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HORN FRAME MOUNTING MEANS

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2 Sheets-Sheet 1

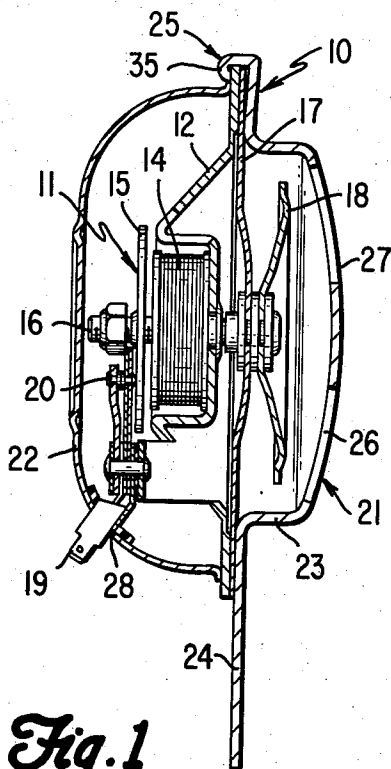


Fig. 1

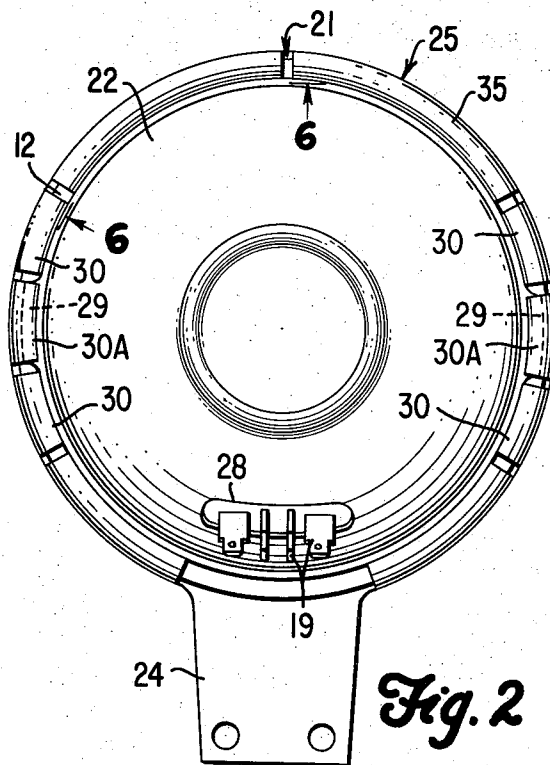


Fig. 2

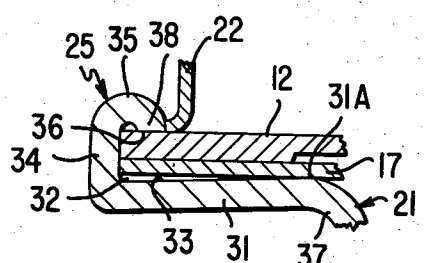


Fig. 4

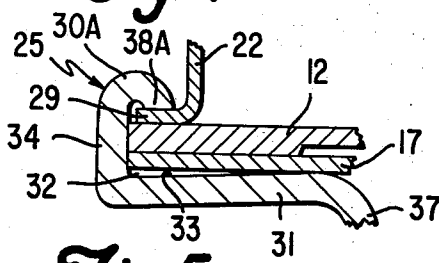


Fig. 5

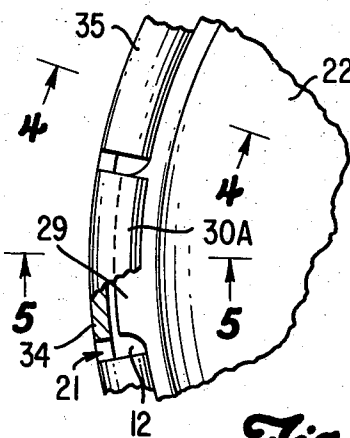


Fig. 3

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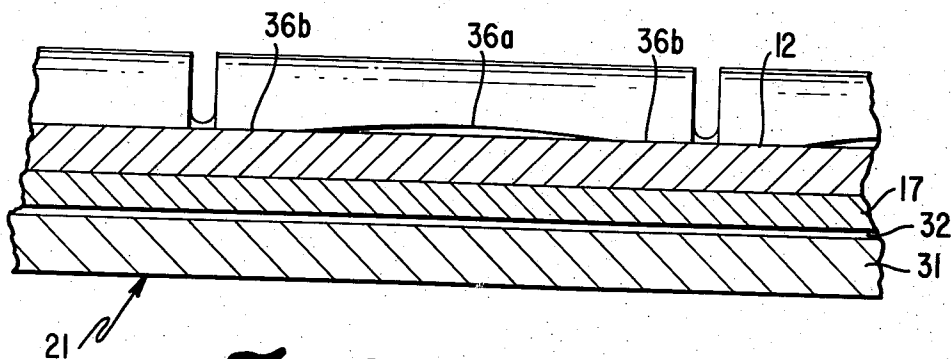
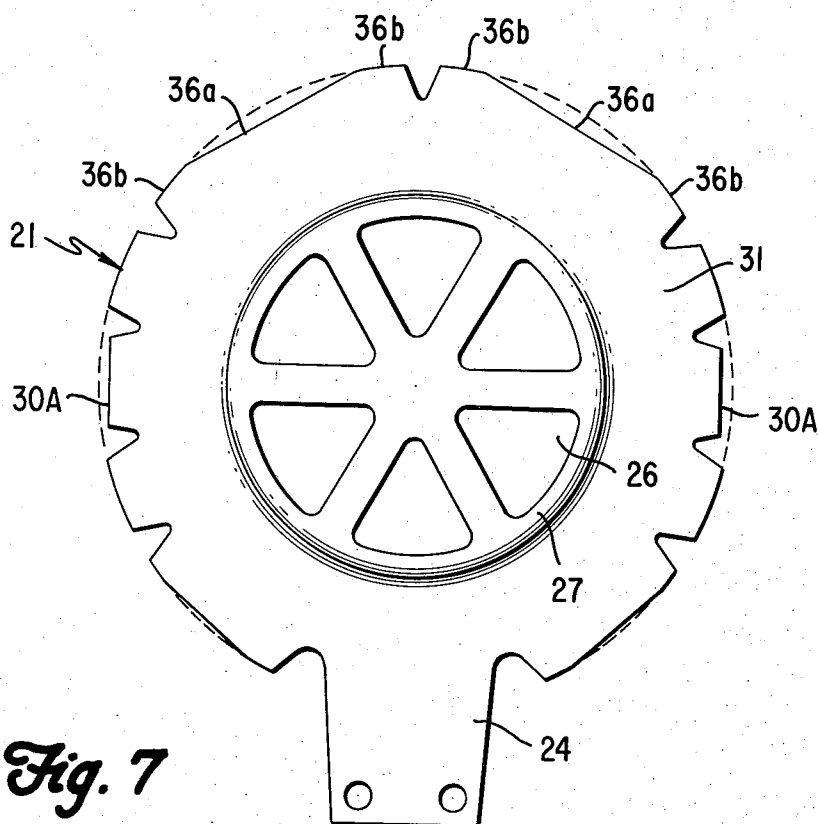
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HORN FRAME MOUNTING MEANS

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2 Sheets-Sheet 2



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3,041,601

HORN FRAME MOUNTING MEANS

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This invention relates to horns and more particularly to automobile horns, and means for mounting such horns.

The horn to which the invention has been applied is of the electrical vibratory type having a perforated housing for issuing the sounds produced. The horn is substantially flat in appearance, the sound issuing through a perforated sheet metal stamping forming the front member for the horn. The sheet metal stamping performs several functions being a combination horn mounting bracket, an ornamental front cover member, and means for holding the assembled horn together. This stamped member comprises the front or forward part of the housing in which the vibratory or sound-producing mechanism is located. A back cover or dome is also provided to form the remaining part of the housing. The back cover is detachable and is perforated to allow the terminal connections of the electrical system to project outwardly.

A principal object of the invention is to simplify the basic horn construction to reduce the manufacturing costs of various horn parts and also to reduce the labor costs of the final assembly of the various horn components.

Another object of the invention is to provide a horn construction having a dished-shaped front grille member, through which the sound issues, which is made of a perforated sheet metal stamping, provided with an integral lateral projection utilized for mounting the horn on a vehicle.

Another object of the invention is to provide a horn construction having a dished-shaped front grille member, through which the sound issues, which is made of a sheet metal stamping provided with an integral peripheral portion, having a reentrant portion to cooperate with the other horn components to hold them together in an assembled unit.

Another object of the invention is to provide a method of assembling the housing components of a horn without the use of bolts, screws, etc., using integral elements on the parts which are maintained in tension, the parts being arranged to allow the removal of the back cover, or dome member for servicing or repair purposes.

Other objects and advantages of this invention relating to the arrangement, operation and function of the related elements of the structure, to various details of construction, to combinations of parts and to economies of manufacture will be apparent to those skilled in the art upon consideration of the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Referring to the drawings:

FIG. 1 is a sectional elevation of an electromagnetic vibratory horn embodying the invention;

FIG. 2 is an elevational view looking at the back of the horn showing important features of the invention;

FIG. 3 is an enlarged, fragmentary elevation of the

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perimetrical edge of the horn showing the assembly details;

FIG. 4 is an enlarged view taken on line 4—4 of FIG. 3;

FIG. 5 is an enlarged view taken on line 5—5 of FIG. 3;

FIG. 6 is an enlarged sectional view taken along line 6—6 of FIG. 2; and

FIG. 7 is a plan view of the horn mounting member at one step of its fabrication.

Referring to the drawings, particularly to FIG. 1, an electromagnetic vibratory type of horn is shown wherein the sound is produced by vibratory movement of a flexible diaphragm. The horn 10 comprises an electromagnetic vibratory motor 11 mounted in an integral frame 12, the details of which are shown in application, Serial No. 780,335 assigned to the same assignee. The vibratory motor 11 is provided with an electromagnetic actuating coil 14, an armature 15 mounted to a stud 16, on the other end of which a vibratory diaphragm 17 and a ringer plate 18 are attached, as shown, all cooperating with the frame 12 to form a sub-assembly. Electric power is provided through the terminal connections 19, which are in electrical circuit with the circuit breaker element 20 and the coil 14, so that the motor is energized to generate a vibration of the motor elements. The armature 15 is thereby moved toward the frame 12 which it strikes at its maximum deflection which sets diaphragm 17 into vibration together with attached ringer plate 18, thereby creating sound. The basic concept of this type of horn is well known in the art and forms no part of this invention. The invention is concerned with a more economical and better method of producing a horn of this type, and more particularly to a simplified housing construction lending itself to mass production at greatly reduced costs.

The housing construction, as shown in FIG. 1, consists of a perforated front member 21 and a removable back dome or cover member 22. An important feature of this invention is that the front member 21 is constructed in a manner that it serves as the cover, a horn mounting bracket, a holding means for assembly, and a grille, through which the sound issues. The grille is preferably of an ornamental design (FIG. 7), providing a pleasing appearance to the horn.

Referring again to the front member 21, it is fabricated as a sheet metal stamping having a dished area 27 integral with an annular cylindrical wall 23 and an integral lateral projection 24 extending beyond the main body of the horn, the projection constituting a horn mounting bracket necessary for mounting the horn on a vehicle. FIG. 1 also shows a section of an integral holding means 25 located on the perimeter of member 21 to be explained more in detail hereinafter. The grille, through which the sound issues, is provided by perforations 26 in the dished portion 27 of the member 21. The features, described with relation to member 21, may all be fabricated from a single sheet metal stamping, which makes the invention desirable from a manufacturing standpoint.

Returning to the dome or back cover member 22, as shown in FIGS. 1 and 2, it also is fabricated as a sheet metal stamping and is provided with an aperture 28, through which the terminal elements 19 project. The member 22 is also provided with a pair of diametrically-disposed peripheral projections 29 which cooperate with

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peripherally-spaced sections 30A of the holding means 25 to hold the member 22 on the main horn assembly to provide a removable portion of the horn housing. This construction is best seen in FIG. 2 where the two projections 29 on the member 22 cooperate with the peripherally spaced holding sections 30 which are integral with the member 21. In the drawing as shown, two different positions for the terminals 19 are possible, with relation to the mounting bracket 24, by rotating member 22 one hundred and eighty degrees. The invention is not to be limited to a specific number of terminal positions as any position could be had by relocating the terminal opening 28 in member 22 relative to the assembled position of the frame 12 and the terminals 19 in the member 21.

In FIGS. 3, 4, and 5 are shown the details of a novel holding means for the horn assembly formed integrally with the front cover 21 to affix the parts of the horn assembly together as a unit. Referring particularly to FIG. 4, the assembly unit is shown in section consisting of the front cover member 21, the motor supporting frame 12, and the diaphragm 17; also shown is a portion of the back cover member 22 which is illustrated in operative position. It is not a part of the permanently affixed unit but is a removable cover unit for the electromagnetic motor 11. Its relative position in the complete horn assembly is shown with relation to the holding means 25.

As can be seen in the drawing, the front cover member 21 is provided with a flat peripheral base portion 31 formed integral with the grille part of the member 21 and the cylindrical portion 23. The peripheral base portion also forms a part of the mounting means 24 which projects laterally beyond the housing of the horn, as is best seen in FIG. 1, having already been described. The peripheral base portion is provided with the slight dished structure by being bent rearwardly through a slight reverse angle, as is also best seen in the upper portion of FIG. 1, so that when it cooperates with the diaphragm 17, as seen in FIGS. 4 and 5, a slight clearance is provided between the cooperating members with a bearing surface 31A being provided between them which is positioned inwardly of the peripheral edge of the diaphragm as shown. The base portion 31, except in the area where the mounting bracket 24 extends outwardly, is provided with an annular upwardly-extending flange 34 which extends transversely of the perimeter of the diaphragm and the base member or frame and terminates in an inwardly rolled portion 35 to provide an arcuate surface 36 to apply a compression to the rearward face of the base member 12. The annular flange 34 forming a cup-shaped element is bent upwardly through an angle greater than 90° and is slotted to break the flange into a series of segments, some of which are adapted to cooperate with the tongues 29 on the back cover member 22, as shown in FIG. 5, to hold the cover member removably in position on the horn unit.

In order to concentrate the pressure applied by the pressure surface 36 on the main frame member 12, the inturned portion of the segment 35 is given an arcuate lower face 36a (FIG. 6), so that the pressure is concentrated at selected points 36b on the frame member 12 much in the same manner as a rivet which has been used for the purpose of assembling horns in the past. This applies the pressure to the diaphragm 17 at spaced points about its periphery with the inturned portion 35 of the segment being proportioned in such a manner that the annular portion 31 of the member 21 is placed under tension by the action between the bearing surface 31a and the bearing surfaces 36b which are active on opposite sides of the assembly consisting of the diaphragm 17 and the main frame member 12 as is best seen in FIG. 4. The perimetrical portion 31 of the member 21 between the bearing surface 31a and the outer flange 34 is resiliently bent by the forces which are created during the curling in of the flange portion 35

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through an angle of approximately 180° to form the downwardly extending portion 38 which terminates in the bearing surface 36. This pressure creates a bending which tends to bring the members into touching relation by reducing the size of the gap 32 between the peripheral flange portion 31 and the bottom face of the diaphragm 17.

The construction disclosed allows the complete assembly of the horn elements without the use of rivets, screws or bolts as has been the practice in the past, yet the pressure points on the vibratory diaphragm 17 remain substantially the same. The spring back of the holding elements which always occurs when an element is being deformed, as, for example, by bending, is obviated by this construction due to the fact that the peripheral portion 31 of the member 21 is given a deflection in a direction to compensate for this spring back which, in part, occurs when the depending portion 38 of the curled over portion 35 is being bent into final holding position. The curled portion extends through an angle of approximately 180°. This allows the construction of a horn in which the elements are held together solely by means of integral portions which are bent to form the holding means. Several parts in the construction of a horn are, therefore, eliminated.

In the fabrication of the horn disclosed, the parts are made from sheet metal stampings with the flange 34 on the member 21 being positioned in an upwardly-extending, substantially cylindrical form, being turned or curled in after the remaining horn parts are placed in assembled relation with the front member 21. The base plate 12 has assembled to it the electromagnetic motor 11, the diaphragm 17, and the wringer plate 18 substantially as shown in FIG. 1 to form a sub-assembly. The face plate 21 with the flange 34 still in uncurled condition, is then fitted to the sub-assembly of the base plate 12 and the diaphragm which fit snugly therein, as shown in FIG. 4. The assembly is then placed in a press which has die members which curl the upper edge of the flange 34 inwardly and then downwardly until the pressure surfaces 36b on the curled in portion contacts the upper surface of the main frame member 12 substantially as shown in FIG. 4. During this period, the pressure surfaces 36b contact the upper face of the main frame member 12 only during the last phase of its forming operation, the curling pressure being continuously applied until the gap 32 between the plate-like flange 31 and the lower side of the diaphragm 17 is substantially closed. This distorts the form of the cup-shaped member 21 by resiliently bending the dished flange portion 31 about a fulcrum formed in the annular region indicated at 31A (FIGS. 4 and 5). During this period, the depending portion 38 of the curled in flange portion 35 of the cylindrical flange 34 is substantially in its final operative position. The fact that the bearing surface 36b of the depending portion 38 makes contact with the upper surface of the main frame member 12 only during the last phase of its forming operation, and due to the fact that the flange member 31 is resiliently deformed in a direction to compensate for any spring back which occurs in the deformation of the flange, the horn elements consisting of the frame member 12, the diaphragm 17, and the face plate 21 are a tightly assembled unit, which can be made substantially uniform through a whole series of forming operations as performed on a mass production line.

The segments diametrically opposite each other, as indicated by 30A, are bent at the same time but are provided with a cut-away portion (FIG. 7) in their original stamping fabrication to provide a small air gap between the depending portion 38A and the upper face of the main frame member 12, as is shown in FIG. 5. This gives space for the engagement of the tongue 29 of the back cover member 22. Preferably the tongues 29 are provided along an axis of the cover member which is normal to the axis of the opening 28 in the cover member through which the terminals 19 project. The cover

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member is positioned on the horn assembly by pressing the sides adjacent the tongues 29 inwardly until they are displaced a sufficient distance to allow the insertion of the tongues 29 under the segments 30A. The deforming pressure is preferably applied manually and, when released, it allows the normal spring back of the cover to hold the tongues under the segments 30A which positions the cover 22 firmly on the horn assembly. In the event it is desirable to make adjustments to the electromagnetic motor 11, the cover 22 is removed by again pressing on the sides of the cover adjacent the tongues 29 to release their engagement with the segments 30A. In this manner, a removable cover is provided for the horn which allows adjustment of the electromagnetic motor while the horn is in service.

It is to be understood that the above detailed description of the present invention is intended to disclose an embodiment thereof to those skilled in the art, but that the invention is not to be construed as limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings since the invention is capable of being practiced and carried out in various ways without departing from the spirit of the invention. The language used in the specification relating to the operation and function of the elements of the invention is employed for purposes of description and not of limitation, and it is not intended to limit the scope of the following claims beyond the requirements of the prior art.

What is claimed:

1. In an electromagnetic vibratory horn, the combination of a basic sub-assembly consisting of a vibratory diaphragm, an electromagnetic driving motor and a base plate for mounting the assembly, a cup-shaped holding means encircling the perimeter of the diaphragm and the base plate, provided with a dished resilient element on the bottom side of the cup-shaped holding means to engage the diaphragm in an annular zone displaced inwardly from its perimeter and a pressure element extending to the other side to contact the base plate adjacent its perimeter to press the base plate and the diaphragm together at their peripheries by constraining the dished resilient element.

2. In an electromagnetic vibratory horn, the combination of a basic sub-assembly consisting of a vibratory diaphragm, an electromagnetic driving motor and a base plate for mounting the assembly, a cup-shaped holding means encircling the diaphragm and the base plate having a lateral projection for mounting the horn on a supporting member, said holding means being provided with a dished resilient element on one side to engage the diaphragm in an annular zone displaced from its perimeter and a reversely bent pressure element extending to the other side to press the base plate and the diaphragm together at their peripheries by constraining the dished resilient element.

3. In an electromagnetic vibratory horn, the combination of a basic sub-assembly consisting of a vibratory diaphragm, an electromagnetic driving motor and a base plate for mounting the assembly, holding means having a cylindrical peripheral flange encircling the diaphragm and the base plate, said holding means being provided with a dished resilient element on one side radially-inwardly of the peripheral flange to engage the diaphragm in an annular zone displaced inwardly of its periphery, and the cylindrical flange having a reversely bent pressure element extending to the other side to press the base plate and the diaphragm together at their peripheries by constraining the dished resilient element.

4. In an electromagnetic vibratory horn, a sub-assembly consisting of a vibratory diaphragm, an electromagnetic motor to vibrate the diaphragm and a base plate to mount the sub-assembly, in combination with a cup-shaped holding member on the forward side of the dia-

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phragm having a dished resilient element bearing against the diaphragm in an annular zone displaced from its periphery, and a pressure element extending in a direction rearward to the other side of the diaphragm to hold the base plate and the diaphragm resiliently together at their peripheries by a constraining of the dished resilient element on the forward side.

5. In an electromagnetic vibratory horn, a sub-assembly consisting of a vibratory diaphragm, an electromagnetic motor to vibrate the diaphragm and a base plate to mount said motor, in combination with a holding member on the forward side of the diaphragm having a dished resilient flange element bearing against the diaphragm radially-inwardly of the periphery thereof, a lateral projection on the member to provide a means for mounting the horn on a supporting means, a cylindrical flange encircling the perimeter of the diaphragm and base plate including a reversely bent pressure element to hold the base plate and the diaphragm resiliently together at their peripheries by a constraining of the dished resilient flange element on the forward side, and a sound-emitting portion cooperating with the holding member.

6. In an electromagnetic vibratory horn, a sub-assembly consisting of a vibratory diaphragm, an electromagnetic motor to vibrate the diaphragm and a base plate to mount the sub-assembly, in combination with a housing member on the forward side of the diaphragm provided with a lateral projection to serve as a mounting means, a resilient integral flange element on the periphery of the housing member bearing against the diaphragm in an annular zone displaced radially inwardly of the periphery of the diaphragm, a cylindrical element integral with the flange element encircling the diaphragm and the base plate, and a reversely-bent pressure element integral with the cylindrical element extending rearward to contact the side of the base plate adjacent its periphery to hold the base plate and the diaphragm resiliently together by a constraining of the resilient flange element on the forward side.

7. A means for resiliently holding together a pair or more of conterminous members comprising a wall element positioned transversely of the members, having on one side an integral pressure portion curled through an angle of approximately 180° to extend in a direction opposite to contact one side of the members, and a resilient dished portion on the other side bent through an angle greater than 90° in the same direction as the pressure portion to provide a clearance and contacting the opposite side of the members radially inside of their perimeters, said resilient dished portion being constrained by the action of the pressure portion to hold the members resiliently together.

8. A means for resiliently holding together a pair or more of conterminous members comprising a cylindrical wall element encircling the members at least in part, having on one side an integral pressure portion reversely curled through an angle of approximately 180° to extend in a direction parallel to the wall element to contact by its edge the outer side of one of the members at spaced points and a dished resilient portion on the other side bent through an angle greater than 90° with reference to the wall element to provide a clearance and contacting the outer opposite side of one of the members radially inside of its perimeter, said resilient dished portion being constrained by the action of the pressure portion to hold the members resiliently together.

9. A housing means for resiliently holding together a pair or more of conterminous members comprising a cylindrical wall element encircling at least in part the perimeters of the members, having on one side an integral pressure portion reversely curled through an angle of approximately 180° to extend in a direction parallel to the wall element to contact the outer side of one of the mem-

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bers at spaced points, an inwardly extending resilient web portion integral with the wall element on the other side bent through an angle greater than 90° with reference to the wall element to provide a clearance and contacting the outer opposite side of one of the members substantially inside of its perimeter, said resilient web portion being constrained by the action of the pressure portion to hold the members resiliently together, and a central portion integral with the resilient portion to cooperate with a sound emitter.

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