SOUND ARRESTER AT THE OPENING OF SOUND-ARRESTING ROOM

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Fig. 1.

Fig. 2.

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This invention relates to a sound-arresting structure consisting in the feature that, at the immediate outside of the openings such as doorways and ventilators of a walled enclosure or room where sounds are produced, is provided a funnel-shaped sound-absorbing ante-room or housing having inwardly curved wall-ends at the exit thereof, and, on the interior of the said sound-absorbing ante-room, several sound-absorbing walls each having waved or ridged surfaces on both sides and erected in the shape of fan at the base of which an inwardly curved sound-absorbing wall is provided.

The object of the present invention is to obtain a sound arrester which eliminates most sounds coming from the sound-generating room by increasing chances of repeated absorptions and mutual damping of the sounds, and which eliminates remaining sounds in collecting them in the tapering housing or funnel.

There have generally been used, merely with object of increasing the sound-absorbing coefficient by increasing the angle of incidence of sounds, such sound arresters as are mainly composed of sound-absorbing walls standing at right angles to the path of sounds. However, these sound arresters are open to the objection that they not only cause inconvenience to passage, but also, particularly when a strong sound is accompanied by a rapid air current, amplify the escaping sounds and, besides, promote a generation of sounds in producing a sudden change of atmospheric pressure at the flank and rear of the walls, and hence they are unable to have adequate effect on arresting sounds.

The present invention is, in order to remove the foregoing defects, provided, on the interior of a funnel-shaped sound-absorbing room, with several sound-absorbing walls standing aslant the course-line of sounds, which serve to increase absorption by reflection and further to absorb repeatedly the remaining sounds by collecting them in a structure the form of funnel, thus displaying its sound-arresting effect perfectly, and, in addition thereto, it makes persons possible to pass through freely.

The construction of the invention is illustrated in the accompanying drawing, in which

Fig. 1 is a plan of horizontal section of Fig. 2 along a line Y—Y.
Fig. 2 is a sectional elevation along a line X—X of Fig. 1.

In the opening 4 of a sound-generating room consisting of outer wall 2 and sound-absorbing wall 3, both ends of the sound-absorbing wall of the opening 4 are outwardly curved to the form of funnel, and, immediately outside the opening 4, there are several vertical walls 5 which are arranged in the shape of fan directing its rivet outward and each of which is covered on both sides with sound-absorbing walls 5 of waved or rugged surfaces. Near the base of the said fan-shaped sound-absorbing wall 5, an inwardly curved sound-absorbing baffle wall 7 is erected. The outer wall 2' and inner sound-absorbing wall 3' which are accommodating the foregoing fan-shaped walls 5 narrowed in proportion as they approach the exit, thus forming a funnel-shaped room, and two ends 6 of the said sound-absorbing walls are curved inwardly at the exit. As the present invention is in the foregoing construction, sounds of short wave-length coming direct through the opening 4 from a sounder in the room 1 are mostly absorbed and eliminated by the rugged surfaces 5 of the fan-shaped sound-absorbing walls 6 and the reflected sounds are also absorbed during the repetition of their complicated reflections in various directions between the waved surfaces 5 facing each other, and in case of there being some remaining sounds they are absorbed by the curved sound-absorbing wall 7 standing at the base of the fan, the sounds reflected from the wall 7 being then partly absorbed and eliminated by the fan-shaped walls 5 again and partly by the wall of room 3'. In case there being further remaining sounds reflected from the wall 3', the reflected sounds go to outer wall of the opening 4 which reflects the sounds to the outside of the fan-shaped sound-absorbing walls 5 again and are absorbed there. In this manner, the sounds coming direct from the sounder are completely eliminated without flowing outside the room.

The sound-waves reflected from the sound-absorbing wall 3 of the room 1 and flowed aslant the opening 4, are directly absorbed by the room wall 3' and reflected sounds are, after repeating reflection between the fan-shaped sound-absorbing wall 6 and room-wall 3', reflected from the inner absorbing wall of the curved exit 6 to the outer surface of the curved wall 7. In case there being further remaining sounds, they are reflected from the said curved wall 7 to the room-wall 3' of the opposite side and sounds of this kind are thus eliminated without flowing outside.

As the sounds of long wave-length effect various reflections in various directions by the waved surfaces of each fan-shaped absorbing wall 5,
there are created sufficient phasic differences among the sound-waves, in consequence of which
the sounds are eliminated completely after their mutual interferences.

In the present invention, chances of reflection and interference are, as abovementioned, increased as many as possible for both sounds of short and long waves, and sound-absorbing operations can be repeated in collecting the remaining sounds in the form of funnel, and on that account the sound-arresting effect of the present invention is far greater than that obtained from old arresters, which has been determined by the experiment.

The sound-arrester at the ventilator at ceiling is constructed similar to that of the doorway as shown in Fig. 2.

I claim:

1. A sound-arresting structure for walled enclosures having an opening, comprising, a vertically and horizontally taping sound absorbing housing having its inner end wall formed by a wall of the enclosure having said opening and having its outer end wall also provided with an opening aligned with said first mentioned opening, inwardly turned wall-ends at each of the said openings, vertically disposed sound absorbing walls each having ridged surfaces on both sides erected in fan-shaped formation longitudinally of the housing between the openings, and an inwardly curved vertically disposed sound absorbing baffle wall located transversely of the housing between the said vertical walls and the opening in the outer wall of the housing.

2. A sound-arresting structure for preventing the emanation of sounds from a walled enclosure having an opening in a wall thereof, said structure comprising a housing arranged at the exterior side of said opening, said housing having a vertical end wall provided with an opening aligned with the said first mentioned opening, a plurality of vertically disposed horizontally spaced sound absorbing wall elements arranged within said housing between said openings, certain of said sound absorbing wall elements being arranged parallel and other arranged oblique to a vertical plane medially intersecting the openings in the walled enclosure and the housing, and a baffle wall vertically arranged transversely of said plane and adjacent the end of said first mentioned vertical wall elements remote from the opening in the walled enclosure.

3. A sound-absorbing structure for preventing the emanation of sounds from a walled enclosure having an opening whose side edges are directed outwardly; a housing located at and surrounding the exterior side of said opening in a wall of the enclosure and including converging side and top walls, a horizontal bottom wall and a vertical outer end wall, said end wall having an opening whose side edges are also directed inwardly of the housing, a plurality of vertically disposed sound absorbing walls extending from the top to the bottom wall of the housing and grouped in spaced relation in said housing between said openings, one of said vertically disposed sound absorbing walls being arranged substantially parallel to a vertical plane intersecting the axis of said openings and the other of said vertical walls being inclined obliquely to said plane whereby related edge portions of said last mentioned walls lie closer to the sides of the first mentioned wall than their opposite edges, and a vertically disposed baffle wall of substantially arcuate formation arranged transversely of said vertical plane and spaced from the edge portions of said first mentioned vertical walls which are spaced relatively close together, said baffle wall being located adjacent the opening in the vertical end wall of the housing.

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