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(54) **Exhaust gas purifying device.**

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Description

The present invention relates to an exhaust gas purifying device according to the pre-characterized part of claim 1. Such devices mounted to an engine unit of, for example, a motorcycle.

In the prior art, an exhaust system of an engine unit of, for example, a motorcycle an exhaust gas purifying device is used in which the exhaust gas is purified by carrying out oxidation reaction utilizing catalyst contact reaction between unburnt constituents such as and/or harmful constituents such as carbon monoxide and hydrocarbon contained in the exhaust gas and a catalyst. The catalyst is utilized for increasing temperature of an engine exhaust gas to carry out the oxidation reaction. In such conventional exhaust gas purifying device, the exhaust gas is purified by the contact of the exhaust gas to the catalyst disposed in a muffler connected to an exhaust gas tube.

The muffler of the motorcycle generally comprises an exhaust pipe section and a muffler section According to the precharacterized part of claim 1, DE-A-2942728 A1 discloses a plate member to which a catalyst is applied. The plate member comprises two plates bent in an arcuate manner adjacently to the inner wall of a muffler body and the plates are mounted to the inner wall surface of the muffler body keeping a clearance of 1 to 5 mm with respect to the inner wall surface so that the exhaust gas flowing through the muffler can be brought into contact with the catalyst applied to the plate member.

In the construction of the conventional exhaust gas purifying device of the structure described above, however, the plates with the catalyst are disposed cylindrically in an assembled state along the inner wall surface of the muffler body adjacently to the inner wall surface thereof and a portion of the exhaust gas to be brought into contact with the catalyst of the plate member has a relatively low temperature in the surrounding portion of a tubular passage. Therefore, it takes much time to increase the temperature to start the catalytic reaction, hence resulting in degradation of an exhaust gas purification performance.

In addition, a surface temperature of the muffler body increases high because the plates with catalyst are disposed near the surface of the muffler body. As a result, it becomes necessary to take countermeasures against the thermal harmful influences suferred from the heated hot surface of the muffler body.

EP-A3-0 401 195 discloses a muffler body including a catalyst plate disposed in the central portion in cross section of the exhaust pipe section of the muffler. The plate extends throughout the longitudinal direction of the exhaust pipe section.

An object of the present invention is to provide an exhaust gas purifying device capable of improving a catalytic reaction between the engine exhaust gas and the device to enhance the exhaust gas purifying performance and reducing thermal influence on a muffler as well as improving an engine power.

This and other objects can be achieved according to the present invention in accordance with the characterizing part of claim 1.

Preferred embodiments are defined in the subclaims.

According to the present invention, the catalyst plate to which a catalyst is applied is disposed near of the exhaust gas section of the muffler, and when the exhaust gas flows flom the engine exhaust port into the muffler, a high temperature portion of the exhaust gas contacts the catalyst. Accordingly, the catalytic reaction promptly and positively starts to thereby enhance the exhaust gas purifying performance. Moreover, since the catalyst plate is, disposed offset from the central portion, an excessive heating of the catalyst plate can be avoided. Due to the distance between the plate and the inner wall surface of the muffler, increasing of the temperature of the muffler surface can be significantly suppressed, resulting in the improvement of the engine output power.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

Fig. 1 is a side view, partially in section, of a muffler provided with an exhaust gas purifying device according to the present invention;

Figs. 2 to 4 are also sectional views taken along the line II-II of Fig. 1 showing embodiments according to the present invention;

Fig. 5 is a sectional view in an enlarged scale of a portion of a catalyst plate of the exhaust gas purifying device;

Fig. 6 is a graph showing a temperature distribution of the exhaust gas in the muffler;

Fig. 7 is a graph showing the surface temperature of the muffler in accordance with the present invention in comparison with a prior art; and

Fig. 8 is a graph showing an engine output according to the present invention in comparison with the prior art.

First, referring to Fig. 1 showing a muffler 10 of a motorcycle equipped with an exhaust gas purifying device according to the present invention. The muffler 10 comprises a muffler body 15 including an exhasut pipe section 11 which is connected to an engine exhaust port of the motorcycle and a muffler section 12 coupled with the exhaust pipe section 11. The muffler section 12 has an expansion chamber formed by swelling a portion of the muffler body 15. An exhaust pipe 13 is connected to the downstream side of the muffler section 12, and a silencer 14 is connected to the exhasut pipe 13. In this embodiment, the muffler 10 is referred to a muffler located on the left side of the motorcycle body.

Fig. 3 is a cross section of the exhaust pipe section 11 of the muffler 10 representing an exhaust gas purifying device according to one embodiment of the present invention. Referring to Fig. 3, the muffler body 15 of the muffler 10 is formed of a pair of inner and outer halves 15a and 15b, in which the inner body 15a is to be disposed on the side of a mototcycle body and the outer body 15b is to be disposed on the outside. The inner and outer muffler bodies 15a and 15b each has a semicircular cross section and constitutes a cylindrical pipe as the muffler body 15 when mated with each other. A plate 16 to which a catalyst is applied is disposed in the muffler body 15 so that both the side ends of the plate 16 are secured, for example by means of welding, to the joined portions of the inner and outer muffler bodies 15a and 15b along the longitucinal directions of the exhaust pipe section 11. The plate 16 will be called a catalyst plate 16 hereinlater for the sake of convenience.

Fig. 3 shows that the catalyst plate 16 is fixedly secured in the vertical direction, as viewed, in the interior of the inner body 15a at a portion offset from the diameter direction of the muffler body 15 within a range of 1/3d to 2/3d ($1/3d < \ell < 2/3d$), wherein a symbol d is an inner diameter of the muffler body, and this range will be referred to as a central portion hereinlater offset to the side of the inner wall surface of the inner muffler body 15a.

Fig. 3 shows a further embodiment according to the present invention, in which the catalyst plate 16 is disposed at the central portion similar to that of Fig. 3, but in the embodiment of Fig. 4, the catalyst plate 16 is provided with a supplementary rib portion 16a at an intermediate portion thereof so as to increase the strength of the catalyst plate 16 as well as to enlarge the surface area of the catalyst.

Fig. 4 shows a still further embodiment according to the present invention, in which the catalyst plate 16 of the type shown in Fig. 3 is mounted to each of the inner and outer bodies 15a and 15b in the central portion of the muffler body 15. Namely, two catalyst plates are disposed in the central portion, i.e. within the range from 1/3d to 2/3d (d: inner diameter of the muffler body 15), for example, in a centrally symmetrical manner. According to this embodiment, the total surface area of the catalyst can be increased as well as increasing of the strength.

With respect to the described preferred embodiments represented by Figs. 2 to 4, the catalyst plate 16 has a sandwich structure, for example, shown in Fig. 5 as an enlarged fragmental section.

Referring to Fig. 5, the catalyst plate 16 comprises a punched plate 17 arranged centrally of the sandwich structure, coating layers 18 applied on both the sides of the punched plate 17 and catalyst layers 19 applied to the outer surface of the coating layers 18, which are disposed for the purpose of improving a firm connection of the catalyst layers 19 to the outer surfaces of the punched plate 17. Although the punched plate 17 is utilized for improving the flow of the exhasut gas through punched holes of the plate 17, a blind plate with no holes may be also utilized.

In a preferred embodiment, it is desired to form the punched plate 17 with a stainless steel plate and to form the coating layers 18 by flame coating a ceramic material such as white aluminium material in ceramic state. As the catalyst 19, it is desired to utilize one for promoting the oxidization reaction to increase the temperature of the exhaust gas, and for this purpose, a catalyst mainly consisting of platinum and rhodium may be preferably utilized.

According to the type of the catalyst, the coating layers 18 may be eliminated.

The exhaust gas purifying device of each of the present embodiments will operates as follows.

In general, as shown in Fig. 6, the exhaust gas from the engine exhasut port flowing through the central portion of the exhaust pipe section of the muffler body 15 has a temperature higher than that flowing along the radially peripheral portion thereof. When the exhasut gas flows in the muffler body 15, the high-temperature exhaust gas flows through the central portion therein. According to the present invention, since the catalyst plate is arranged near the central portion of the flow passage, the high-temperature exhaust gas positively comes into contact with the catalyst, i.e. catalyst layers of the catalyst plate, and promptly reacts therewith. Therefore, the catalytic reaction will start promptly and the exhaust gas purification capability can be hence enhanced.

Furthermore the temperature of the inner wall surface of the muffler body 15 is not highly increased by the catalytic reaction. In this viewpoint, Fig. 7 shows that the surface temperature of the muffler body according to the present invention is lower as indicated by the solid line A in comparison with a conventional one indicated by the dotted line B throughout the whole longitudinal length of the muffler.

In addition, as shown in Fig. 9, since the surface temperature of the muffler body is less increased, an influence caused by the temperature increasing less effects on the diffuser of the muffler, so that the lowering of the output power becomes less throughout the whole revolution range of the engine as indicated by the solid line C in comparison with the conventional muffler, indicated by the dotted line D.

In the foregoing embodiment, the exhaust gas purifying device is equipped for the muffler disposed on the left side of the motorcycle body, but substantially the same device is disposed to the muffler on the right side of the motorcycle body. In this case, when the catalyst plate is arranged in an offset manner such as shown in Fig. 2 or 3, the catalyst plate will be displaced on the side of the inner wall of the inner body half 15a.

Claims

1. An exhaust gas purifying device, specifically for an motorcycle, in which an exhaust gas from an exhaust port of an engine is purified by a member provided with a catalyst disposed in a cylindrical muffler (10) provided with an exhaust pipe section connected to the engine exhaust gas port, characterized in that a catalyst plate means (16) to which a catalyst (19) is applied is disposed so as to extend throughout a longitudinal direction of the exhaust pipe section (11) at a portion diametrically offset from the center in cross section of the exhaust pipe section (11).

2. A device according to claim 1, wherein said catalyst plate means (16) includes at least one plate member of a sandwich structure comprising a central plate (17) and catalyst layers (19) disposed on both side surfaces of the central plate (17).

3. A device according to claim 2, wherein said central plate (17) is a punched plate (17) provided with a plurality of perforations.

4. A device according to claims 2 or 3, wherein said central plate is a solid plate.

5. A device according to any one of claims 2 to 4, wherein said central plate (17) comprises a stainless steel plate and said catalyst layers (19) are mainly formed of plutinum and rhodium.

6. A device according to any one of claims 2 to 5, wherein coating layers (18) are further disposed between the central plate (17) and the catalyst layers (19), said coating layers (19) being formed by flame coating white aluminium in ceramic state.

7. A device according to any one of claims 1 to 6, wherein said catalyst plate means is one single catalyst plate member (16).

8. A device according to any one of claims 1 to 7, wherein said catalyst plate means (16) is composed of one catalyst plate member (16) and is disposed in the diametrically central portion of the exhaust pipe section (11) within a range of 1/3d to 2/3d, wherein a symbol d designates an inner diameter of the exhaust pipe section (11), offset from an inner surface thereof.

9. A device according to claim 8, wherein said catalyst plate member (16) is provided with a rib portion (16a) formed at an intermediate portion thereof.

10. A device according to any one of claims 1 to 6, wherein said catalyst plate means comprises two catalyst plate members (16) disposed diametrically symmetrically in the diametrically central portion of the exhaust pipe section (11) within a range of 1/3d and 2/3 d, wherein a symbol d designates an inner diameter of the exhaust pipe section (11), offset from an inner surface thereof.

Revendications

1. Dispositif d'épuration de gaz d'échappement, en particulier pour un motocycle, dans lequel un gaz d'échappement provenant d'un orifice d'échappement d'un moteur est épuré par un organe muni d'un catalyseur disposé dans un silencieux cylindré 10 muni d'un tronçon de tube d'échappement relié à l'orifice du gaz d'échappement du moteur, caractérisé en ce que des moyens de plaques de catalyseur 16 sur lesquels est appliqué un catalyseur 19 sont disposés de façon à s'étendre selon une direction longitudinale à travers un tronçon de tube d'échappement 11, dans une partie diamétralement décalée par rapport au centre de la section transversale du tronçon du tube d'échappement 11.

2. Un dispositif selon la revendication 1, dans lequel lesdits moyens de plaques de catalyseur 16 comportent au moins un organe de plaques d'une structure en sandwich comprenant une plaque centrale 17 et des couches de catalyseur 19 disposées sur les deux côtés de surface de la plaque centrale du 17.

3. Un dispositif selon la revendication 2, dans lequel ladite plaque centrale 17 est une plaque perforée 17 munie d'une pluralité de perforations.

4. Un dispositif selon les revendications 2 ou 3, dans lequel ladite plaque centrale est une plaque massive.

5. Un disposition selon l'une quelconque des revendications 2 à 4, dans lequel, ladite plaque centrale 17 comporte une plaque en acier inoxydable et lesdites couches de catalyseur 19 sont principalement constitués de platine et de rhodium.

6. Un dispositif selon l'une quelconque des revendications 2 à 5, dans lequel des couches de revêtements 18 sont en outre disposées entre la plaque centrale 17 et les couches de catalyseur 19, lesdites couches de revêtement 19 étant formées par revêtement à la flamme d'aluminium blanc à l'état céramique.

7. Un dispositif selon l'une quelconque des revendications 1 à 6, dans lequel lesdits moyens de plaques de catalyseur sont constitués par un organe unique de plaques catalyseur 16.

8. Un dispositif selon l'une quelconque des revendications 1 à 7, dans lequel lesdits moyens de plaques de catalyseur 16 sont constitués d'un organe de plaques de catalyseur 16 et sont disposés dans la partie diamétralement centrale du tronçon du tube d'échappement 11, à l'intérieur d'une zone comprise entre 1/3 et 2/3 du diamètre, dans lequel un symbole d désigne le diamètre intérieur du tronçon du tube d'échappement 11, décalé par rapport à la surface intérieure de ce tronçon.

9. Un disposition selon la revendication 8, dans lequel ledit organe de plaques de catalyseur 16 est muni d'une partie nervurée 16a formée dans sa partie intermédiaire.

10. Un dispositif selon l'une quelconque des revendications 1 à 6, dans lequel lesdits moyens de plaques de catalyseur comportent deux organes de plaques de catalyseur 16 disposés diamétralement et symétriquement dans la partie diamétralement centrale du tronçon du tube d'échappement 11, dans une zone comprise entre 1/3 d 2/3 d, dans lequel le symbole d désigne le diamètre intérieur du tronçon du tube d'échappement 11, décalé par rapport à la surface intérieure de ce tronçon.

Patentansprüche

1. Abgasreinigungsvorrichtung, insbesondere für ein Motorrad, bei der ein aus einem Abgasauslaß eines Motors kommendes Abgas durch ein mit einem Katalysator ausgestattetes Element gereinigt wird, welches in einem zylindrischen Auspufftopf (10) angeordnet ist, der mit einem mit dem Motor-Abgasauslaß verbundenen Abgasrohrabschnitt ausgestattet ist, **dadurch gekennzeichnet,** daß eine Katalysator-Plattenanordnung (16), auf die ein Katalysator (19) aufgebracht ist, derart angeordnet ist, daß sie sich in Längsrichtung in einem Bereich durch den Abgasrohrabschnitt (11) erstreckt, welcher gegenüber der Querschnitt-Mitte des Abgasrohrabschnitts (11) versetzt ist.

2. Vorrichtung nach Anspruch 1, bei der die Katalysatorplattenanordnung (16) mindestens ein Plattenelement in Sandwichbauweise aufweist, welches eine Mittelplatte (17) und auf beiden Flächen der Mittelplatte (17) befindliche Katalysatorschichten (19) enthält.

3. Vorrichtung nach Anspruch 2, bei der die Mittelplatte (17) eine gestanzte Platte (17) mit mehreren Perforierungen ist.

4. Vorrichtung nach Anspruch 2 oder 3, bei der die Mittelplatte eine massive Platte ist.

5. Vorrichtung nach jedem der Ansprüche 2 bis 4, bei der die Mittelplatte (17) eine Platte aus rostfreiem Stahl aufweist und die Katalysatorschichten (19) hauptsächlich aus Platin und Rhodium gebildet sind.

6. Vorrichtung nach jedem der Ansprüche 2 bis 5, bei der zwischen der Mittelplatte (17) und den Katalysatorschichten (19) außerdem Überzugsschichten (18) angeordnet sind, welche durch Flammbeschichten weißen Aluminiums in keramischem Zustand gebildet sind.

7. Vorrichtung nach jedem der Ansprüche 1 bis 6, bei der die Katalysatorplattenanordnung durch ein einzelnes Katalysatorplattenelement (16) gebildet ist.

8. Vorrichtung nach jedem der Ansprüche 1 bis 7, bei der die Katalysatorplattenanordnung (16) sich aus einem Katalysatorplattenelement (16) zusammensetzt und in dem diametralen Mittelbereich des Auspuffrohrabschnitts (11) innerhalb einer Zone von 1/3 d bis 2/3 d versetzt gegenüber dessen Innenfläche angeordnet ist, wobei das Symbol d einen Innendurchmesser des Auspuffrohrabschnitts (11) bezeichnet.

9. Vorrichtung nach Anspruch 8, bei der das Katalysatorplattenelement (16) mit einem an einem Zwischenbereich des Elements ausgebildeten Rippenabschnitts (16a) ausgestattet ist.

10. Vorrichtung nach jedem der Ansprüche 1 bis 6, bei der die Katalysatorplattenanordnung zwei Katalysatorplattenelemente (16) aufweist, die in dem diametral mittleren Bereich des Abgasrohrabschnitts (11) in einem Bereich von 1/3 d und 2/3 d versetzt von dessen Innenfläche in diametralsymmetrischer Anordnung liegen, wobei das Symbol d einen Innendurchmesser des Abgasrohrabschnitts (11) bezeichnet.

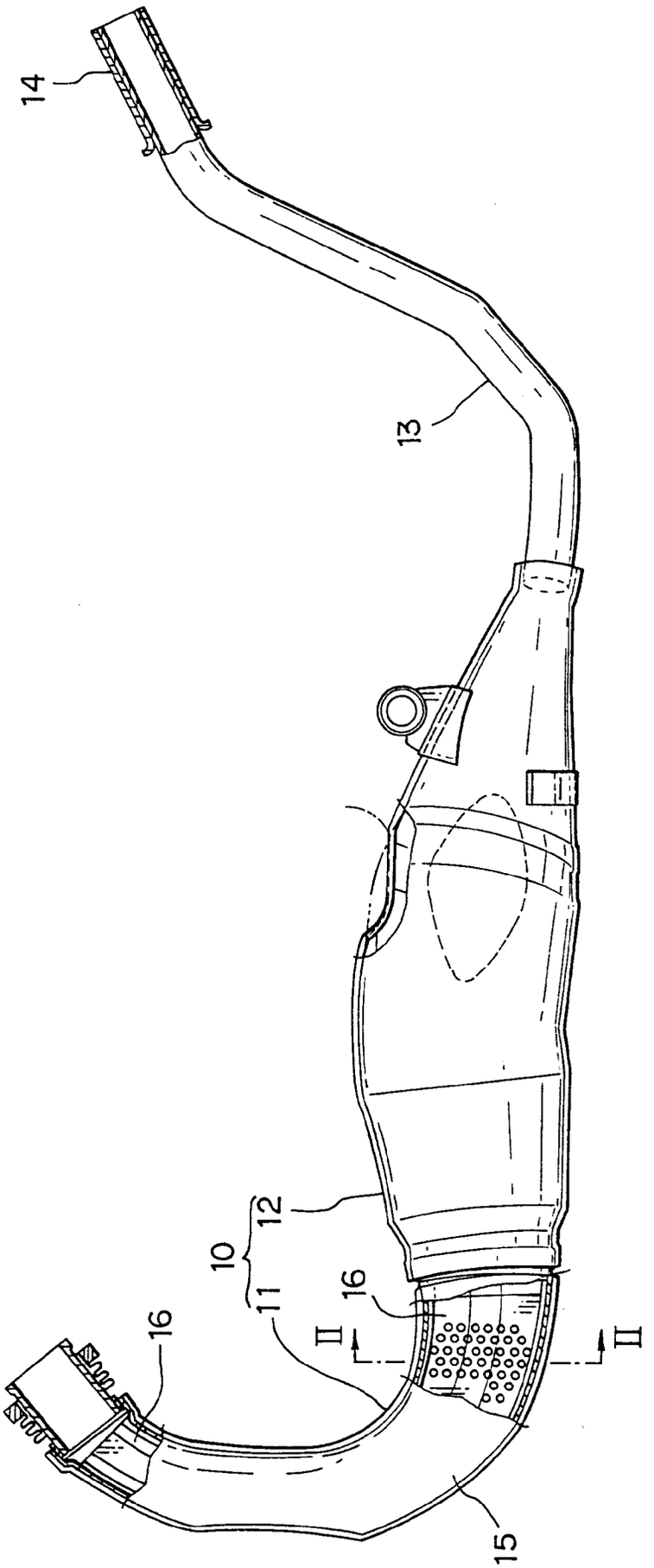

FIG. 1

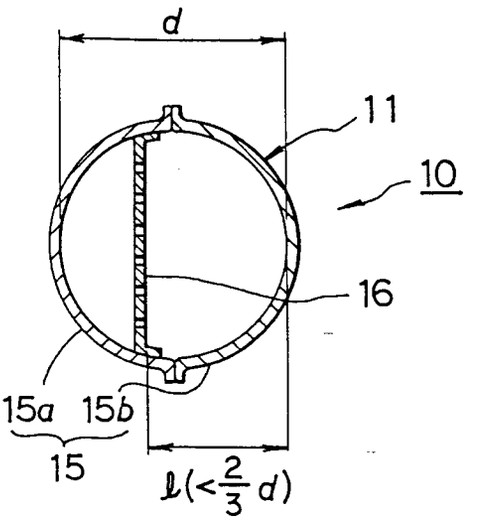

FIG. 2

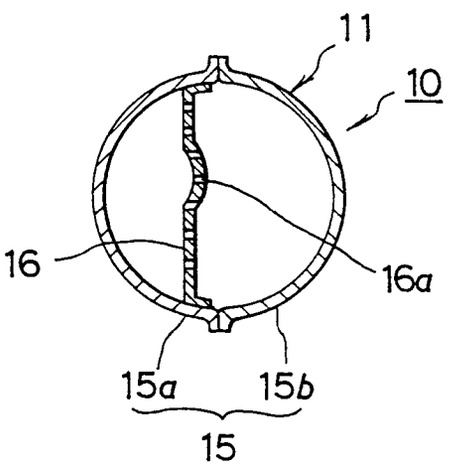

FIG. 3

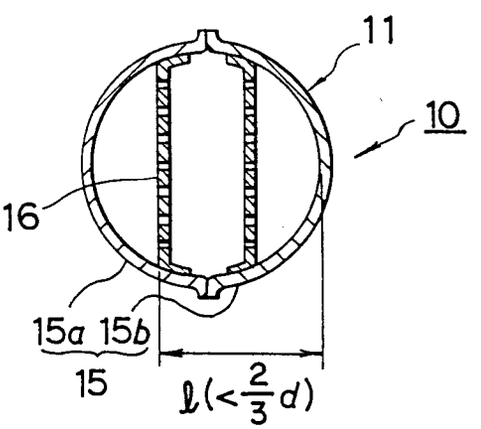

FIG. 4

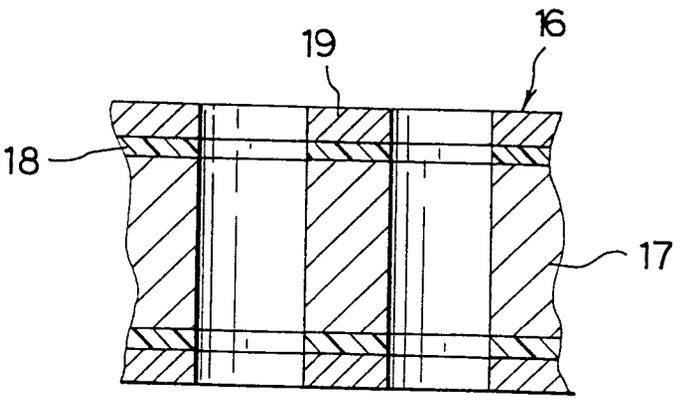
19
16
18
17

FIG. 5

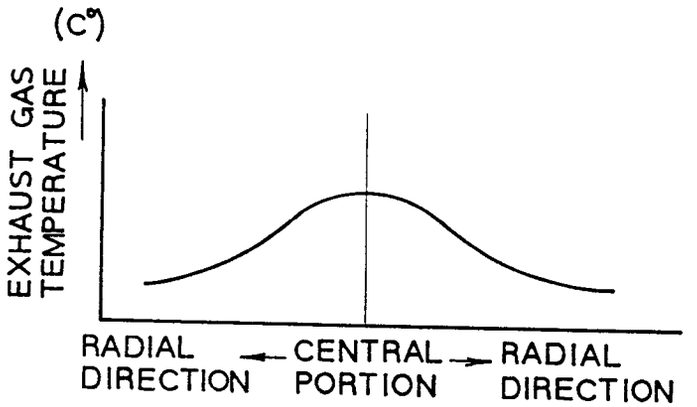
(C°)
EXHAUST GAS TEMPERATURE
RADIAL DIRECTION
CENTRAL PORTION
RADIAL DIRECTION

FIG. 6

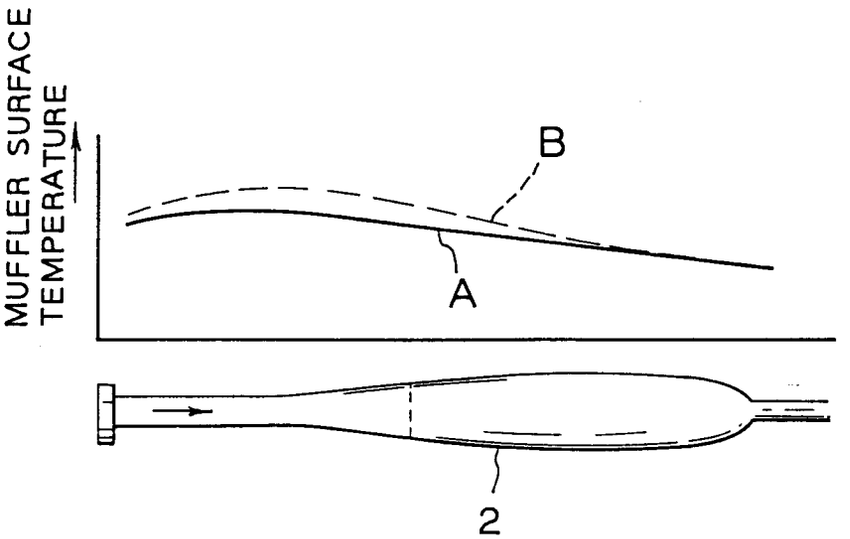
MUFFLER SURFACE TEMPERATURE
B
A
2

FIG. 7

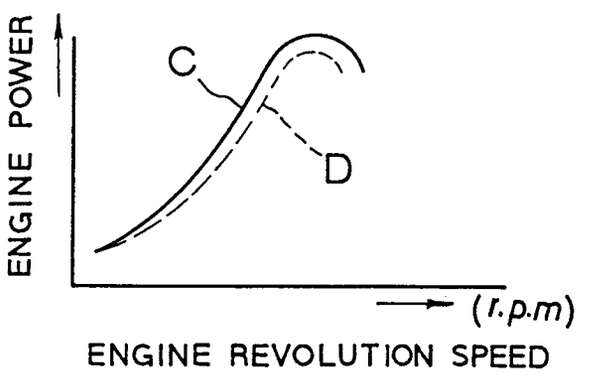
ENGINE POWER
C
D
(r.p.m)
ENGINE REVOLUTION SPEED

FIG. 8