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Frederiksen

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[54] **SILENCER**

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[63] Continuation of Ser. No. 309,305, Nov. 24, 1972, abandoned.

[30] **Foreign Application Priority Data**

Nov. 24, 1971 Denmark 5760/71

[52] **U.S. Cl.** **181/57;** 181/69

[51] **Int. Cl.**[2] **F01N 1/08**

[58] **Field of Search** 181/49, 50, 57, 69

[56] **References Cited**

UNITED STATES PATENTS

227,302	5/1880	Richards	181/57
756,203	4/1904	Barthel	181/57
1,431,907	10/1922	Cramer	181/50
1,756,916	4/1930	Stranahan	181/69
2,037,884	4/1936	Day	181/50
2,144,631	1/1939	Kurth	181/50
2,239,549	4/1941	Chipley	181/57
2,667,940	2/1954	Gallihugh	181/57
2,881,852	4/1959	Morrish	181/57
2,937,707	5/1960	Ernst	181/50
3,016,972	1/1962	Dugas	181/57

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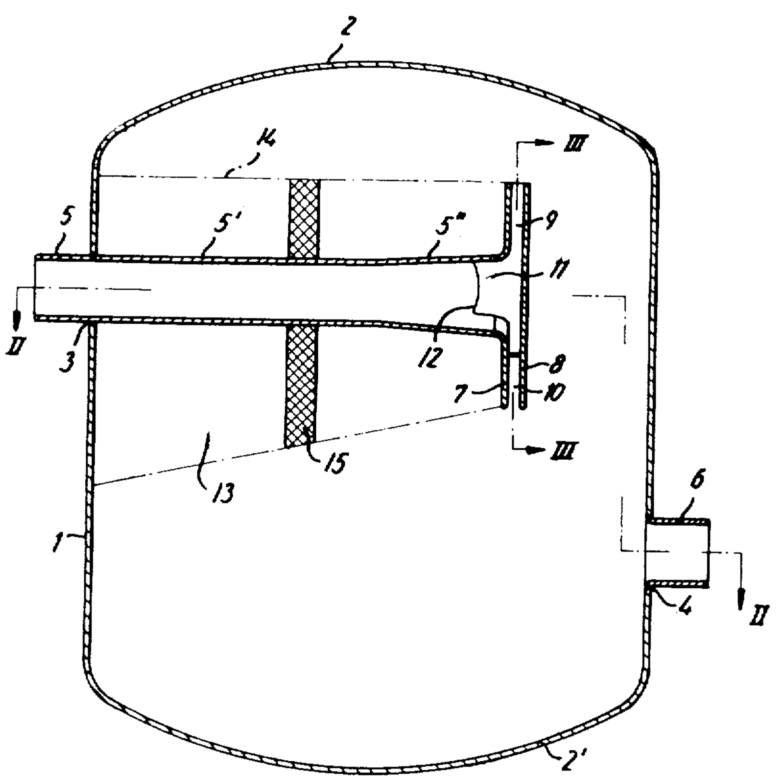
[57] **ABSTRACT**

In an expansion chamber silencer, such as an exhaust silencer for internal combustion engines, the inlet pipe is extended into the expansion chamber and is terminated by a cross plate diffuser converting the fluid flow through the inlet pipe into a curtain flow entering the expansion chamber in a direction that is substantially radial to the inlet pipe direction.

11 Claims, 6 Drawing Figures



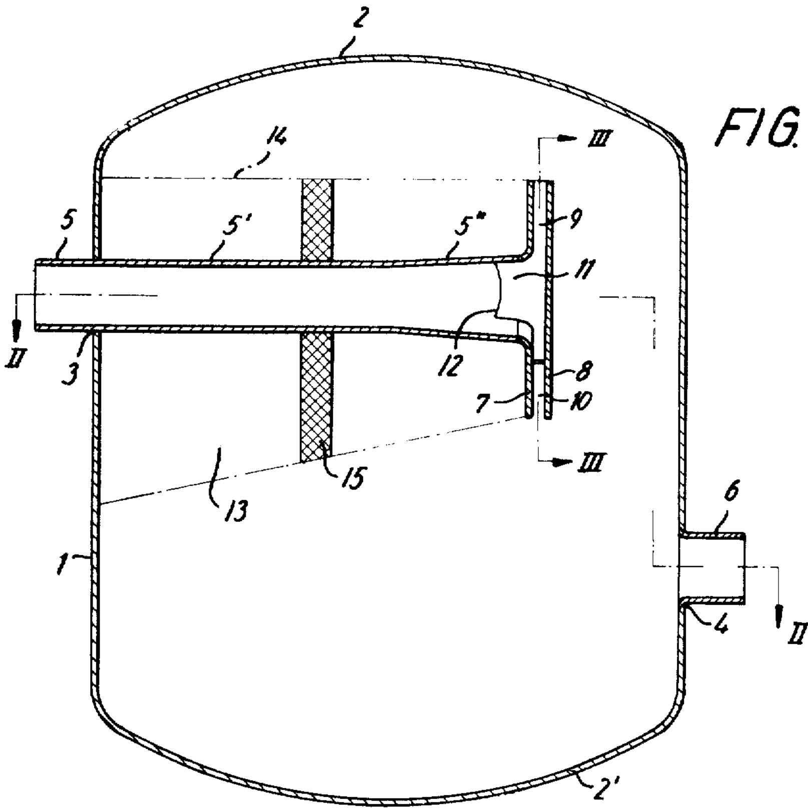


FIG.1

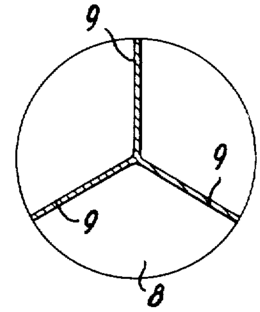


FIG.3

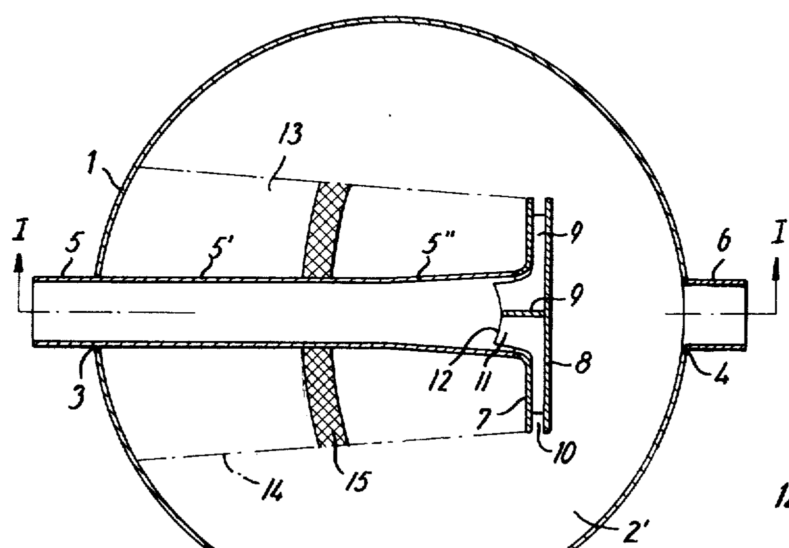


FIG.2

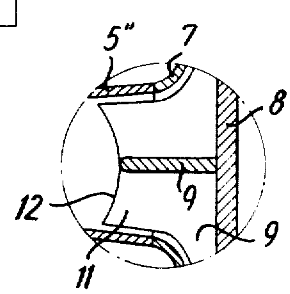


FIG. 2A

FIG. 4

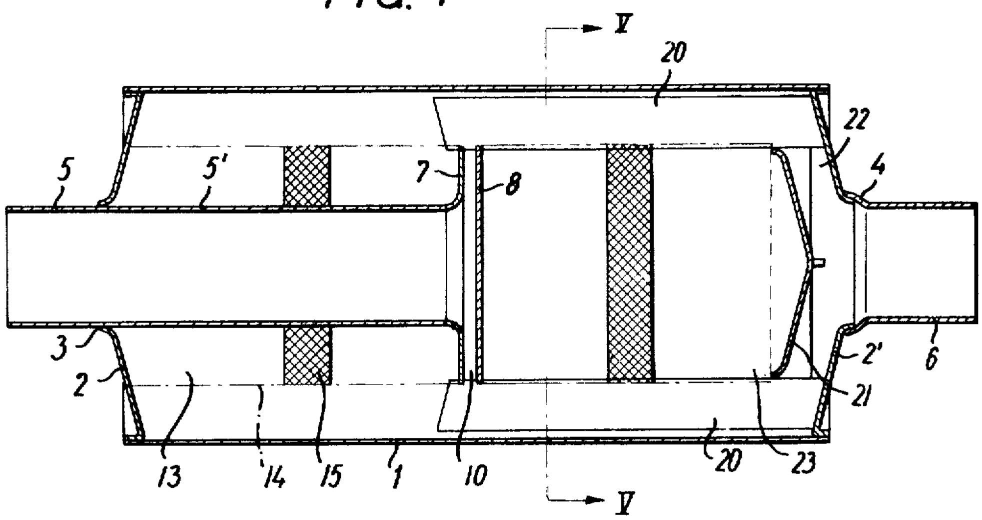
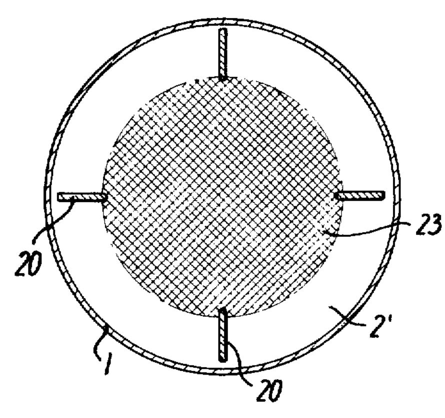


FIG. 5



SILENCER

This is a continuation of application Ser. No. 309,305, filed Nov. 24, 1972 now abandoned.

The invention relates to a silincer of the expansion chamber type for reducing noise propagation by the flow of gaseous fluids through tubular ducts, e.g. exhaust pipes for internal combustion engines.

The bounding wall of an expansion chamber silencer comprises an aperture in communication with an inlet duct and an aperture in connection with an outlet duct, and the transverse dimension and the length of the chamber are larger than the diameter of the inlet and outlet ducts. The principle permits several apertures for inlet as well as for outlet ducts, but in this case this will be disregarded for the sake of simplicity.

The effect of an expansion chamber silencer consists in the fact that chamber and outlet duct detain a greater or smaller part of the noise arriving from the inlet duct.

With regard to the effect, the outlet duct forms an integral part of the silencer. With regard to the construction, chamber and outlet duct may form separate parts which are intended for being assembled by connecting branches, flanges or the like.

The reduced noise issuing from the silencer depends generally on the noise which from the inlet duct is induced in the chamber, and on the capability of the chamber and the outlet duct of detaining this noise.

The function of the silencer may be further explained in connection with the conventional design in which the expansion chamber consists of a cylindrical casing with two flat end plates for the external and coaxial connection of the inlet duct at one end plate and the outlet duct at the other end plate.

The noise which from the inlet duct is induced in the chamber depends on the degree to which the noise content of arriving sound waves is reflected from the cross-sectional transition between inlet duct and chamber, and on the formation of flow eddies caused by the fluid when flowing into the chamber.

The reflection of the sound waves, arriving through the inlet duct, at the said cross-sectional transition depends on several parameters, including particularly the pitch or frequency of the sound waves and thereby their wave length, the flow velocity in the duct as well as the proportion between the cross-sectional areas of the chamber and the inlet duct.

Low-frequency sound waves having wave lengths considerably larger than the transverse dimension of the chamber will to a high degree be reflected from the cross-sectional transition, the better the larger the cross-section of the chamber in proportion to the cross-section of the duct.

High-frequency sound waves having wave lengths of the same order of magnitude as the cross-section of the inlet duct, or less, will only to a negligible degree or not at all be reflected from the cross-sectional transition, even in the case that the cross-section of the chamber is large compared to the cross-section of the duct.

Medium-frequency sound waves having wave lengths of the same order of magnitude as the transverse dimension of the chamber will to some degree be reflected from the cross-sectional transition but not to so high a degree as is the case with low-frequency waves. The degree of reflection will increase with the proportion of the cross-sections of the chamber and the duct, although this tendency is hardly as pronounced as is the case with low-frequency waves.

It may be concluded that in the conventional expansion chamber silencer the chamber is exposed to a powerful noise from the inlet duct (dependent on the noise source, e.g. an internal combustion engine) in the full audible frequency range, and the conditions at the cross-sectional transition between duct and chamber shifts this load in the direction of medium and particularly high frequencies. The capability of the silencer of reducing the arriving noise is good within the low-frequency range, but less good within the medium-frequency range, and within the high-frequency range the silencer is ineffective.

Where there is a need for a perceptible reduction of noise within the whole range from low to high frequencies it has been customary to combine the expansion chamber silencer with an extra silencer of the adsorption type, such a silencer being effective with regard to high frequencies, less effective in the case of medium frequencies and ineffective at low frequencies. A combination like that mentioned above may in a way be excellent, but there is an evident need for an expansion chamber silencer which without the aid of an extra silencer offers a satisfactory reduction of noise within the full range from low to high frequencies.

In a modification of the conventional expansion chamber silencer the inlet duct is elongated so as to extend a greater or smaller distance into the chamber. This does not result in any noticeable change in the high transmission of noise to the chamber, but some change is achieved in the capability of the silencer of reducing the medium-frequency noise. On the assumption that the chamber is of a regular shape, many of the natural pulsations of the fluid in the chamber will have their pressure pulsation node in the centre of the chamber. Consequently, if the duct is extended to this centre, such natural pulsations will, principally, not be initiated or struck, and by this means the fluid in the chamber and thus also the fluid in the outlet duct will be relieved of the energy of sound pulsation corresponding thereto. However, unless the length and the transverse dimension of the chamber are disproportionately large, this effect will be limited to the lowest natural frequency of the fluid in the chamber, due to the fact that the transmission of noise from the inlet duct to the chamber takes place not at a point, but over a certain range of volume, the minimum dimension of which corresponds fairly well to the transverse dimension of the duct. By this modification is achieved that approximately a single medium-frequency resonance is avoided, whereas a noticeable change in the noise conditions within the low-frequency and high-frequency ranges cannot be expected. The result of the extension of the duct is that the gas jet introduced is localized closer to the hole edge of the outlet duct, and this may easily produce undesirable edge sounds resulting in an increased high-frequency noise. The gas jet will even have the opportunity of striking natural pulsations in the outlet duct with the result that the medium-frequency reduction is reduced. This modification should thus be applied suitably carefully, and, at best, the result is a comparatively limited improvement of the medium-frequency reduction of the silencer.

In another known modification of the conventional expansion chamber silencer the chamber wall is completely or partially covered by a lining of porous, sound-absorbing material, e.g. mineral wool. In principle, this measure provides a reduction of the noise of the fluid in the chamber but this reduction is only of substantial importance as far as high frequencies are concerned, because the known absorption materials possess a poorer capability of absorbing sound of medium frequency, let alone sound of low frequency. However, this modification seems to be of only limited usefulness, since a better total high-frequency reduction can be achieved by an analogous lining inside the outlet duct. In fact, the reduction of noise measured in db. per unit of length of chamber or duct is approximately inversely proportional to the transverse dimension of the flow which is significantly larger in the chamber than in the outlet duct.

In a third variant of the known expansion chamber silencer the inlet duct is elongated so as to extend a suitable distance into the chamber and is closed by a terminating transverse plate. To permit flow communication from the duct to the chamber, the wall of the duct extension is provided with holes made by perforation or slitting. In this way the transmission of noise from the duct to the chamber is reduced because the terminating transverse wall is effective to reflect the arriving sound waves. Now, the transmission of noise occurs through the holes in the wall of the duct extension against a resistance that, according to the circumstances, is of a resistive nature, thereby influencing low-frequency noise, or of reactive nature, influencing high-frequency noise. As, however, the total flow-passage area of the holes should normally be somewhat larger than the duct cross-section proper in order that the loss in pressure via the silencer should not become too great, the acoutstic resistance of the holes will — according to experience — in reality be modest. A difficulty encountered is, incidentally, that the holes should resist the transmission not only of the waves arriving directly from the inlet duct, but also of the sound waves reflected undiminished from the transverse plate. To this must be added that the relatively sharp edges of the holes may give rise to high-frequency edge sounds. The best result to be achieved is consequently only a moderate reduction of the transmission of noise from duct to chamber. In the case of a less favourable shaping of the holes the fluid in the chamber may be exposed to an increased admission of noise, in particular high-frequency noise, dependent on the presence and intensity of edge sounds. An additional drawbach is that, in spite of an ample dimensioning, the holes in the wall offer a higher flow resistance than a duct extension without a transverse plate.

The aim of the invention is to provide a gaseous fluid expansion chamber silencer so designed that the entire content of audible noise in the flow of fluid originating from the noise source, e.g. the exhaust process of an internal combustion engine, is reduced essentially by the passage of the fluid through the silencer, and that this passage is connected with a particularly low flow resistance as well as minimum of turbulence noise.

More specifically, the invention relates to a silencer which is intended for the reduction of the transmission of noise by the flow of gaseous fluids through tubular ducts, particularly exhaust pipes for internal combustion engines, and comprising an expansion chamber casing with apertures for inlet and outlet pipes connected thereto, the inlet pipe being extended into the casing and permitting a lateral flow of fluid to the casing. According to the invention the silencer is characterized in that the end of the inlet pipe extension is formed by a preferably substantially axis-symmetrical cross plate diffuser, through which the flow of fluid is led to the casing substantially in the form of a thin curtain.

The invention is based on the recognition that the cross plate diffuser possesses properties that are acoustically favourable in several respects. As will be known, such a diffuser consists substantially of two plates, one of which is a flow-deflecting full plate while the other is a hole plate which is substantially parallel to the full plate and is connected to the inlet duct of the diffuser. To counteract unnecessary flow losses, the hole edge portion of the plate may be designed with a suitable axis-symmetrical rounding, and the full plate — in the following called the cross plate — is secured in relation to the hole plate in a suitable way.

Due to its orientation perpendicular to the axial direction of the inlet pipe and the pipe extension, the cross plate will to an essential degree reflect high-frequency noise, that is to say will throw the content of highly pitched sounds in the flow of fluid back into the inlet duct, since high-frequency sound waves are of a distinctly direction-stable and therefore, in the present case, axis-parallel nature in propagation as well as in reflection. Already for this reason a considerable reduction of the transmission of high-frequency noise from the inlet pipe to the casing is achieved.

The external transverse dimension of the two plates of the diffuser is necessarily larger than the transverse dimension of the pipe extension and, consequently, the two plates form together an annular slot-shaped outlet duct. The mass of the flowing fluid in this outlet slot contributes inertially to an essential resistance against the passage of high-frequency and medium-frequency noise, and thereby assists the cross plate to reflect such noise components to the inlet pipe.

The narrow outlet slot of the diffuser ensures that the discharge of the fluid into the casing has the nature of a correspondingly narrow and thereby curtain-shaped gas jet. The issue of high-frequency and medium-frequency turbulence noise from this gas jet will be essentially smaller than from the gas jet which the same flow of fluid would form in the casing if the cross plate diffuser were removed. This is due to the fact that the volume of the flow-turbulent mixing zone of the diffuser will be reduced to about one third and that the energy density of high-frequency and medium-frequency noise within this volume is essentially smaller in the case of the diffuser jet due to the lower particle velocity, caused by the diffuser effect, in the outlet aperture. This circumstance also contributes to the fact that when a cross plate diffuser according to the invention is used, a considerable reduction of the transmission of high-frequency and medium-frequency noise from the inlet pipe to the casing is achieved.

The good effect of the silencer in the case of low-frequency noise is ensured in a conventional way by a suitable dimensioning of the casing and the associated outlet pipe.

To this must be added that the cross plate diffuser according to the invention without any difficulty, and while preserving its good effect with regard to noise suppression, can be designed in such a way that the drop in pressure from the inlet pipe to the casing can be kept very low, that is to say at a small fraction of the dynamic pressure in the flow of fluid in the inlet pipe. This contributes to keeping the total flow resistance of the silencer at a low level, and this is of importance in many cases, in particular if the flowing fluid is exhaust gas from an internal combustion engine, and most certainly if such an engine is provided with an exhaust-operated turbo-charger.

According to the invention the inlet pipe extension may have an axially varying cross-section before the cross plate diffuser, preferably of a conically converging or a conically diverging nature. This form is chosen with a view to the fact that when a silencer is to be designed or selected for a given purpose it may be desirable to weigh the pros and cons of the desire of the reduction of noise compared to demands as to flow resistance, space requirements etc. Per se, the detailed design of the cross plate diffuser will to a wide extent allow such a weighing of desires and demands, but the possibilities will be greater if the shape of the inlet pipe extension can be varied as described above. A conically convergent pipe member before the diffuser will generally give the silencer an increased noise reduction and at the same time an increased flow resistance, while a conically divergent pipe member before the diffuser will show opposite effects.

In a preferred embodiment of the invention, the silencer as a whole is axis-symmetrical and comprises an expansion casing having a circular-cylindrical shell and two axis-symmetrical end plates, each of which is provided with a central aperture for inlet and outlet pipes, respectively, the extension of the inlet pipe as well as the cross plate diffuser being placed coaxially in the casing. The expedient feature of this embodiment with a distinct longitudinal direction coinciding with the axis of symmetry of the silencer is, with regard to the effect achieved, particularly based on the following two circumstances.

Firstly, many of the possible natural pulsations of the fluid in the casing will be of a longitudinal nature, and this implies that when the axial positioning of the cross plate diffuser in relation to the casing is chosen it is possible selectively to influence the formation and suppression of such pulsations. In this connection it is of particular importance that the flow of fluid from the diffuser has a substantially radial direction and a curtain-like and thereby narrow and well-defined geometrical shape. If the diffuser is positioned approximately halfway between the two end plates of the casing, many possible longitudinal natural pulsations are not struck since, principally, one half of these pulsations have pressure pulsation nodes in or close to the central transverse plane between the end plates, that is to say in or close to the plane of the curtain flow. Thus, the formation of noise of substantially medium-frequency in the fluid in the casing is avoided.

Secondly, it has turned out that by the curtain flow sweeping the inside of the wall of the casing it is possible, in spite of energy losses caused by shocks, to achieve a limited, but not insignificant recuperation of static pressure. The probable explanation of this rather surprising effect may be that in relation to the curtain flow the wall of the casing acts almost as an extra cross plate diffuser having only one flow-conducting plate. Experiments have proved that by a radial distance between the periphery of the cross plate diffuser and the inside of the wall of the casing of the order of magnitude of 5 times the slot width of the diffuser duct, in combination with an otherwise expedeint design of the cross plate diffuser, it is possible to achieve so large an extra pressure recuperation in the casing that the total pressure loss from inlet pipe to casing equals nil or is even negative.

The inlet pipe extension may be surrounded by sound-absorbing material which transversely to the pipe is spaced from the walls of the expansion casing. The purpose of the sound-absorbing material is to reduce the content of particularly high-frequency noise of the fluid in the casing, and the material may be of a known type, e.g. loose mineral wool which in a conventional way may be secured within a surrounding jacket of perforated sheet material.

The pipe extension offers the particular possiblity that the body of absorption material may be a stack of pressed mineral wool plates of a known type, a hole being cut out in each plate for a relatively tight fit on the pipe. Such a plate stack having any suitable surface shape may easily be fitted on the pipe extension between the hole plate of the diffuser and the wall of the casing with a suitable degree of axial pressure for achieving a good securing and stability of shape.

It may be pointed out that the pipe extension of the silencer should have no perforation or slitting, since this may entail an essential risk of undesirable and loud edge sounds in the flow of fluid.

The two flow-limiting plates of the cross plate diffuser may be interconnected by means of intermediate ribs which are preferably radial and have a rounded front edge facing the flow of fluid. The ribs serve primarily for securing the cross plate to the hole plate, so that their mutual location and consequently the flow geometry of the diffuser are preserved under all circumstances. This embodiment of the diffuser will be suited for being produced by diecasting or by sheet metal work. The length, cross-sectional shape and location of the ribs may be chosen at will if only the requirement as to securing is fulfilled, but the ribs must not, however, essentially detract from the properties of the diffuser regarding noise and flow. It is of particular importance that the front edge of the ribs facing the flow of fluid is rounded to counteract the formation of edge sound. With a view to this it may be expedient if the front edge of the ribs has been extended in front of the hole edge of the hole plate, since edge sounds, if any, will then be reflected from the cross plate of the diffuser together with other high-frequency noises in the arriving fluid. The extended portion of the ribs may moreover serve as centering guide when the diffuser is being assembled with the extension of the inlet pipe.

In another embodiment of the silencer the two flow-limiting plates of the cross plate diffuser are secured to each other at their periphery by means of preferably radially oriented ribs with a rounded cross-sectional form of the inner edge facing the flow of fluid, and the two plates are furthermore by means of the same ribs rigidly connected to the wall or end plates of the expansion casing. This embodiment is suited for being produced by sheet-metal work and welding. In this case the ribs contribute to securing the diffuser firmly in the casing, and this may be necessary in cases when the silencer is exposed to vibrations and shocks.

A special embodiment of the silencer is characterized in that the ribs are coaxial with the cross plate diffuser and the extension of the inlet pipe and form stay elements that are connected to the wall of the expansion casing at the aperture of the outlet pipe so as to be axis-symmetrical around this aperture. In the vicinity of this aperture the ribs furthermore form fastening means for a shield which together with the casing wall around the aperture bounds on outlet passage for the fluid flow leading to the aperture. The space within the ribs and between the shield and the cross plate diffuser is preferably completely or partially filled with sound-absorbing material.

This embodiment of the silencer is of particular interest in the case where the silencer as a whole is axis-symmetrical, and especially when absorption material, consisting of circular discs of pressed mineral wool plate and having an outer diameter corresponding to the outer diameter of the diffuser is positioned around the inlet pipe extension as well as in the space between diffuser and shield. By this means a very effective reduction of the high-frequency noise in the fluid in the casing can be achieved. If the diffuser is located halfway between the end plates of the casing, and if the radial distance from the periphery of the diffuser to the wall of the casing is about 5 times the width of the diffuser slot, and if an outlet pipe of a sufficient length is used, a silencer is provided which with a minimum of flow resistance and space requirements to an essential degree reduces all audible noise in the flow of fluid.

The invention will now be more fully explained with reference to the accompanying drawings, in which

FIG. 1 is a vertical section taken on line I-I in FIG. 2 in a first embodiment in which the silencer casing consists of a cylindrical, vertical shell with domed end plates and radially directed inlet and outlet pipe branches,

FIG. 2 a horizontal section taken on line II—II in FIG. 1,

FIG. 2A a section of FIG. 2 on a larger scale,

FIG. 3 is a vertical section taken on line III—III in FIG. 1 in the cross plate diffuser of the silencer,

FIG. 4 an axial section in another embodiment of the silencer with axial fluid passage, and

FIG. 5 a cross-section taken on line V-V in FIG. 4

The silencer shown in FIGS. 1–3 comprises an expansion casing consisting of a cylindrical shell 1 and two outwardly domed end plates 2 and 2'. At different levels the shell 1 has apertures 3 and 4 for a radial inlet pipe 5 and a radial outlet pipe 6. These pipes are outside the casing shown as short pipe branches to which pipe members can be connected having dimensions suited to the conditions. The inlet pipe 5 has an extension 5' which in the embodiment shown is cylindrical as far as to the axis of the casing and after that consists of a conically diverging section 5'', the wide end edge of which is by welding connected smoothly to the inner edge of a circular hole plate 7 which is located at right angles to the axis of the inlet pipe and the inner edge portion of which forms a smooth transition rounding from the pipe section 5''. Parallel to the hole plate 7 and at a slight distance therefrom is mounted a circular full plate 8 which according to FIGS. 1–3 is connected to the hole plate 7 by means of three radial ribs 9, the height of which determines the width of the annular slot 10 between the two plates 7 and 8 and the inner end portions 11 of which are interconnected and extend a short distance into the pipe section 5'', where they terminate with concave front edges 12 and the cross-section of which is rounded towards the flow of fluid, see FIG. 2A.

The extension 5', 5'' of the inlet pipe is surrounded by porous, sound-absorbing material 13 which fills the space from the shell 1 to the hole plate 7, but has a free surface 14 transversely to the pipe extension. As shown, this sound-absorbing material may expediently consist of a stack of hole discs 15 which fit suitably tightly around the pipe extension 5', 5'', and which can be deformed, FIG. 2, so as to fill the said space completely.

In FIGS. 4 and 5 there have for corresponding or analogous components been used the same reference numerals as in FIGS. 1–3. The silencer according to FIGS. 4 and 5 comprises a casing consisting of a shell 1 and two conical end plates 2 and 2'. An inlet pipe 5 extends centrally through the end plate 2 and is provided with a cylindrical extension 5', which in the zone at the axial centre of the casing is assembled with a hole plate 7, the edge portion of which is secured axially and radially by engagement with recesses in the inner edge of four equidistant ribs 20 which are spaced slightly from the inside of the shell 1 and are parallel to the axis of the latter and are supported by the end plate 2' with the outlet pipe 6 of the silencer. A full plate 8 is secured correspondingly and in such a position that together with the hole plate 7 it forms an annular outlet slot 10.

At a comparatively short distance from the end plate 2' a shield 21 which bounds an outlet passage 22 is fitted in the space between the ribs 20. Between the shield 21 and the full plate 8 a sound-damping mateial 23 is inserted which may be of the same type as the sound-damping material 13 around the extension 5' of the inlet pipe.

For the sake of completeness should be mentioned that one and the same silencer casing may comprise two or more inlet pipes, e.g. one from each cylinder, and possible also several outlet pipes, and that several silencers may be combined in series with suitably dimensioned communication ducts which serve as inlet and outlet pipes for the different silencer casings. The communication ducts need not be rectilinear and this together with the small space required by each silence will in many cases make possible a convenient mounting of the complete silencer unit, e.g. in the undercarriage of buses or lorries.

The silencer according to the invention is also well suited in connection with suction plants, e.g. for the renewal of air in living rooms, or as a suction silencer for internal combustion engines and compressors.

I claim:

1. A silencer for gaseous fluid flows including a casing forming an expansion chamber, inlet and outlet pipes communicating with said chamber into which one end of said inlet pipe is extended, and a cross-plate diffusor comprising an apertured plate flaring from the end of said inlet pipe and forming a generally curved extension thereof, and an unapertured plate spaced axially from and extending substantially parallel to the outer portion of said apertured plate, the outer portions of said plates being spaced radially from a wall of said casing and forming together a slot through which the fluid flow from the inlet pipe enters said expansion chamber as a curtain flow laterally to the flow direction in said inlet pipe, the average radius of curvature of said extension being at least as great as the width of said slot.

2. A silencer as claimed in claim 1, wherein the radial spacing of said outer plate portions spaced radially

from the wall of said casing is at least as great as the width of said slot.

3. A silencer as claimed in claim 1, wherein said extended inlet pipe end has a gradually increasing cross-section upstream of said apertured plate.

4. A silencer as claimed in claim 1, wherein said casing comprises a regularly cylindrical peripheral wall and a pair of axis-symmetrical end walls having central apertures for the inlet and outlet pipe, respectively, said extended inlet pipe end as well as said cross-plate diffusor being located axially in said casing.

5. A silencer as claimed in claim 1, wherein said generally curved extension has a constant radius of curvature.

6. A silencer as claimed in claim 1, wherein said inlet pipe end extending into said chamber is surrounded by a sound-absorbing material having an outer peripheral surface that is spaced radially from said wall.

7. A silencer for gaseous fluid flows including a casing forming an expansion chamber, inlet and outlet pipes communicating with said chamber into which one end of said inlet pipe is extended, a cross-plate diffusor comprising an apertured plate flaring from the end of said inlet pipe and forming a generally curved extension thereof and an unapertured plate spaced axially from and extending substantially parallel to the outer portion of said apertured plate, the outer portions of said plates being spaced radially from a wall of said casing and forming together a slot through which the fluid flow from the inlet pipe enters said expansion chamber as a curtain flow laterally to the flow direction in said inlet pipe, the average radius of curvature of said extension being at least as great as the width of said slot, and means rigidly interconnecting said plates.

8. A silencer as claimed in claim 7, wherein said plates are interconnected by means of intermediate ribs extending outwardly from said inlet pipe and having rounded front edges facing the flow in said inlet pipe.

9. A silencer as claimed in claim 7, wherein said plates are interconnected by means of a plurality of ribs extending substantially parallel to said inlet pipe and secured to said casing and to said plates at the periphery thereof.

10. A silencer as claimed in claim 9, wherein said ribs at one end thereof are secured to a wall of said casing at points lying on a circle surrounding said outlet pipe, a shield carried by said ribs and forming together with said wall a fluid outlet passage leading to said outlet pipe, said shield being axially spaced from said unapertured plate, and soundabsorbing material in the space between the shield and said unapertured plate.

11. A silencer comprising a casing, an inlet pipe and an outlet pipe, means causing inlet gas to flow longitudinally within said casing in a first portion thereof, means including two parallel plates transverse to the longitudinal direction of the silencer for converting longitudinal flow to a radial planar flow including a first said plate connected to said inlet pipe, said connection being smooth and continuously curved, said second plate comprising a non-perforated barrier to gas flow and being disposed centrally within said casing with a peripheral opening therearound, the outer portions of said plates being spaced from said casing and forming together a slot through which the fluid flow from said inlet pipe enters the chamber within said casing as a curtain flow, and cylindrical passage means downstream from said second plate for converting radially moving gases to generally longitudinal movement toward said outlet pipe, said plates being mutually proximate to affect a primary portion of a conversion from gas velocity to smoothes gas pressure.

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