July 18, 1939. R. S. ANDERSON 2,166,838

SOUND REPRODUCING SYSTEM

Filed April 13, 1938 2 Sheets-Sheet 1

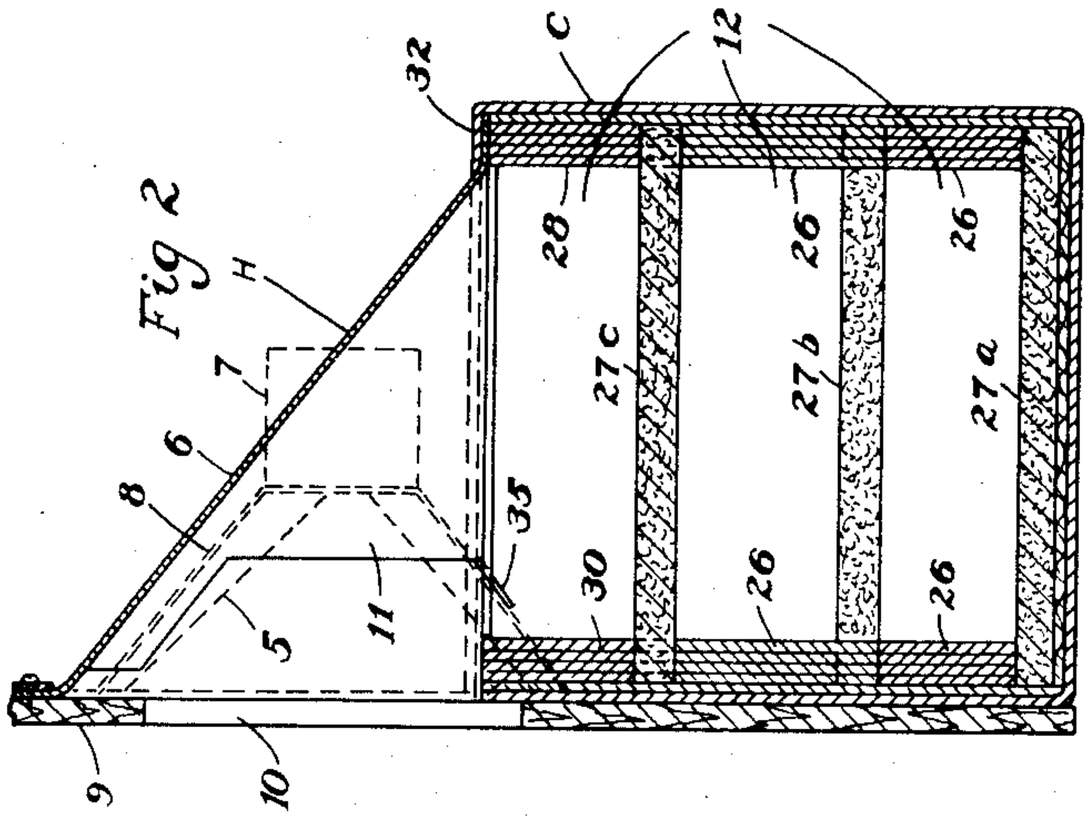

Fig 2

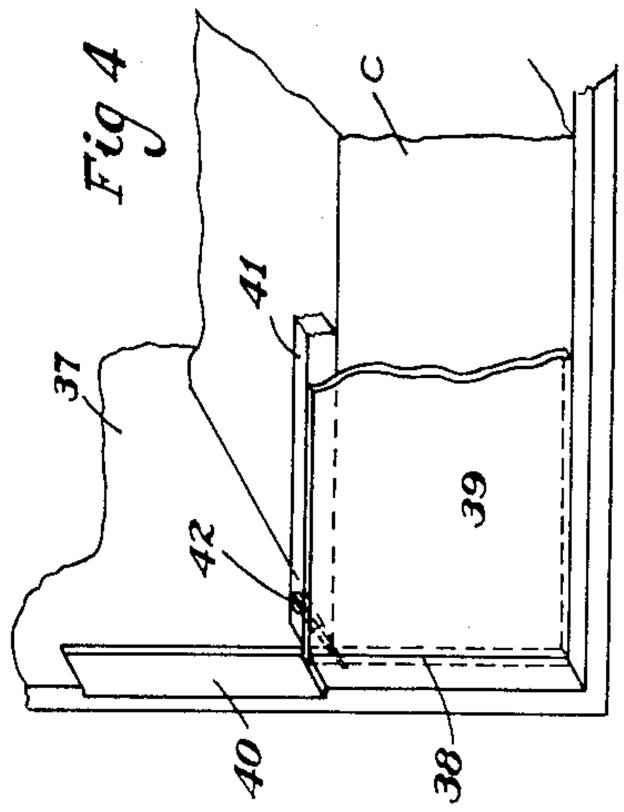

Fig 4

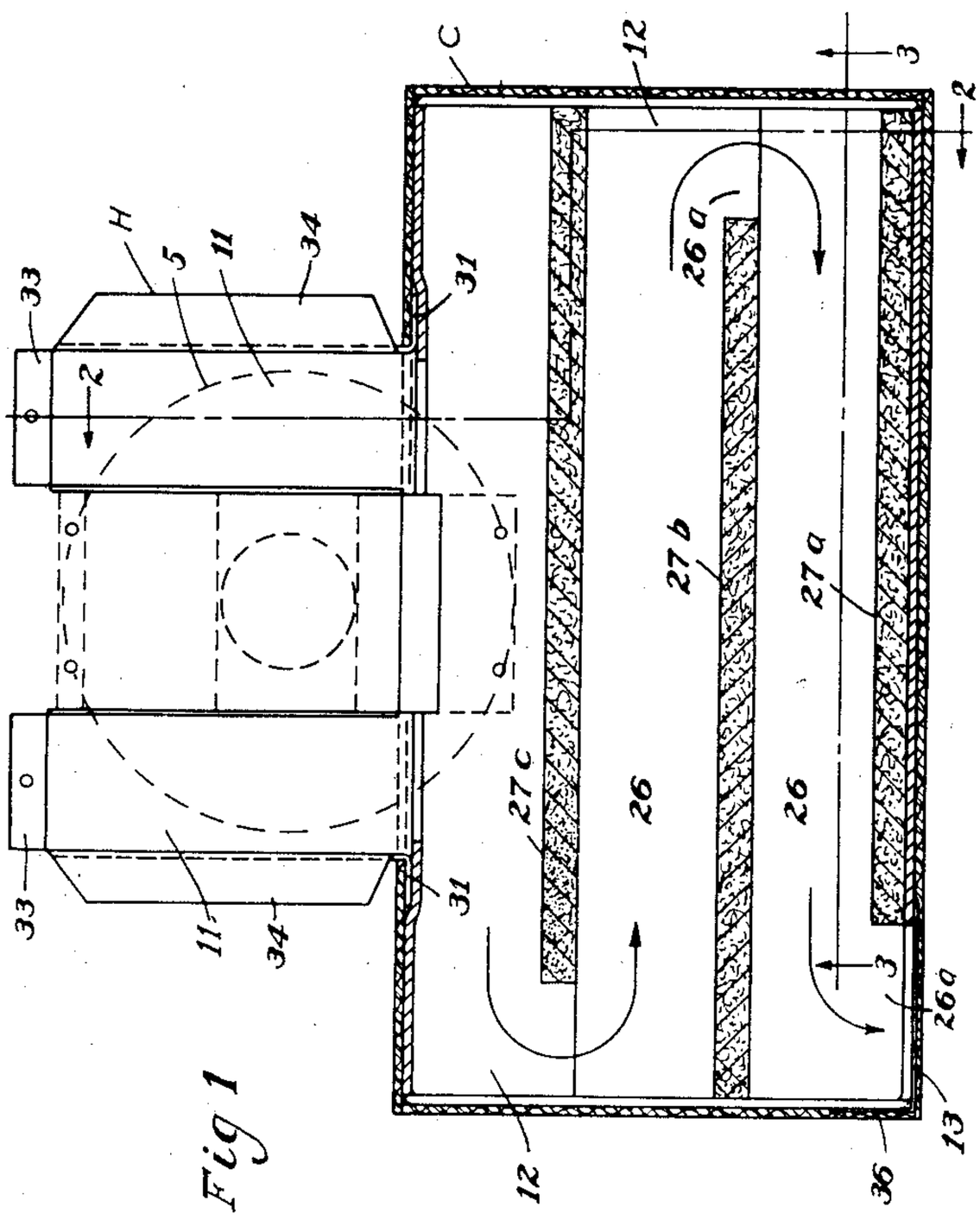

Fig 1

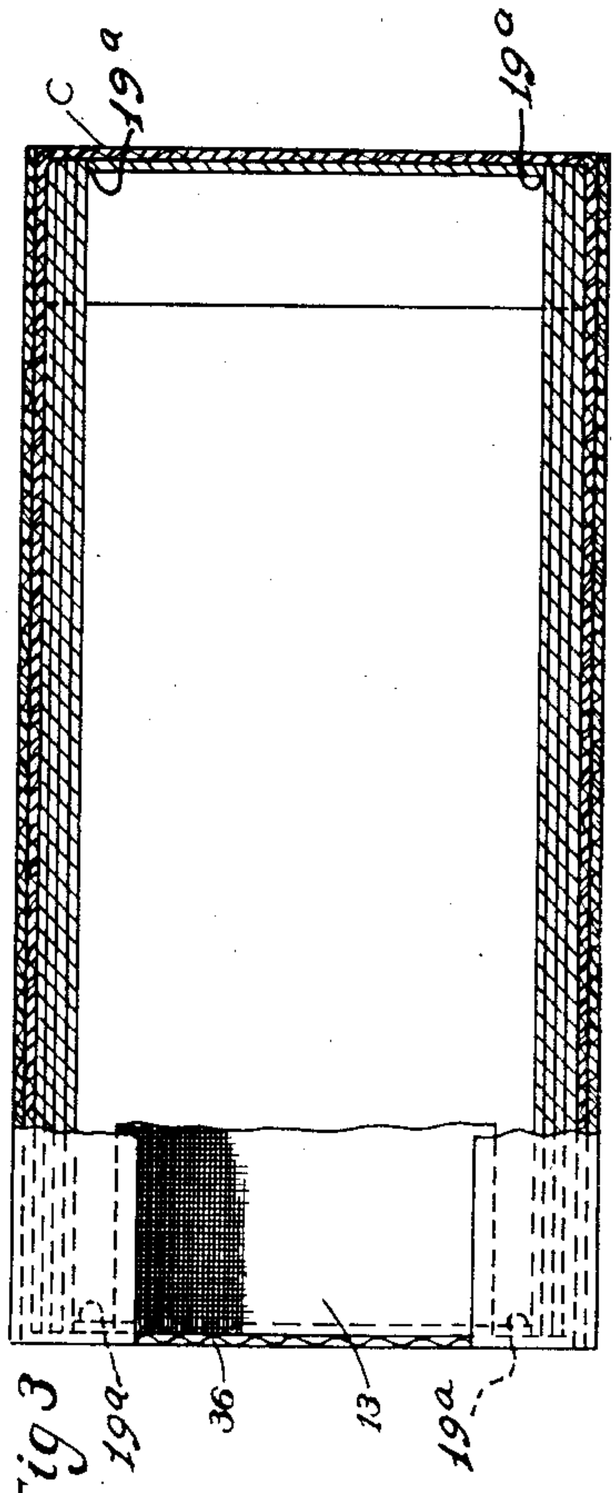

Fig 3

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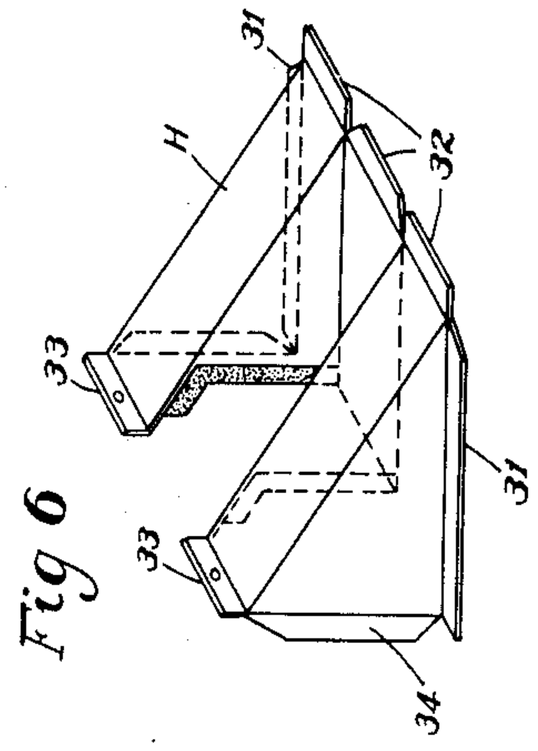

Fig 6

Fig 5

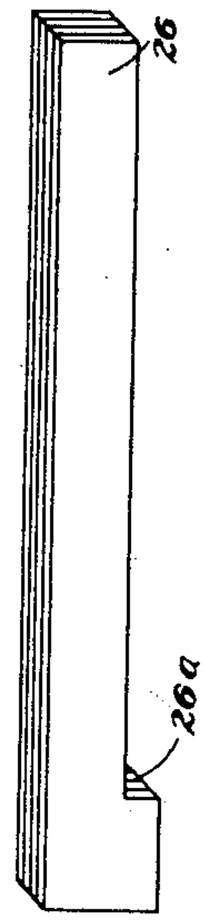

Fig 8

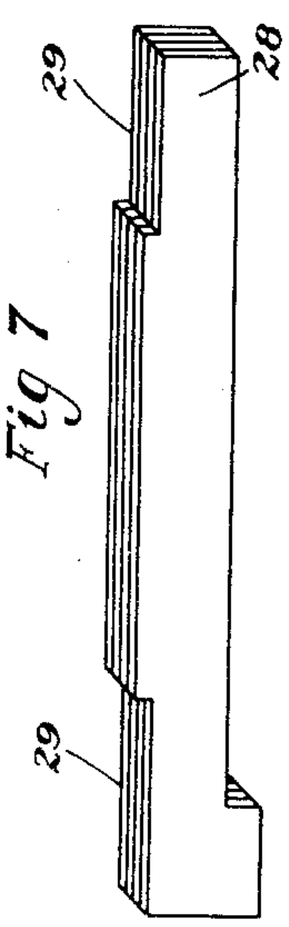

Fig 7

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UNITED STATES PATENT OFFICE

2,166,838

SOUND REPRODUCING SYSTEM

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Application April 13, 1938, Serial No. 201,798

7 Claims. (Cl. 181—31)

This invention relates to a sound absorbing system.

In the Benjamin Olney Patent No. 2,031,500 granted February 18, 1936, and in the Benjamin Olney et al. Patent No. 2,041,777 granted May 26, 1936, there are disclosed sound reproducing systems wherein the majority of the sound transmitted from the rear surface of the loud speaker diaphragm is absorbed while the remaining portion of said sound from this surface in the lower or base audio frequency range, is resonated so that the response of the system is uniform throughout a large extent of the audio frequency range.

The present invention has for its purpose a sound reproducing system of the type disclosed in the mentioned patents which is of further simplified construction and which further reduces the cost of construction thereof.

The various features and advantages of the invention will appear from the detailed description and claims when taken with the drawings, in which:

Fig. 1 is a front elevation of the sound system of the present invention with the cabinet or baffle and the front wall of the casing and adjacent spacers omitted, the loud speaker being indicated in dotted lines;

Fig. 2 is a vertical section through the system taken on the line 2—2 of Fig. 1;

Fig. 3 is a bottom view of the system partially in section, the section being taken on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary detailed rear view of the system enclosed in a cabinet showing the manner in which the sound system is retained in the cabinet;

Fig. 5 is an exploded view of the several elements comprising a casing employed in the system;

Fig. 6 is a perspective view of the loud speaker housing unit, and

Figs. 7 and 8 are perspective views of different spacing units utilized in the system.

Referring to the drawings, 5 generally designates the diaphragm or sound radiator of a cone-type loud speaker 6, the actuating element of which is enclosed within a generally rectangular shell 7 supported on the bracket 8. It will be understood that this loud speaker is supported at the rear of a baffle 9 (Fig. 2), having an opening 10 therein through which sound is transmitted from one surface of the diaphragm, all as clearly illustrated in the previously mentioned patents. The sound generated at the rear surface of the diaphragm, and which would normally develop cavity resonances within the speaker cabinet is, for the most part, absorbed in a sound damping, circuitous passageway, as disclosed in the mentioned patents.

In the present arrangement sound generated at the rear surface of the loud speaker diaphragm 5 is discharged into two passages 11 formed in an integral cone housing H to be described. These passages in the cone housing communicate with a top opening in a composite casing C, which casing is provided with a circuitous channel 12 therein having sound absorbing walls and discharging into free air through an opening 13 in the bottom of the casing.

The composite casing C comprises an inner section generally designated 14, an intermediate section generally designated 15, and an outer section designated 16. The inner section 14 includes a bottom portion 17 having a rectangular opening 18 near one end thereof, which portion is provided with upright pieces 19 having their vertical edges 19*a* offset or set back from the free edges of the portion 17 for a purpose to be hereinafter set forth. The upright pieces 19 are provided with horizontal flaps 20 substantially equal in length to the width of the portion 17. The intermediate section 15 has generally the shape of a rectangular box open at its top and bottom, except that its front wall is provided with a cut-out portion 21. The outer section 16 generally comprises a rectangular box open at its ends with its bottom portion 22 provided with a cut-out part 23, so positioned and of such size as to register with the opening 18 in the inner section. The top and front side of the outer section is provided with a cut-out portion 24 of such size and so positioned as to register generally with the open space between the flaps 20 of the inner section. This cut-out portion 24, which extends into the front of the outer section, is of a size and is so positioned as to register with the cut-out part 21 in the intermediate section 15. It will be noted that the outer section is provided with notches 25 cut in the margins of the opening 24 substantially at the fold defining the top and front of the outer section. The function of these notches will be described later. It will be understood that the sections 14, 15 and 16 are made of inexpensive material such as paste board or corrugated board which can be cut into suitable blanks and folded or formed into the structures shown in Fig. 5.

The sound damping passageway is formed by certain of the walls of the casing and by pairs of

spacers 26 which support horizontally extending sheets 27 of sound absorbing material, which sheets are very light fibrous board now sold under the name of "Cellufoam", although any light, compact, sound-absorbing material, having sufficient rigidity to be self-supporting, can be used.

In assembling the system the inner section 14 is partially inserted into the intermediate section 15 in the direction indicated by the vertical arrow in Fig. 5. A sheet 27*a* of the "Cellufoam" of a width equal to the bottom portion 17 and of such length as to extend from the edge of the cut-out 18 to the remote upright 19 of the inner section, is placed on the bottom portion 17. A pair of L-shaped spacers 26, as shown in Fig. 8, are then placed on the long margins of the sheet 27*a*, the projections 26*a* on the spacers engaging the free end of the sheet and the ends of the spacers respectively disposed between the vertical edges 19*a* of the uprights 19 of the inner section and the adjacent wall of the intermediate section 15. A second sheet of Cellufoam 27*b* of a length approximately equal to the first sheet is then placed on the top edges of the last-mentioned spacers so that the right hand end of this last-mentioned sheet is spaced from the right hand end of the casing, but the left end thereof snugly engages the left end of the casing as viewed in Fig. 1. A second pair of L-shaped spacers 26, similar to the first pair of spacers are then placed with their lower edges on the top surfaces of the long margins of the sheet and with their projections 26*a* engaging the right hand end of the sheet to retain it in the position illustrated. A third sheet of Cellufoam 27*c* of a length and width equal to the first two sheets, is then placed within the casing with the long margins thereof resting on the last-mentioned spacers. In this instance, the right hand end of the sheet 27*c* engages the right hand end of the casing while the left end of the sheet is spaced from the left end of the casing. It will thus be seen that the sheets are staggered with respect to a vertical plane in order to provide the circuitous sound damping passage 12 previously referred to. The rear margin of the top sheet 27*c* of Cellufoam is retained in position by an L-shaped spacer 28 similar to those already described except that its top edges are cut away as indicated at 29 (Fig. 7), to provide recesses for receiving the flaps 20 on the inner section. The front margin of this last-mentioned sheet is retained in position by short rectangular spacers 30 of a length slightly less than the width of the flaps 20 and of a depth approximately equal to the space between the top surface of this sheet and the flaps 20. The short spacer 30 at the left end of the casing, as viewed in Fig. 1, may be L-shaped, to provide a projection for engaging the free end of the top sheet 27*c*. After the parts have been assembled in the manner just described, the inner section 14 is forced completely into the intermediate section 15, after which these two sections in telescoped relation, are inserted into the outer section 16 through the open end thereof as indicated by the horizontal arrow in Fig. 1. The several spacers 26, 28 and 30 may conveniently be made of corrugated paper board, however, if it is desired to increase the sound absorbing area of the circuitous channel 12, these spacers may like sheets 27 be made of sound absorbing material.

The cone housing H previously referred to is preferably made from a blank of pasteboard or corrugated board material provided with flaps and folded into shape generally indicated in Fig. 6. In assembling the cone housing into the previously assembled casing the side flaps 31 on this housing are inserted through the notches 25 in the outer section 16 for retention between the top of the outer section and the flaps 20 of the inner section 14 which, it will be understood, are held against the inner surface of the top of the outer section by means of the several spacers. The rear flaps 32 are held between the spacer 28 and the top of the outer section 16. The top flaps 33 of the housing provide means for attaching the housing to the baffle 9 (Fig. 2) while the flaps 34 may be fastened to or snugly engage the baffle so that there will be no sound leakage at the junction between the cone housing and the baffle. The flap 35 which is located on the portion of the housing between the two passageways 11 formed therein, snugly rests against the lower arm of the bracket of the loudspeaker so that there will be no sound leakage at this point.

The bottom opening 13 in the casing is preferably covered with a wire screen 36 which does not impede the passage of sound therethru but which prevents the entrance of vermin into the casing. This screen may be attached by means of gummed tape for example to the outer surface of the inner section 14, to cover the opening 18 therein. As shown in Figs. 1 and 3, the screen will be held between the bottom portion of the inner section and the bottom wall of the outer section and also between the left hand upright 19 of the inner section and the adjacent end wall of the intermediate section 15.

In Fig. 4 there is shown a preferred and simple manner of supporting the casing C within a cabinet. The inner surface of each side wall of the cabinet 37 is provided with a vertically extending slot 38 spaced from the front wall or baffle 9 of the cabinet a distance equal to the width of the casing C. These slots receive the ends of a sliding panel 39. The panel is inserted in the slots by moving the same into the cabinet while the ends are disposed in the recesses 40 until alined with the slots 38 at which time the panel can be lowered into the position shown in Fig. 4. A clamping strip 41 secured to the upper margin of the panel 39 firmly engages the top of the casing C and is held in position by means of screws 42 carried by the strip and anchored in the side walls of the cabinet.

What I claim is:

1. A sound damping structure for use in a sound reproducing system comprising a casing having an inlet opening and an outlet opening therein, said casing including an inner section and an outer section each comprising sheet material and with a portion of one section in superimposed relation to a portion of the other section adjacent said inlet opening, partitions of sound damping material arranged in staggered relation in said casing defining a circuitous channel from said inlet opening to said outlet opening, and a loudspeaker housing formed from a sheet of material and having at least one passage therein, said housing having flaps integral therewith retained between said portions to bring said passage and said channel in communicating relation.

2. A sound damping structure for use in a sound reproducing system comprising a casing having an inlet opening and an outlet opening therein, said casing including an inner section and an outer section each comprising sheet material and with a portion of one section in superimposed relation to a portion of the other section adjacent said inlet opening, partitions of

sound damping material arranged in staggered relation in said casing defining a circuitous channel from said inlet opening to said outlet opening, a loudspeaker housing formed from a single sheet of material to provide twin passages therein, said housing having flaps integral therewith retained between said portions to bring said passages and said channel in communicating relation.

3. A sound damping structure for use in a sound reproducing system comprising an elongated casing having an inlet opening and an outlet opening therein, a series of sound damping sheets of a width approximately equal to the inside width of said casing and of a length substantially less than the length of said casing, said sheets being arranged in spaced overlying relation in said casing with their side edges adjacent the side surfaces of said casing and with an end edge of each sheet in contact with an end surface of said casing, adjacent sheets having said end edges respectively in contact with opposite end surfaces of said casing to provide a circuitous channel from said inlet to said outlet, and a pair of spacers extending lengthwise of the casing between certain of said sheets and having their edges engaging the long margins thereof, each of said spacers having an integral projection thereon engaging the free end of one of said sheets and the adjacent inner end of said casing.

4. A sound damping structure for use in a sound reproducing system comprising an elongated casing having an inlet opening and an outlet opening therein, said casing including an inner section and an outer section in telescoping relation, a series of sound damping sheets of a width approximately equal to the inside width of said casing and of a length substantially less than the length of said casing, said sheets being arranged in spaced overlying relation in said casing with their side edges adjacent the side surfaces of said casing and with an end edge of each sheet in contact with an end surface of said casing, adjacent sheets having said end edges respectively in contact with opposite end surfaces of said casing to provide a circuitous channel from said inlet to said outlet, and a pair of spacers extending lengthwise of the casing between certain of said sheets and having their edges engaging the long margins of said sheets, at least one spacer of a pair having an integral projection thereon engaging the free end of one of said sheets and the adjacent end of said last-mentioned spacer engaging the adjacent inner end surface of said casing.

5. A sound damping structure for use in a sound reproducing system comprising an elongated casing having an inlet opening and an outlet opening therein, said casing including an inner section and an outer section in telescoping relation, a series of sound damping sheets of a width approximately equal to the inside width of said casing and of a length substantially less than the length of said casing, said sheets being arranged in spaced relation in said casing and with an end edge of each sheet in contact with an end surface of said casing, adjacent sheets having said end edges respectively in contact with opposite end surfaces of said casing to provide a circuitous channel from said inlet to said outlet, and a pair of spacers extending lengthwise of the casing between certain of said sheets and having their edges engaging the long margins of said sheets, the inner section of said casing having cut-out portions in the ends thereof to receive the ends of said spacers and to hold said spacers against movement in one direction.

6. A casing for use in a sound damping system comprising an inner section, an intermediate section and an outer section, said inner section including a bottom portion with an opening therein, uprights integral with said portion having their vertical edges offset inwardly from the free edges of said portion and a flap on each upright disposed in approximate parallel relation with said bottom portion to provide a partial closure for the top of said inner section, said intermediate section being in the form of a rectangular box open at its top and bottom, said inner section being snugly telescoped in said intermediate section, said outer section being in the form of a rectangular box open at its opposite ends, said intermediate section being snugly telescoped in said outer section, said outer section having an opening in its bottom part in registry with the opening in the bottom portion of said inner section to constitute an outlet for said casing, said outer section also having an opening in its top in registry with a portion of the space between said flaps to constitute an inlet opening, pairs of spacers having their respective ends positioned in the recesses formed by the offset edges of said uprights, sound damping sheets arranged in staggered relation in said casing and having their long margins engaging the long edges of said spacers to provide a circuitous channel from said inlet to said outlet opening, and a loudspeaker housing communicating with said inlet opening.

7. A sound damping structure for use in a sound reproducing system, comprising an elongated casing having an inlet opening in the top wall and an outlet opening in the bottom wall thereof, a sound damping sheet of a width approximately equal to the inside width of said casing and of a length substantially less than the length of said casing, said sheet being arranged in spaced overlying relation to the bottom wall of said casing with the side edges thereof adjacent the side walls of said casing and with an end edge thereof in contact with an end wall of said casing to provide a circuitous channel from said inlet to said outlet, said casing having recesses in the end walls thereof and a pair of spacers extending lengthwise of the casing below said sheet and having their edges engaging the long margins thereof, the ends of said spacers seating in said recesses.

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