United States Patent

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[54] **EXHAUST GAS MUFFLER MEANS**
17 Claims, 22 Drawing Figs.

[52] **U.S. Cl.** **181/36,** 181/54, 181/59
[51] **Int. Cl.** **F01n 1/02,** F01n 1/08, F01n 7/08
[50] **Field of Search** 181/53, 54, 36, 36.2, 48, 59

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Primary Examiner—Robert S. Ward, Jr.
Attorney—Steinberg and Blake

ABSTRACT: An exhaust gas muffler means adapted to be provided in a gas exhaust pipe of the internal combustion engine and the like, comprising a series of buffing elements arranged in and along the gas exhaust pipe. Each buffing element comprises a blind chamber, a throat and a plurality of outlets. The buffing elements are communicated with one after another intermediate a part of the gas exhaust pipe or directly. Not only the barking sounds but also low frequency noise are damped and deadened.

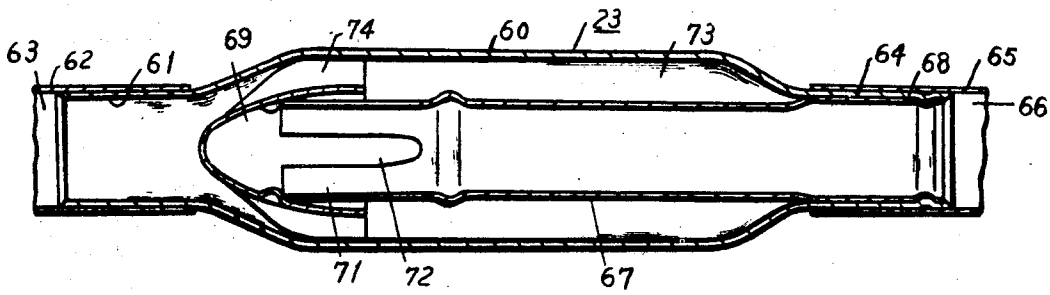


Fig. 1



Fig. 2

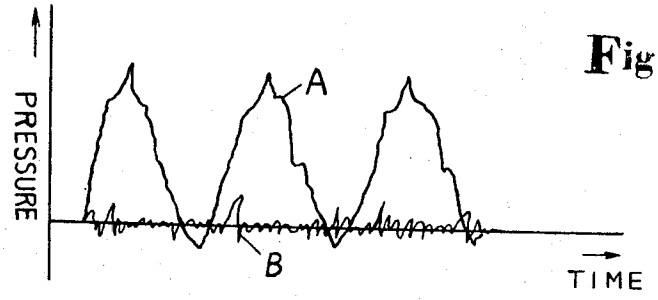


Fig. 3

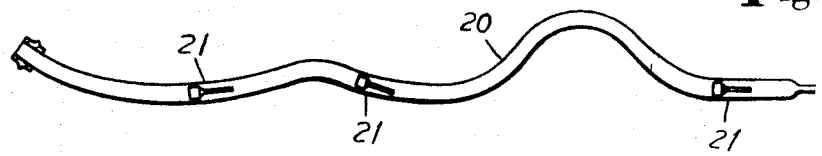


Fig. 4

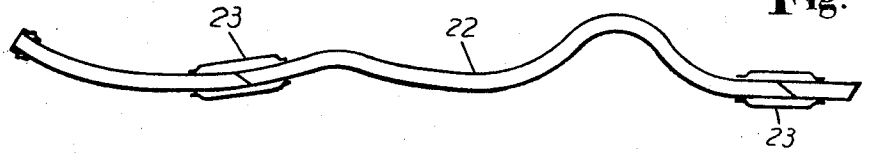


Fig. 5

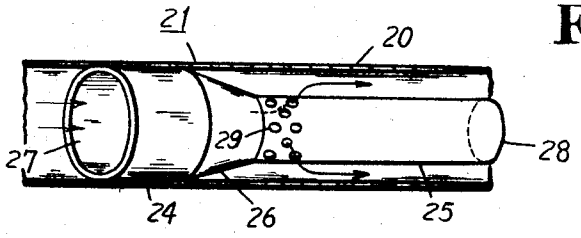
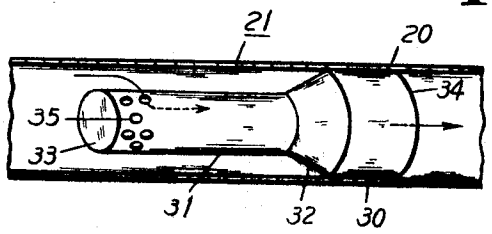


Fig. 6



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Fig. 7

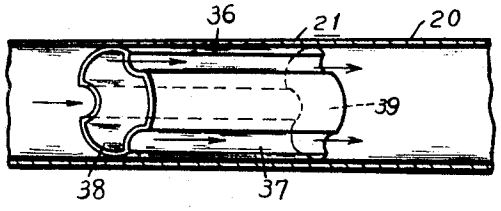


Fig. 8

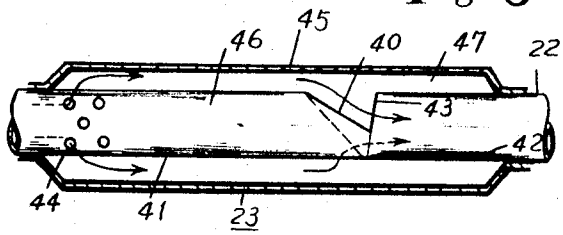
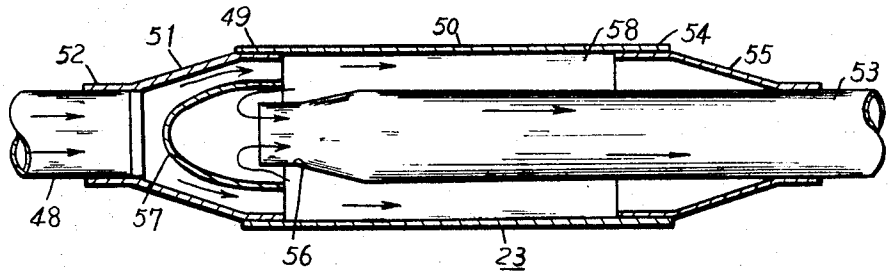


Fig. 9



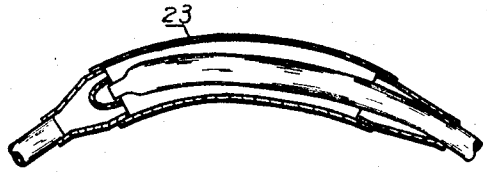


Fig. 10

Fig. 11

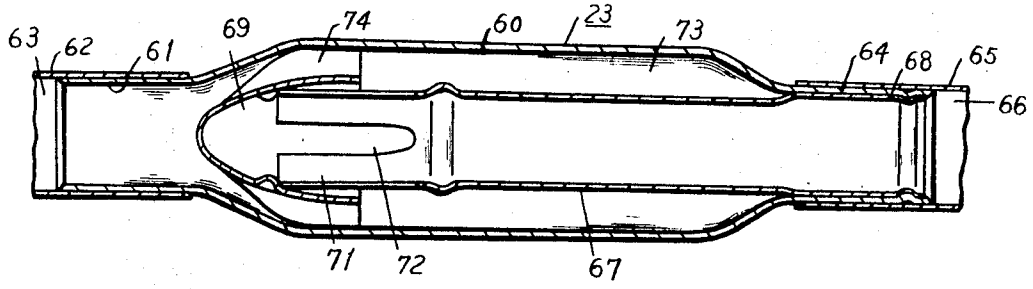
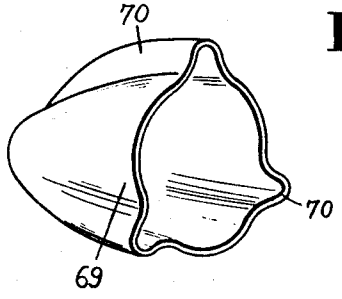


Fig. 12



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Fig. 13

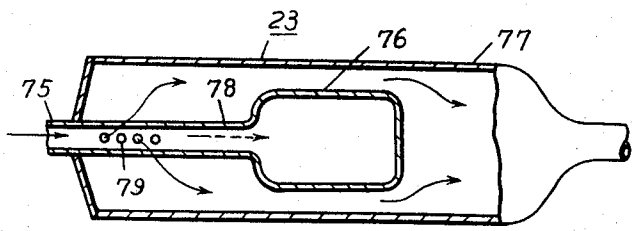


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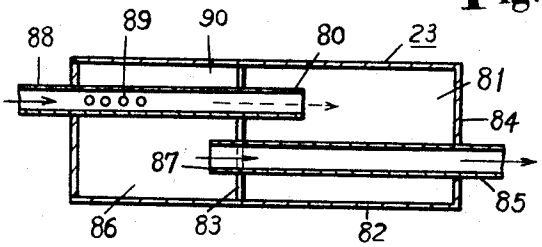


Fig. 15

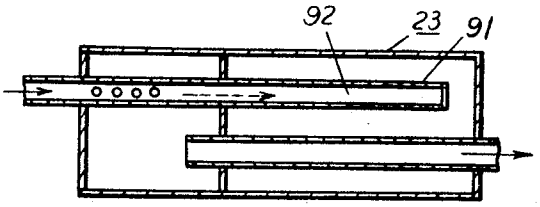


Fig. 16

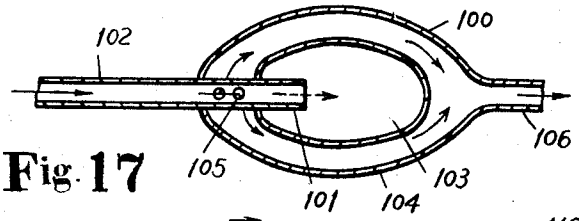


Fig. 17

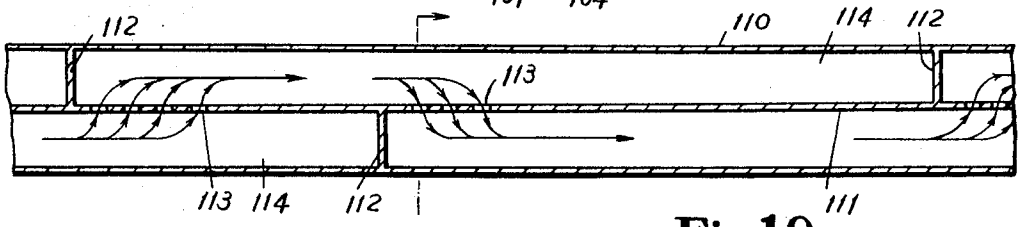


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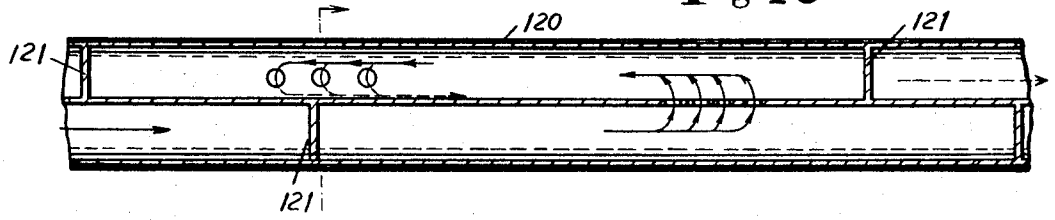


Fig. 21

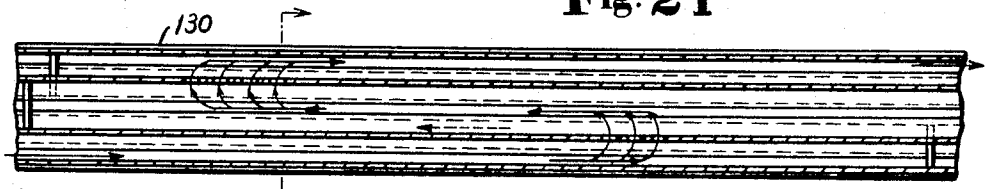


Fig. 18

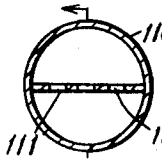


Fig. 20

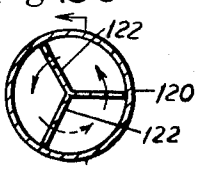
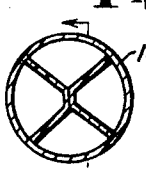


Fig. 22



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EXHAUST GAS MUFFLER MEANS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The field of art to which this invention pertains is a device through which the exhaust gases from an internal combustion engine and the like are passed to suppress the audible vibrations.

2. Description of the Prior Art

The exhaust sound generated by the exhaust of the internal combustion engine and the like is roughly divided into two classes. The first one is the pressure waves of rather low frequency accompanied by the exhaust gas burnt in and exhausted from the cylinders of the engine. The other is the acoustic waves of rather high frequency generated by the expansion of the exhausted gas, as shown in FIG. 2 The pressure waves A are of range of from 30 to 200 cycles per second depending upon the rotation of the engine and characterized by the small negative pressure. The acoustic waves B are mixed waves of a range of from 100 to 5000 cycles per second of which the positive pressure and the negative pressure are evenly distributed. The pressure waves A are more than 10 times of the acoustic waves in energy level. In case of the exhaust sound of the internal combustion engine, energy of the pressure waves is substantially larger than that of the acoustic waves which is extremely small.

Heretofore, a muffler is such that a cavity having a larger diameter than an exhaust pipe is formed in a suitable location in the pipe and divided into several chambers having suitable volumes by baffle plates. These chambers are communicated with one after another on the basis of the acoustic theory of plane waves so as to function as an expanding chamber, a resonant chamber, an interfering chamber, and an absorbing chamber (which may be filled with a sound absorbing material) and thus intended to damp out sounds mainly of high frequency. Such noise as accompanying pulsative dynamic pressure of pressure waves and intermittent flow of gases, of which energy is 10 times of that of sound waves, as produced by the piston type internal combustion engine, the compressor, and the like is subsidiarily depressed and rectified by impedance among the above-mentioned expanding chamber, resonant chamber, interfering chamber and absorbing chamber as far as the prior art concerns. In addition, it has been difficult to deaden sounds of low frequencies caused by the pulsative dynamic pressure of pressure waves and intermittent flow of gases, by the conventional muffler due to a restriction in the setting position and the size thereof, particularly in an automobile.

One object of this invention is to provide an exhaust gas muffler means, in which the pulsative dynamic pressure of intermittent flow of gases accompanying such pressure waves as causing the low frequency sounds is introduced into a buffing chamber, in which the pressure is buffed and absorbed by adiabatic compression by virtue of elasticity of the gases, so as to reduce low frequency sounds generated secondarily at the tailpipes.

Another object of this invention is to provide an exhaust gas muffler means, which may be mass-produced from an inexpensive metal pipe and have a light and strong structure and in which the weight is longitudinally evenly distributed.

Still another object of this invention is to provide an exhaust gas muffler means, in which it is possible to damp low frequency acoustic waves and pressure waves by virtue of an exhaust pipe of which the length is several times substantially while appearing compact, so that the same is suitable to fit an exhausting system having a relatively short exhaust pipe.

A still further object of this invention is to provide an exhaust gas muffler means, which may be useful independently or in combination with the conventional muffler.

A still further object of this invention is to provide an exhaust gas muffler means, which may be easily standardized by virtue of a minimized number of parts thereof, so that another gas muffler means for another engine having a similar displacement may be constructed with the same parts.

SUMMARY OF THE INVENTION

In accordance with the general feature of this invention, there is an exhaust gas muffler means adapted to be provided in a gas exhaust pipe of the internal combustion engine and the like, comprising a series of buffing elements arranged in and along the gas exhaust pipe. Each of the buffing elements comprises a blind buffing chamber having at least a throat and a plurality of outlets. The exhaust gas is introduced into the buffing chamber through the throat and expelled out of the buffing chamber through the outlets communicated with the throat of the subsequently arranged buffing element exclusive of the foremost throat and the hindmost outlets. And the outlets are positioned so as to direct the exhaust gas sidewise in connection with the direction of the incoming exhaust gas.

The efficiency in the buffing chamber depends mainly upon the volume thereof and the total sum of the areas of the outlets. In general, the larger the volume of the buffing chamber, the larger the buffing action against the pressure waves becomes, and the negative effect of a large total area of the outlets is reduced by thus enlarged volume. However, if it is intended to enlarge the effect for damping action by means of reduced total area of the outlets, the resistance to the exhaust gas flow is increased. Under these circumstances, it is necessary to select suitable values for these variations in view of still further conditions.

A plain pipe having a length of the conventional muffler used for a conventional automobile was connected with an engine for measuring the pressure distribution of the exhaust gas of the engine, resulting in to find that the pressure distribution became a constant state by a usual operation of the engine and that only several nodes and loops existed along the pipe. Therefore, it is possible to amplify the effect of the buffing element by mounting the same at the node, where the pressure of the pressure waves is peaked, upon detection of such nodes. However, it is not preferred to increase the number of the buffing elements beyond an extent, because the resistance to the exhaust gas flow is increased as the number increases.

In order to design the buffing element, of which elastic coefficient has been adjusted so as to effectively damp and absorb the energy of the pulsative dynamic pressure of the pressure waves and intermittent exhaust gas flow, it is preferred to satisfy the following formula:

$$f=(\sqrt{K\times g/W})\times(1/2\pi)$$

wherein f represents the resonance oscillation frequency of the buffing chamber, g represents the acceleration of gravity or 980 cm./sec.^{2}, W represents the absolute pressure subjected to the buffing chamber from the throat by the pressure waves and the intermittent flow of the exhaust gas (in unit of kg./cm.^{2}), and K represents the elastic coefficient of the buffing chamber, of $K=AkP_oS/H_o$ in which A is the proportional constant, k is the polytropic index, P_o is the pressure inside the buffing chamber, S is the cross-sectional area of the throat, and H_o is the lateral length of the buffing chamber.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be better understood and other objects and additional advantages of the invention will become apparent upon perusal of the following description taken in connection with the drawings, in which:

FIG. 1 is a plan view of an example of a conventional muffler for the automobile;

FIG. 2 is a graph indicating a property of an exhaust sound of an internal combustion engine;

FIG. 3 is a plan view of an embodiment of the exhaust gas muffler means in accordance with this invention;

FIG. 4 is a plan view of another embodiment of the exhaust gas muffler means in accordance with this invention;

FIG. 5 is a perspective view of a buffing element provided in the embodiment shown in FIG. 3, showing the structure of the buffing element;

FIGS. 6 and 7 are perspective views showing modifications of the buffing element shown in FIG. 3, respectively;

FIGS. 8, 9, 10 and 11 are axially sectional views of further embodiments of the buffing element shown in FIG. 4, respectively;

FIG. 12 is a perspective view of a guide shown in FIG. 11;

FIGS. 13, 14, 15 and 16 are axially sectional views of still further embodiments of the buffing element shown in FIG. 4, respectively;

FIGS. 17, 19 and 21 are axially sectional views of still further embodiments of the buffing elements which constitute appreciable lengths of the gas exhaust pipe in accordance with this invention, respectively; and

FIGS. 18, 20 and 22 are cross-sectional views of the buffing elements shown in FIGS. 17, 19 and 21, respectively.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring more particularly to the drawings, the preferred embodiments of this invention will now be described; however, this description will be understood to be illustrative of the invention and not as limiting it to the particular constructions shown and described. An exhaust pipe is provided with a plurality of buffing elements. An exhaust pipe **20** is provided with buffing elements **21** as shown in FIG. 3. Another exhaust pipe **22** is provided with another buffing elements **23** as shown in FIG. 4. These are the arrangements of the exhaust gas muffler means in accordance with this invention.

The exhaust pipe **20** is a rather big pipe, while the exhaust pipe **22** is a rather thin pipe. The buffing element **21** is provided inside the exhaust pipe **20** so that the latter has an even outside diameter along the full length. The buffing element **23** is protruded outside the exhaust pipe **22** so that it is possible to make the pipe **22** thin, but the buffing element **23** is rather big. In view of these facts, it is preferred that either of the above two types is selected or they are suitably combined with each other considering, for example, ground clearance of an automobile.

In FIGS. **5** to **7**, inclusive three embodiments of the buffing element **21** are illustrated. A buffing element **21** shown in FIG. **5** comprises three parts: a big pipe **24** and a thin pipe **25** are connected with each other intermediate a frustoconical pipe **26**. The big pipe **24** is fit and joined inside the exhaust pipe **20**. The head end **27** is opened. The tail end **28** is closed. A plurality of perforations **29** are perforated through the head part of the thin pipe **25**. The interior of the thin pipe **25** between the perforations **29** and the closed tail and **28** functions as a buffing chamber.

A buffing element **21** shown in FIG. **6** comprises also three parts: a big pipe **30** and a thin pipe **31** are connected with each other intermediate a frustoconical pipe **32**. The big pipe **30** is fit and joined inside the exhaust pipe **20**. The tail end **34** of the big pipe **30** is opened. The head end **33** of the thin pipe **31** is closed. A plurality of perforations **35** are perforated through the head part of the tubular wall of the thin pipe **31**. A longitudinally tubular space between the wall of the exhaust pipe **20** and the wall of the thin pipe **31** extending from the perforations **35** to the frustoconical pipe **32** functions as a buffing chamber.

A buffing element **21** shown in FIG. **7** is appreciably different from the above two embodiments, which comprises a length of pipe **36** fit and joined inside the exhaust pipe **20**. The wall of the inside pipe **36** is formed with some longitudinal internally fluted parts **37** so as to form longitudinal troughs inside the wall of the exhaust pipe **20**. Therefore, if the number of such troughs **37** is four, the cross section of the inside pipe **36** is cruciform. The head end **38** of the inside pipe **36** is opened and the tail end **39** thereof is closed. The troughs **37** are open at both ends. The interior of the inside pipe **36** functions as a buffing chamber.

In FIG. **8** an embodiment of the buffing element **23** shown in FIG. **4** is illustrated. The buffing element **23** shown in FIG. **8** comprises a part of the exhaust pipe **22** pinched into closure **40**. The wall of the exhaust pipe **22** is circumferentially partly cut into two parts: a front part **41** and a rear part **42**. The tail end of the front part **41** is closed as above. The head end **43** of the rear pipe **42** is opened externally. The front pipe **41** is formed with a plurality of perforations **44** lying somewhere short of the closure **40**. An outer tubular casing **45** is jointed with the tail part of the front pipe **41** and the head part of the rear pipe **42** so as to cover the perforations **44** and some length of the head part of the rear pipe **42**. Two blind spaces, one **46** in the front pipe **41** and the other **47** outside the rear pipe **42**, serve as buffing chambers.

In FIG. **9** another embodiment of the buffing element **23** shown in FIG. **4** is illustrated. This buffing element **23** is located at the rear end of a front exhaust pipe **48**. The head end **49** of a big pipe **50** is jointed with the big end of a reducer **51**, of which the thin end **52** is jointed with the tail end of the front exhaust pipe **48**. A rear exhaust pipe **53** having the same diameter with the front exhaust pipe **48** is inserted into the tail end **54** of the big pipe **50**. The tail end **54** is jointed with the rear exhaust pipe **53** by means of another reducer **55**. The head end **56** of the rear exhaust pipe **53** is extended to the head end **49** of the big pipe **50** and somewhat reduced. The head end **56** is surrounded at a distance by a gas guide **57** of a semispherical wall which is supported in place by a suitable means inside the reducer **51**.

In operation of this embodiment, the exhaust gas departing from the front exhaust pipe **48** is guided by the guide **57** into the tubular blind space **58** formed between the big pipe **50** and the rear exhaust pipe **53**, whence the same is introduced into the rear exhaust pipe **53** through the annular space between the guide **57** and the head end **56** of the rear exhaust pipe **53**. The tubular blind space **58** functions as a buffing chamber. The exhaust gas once compressed in the buffing chamber **58** is reactively expanded, borne by the guide **57**, and deflected into the head end **56** of the rear exhaust pipe **53**. The head end **56** is reduced from a diameter to a less diameter whereby the resistance subjected to the exhaust gas stream is reduced.

The buffing element **23** shown in FIG. **9** may be bent in whole to an extent as shown in FIG. **10**, so as to facilitate its arrangement in a case.

A buffing element **23** shown in FIG. **11** is somewhat similar to that shown in FIG. **9**. The buffing element comprises a big pipe **60** of which both ends are reduced, the head end **61** being adapted to be closely inserted into the tail end **62** of the front exhaust pipe **63** and the tail end **64** of the big pipe **60** being adapted to be closely inserted into the head end **65** of the rear exhaust pipe **66**. Another pipe **67**, of which the tail end **68** is closely inserted into the tail end **64** of the big pipe **60**, is extended inside the big pipe **60** ahead to a guide **69**. The guide **69** comprises a semispheroidal wall having three axial ribs **70** which are adapted to fit closely in the big pipe **60** so as to form three trisected annular passages **74**, as shown in FIG. **12**. The head end **71** of the inside another pipe **67** is engaged with and in the guide **69** and fixed thereby in place. Several axial slots **72** are formed in the head end **71** of the inside another pipe **67**.

In operation of this embodiment, the exhaust gas departing from the front exhaust pipe **63** is guided by the guide **69** through the three trisected annular passages **74** into a tubular blind space **73** formed between the rear part of the big pipe **60** and the inside another pipe **67**, whence the gas is admitted inside the inner another pipe **67** communicated with the rear exhaust pipe **66**, through the interiors of the three ribs **70** and the slots **72** of the inner another pipe **67**.

A buffing element **23** embodying this invention as shown in FIG. **13** comprises the tail end of the front exhaust pipe **75**. The tail end is expanded into a buffing chamber **76** and surrounded at a distance from and by a big pipe **77** together with a throat **78** positioned in front of the buffing chamber **76** and several perforations **79** formed in the wall of the front exhaust pipe **75**. The exhaust gas gone right on in the front exhaust pipe **75** is once compressed in the buffing chamber **76**, whence admitted into the big pipe **77** through the perforations **79**. Of course, the big pipe **77** serves as a supporting member for the whole structure.

Another buffing element 23 shown in FIG. 14 differs from the preceding embodiment in that the tail end 80 of the front exhaust pipe 88 is opened inside a buffing chamber 81 formed by a big pipe 82, a front partition 83 and a rear partition 84, and that a rear exhaust pipe 85 is extended through the buffing chamber 81 into a front chamber 86 in front of the buffing chamber 81 and terminated with an open head end 87. The perforations 89 and the throat 90 are formed and positioned similarly to the preceding embodiment.

Still another buffing element 23 shown in FIG. 15 is quite similar to the preceding embodiment in accordance with this invention except that the tail end 91 of the front exhaust pipe 92 is closed so that the interior of the closed end 91 constitutes a buffing chamber 92 by itself.

The preceding embodiments of the buffing elements 21 and 23 in accordance with this invention are all cylindrical in shape, but it is not necessary to shape so. FIG. 16 illustrates a buffing element 100, which is spheroidal in shape. The tail end 101 of the front exhaust pipe 102 is opened and protruded inside a spheroidal chamber 103 which is a blind buffing chamber. A larger spheroidal casing 104 surrounds at a distance the smaller spheroidal chamber 103 and is communicated with the front exhaust pipe 102 by several perforations 105 formed in the wall of the front exhaust pipe 102 between the head end of the larger spheroidal casing 104 and the smaller spheroidal chamber 103. The larger spheroidal casing 104 is extended into a rear exhaust pipe 106 from the tail end of the casing 104. The tail end 101 of the front exhaust pipe 102 is the throat of the buffing chamber 103.

Now there are further three embodiments of this invention which are appreciably different from the preceding embodiments in appearance, as shown in FIGS. 17 to 22, inclusive. However, these embodiments belong to the series of the buffing elements 21 shown in FIGS. 3, 5, 6 and 7. In the embodiments shown in FIGS. 3, 5, 6 and 7, the buffing chamber is arranged concentrically to the exhaust pipe, while in the embodiments shown in FIGS. 17 to 22, the buffing chamber is arranged eccentrically to and inside the exhaust pipe. The buffing chambers in the former embodiments are intermittently arranged in and along an exhaust pipe, while those in the latter embodiments are continuously arranged in and along an exhaust pipe.

In an embodiment shown in FIGS. 17 and 18, there is an exhaust pipe 110 which is longitudinally bisected by a longitudinal partition 111 so as to form two longitudinal compartments having semicircular cross sections, respectively. These longitudinal compartments are divided into unit compartments similarly with each other by radial partitions 112. However, these radial partitions 112 of the two longitudinal compartments are zigzag arranged so that the unit compartments are also zigzag arranged. There are several, for example, four perforations 113 formed in the longitudinal partition 111 in the proximity of the head end of each unit compartment so as to communicate one of the one side unit compartments with one of the other side unit compartments. Because these unit compartments are zigzag arranged, all unit compartments are communicated successively one after another. The location of the perforation 113 in a unit compartment is the proximity of the head end thereof and a part somewhat rearwards from the longitudinal center, which corresponds to the head end of the next unit compartment belonging to the other side, so that there is formed a blind chamber 114 between the said part and the tail end of the unit compartment. This individual blind chamber 114 functions as a buffing chamber. These zigzag arranged buffing chambers 114 may be continuously arranged longitudinally in the exhaust pipe 110 as long as desired.

FIGS. 19 and 20 illustrate an exhaust pipe 120 formed with a series of unit compartments defined by radial partitions 121 similarly to the preceding embodiment. However, this exhaust pipe 120 is longitudinally trisected by the longitudinal partitions 122 and the radial partitions 121 are arranged in such a manner that between any adjoining two belonging to a longitudinal compartment are positioned one radial partition of another longitudinal compartment and one radial partition of still another longitudinal compartment, and the order is repeated. Accordingly, it is deemed that the exhaust gas is passed through a substantially coiled path.

FIGS. 21 and 22 illustrates another exhaust pipe 130 which is quite similar to that shown in FIGS. 19 and 20 except the quartered cross section of the exhaust pipe 130 substituted for the trisected cross section of the corresponding pipe 120.

While particular embodiments of the invention have been illustrated and described, modifications thereof will readily occur to those skilled in the art. It should be understood therefore that the invention is not limited to the particular arrangements and structures disclosed but that the appended claims are intended to cover all modifications which do not depart from the true spirit and scope of the invention.

What we claim as new and desired to be secured by Letters Patent of the United States is:

1. In an exhaust gas muffler means, at least one buffing element comprising a blind buffing chamber having at least a throat and a plurality of outlets, exhaust gas being introduced into said buffing chamber through said throat and expelled out of said buffing chamber through said outlets, and said outlets being positioned so as to direct said exhaust gas sidewise in connection with the direction of the incoming exhaust gas, the elastic coefficient being adjusted so as to effectively damp and absorb the energy of the pulsative dynamic pressure of the pressure waves and intermittent exhaust gas flow, by designing so as to satisfy the following formula:

$$f=(\sqrt{K\times g/W})\times(1/2\pi)$$

wherein f represents the resonance oscillation frequency of the buffing chamber, g represents the acceleration of gravity or 980 cm./sec.^{2}, W represents the absolute pressure subjected to the buffing chamber from the throat by the pressure waves and the intermittent flow of the exhaust gas (in unit of kg./cm.^{2}), and K represents the elastic coefficient of the buffing chamber, or $K-AkP_oS/H_o$ in which A is the proportional constant, k is the polytropic index, P_o is the pressure inside the buffing chamber, S is the cross-sectional area of the throat, and H_o is the lateral length of the buffing chamber.

2. A buffing element as a component of said exhaust gas muffler means as claimed in claim 1, comprising

an outer casing, an inner chamber, and an exhaust gas incoming pipe,

said outer casing being jointed and communicated with a rear exhaust pipe,

said inner chamber being a blind buffing chamber communicated with said exhaust gas incoming pipe through said throat only, and

said exhaust gas incoming pipe being provided with a plurality of perforations, through which the same is communicated with the interior of said outer casing.

3. A buffing element as a component of said exhaust gas muffler means as claimed in claim 1, comprising

an outer casing, an inner chamber, and an exhaust gas incoming pipe,

said outer casing being a part of said exhaust gas incoming pipe,

said inner chamber being a blind buffing chamber formed by a thin pipe having a closed tail end and arranged concentrically to said exhaust gas incoming pipe, and

said thin pipe having a plurality of perforations at a part in the proximity of its opened head end forming said outlets and jointed with the tail end of a frustoconical through pipe by which said exhaust gas incoming pipe is checked.

4. A buffing element as a component of said exhaust gas muffler means as claimed in claim 1, comprising

an outer casing, an inner chamber, and an exhaust gas incoming pipe,

said outer casing being a part of said exhaust gas incoming pipe,

said inner chamber being a blind buffing chamber formed by a longitudinally tubular space between said outer casing and a thin pipe having an opened tail end jointed

with the head end of a frustoconical through pipe, by which said exhaust gas incoming pipe is checked, and

said thin pipe having a plurality of perforations forming said outlets at a part in the proximity of its closed head end and being arranged concentrically to said exhaust gas incoming pipe.

5. A buffing element as a component of said exhaust gas muffler means as claimed in claim 1, comprising

an outer casing, an inner chamber, and an exhaust gas incoming pipe,

said outer casing being a part of said exhaust gas incoming pipe,

said inner chamber being a blind buffing chamber formed by an inside pipe arranged concentrically to said exhaust gas incoming pipe and having a closed tail end, and

said inside pipe being circumferentially partly jointed with and circumferentially partly disengaged from the inside of said exhaust gas incoming pipe so as to form several longitudinally through troughs between said inside pipe and said exhaust gas incoming pipe.

6. A buffing element as a component of said exhaust gas muffler means as claimed in claim 1, comprising

an outer casing, an inner chamber, and an exhaust gas incoming pipe,

said outer casing being arranged concentrically to and around a part of said exhaust gas incoming pipe and having a reduced head end and a reduced tail end so as to joint with said part,

said part being divided into a front pipe and a rear pipe,

said front pipe having a plurality of perforations in the proximity of its opened head end and a closed tail end so as to form a blind buffing chamber, and

said rear pipe having an opened head end an opened tail end, so that another blind buffing chamber is formed in the form of a tube between said rear pipe and the rear part of said outer casing.

7. A buffing element as a component of said exhaust gas muffler means as claimed in claim 1, comprising

an outer casing, an inner chamber, and an exhaust gas incoming pipe,

said outer casing being a laterally expanded frontward extension of a rear exhaust pipe having a closed head end,

said inner chamber being a blind buffing chamber formed by an expanded part having a closed tail end, of said exhaust gas incoming pipe extended into said outer casing, and

said exhaust gas incoming pipe having a plurality of perforations between said closed head end and said expanded part.

8. A buffing element as a component of said exhaust gas muffler means as claimed in claim 1, comprising

an outer casing, an inner chamber, and an exhaust gas incoming pipe,

said outer casing comprising a front chamber and a blind buffing chamber in which said exhaust gas incoming pipe extended through said front chamber has an opened tail end,

said inner chamber being said blind buffing chamber, and

said exhaust gas incoming pipe having a plurality of perforations in its part arranged in said front chamber so as to communicate with a rear exhaust pipe which has an opened head end in said front chamber.

9. A buffing element as a component of said exhaust gas muffler means as claimed in claim 1, comprising

an outer casing, an inner chamber, and an exhaust gas incoming pipe,

said outer casing comprising a front chamber,

said inner chamber being a blind buffing chamber comprising a blind tail end of said exhaust gas incoming pipe extended through said front chamber and out thereof, and

said exhaust gas incoming pipe having a plurality of perforations in its part arranged in said front chamber so as to communicate with a rear exhaust pipe which has an opened head end in said front chamber.

10. A buffing element as a component of said exhaust gas muffler means as claimed in claim 1, comprising

an outer casing, an inner chamber, and an exhaust gas incoming pipe,

said outer casing being a spheroidal chamber extended from a rear pipe,

said inner chamber being a blind buffing chamber arranged inside said spheroidal chamber, and

said exhaust gas incoming pipe being extended into said inner chamber and provided with an opened tail end in said inner chamber and a plurality of perforations in said spheroidal chamber so as to communicate with said rear pipe.

11. A group of buffing elements as components of said exhaust gas muffler means as claimed in claim 1, comprising

parts of said exhaust gas pipe itself,

each of said parts being formed by dividing a length of said exhaust gas pipe into some longitudinal compartments by longitudinal partitions and then dividing each of said longitudinal compartments into a series of subcompartments by lateral partitions extended only within said respective compartment,

said lateral partition of any compartment being zigzag arranged to another lateral partition of any other compartment, and

said longitudinal partition of any subcompartment being provided with several perforations serving as said throat for said subcompartment and as said outlets for an adjoining subcompartment and another several perforations serving as said outlets for the first-named subcompartment and as said throat for another adjoining subcompartment, whereby said exhaust gas is passed through said part along a generally coiled passage.

12. A group of buffing elements as claimed in claim 11, in which said longitudinal compartments are two.

13. A group of buffing elements as claimed in claim 11, in which said longitudinal compartments are three.

14. A group of buffing elements as claimed in claim 11, in which said longitudinal compartments are four.

15. In an exhaust gas muffler means, at least one buffing element comprising a blind buffing chamber having at least a throat and a plurality of outlets, exhaust gas being introduced into said buffing chamber through said throat and expelled out of said buffing chamber through said outlets, and said outlets being positioned so as to direct said exhaust gas sidewise in connection with the direction of the incoming exhaust gas, said buffing element including

an outer casing, an inner chamber, an exhaust gas incoming pipe, and a semispherical gas guide,

said outer casing being arranged concentrically to said exhaust gas incoming pipe and jointed with the rear end thereof intermediate a reducer and a rear exhaust pipe intermediate another reducer,

said inner chamber being a blind buffing chamber formed between said outer casing and a frontward extension of said rear exhaust pipe, and

said semispherical gas guide being arranged inside the first-named reducer in such a manner that an opened head end of said frontward extension forming said outlets is partially covered thereby and that said exhaust gas incoming pipe is communicated with said inner chamber outside said gas guide and said inner chamber is communicated with said opened head end inside gas guide.

16. A buffing element as a component of said exhaust gas muffler means as claimed in claim 15, which is bent in whole in accordance with a curved longitudinal axis.

17. In an exhaust gas muffler means, at least one buffing element comprising a blind buffing chamber having at least a

throat and a plurality of outlets, exhaust gas being introduced into said buffing chamber through said throat and expelled out of said buffing chamber through said outlets, and said outlets being positioned so as to direct said exhaust gas sidewise in connection with the direction of the incoming exhaust gas, said buffing element comprising

an outer casing, an inner chamber, an exhaust gas incoming pipe, and a semispheroidal gas guide,

said outer casing being arranged concentrically to said exhaust gas incoming pipe and having a head reduced part jointed with the rear end of said exhaust gas incoming pipe and a tail reduced part jointed with a rear exhaust pipe,

said inner chamber being a blind buffing chamber formed between the rear half of said outer casing and an inner pipe having an opened tail end and jointed with said tail reduced part, and

said semispheroidal gas guide having several axial ribs jointed with said outer casing in such a manner that an opened head end of said inner pipe forming said outlets in partially covered thereby and that said exhaust gas incoming pipe is communicated with said inner chamber outside said gas guide and said inner chamber is communicated with said opened head end inside said gas guide.