

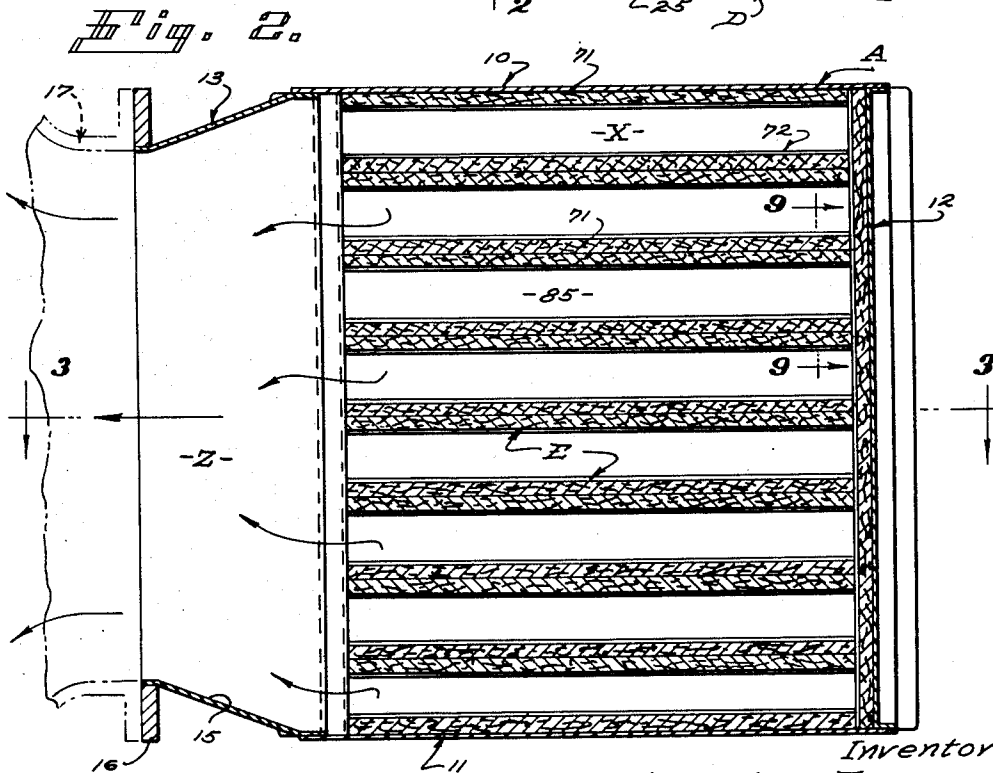
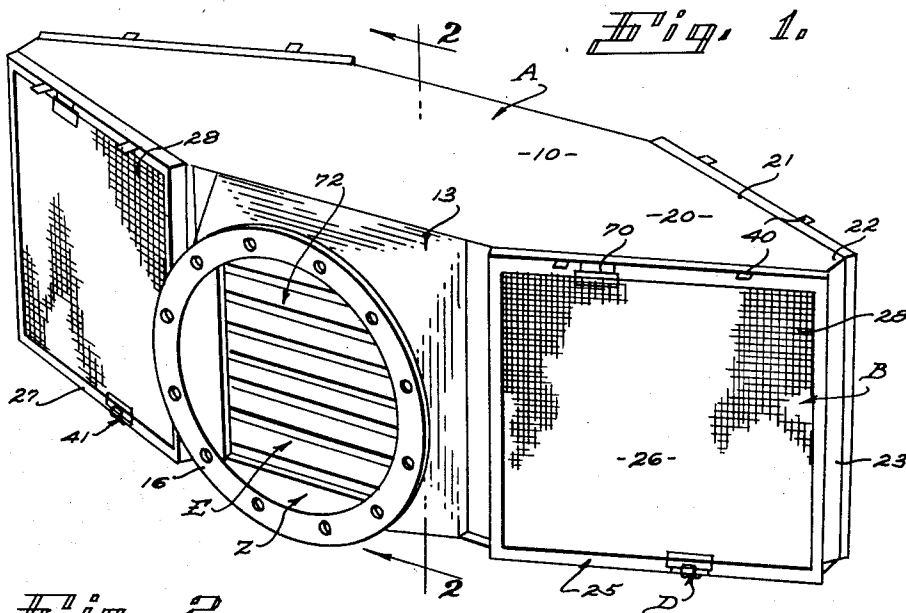
May 15, 1951

R. S. FARR ET AL
AIR HANDLING APPARATUS

2,552,847

Filed Nov. 22, 1948

3 Sheets-Sheet 1



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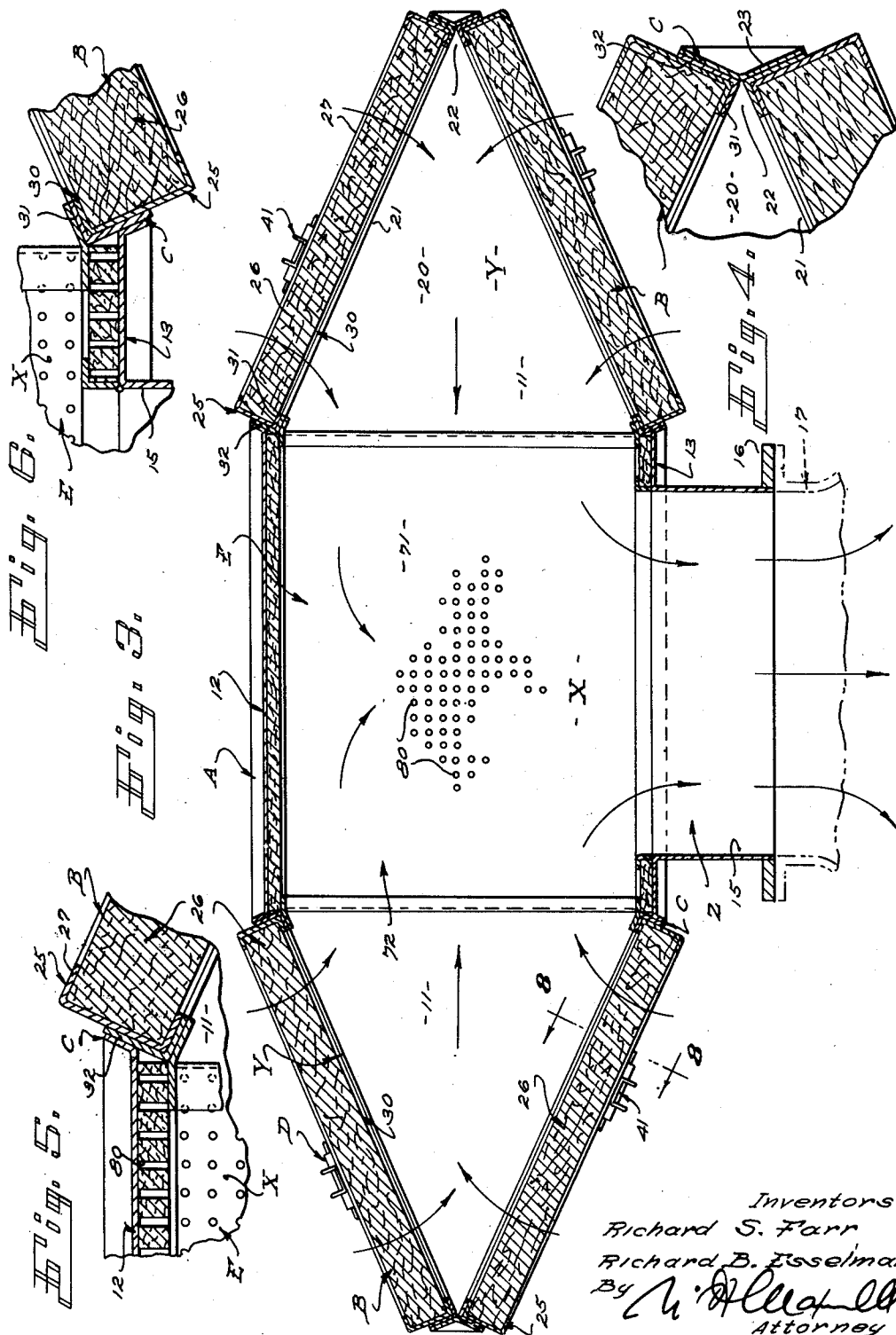
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

Fig. 7.

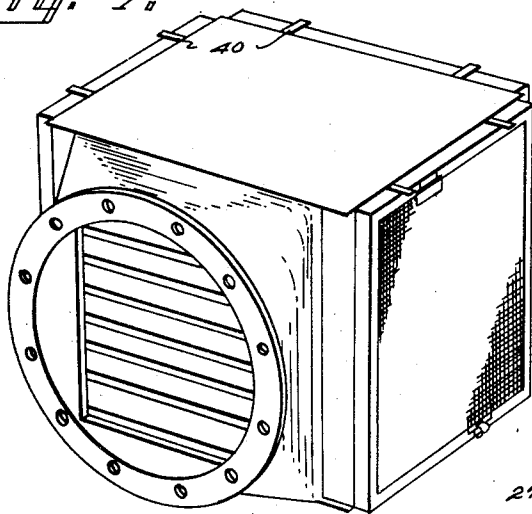


Fig. 10.

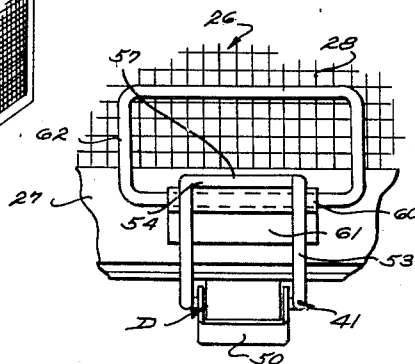


Fig. 8.

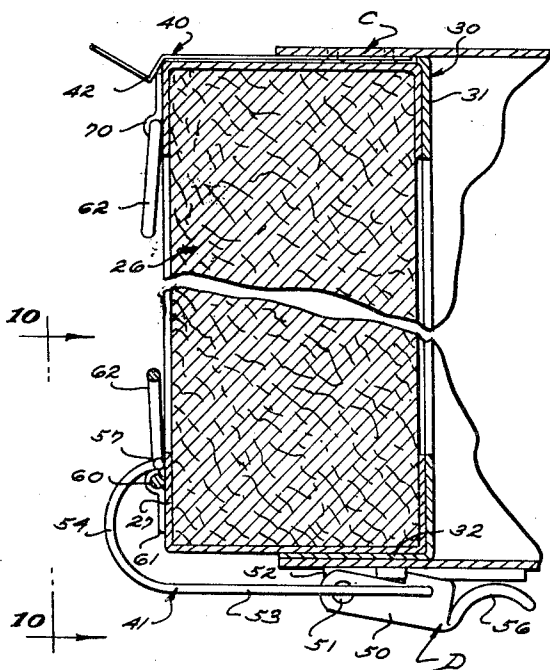
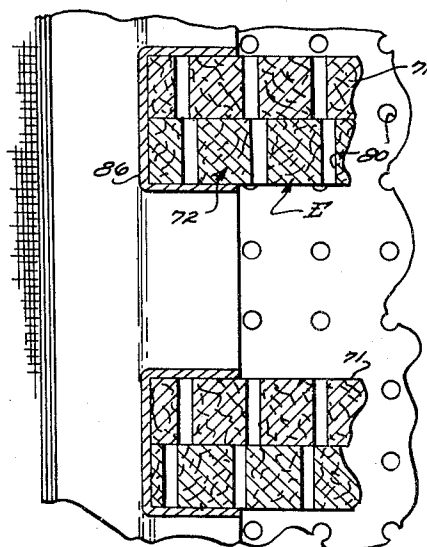


Fig. 9.



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UNITED STATES PATENT OFFICE

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AIR HANDLING APPARATUS

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3 Claims. (Cl. 183—74)

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This invention has to do with air handling apparatus and is more specifically concerned with apparatus serving to handle a flow of air in such manner as to dampen or check sound and at the same time clean the air being handled. It is a general object of this invention to provide apparatus of the general character referred to which is of simple, practical, effective construction and which operates dependably and in a highly efficient manner, both as to the dampening of sound and as to the cleaning of the air that is being handled.

There are numerous situations where air is handled and where it is desirable, if not highly important, that the air be cleaned in the course of its being handled and that it be so handled as to check or dampen the communication of sound. An example of such a situation is where air is being supplied to a machine such as an engine to be used in the machine, and where the machine is generating noise which is undesirable, or where the apparatus employed to supply the air is generating noise that is undesirable, or both. More specifically, in the case of an internal combustion engine where air is supplied by a supercharger it is important that the air be cleaned, and the usual supercharger being a turbine or rotary type mechanism, operating at high speed, has something of a siren action and consequently develops or generates a very undesirable noise.

It is a general object of this invention to provide apparatus useful, generally, in situations where air being handled is to be cleaned and sound is to be dampened. The apparatus of the present invention is in no way concerned with use in any particular situation. However, for purpose of illustration we have elected to show a form of the invention particularly suited for use in connection with an internal combustion engine or in connection with a supercharger which supplies air to an internal combustion engine, the device being of such form and construction as to effectively clean the air supplied and at the same time effectively dampen or check the communication of undesirable noise.

A general object of the invention is to provide a structure of the general character referred to which employs filter units in a simple practical efficient arrangement and at the same time incorporates sound dampening means so related to the filtering elements as to handle the flow or stream of air to effectively dampen the communication of sound while offering a minimum of resistance to the flow of the air. With the construction

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provided by the present invention there is a simple, practical, yet highly effective arrangement of sound dampening elements or plates, all of which handle the air after it has been cleaned by the filter units, and the structure is such that the cleaning of the air and the dampening of the sound are effected with a minimum of deflection of the air, that is without materially altering the direction of flow of air through the apparatus.

Another object of this invention is to provide a structure of the general character referred to wherein the various parts requiring service or periodic attention are so located as to be readily accessible, and parts requiring detachment or removal for cleaning or repair are readily separable from the other elements of the structure.

The various objects and features of our invention will be fully understood from the following detailed description of typical preferred forms and applications of the invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a perspective view of apparatus provided by the present invention showing it ready for application to the intake of other equipment such, for example, as the supercharger of an internal combustion engine, or the like. Fig. 2 is an enlarged detailed sectional view taken in the general direction indicated by line 2—2 on Fig. 1. Fig. 3 is a plan section through the structure taken in the direction indicated by line 3—3 on Fig. 2. Fig. 4 is an enlarged detailed sectional view of a portion of the structure shown in Fig. 3. Fig. 5 is an enlarged detailed view of a portion of another structure shown in Fig. 3. Fig. 6 is an enlarged detailed view of another portion of the structure shown in Fig. 3. Fig. 7 is a perspective view of another form of the invention. Fig. 8 is an enlarged detailed sectional view taken substantially as indicated by line 8—8 on Fig. 3. Fig. 9 is an enlarged detailed sectional view taken as indicated by line 9—9 on Fig. 2, and Fig. 10 is a view taken as indicated by line 10—10 on Fig. 3.

Referring first to the form of the invention shown in Figs. 1, 2, 3, 4, 5, 6, 8 and 9 of the drawings, the structure of the present invention involves, generally, a body A, one or more filter units B, means C supporting the filter units from the body A, releasable fastening means D holding the units B in position relative to the supporting means C, and sound dampening means E carried by the body A.

The body A is in the general form of a box-

like frame characterized by a plurality of walls which define a chamber X, one or more inlet openings Y, and one or more outlet openings Z. In the particular case illustrated the chamber X accommodates or carries the means E, there is a multiplicity of inlet openings Y with filter units B at the inlet openings, and there is a single outlet opening Z. In the case illustrated the body is rectangular in form or flat-sided, however, by the term "box-like" we do not mean to limit ourselves to a body of the form or shape shown, as it will be apparent that the body may take on various shapes or forms.

It is to be understood that so far as the present invention is concerned the structure embodying it may be arranged, positioned, or disposed in any suitable manner, that is, by its nature the structure does not require that it be mounted, located, or arranged with any particular part up, down, or in any other special position. For the purpose of facilitating an understanding of the invention we will refer to certain elements of the structure as being at the bottom, top, ends, etc., it being understood that such terms or definitions are used merely to facilitate an understanding of the relative locations of the various parts and that a part that may be referred to as a bottom might well be a top, or the top, if the structure is reversed as to arrangement.

The body in the form illustrated involves a top 10, a bottom 11, a back 12, and a front 13. The body is without members or elements at its ends at which points or parts it is open and wholly unrestricted.

In the preferred form of the invention the various elements of the body forming parts such as parts 10 to 13, inclusive, are formed of panels or bodies of sheet metal, or the like, and it is to be understood that the various parts may, in practice, be joined, coupled, fastened, or otherwise secured together either separately or permanently, in any suitable manner.

In the particular form of the invention illustrated the top, bottom, and back of the body are all simple, flat plates or panels, whereas the front 13 of the body, which is provided with the outlet opening Z, is extended or has a forwardly projecting portion forming an outlet duct 15, and the duct 15 is provided at its outer end with a flange 16 by which the structure may be coupled to other equipment, such as is indicated at 17.

In the form of the invention under consideration two separate filter units B are provided at each end of the body and to facilitate accommodation of such filter units the top 10 and bottom 11 of the body have end extensions 20 with edge portions 21 that converge to outer or tip ends 22. The tip end portions of the extensions of the top are joined to the tip end portions of the extensions of the bottom by uprights or spreaders 23, as clearly shown throughout the drawings. The extensions or projections 20 of the top and bottom combined with the spreaders 13 define lateral extensions of the chamber X which are outwardly convergent.

The form of the invention under consideration contemplates utilizing two filter units B at each end of the structure and in the preferred arrangement the several filter units B are alike both in form and construction. As shown in the drawings, each filter unit B is characterized by a frame 25 and a pad or filter cell 26 mounted in or carried by the frame. The particular frame 25 illustrated is rectangular in form and has inwardly projecting edge flanges 27 which confine

the cell in the frame. It is to be understood that if the cell 26 requires support or bracing in addition to that afforded by the frame, or if it is desired to confine the cell, as by means of end screens 28, or the like, such elements may be included in filter units.

In practice the specific form, construction or action of the filter units B may be varied as the service to be performed shall require. For instance, in the case of a filter to be used in connection with a supercharger for an engine or the like, the filter units B may be advantageously formed and constructed as disclosed in Patent No. 2,286,479, issued to Morrill N. Farr, or as set forth in the application of Richard S. Farr, Serial No. 669,943, filed September 27, 1946, now Patent No. 2,450,241.

The means C provided for supporting the filter units B from the frame A serve to support the filter units at the inlet openings Y established by the body construction and in the particular case illustrated where the inlet openings are at the ends of the body the means C supports the filter units at the ends of the body. In the form of the invention illustrated the means C provides a holder 30 for each filter unit B and the holders are so mounted on or carried by the body A as to occur at the converging portions or sides of the chamber extensions of the body so that the filter units at each end of the body are mounted to project, as to the body portions 20, to converge and closely approach each other or join at the point where the extensions are connected by the spreader 23.

Each holder 30 may include a rectangular seat 31 against or on which the frame of a filter unit may rest, and it may have a projecting marginal flange 32 which serves to properly locate the filter unit with reference to the seat. It will be observed from the drawings that the seats 30 and flanges 32 face outwardly for convenient reception of the filter units. It is to be understood that in practice the holders 30 may be formed or built up in any desired manner and they may be secured or anchored to various parts of the body so as to be firmly or rigidly supported thereby, or they may even be integrally joined to the body to be, in effect, parts thereof.

The releasable fastening means D provided for holding the units B in the holders 30 may, in practice, vary widely in form and construction. In fact, so far as the broader aspects of the invention are concerned, any suitable fastening means may be employed in this connection. In accordance with the preferred form of the invention the fastening means E employed to hold a filter unit B in a holder 30 involves one or more hooks 40 at one side of the holder and one or more toggle clamps 41 at the opposite side of the holder, the hooks and clamps being coordinated with the holder and filter unit so that when engaged the unit is secured in the holder.

In the particular case illustrated a plurality of hooks 40 are employed at one side of the frame and they are in the nature of fingers projecting from the flange of the holder, which fingers have inwardly turned heads 42 to engage over and retain the filter units. The fingers may be of considerable length and may be of flexible material such as spring steel, or the like, to facilitate convenient handling of the filter unit.

In the case illustrated a single clamp 41 is employed in connection with each holder and

its supported filter unit, and the clamp is so constructed and arranged as to hold the filter unit through a toggle action or over-center arrangement. In the particular case illustrated the clamp 41 involves a lever 50 carried by a pivot pin 51 supported by a bracket 52 and an arm 53 is pivotally carried by the lever and has a hook-like head 54 which engages around the edge portion of the filter unit to bear on a flange thereof. The bracket 52 projects from flange 32 of the holder at the side of the holder opposite to that where the hooks 40 are located and the lever 50 is carried by the pivot pin supported by the bracket 52 so that it can be swung inwardly in the direction indicated by the arrow in Fig. 3 to a position where it is substantially parallel with the flange which carries the bracket. The lever has an operating handle 55 and the arm 53, which may be formed of a suitably looped resilient rod, or the like, is pivotally coupled to the lever 50 remote from the pivot pin 51 and extends outward beyond the flange which supports the bracket 52.

The head portion 54 of the arm 53 is curved or deflected inwardly and the end 57 of the head is so located as to have pressure engagement with the outermost flange 27 of the filter unit when the lever 50 is in an position substantially parallel with the flange of the holder, as shown in Fig. 3 of the drawings. It is to be observed that when the parts are in this position the arm has passed the center of the pivot pin 51 so that it tends to swing the lever inwardly as indicated by the arrow, and it will be understood that by suitably shaping and proportioning the arm with its hooked part 54 and by making the arm resilient, this structure will provide a resilient clamp that holds the filter unit B on the seat of the holder in a most secure, firm and satisfactory manner.

In the preferred form of the invention a projection 60 is provided on the flange 27 of the filter unit and the hook 54 of the arm 53 is engaged behind or over the projection 60 so that the end 57 of the hook is properly positioned relative to the filter unit and the hook is held against accidental disengagement from the filter unit. The projection 54 as shown in the drawings is a looped part secured to the flange 27 by a lip 61, and a looped handle 62 is carried by the projection 61 forming a convenient grip that facilitates operation or handling of the filter unit in the course of being arranged in place or removed from the structure, or if it is handled apart from the structure. In this connection it is desirable that the unit be provided with one or more additional handles as at 70 to facilitate convenient handling of the unit.

The sound dampening means E provided by the present invention, and as shown in the drawings involves sheets or bodies 71 of sound insulating absorbing or deadening material applied to the inner sides of the panels or walls which define the chamber of the body. In using the term "sound deadening" we mean to include phenomena such as sound insulating, sound absorbing or sound dampening. In the particular case illustrated such sheets or bodies of material 71 are applied to or secured on the inner sides of the top 10, bottom 11 and back 12. In accordance with the invention the means E further includes what we will refer to as a grill of panels 72 each of which involves one or more sheets of sound deadening or dampening material, and the several panels are arranged in spaced relation parallel

with each other and in planes parallel with that in which the air flows in passing from the inlet openings Y through the body and to the outlet opening Z.

In the particular case illustrated it will be apparent that as the air enters the inlet openings Y by passing through the filter units B it flows in a horizontal direction or in a horizontal plane through the body and out through the horizontally disposed outlet duct 15. In this case the panels 72 of the grill of sound deadening elements are horizontally disposed. In the particular case illustrated each panel is formed of two sheets of deadening material and we have illustrated a deadening material which is of soft fibrous formation and which has a plurality of cavities or openings 80 such as are characteristic of materials of this kind.

In the case illustrated the several panels of the means E are spaced a substantial distance apart affording ample parallel horizontally disposed flow passages 85 handling the flow of air with a minimum of resistance. The particular panels 72 shown in the drawings are substantially rectangular in plan configuration and they are held at their edges by suitable supports or clips 86 which, in turn, are mounted on or secured to parts of the body A, as for instance the front and back of the body.

With the construction provided by the present invention the filter units B are effectively releasably held to cover or extend over the inlet openings Y as defined by the body A and as the structure operates air flows through the filter units and is cleaned, as it enters the body. Having entered the body the air flows freely through the body passing between the panels of means E to finally discharge or pass out of the body through the duct 15 at the front of the body. By arranging the sound deadening or dampening panels 72 of the means E parallel with each other and parallel with the general direction of flow of the air, they offer a minimum resistance to air flow and yet they are highly effective or efficient in dampening noise that would otherwise be passed by the structure.

In the form of the invention illustrated in Fig. 7 of the drawings the top and bottom are without the extensions 20 and in this case there is but a single filter unit B at each end of the body. In this case the holders provided for supporting the filter units and the elements of the means D which retain the filter units may correspond in form and construction with these parts as they occur in the form of the invention first described.

Having described only typical preferred forms and applications of our invention, we do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to ourselves any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described our invention, we claim:

1. A structure of the character described including, a box-like body having edge portions defining end air inlet openings and having an outlet opening, a pair of substantially flat filter units at each end of the body, and sound deadening means in the body, the filter units of each pair being joined to opposite edge portions of the body at an end of the body and projecting outwardly therefrom and toward each other to join at a point spaced from said end of the body, the body having substantially triangular exten-

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sions at each end cooperating with the filter units to establish air passages between the filter units and the ends of the body so air passed by the filter units enters the body to flow therethrough and from the outlet.

2. A structure of the character described including, a box-like body open at its ends and at its front and having top and bottom walls with end extensions having converging edge portions, a plurality of filter units, holders carried by and between the edge portions of the end extensions at each end of the body and disposed in V-shaped relation and each supporting a filter unit for removal from the exterior of the structure, means releasably retaining the filter units in engagement with the holders, and sound deadening material in the body.

3. A structure of the character described including, a box-like body open at its ends and at its front and having top and bottom walls with outward extensions having converging edges joined at the outer ends of the extensions and having spreaders joining the outer ends of the extensions, a plurality of like flat filter units, rectangular frame-like holders carried by the extensions at the sides thereof and each carrying a filter unit, means releasably retaining the filter units in the holders, a lining of sound deadening material in the body, and a plurality of spaced parallel flat panels of sound deadening material

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supported in the body parallel with flow of air through the body between the ends and front thereof.

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