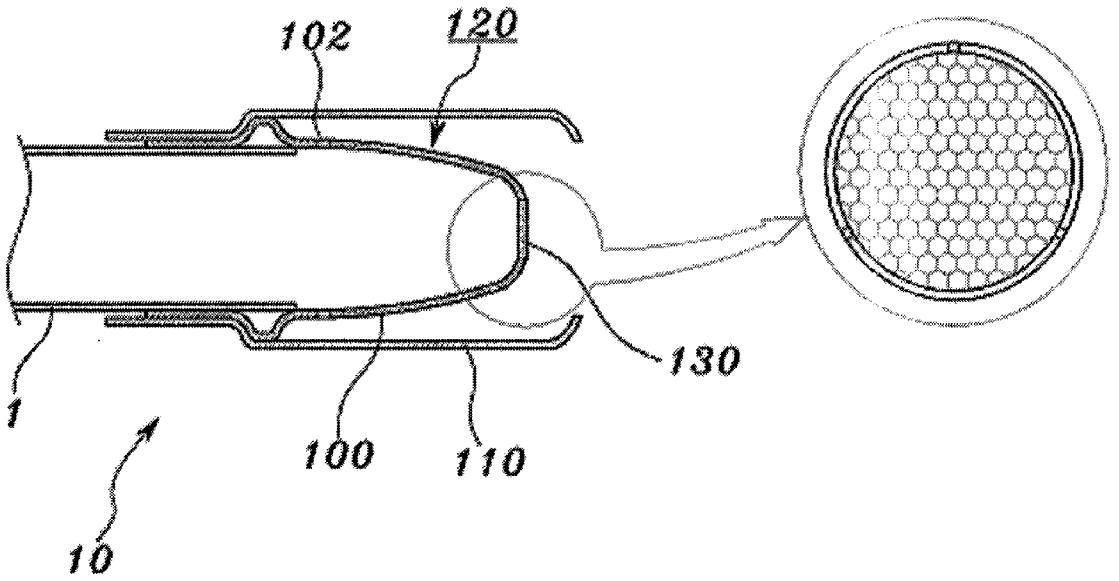


FIG. 7

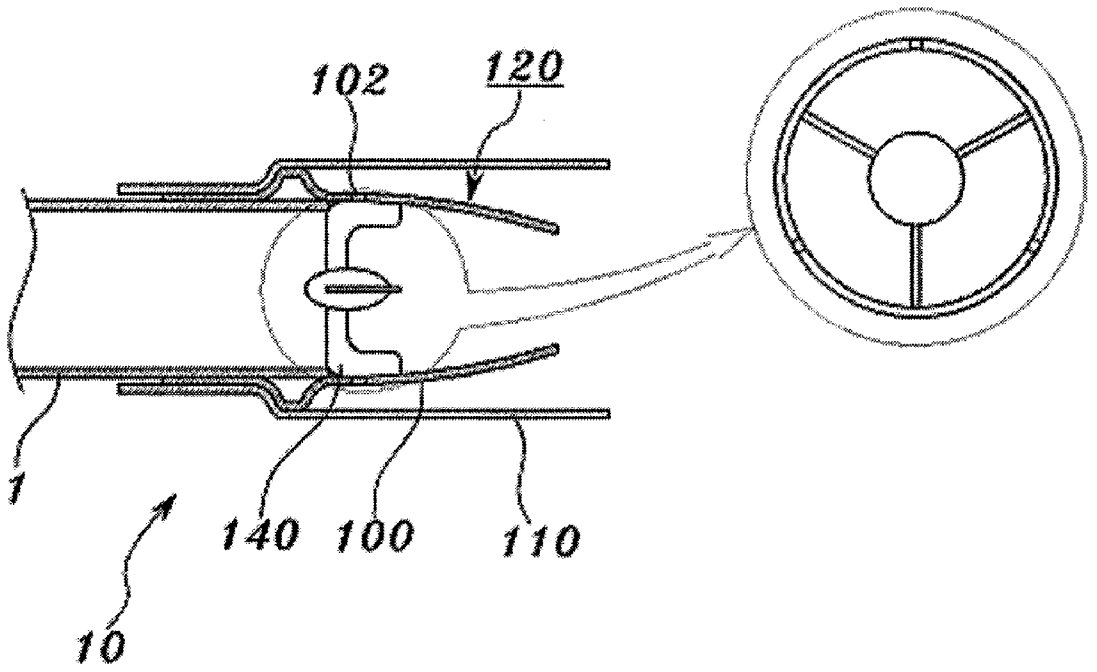


FIG. 8

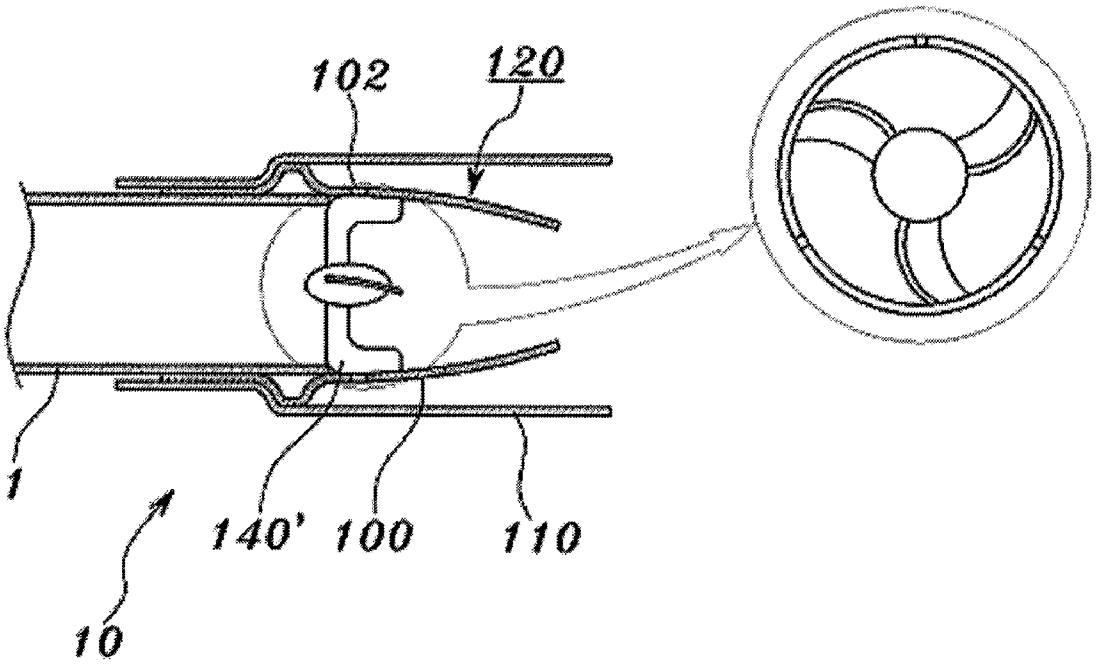


FIG. 9

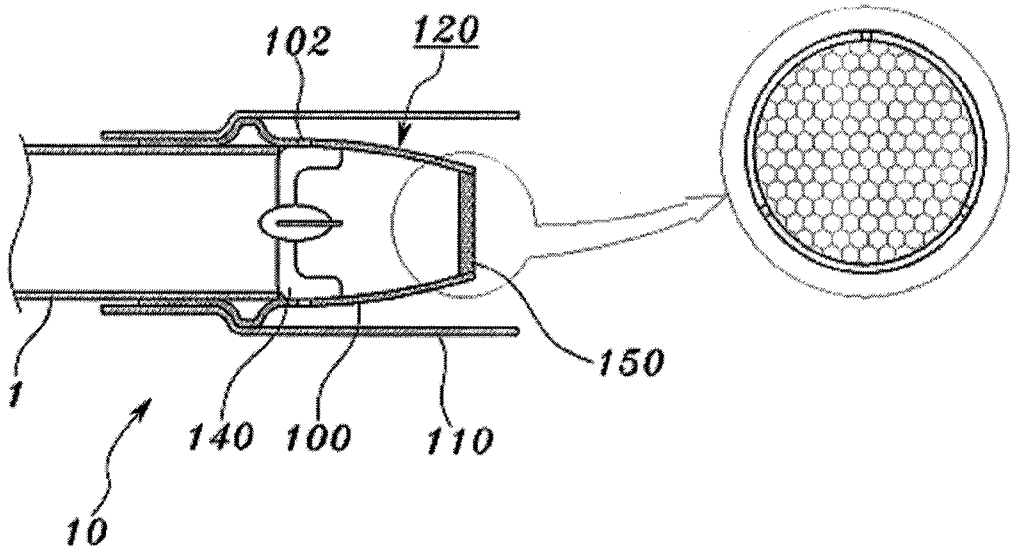


FIG. 10

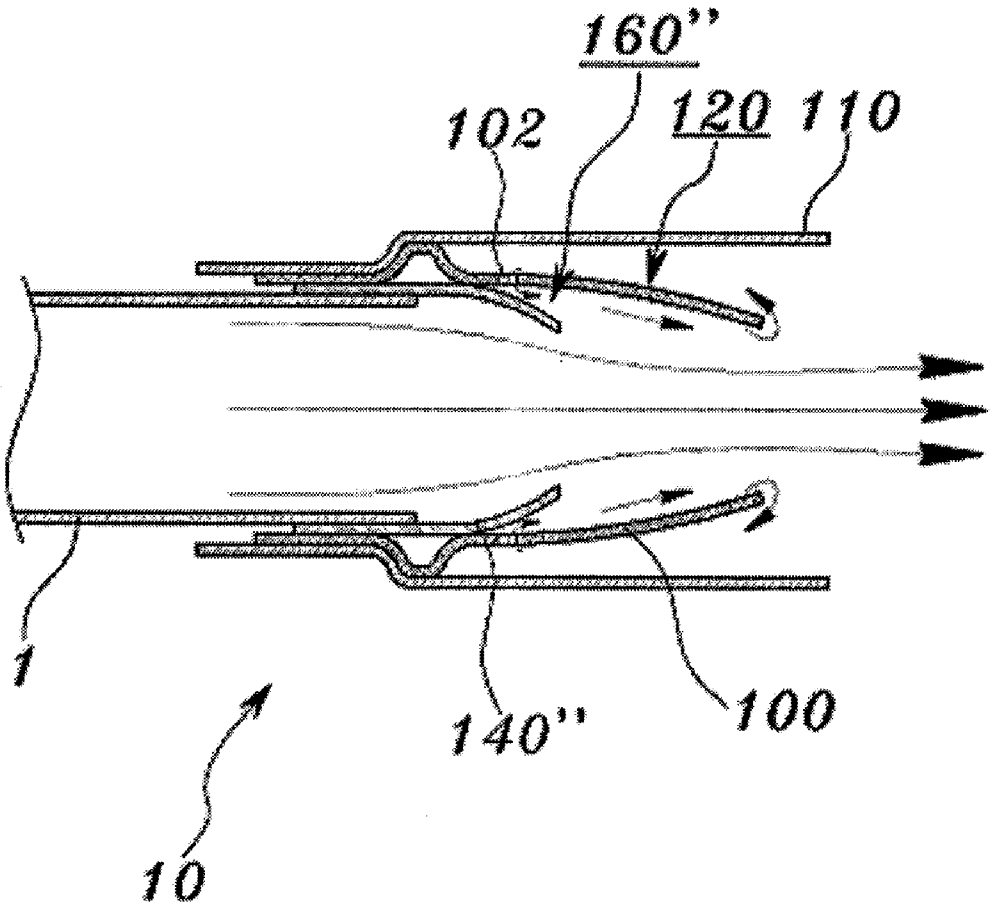


FIG. 11

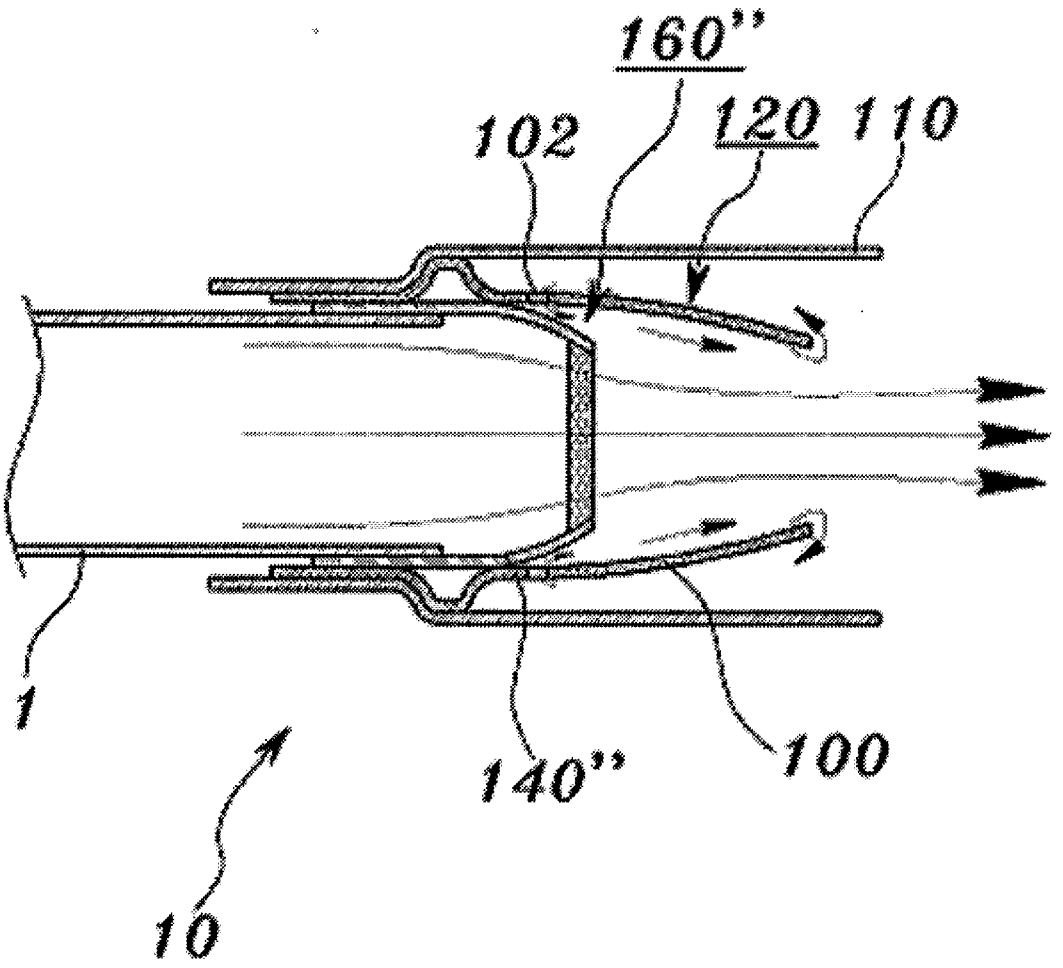
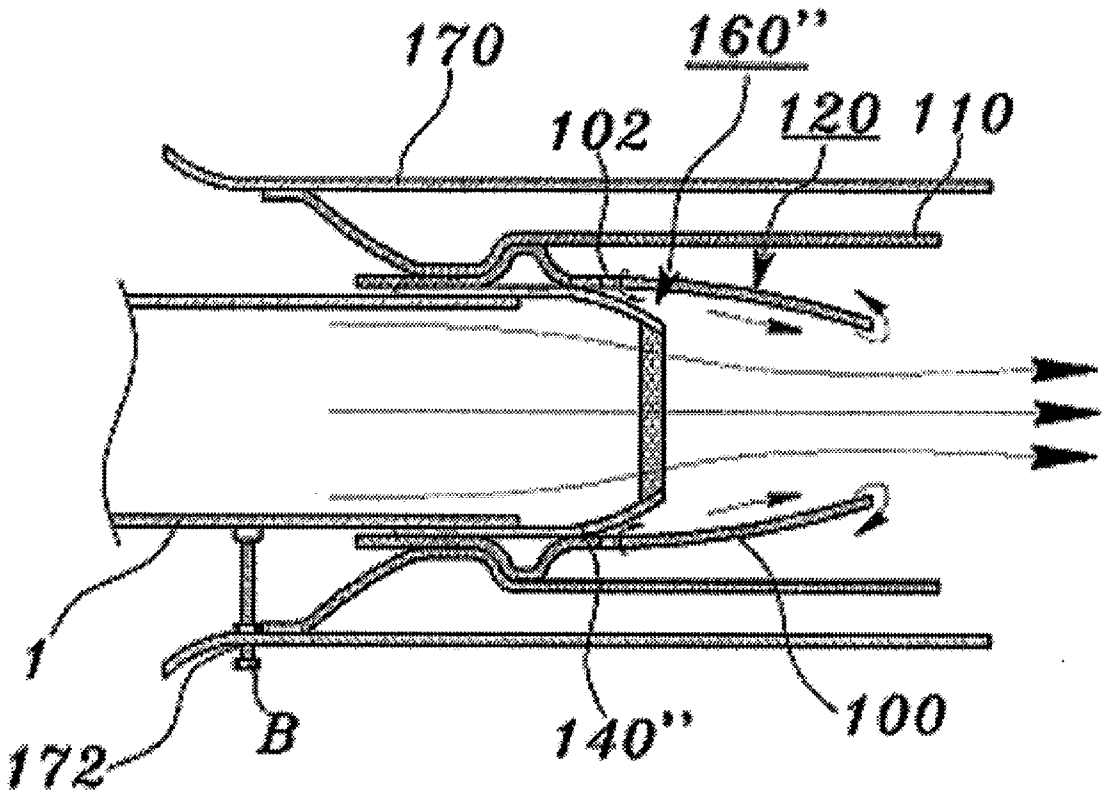


FIG. 12



APPARATUS FOR REMOVING EXHAUST GAS PRESSURE AND PREVENTING BACKFLOW OF EXHAUST GAS

TECHNICAL FIELD

[0001] The present invention relates, in general, to apparatuses for removing exhaust gas pressure and preventing backflow (exhaust pulse) of exhaust gas and, more particularly, to an apparatus for removing exhaust gas pressure and preventing the backflow of exhaust gas, which includes a mounting pipe, which is fitted over the rear end of an exhaust gas pipe extending from an internal combustion engine or the rear end of a gas flue of a boiler and has a plurality of backflow gas guide holes in a line around the circumferential surface thereof at predetermined positions, and a secondary exhaust gas pipe, which is provided around the mounting pipe, such that a backflow passage is defined between the mounting pipe and the secondary exhaust gas pipe, the backflow passage being open from the backflow gas guide holes in the direction in which exhaust gas is discharged, so that,

[0002] of exhaust gas, which is discharged through the mounting pipe, backflow gas (exhaust pulse) is guided into the backflow passage, which is defined between the secondary exhaust gas pipe and the mounting pipe, and the guided backflow gas is drawn into the mounting pipe through backflow gas discharge holes and is discharged outside along with subsequent exhaust gas, thus preventing backflow gas from being drawn into an exhaust gas pipe, and,

[0003] as such, in the case where backflow gas is prevented from flowing backwards into the exhaust gas pipe, the performance of the internal combustion engine can be enhanced, thus improving gas mileage and reducing exhaust fumes, thereby maximizing thermal energy efficiency, and furthermore, the apparatus of the present invention is easily installed merely by forcibly fitting it over the exhaust gas pipe, thus being convenient for a user.

BACKGROUND ART

[0004] Generally, in the case of internal combustion engines, because exhaust gas, which is a pollutant occurring as a result of the combustion in an internal combustion engine, is discharged at a relatively high pressure of approximately 3 to 5 kg/cm^2 and at a relatively high temperature of approximately 600° C., a catalytic device and a silencer are essential.

[0005] In the internal combustion engine, when exhaust gas is discharged from the engine, a vacuum is created in an exhaust manifold, thus creating a primary exhaust resistance which interferes with the discharge of exhaust gas. Subsequently, the flow speed of the exhaust gas is markedly reduced when the exhaust gas passes through a purifier, thus creating a secondary exhaust resistance.

[0006] Thereafter, when exhaust gas, which is drawn into the silencer, passes through multi-stepped partition plates, tertiary exhaust resistance is created.

[0007] In this gas discharge process, the silencer is typically designed to have a capacity that is fifteen to twenty times larger than the engine displacement, so that exhaust resistance is unavoidably created. Thereby, the output of the engine is reduced, and fuel consumption and the amount of pollutants are increased by 5% to 10%.

[0008] Therefore, it is to be appreciated that combustion efficiency can be enhanced merely by smoothly discharging exhaust gas so that gas mileage, output energy and thermal energy are improved. To achieve the above purpose, various conventional techniques have been proposed.

[0009] In the case of boilers, when opposite airflow is applied to a gas flue, outside air flows backwards, and it may enter a combustion chamber, with the result that incomplete combustion is induced and that steam and suspended nitrogenous compound matter, created during the combustion process, become adsorbed on the surface of a heat exchanger.

[0010] In the case where such events are repeated, the performance of a heat exchanger of the boiler is deteriorated, and a problem of a reduction in thermal energy is induced. A lot of research aiming to solve these problems has been conducted.

[0011] Meanwhile, as a representative example of the conventional techniques, an exhaust gas discharge device for vehicles using the flow of air was proposed in Korean Patent Laid-Open Publication No. 2000-56951. This technique, using the flow of air, is devised such that the streamlined body of the exhaust gas discharge device is coupled to a tail pipe, so that when the vehicle travels, a low pressure region is formed around the exhaust gas discharge device by the flow speed of air that passes along the surface of the streamlined body, and exhaust gas is thus sucked out by the lower pressure, thereby promoting the discharge of exhaust gas.

[0012] However, this technique is disadvantageous in that the streamlined body has a relatively large and complex structure, which affects the installation thereof, so that it is very difficult to use this technique in practice.

[0013] Meanwhile, as another example of the conventional techniques, in a tail pipe of a main silencer having a vortex generator, which was proposed in Korean Patent Laid-Open Publication No. 1998-75223, a vortex-generating blade is provided at a medial portion in the tail pipe so as to be rotatable by exhaust gas. This technique is constructed such that the blade is rotated by exhaust gas, thus generating vortexes, thereby promoting the discharge of exhaust gas. However, there is a problem in that the blade serves as a source of some resistance that interferes with the flow of exhaust gas, and the construction thereof may be deformed by high heat, thus it cannot be used in practice.

[0014] As another example of the conventional techniques, in an exhaust gas discharging device using vortexes, which was proposed in Korean Patent Registration No. 257874, a separate duct for drawing outside air is provided on the front end of a silencer, which is provided in an exhaust gas discharge path. Furthermore, a vane, which draws outside air and generates vortexes, is installed in the duct. In addition, the device has a damper for regulating the amount of drawn outside air which is operated in proportion to the opening degree of a throttle valve.

[0015] However, in this technique, because a sub duct, through which outside air passes, is provided on the front end of the silencer, which serves to generate vortexes in the exhaust gas discharge path and reduce exhaust noise, exhaust noise is transferred outside through the sub duct, thus increasing noise. Furthermore, due to the installation of the outside air regulating damper, which is operated in conjunction with the throttle valve of the engine, there is a disadvantage in that the structure and the configuration of the device are complicated.

[0016] As another example of the conventional techniques, in an exhaust gas discharge device for vehicles, which was proposed in Korean Utility Model Application No. 20-0010194, air inflow holes are formed in the device, and

screw plates and steel plates are provided around the inflow holes to form vortexes using air flow generated when a vehicle travels.

[0017] However, this device is constructed such that vortexes are created by the steel plates and the screw plates in a flared tube, so that exhaust gas must pass through a relatively narrow path. Therefore, the device is problematic in that it is structurally unstable, exhaust resistance and backflow of air are generated, and aerodynamic noise is generated around the rear end of a silencer.

[0018] The above-mentioned techniques realize an increase in the flow speed of exhaust gas, thus having advantages of enhancing the output of the engine and reducing fuel consumption. However, there are disadvantages in that, when the vehicle is stopped or travels at a low speed, the effect thereof is markedly reduced, and, when the vehicle travels at a high speed, aerodynamic noise is generated around the rear end of the silencer.

DISCLOSURE OF THE INVENTION

[0019] Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide an apparatus for removing exhaust gas pressure and preventing the backflow of exhaust gas, which includes a mounting pipe, which is fitted over the rear end of an exhaust gas pipe extending from an internal combustion engine or the rear end of a gas flue of a boiler, and has a plurality of backflow gas guide holes in a line around the circumferential surface thereof at predetermined positions, and a secondary exhaust gas pipe, which is provided around the mounting pipe, such that a backflow passage is defined between the mounting pipe and the secondary exhaust gas pipe, the backflow passage being open from the backflow gas guide holes in the direction in which exhaust gas is discharged, so that,

[0020] of exhaust gas, which is discharged through the mounting pipe, backflow gas (exhaust pulse) is guided into the backflow passage, which is defined between the secondary exhaust gas pipe and the mounting pipe, and the guided backflow gas is drawn into the mounting pipe through backflow gas discharge holes and is discharged outside along with subsequent exhaust gas, thus preventing backflow gas from being drawn into an exhaust gas pipe, and,

[0021] as such, in the case where backflow gas is prevented from flowing backwards into the exhaust gas pipe, the performance of the internal combustion engine can be enhanced, thus improving gas mileage and reducing exhaust fumes, thereby maximizing thermal energy efficiency, the apparatus of the present invention being easily installed merely by forcibly fitting it over the exhaust gas pipe, thus being convenient for a user.

[0022] In order to accomplish the above object, the present invention provides an apparatus for removing exhaust gas pressure and preventing backflow of exhaust gas, including: a mounting pipe having a structure that is fitted over an end of an exhaust gas pipe extending from an internal combustion engine or an end of a gas flue of a boiler, such that a part of the mounting pipe other than a part thereof that is fastened to the end of the exhaust gas pipe protrudes outwards from the end of the exhaust gas pipe, the mounting pipe being hollow, such that an interior thereof communicates with the exhaust gas pipe, with a plurality of backflow gas guide holes formed in the mounting pipe in a line around a circumference thereof at positions adjacent to the end of the exhaust gas pipe; and a secondary exhaust gas pipe provided into a shape to surround the mounting pipe, wherein a backflow passage is defined between the mounting pipe and the secondary exhaust gas pipe, so that a backflowing portion of exhaust gas, which is discharged from the mounting pipe, is drawn into the backflow passage and is guided into the mounting pipe through the backflow gas guide holes, and the guided backflow gas is discharged outside again.

[0023] Preferably, each of ends of the mounting pipe and the secondary exhaust gas pipe, which are opposite to ends thereof that are fastened to the exhaust gas pipe, is bent towards a longitudinal central axis, and a cross-sectional area of a space defined by the bent end of the secondary exhaust gas pipe is greater than a cross-sectional area of a space defined by the bent end of the mounting pipe.

[0024] The apparatus may further include an internal flue provided in the end of the mounting pipe which is opposite the end thereof that is fastened to the exhaust gas pipe, the internal flue having a honeycomb structure.

[0025] Furthermore, the apparatus may further include a gas guide blade unit provided in the mounting pipe to minimize collisions between the backflow gas, which is discharged through the backflow gas guide holes, and exhaust gas, and to increase a speed at which the exhaust gas is discharged, thus rapidly and smoothly discharging the exhaust gas.

[0026] In addition, the gas guide blade unit may include: a plurality of blades provided on an inner surface of the mounting pipe, each of the plurality of blades being disposed between the adjacent backflow gas guide holes; and a conical blade support body provided at a center of the mounting pipe at which the blades are coupled to each other.

[0027] As well, each of the plurality of blades may be curved so as to be inclined at a predetermined angle relative to a direction in which the exhaust gas is discharged.

[0028] The apparatus may further include a blade flue provided in the end of the mounting pipe which is opposite to the end thereof that is fastened to the exhaust gas pipe, the blade flue having a honeycomb structure.

[0029] Furthermore, the apparatus may further include a gas guide blade unit, an end thereof interposed between the mounting pipe and the exhaust gas pipe, the gas guide blade unit having a longitudinal cross-section curved towards a longitudinal central axis thereof such that a cross-sectional area of a space defined by the gas guide blade unit is reduced in a direction in which the exhaust gas is discharged, thus increasing a flow speed of the exhaust gas, the gas guide blade unit defining a second backflow passage, communicating with the backflow gas guide holes, between the gas guide blade unit and a circumferential inner surface of the mounting pipe.

[0030] In addition, the apparatus may further include a blade flue provided in a rear end of the gas guide blade unit with respect to the direction in which the exhaust gas is discharged, the blade flue having a honeycomb structure.

[0031] Moreover, the apparatus may further include a tertiary exhaust gas pipe provided around the secondary exhaust gas pipe, the tertiary exhaust gas pipe having a locking hole, into which a locking bolt is inserted, in an end of the tertiary exhaust gas pipe adjacent to the end of the exhaust gas pipe,

so that the secondary exhaust gas pipe is firmly fastened to the exhaust gas pipe by the tertiary exhaust gas pipe.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] FIG. **1** is a view illustrating an apparatus for removing exhaust gas pressure and preventing backflow of exhaust gas, according to the present invention;

[0033] FIG. **2** is a partial sectional view taken along the line A-A' of FIG. **1**;

[0034] FIG. **3** is a side sectional view of the exhaust gas backflow prevention apparatus according to the present invention;

[0035] FIG. **4** is a view showing the flow of exhaust gas in the exhaust gas backflow prevention apparatus according to the present invention;

[0036] FIG. **5** is a view illustrating another embodiment of an exhaust gas backflow prevention apparatus, according to the present invention;

[0037] FIG. **6** is a view illustrating an exhaust gas backflow prevention apparatus provided with an internal flue, according to a modification of the embodiment of the present invention;

[0038] FIG. **7** is a view illustrating an exhaust gas backflow prevention apparatus provided with a stationary blade, according to another embodiment of the present invention;

[0039] FIG. **8** is a view illustrating another embodiment of the stationary blade of the exhaust gas backflow prevention apparatus, according to the present invention;

[0040] FIG. **9** is a view showing a modification of FIG. **7**, in which a blade flue is further provided;

[0041] FIG. **10** is a view showing another embodiment of the stationary blade of the exhaust gas backflow prevention apparatus, according to the present invention;

[0042] FIG. **11** is a view showing a modification of FIG. **10**, in which a blade flue is further provided; and

[0043] FIG. **12** is a view illustrating an exhaust gas backflow prevention apparatus provided with a tertiary exhaust gas pipe, according to another embodiment of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0044] Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the attached drawings.

[0045] Although the preferred embodiments of the present invention will be disclosed for illustrative purposes, they do not limit the bounds of the present invention, and those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the technical scope and spirit of the invention.

[0046] FIG. **1** is a view illustrating an apparatus for removing exhaust gas pressure and preventing the backflow of exhaust gas, according to the present invention. FIG. **2** is a partial sectional view taken along the line A-A' of FIG. **1**. FIG. **3** is a side sectional view of the exhaust gas backflow prevention apparatus according to the present invention. FIG. **4** is a view showing the flow of exhaust gas in the exhaust gas backflow prevention apparatus according to the present invention. FIG. **5** is a view illustrating another embodiment of an exhaust gas backflow prevention apparatus, according to the present invention. FIG. **6** is a view illustrating an exhaust gas backflow prevention apparatus provided with an internal flue, according to a modification of the embodiment of the present invention. FIG. **7** is a view illustrating an exhaust gas backflow prevention apparatus provided with a stationary blade, according to another embodiment of the present invention. FIG. **8** is a view illustrating another embodiment of the stationary blade of the exhaust gas backflow prevention apparatus, according to the present invention. FIG. **9** is a view showing a modification of FIG. **7**, in which a blade flue is further provided. FIG. **10** is a view showing another embodiment of the stationary blade of the exhaust gas backflow prevention apparatus, according to the present invention. FIG. **11** is a view showing a modification of FIG. **10**, in which a blade flue is further provided. FIG. **12** is a view illustrating an exhaust gas backflow prevention apparatus provided with a tertiary exhaust gas pipe, according to another embodiment of the present invention.

[0047] As shown in the drawings, the apparatus **10** for removing exhaust gas pressure and preventing the backflow of exhaust gas according to the present invention includes a mounting pipe **100** and a secondary exhaust gas pipe **110**, which have concentric circular shapes having different diameters.

[0048] The mounting pipe **100** is fitted over the outer surface of the rear end of an exhaust gas pipe **1**, which extends from a boiler or an internal combustion engine. Furthermore, backflow gas guide holes **102** are formed around the circumferential outer surface of the mounting pipe **100** at positions adjacent to the rear end of the exhaust gas pipe **1**.

[0049] The secondary exhaust gas pipe **110** is fitted over the outer surface of the mounting pipe **100** into a shape that surrounds the mounting pipe **100**. Thus, the secondary exhaust gas pipe **110** surrounds the mounting pipe **100** and defines a backflow passage **120**, which is open at one end thereof, between the secondary exhaust gas pipe **110** and the mounting pipe **100**.

[0050] In other words, the mounting pipe **100** and the secondary exhaust gas pipe **110** are coupled at front ends thereof to each other and define therebetween the backflow passage **120**, which extends from the medial portions of the mounting pipe **100** and the secondary exhaust gas pipe **110** and is open towards their rear ends. That is, the backflow passage **120** is formed between the mounting pipe **100** and the secondary exhaust gas pipe **110** such that it is open from the backflow gas guide holes **102** in the direction in which exhaust gas is discharged.

[0051] Typically, in the case of a boiler or an internal combustion engine, due to the structural characteristics thereof, a backflow phenomenon, in which gas backflow is generated around the rear end of the exhaust gas pipe **1** and some exhaust gas thus flows backwards into the exhaust gas pipe **1**, occurs. However, in the present invention, thanks to the above-mentioned construction, backflow gas enters the backflow passage **120**, rather than entering the exhaust gas pipe **1**.

[0052] In other words, when exhaust gas, which is discharged from the exhaust gas pipe **1**, passes through the mounting pipe **100**, which communicates with the exhaust gas pipe **1**, backflow gas attributable to back pressure is drawn into the backflow passage **120**, so that the backflow gas is prevented from entering the mounting pipe **100** backwards.

[0053] Furthermore, the backflow gas, which is drawn into the backflow passage **120**, is moved into the mounting pipe **100** through the backflow gas guide holes **102**, which are formed in the mounting pipe **100**, and is discharged along with subsequent discharge gas outside the mounting pipe **100**.

[0054] Here, the mounting pipe **100** has a funnel shape such that the longitudinal cross-section thereof is inclined towards the longitudinal central axis thereof from the front end of the mounting pipe **100**, which is coupled to the rear end of the exhaust gas pipe **1**, to the rear end of the mounting pipe **100**, so that the speed at which exhaust gas is discharged can be increased. Furthermore, due to this shape of the mounting pipe **100**, the distance by which the mounting pipe **100** is spaced apart from the secondary exhaust gas pipe **110** is varied such that the sectional areas of the opposite ends of the backflow passage **120** differ from each other.

[0055] As such, because the cross-section of the backflow passage **120** is increased from the front end thereof, which communicates with the backflow gas guide holes **102**, to the rear end thereof, the speed at which backflow gas is drawn into the rear end of the backflow passage **120** is increased, so that the inflow of backflow gas into the backflow passage is promoted and the backflow gas is smoothly drawn into the mounting pipe through the backflow gas guide holes **102**.

[0056] As shown in FIG. **5**, the mounting pipe **100** and the secondary exhaust gas pipe **110** may be constructed such that the free ends (the rear ends) thereof are bent towards the longitudinal central axis. In this case, the speed at which exhaust gas is discharged is further increased around the bent ends of the mounting pipe **100** and the secondary exhaust gas pipe **110**, thus making the discharge of exhaust gas easy.

[0057] In other words, the ends of the mounting pipe **100** and the secondary exhaust gas pipe **110**, which are opposite the rear end of the exhaust gas pipe **1**, and through which exhaust gas is discharged out of the apparatus, are bent inwards, so that the flow speed of exhaust gas is increased from the front end of the mounting pipe **100**, which is fastened to the exhaust gas pipe **1**, to the rear end thereof, thus making the discharge of exhaust gas easy.

[0058] Furthermore, in the case where the rear end of the mounting pipe **100** is bent towards the longitudinal central axis thereof, backflow gas can be more effectively prevented from flowing backwards through the rear end of the mounting pipe **100**.

[0059] Here, the cross-sectional area of space defined by the rear end of the secondary exhaust gas pipe **110** is greater than the cross-sectional area of space defined by the rear end of the mounting pipe **100**, thus defining an inlet of the backflow passage **120**. The backflow passage **120** serves to reduce the amount of backflow gas, along with the secondary exhaust gas pipe **110** having the bent end.

[0060] Meanwhile, an internal flue **130** may be provided in the rear end of the mounting pipe **100**. The internal flue **130** has a honeycomb structure and serves to prevent exhaust gas from being undesirably diffused around the edge of the rear end of the mounting pipe **100**, such that exhaust gas can be rapidly and smoothly discharged outside.

[0061] As shown in FIGS. **7** through **9**, a gas guide blade unit **140** may be provided in the mounting pipe **100** to more smoothly discharge exhaust gas that has passed through the exhaust gas pipe **1**. Furthermore, backflow gas, which is drawn into the mounting pipe **100** through the backflow gas guide holes **102**, can be effectively discharged by the smooth discharge of exhaust gas.

[0062] The gas guide blade unit **140** includes a blade support body and a plurality of blades. The blades are provided on the inner surface of the mounting pipe **100**, and each blade is disposed between the adjacent backflow gas guide holes **102**. The blade support body has a conical shape and is disposed at the junction of the blades, that is, at the center of the mounting pipe.

[0063] In the embodiment of the present invention, although the blade support body has been illustrated as having a conical shape, the blade support body can have any shape, as long as it makes it possible for exhaust gas to rapidly and smoothly flow through the mounting pipe **100**.

[0064] Meanwhile, as another embodiment of the gas guide blade unit, as shown in FIG. **8**, a gas guide blade unit **140'** may have a structure such that each blade is curved so as to be inclined at a predetermined angle relative to the direction in which exhaust gas is discharged. In this case, exhaust gas can be discharged more rapidly, so that backflow gas, which has passed through the backflow gas guide holes **102**, can be discharged more effectively.

[0065] Furthermore, a blade flue **150** having a honeycomb structure may be provided in the free end (the rear end) of the mounting pipe **100**, such that exhaust gas can be discharged more smoothly. Thus, backflow gas, which is drawn into the mounting pipe **100** through the backflow gas guide holes **102**, can be effectively discharged due to the smooth discharge of exhaust gas.

[0066] Meanwhile, as shown in FIGS. **10** and **11**, a gas guide blade unit **140"** may be provided in the mounting pipe **100** and, in detail, may be interposed between the exhaust gas pipe **1** and the mounting pipe **100**.

[0067] The gas guide blade unit **140"** has a shape in which the longitudinal cross-section thereof is curved towards the longitudinal central axis thereof such that the cross-sectional area of space defined thereby is reduced from the front end thereof to the rear end thereof with respect to the direction in which exhaust gas is discharged. Thus, a second backflow passage **160"** is defined between the mounting pipe **100** and the gas guide blade unit **140"**.

[0068] As such, in the case where the rear end of the gas guide blade unit **140"** is bent towards the longitudinal central axis thereof, the discharge speed of exhaust gas that has passed through the exhaust gas pipe **1** is increased, thus promoting the smooth discharge of exhaust gas.

[0069] The second backflow passage **160"** serves to prevent backflow gas, which is drawn into the backflow passage **120**, from flowing backwards into the exhaust gas pipe **1** after passing through the backflow gas guide holes **102**, such that backflow gas can discharged outside more reliably and effectively.

[0070] Furthermore, preferably, a blade flue **150"** having a honeycomb structure may be provided in the rear end of the gas guide blade unit **140"**, so that exhaust gas can be discharged more effectively, and backflow gas, which is drawn into the mounting pipe **100** through the backflow gas guide holes **102**, can be effectively discharged due to the smooth discharge of exhaust gas.

[0071] Meanwhile, the present invention may have a structure such that a tertiary exhaust gas pipe **170** is provided around the secondary exhaust gas pipe **110**. In this case, the opposite ends of the tertiary exhaust gas pipe **170** are disposed outside the respective opposite ends of the secondary exhaust gas pipe **110**, so that the tertiary exhaust gas pipe **170** completely covers the secondary exhaust gas pipe **110**.

[0072] Furthermore, a locking hole **172** for insertion of a locking bolt B is formed in the end of the tertiary exhaust gas pipe **170**, which is adjacent to the exhaust gas pipe **1**. The

locking bolt B is rotatably inserted into the locking hole **172** to compress part of the outer surface of the exhaust gas pipe **1**.

[0073] As such, the tertiary exhaust gas pipe **170** is coupled to the secondary exhaust gas pipe **110**, and the locking bolt B compresses the part of the outer surface of the exhaust gas pipe **1** in the opposite direction. Thereby, the tertiary exhaust gas pipe **170** can be firmly fastened to the exhaust gas pipe **1**.

[0074] Furthermore, in this embodiment, because the tertiary exhaust gas pipe **170** is provided in a shape in which it surrounds the mounting pipe **100** and the secondary exhaust gas pipe **110**, the mounting pipe **100** and the secondary exhaust gas pipe **110** can be protected by the tertiary exhaust gas pipe **170**, and a superior external appearance of the apparatus can be ensured, thus satisfying the needs of consumers.

INDUSTRIAL APPLICABILITY

[0075] As described above, the present invention provides an apparatus for removing exhaust gas pressure and preventing the backflow of exhaust gas, which is constructed such that the backflowing portion of exhaust gas is guided into a backflow passage, which is defined between a secondary exhaust gas pipe and a mounting pipe, and guided backflow gas is drawn into the mounting pipe through backflow gas discharge holes and is discharged outside along with subsequent exhaust gas, thus preventing backflow gas from being drawn into an exhaust gas pipe.

[0076] In the case where exhaust gas pressure is removed by preventing the inflow of backflow gas, the performance of an internal combustion engine can be enhanced, thus improving gas mileage and reducing exhaust fumes, thereby maximizing thermal energy efficiency. Furthermore, the apparatus of the present invention can be easily installed merely by forcibly fitting it over the exhaust gas pipe, thus being convenient for a user. As such, the present invention is regarded as being effective and useful.

1-10. (canceled)

11. An apparatus for removing exhaust gas pressure and preventing backflow of exhaust gas, comprising:

a mounting pipe having a structure that is fitted over one of an end of an exhaust gas pipe extending from an internal combustion engine and an end of a gas flue of a boiler, such that a part of the mounting pipe protrudes outwards from the end of the exhaust gas pipe, the mounting pipe being hollow, such that an interior thereof communicates with the exhaust gas pipe, with a plurality of backflow gas guide holes formed in the mounting pipe in a line around a circumference thereof at positions adjacent to the end of the exhaust gas pipe; and

a secondary exhaust gas pipe surrounding the mounting pipe, wherein

a backflow passage is defined between the mounting pipe and the secondary exhaust gas pipe, so that a backflowing portion of exhaust gas, which is discharged from the mounting pipe, is drawn into the backflow passage and is guided into the mounting pipe through the backflow gas guide holes, and the guided backflow gas is discharged from the mounting pipe again.

12. The apparatus for removing exhaust gas pressure and preventing backflow of exhaust gas according to claim **11**, wherein an end of the mounting pipe and an end of the secondary exhaust gas pipe, each of which are opposite to ends thereof that are fastened to the exhaust gas pipe, are bent towards a longitudinal central axis, and a cross-sectional area of a space defined by the bent end of the secondary exhaust gas pipe is greater than a cross-sectional area of a space defined by the bent end of the mounting pipe.

13. The apparatus for removing exhaust gas pressure and preventing backflow of exhaust gas according to claim **11**, further comprising:

an internal flue provided in an end of the mounting pipe which is opposite an end thereof that is fastened to the exhaust gas pipe, the internal flue having a honeycomb structure.

14. The apparatus for removing exhaust gas pressure and preventing backflow of exhaust gas according to claim **11**, further comprising:

a gas guide blade unit provided in the mounting pipe to minimize collisions between the backflow gas, which is discharged through the backflow gas guide holes, and exhaust gas, and to increase a speed at which the exhaust gas is discharged.

15. The apparatus for removing exhaust gas pressure and preventing backflow of exhaust gas according to claim **14**, wherein the gas guide blade unit comprises:

a plurality of blades provided on an inner surface of the mounting pipe, each of the plurality of blades being disposed between the adjacent backflow gas guide holes; and

a conical blade support body provided at a center of the mounting pipe at which the blades are coupled to each other.

16. The apparatus for removing exhaust gas pressure and preventing backflow of exhaust gas according to claim **15**, wherein each of the plurality of blades is curved so as to be inclined relative to a direction in which the exhaust gas is discharged.

17. The apparatus for removing exhaust gas pressure and preventing backflow of exhaust gas according to claim **14**, further comprising:

a blade flue provided in an end of the mounting pipe which is opposite to an end thereof fastened to the exhaust gas pipe, the blade flue having a honeycomb structure.

18. The apparatus for removing exhaust gas pressure and preventing backflow of exhaust gas according to claim **14**, further comprising:

a gas guide blade unit, an end thereof interposed between the mounting pipe and the exhaust gas pipe, the gas guide blade unit having a longitudinal cross-section curved towards a longitudinal central axis thereof such that a cross-sectional area of a space defined by the gas guide blade unit is reduced in a direction in which the exhaust gas is discharged, thus increasing a flow speed of the exhaust gas, the gas guide blade unit defining a second backflow passage, communicating with the backflow gas guide holes, between the gas guide blade unit and a circumferential inner surface of the mounting pipe.

19. The apparatus for removing exhaust gas pressure and preventing backflow of exhaust gas according to claim **18**, further comprising:

a blade flue provided in a rear end of the gas guide blade unit with respect to the direction in which the exhaust gas is discharged, the blade flue having a honeycomb structure.

20. The apparatus for removing exhaust gas pressure and preventing backflow of exhaust gas according to claim **11**, further comprising:

a tertiary exhaust gas pipe provided around the secondary exhaust gas pipe, the tertiary exhaust gas pipe defining a locking hole, into which a locking bolt is inserted, in an end of the tertiary exhaust gas pipe adjacent to the end of the exhaust gas pipe, so that the secondary exhaust gas pipe is firmly fastened to the exhaust gas pipe by the tertiary exhaust gas pipe.

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