Sept. 7, 1943. L. B. WAMNES ET AL 2,328,761

DOOR

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Fig. 1,

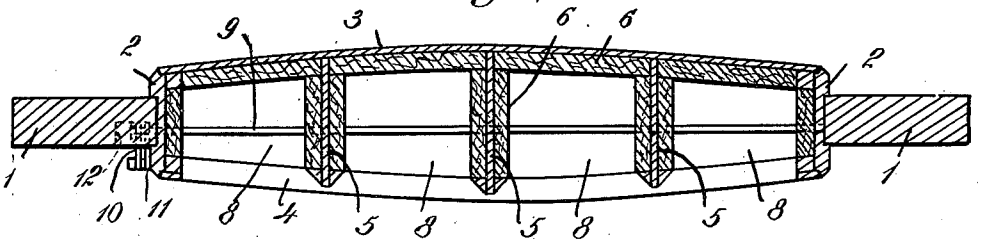


Fig. 2,

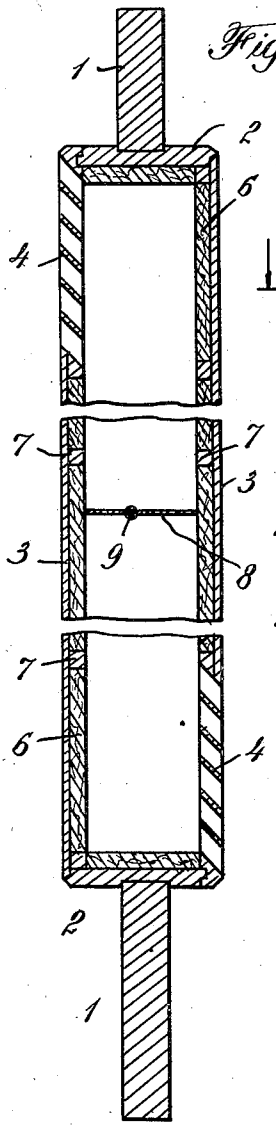


Fig. 3,

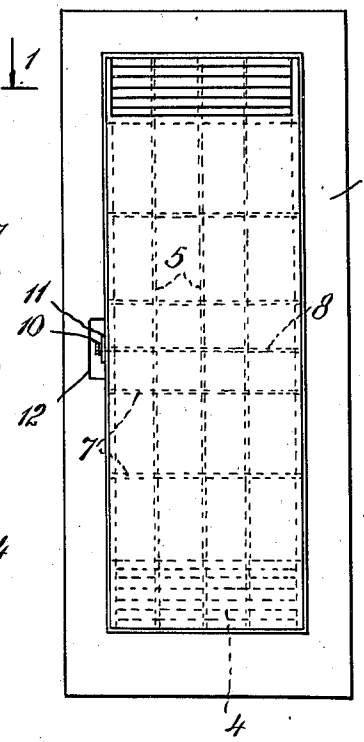
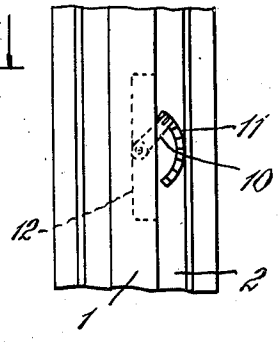


Fig. 4,



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2,328,761

DOOR

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3 Claims. (Cl. 98—87)

Our invention relates to improvements in doors. In particular our invention embodies an improved door adapted to provide the usual means of ingress and egress to and from a room or other confined space and, in the closed position, to provide privacy both physical and audible while at the same time permitting a free flow of air for ventilation. Our improved door is adapted to receive and house standard household finishing hardware and therefore can readily be installed, without making special provisions therefor, in any doorway where it is desired at all times to maintain a low resistance path for the passage of a large volume of air while at the same time affording a closure which will provide physical privacy and prevent, at least to a substantial extent, the transmission of articulate sound. At the same time the appearance of this door avoids seeming bulkiness so that it does not offend aesthetic tastes.

Our improved door is of especial utility in structures provided with air conditioning or mechanical ventilating systems as well as in structures relying on natural ventilation, since continued introduction of a supply of fresh air adequate to maintain proper ventilation into a room, series of rooms, or other confined space, irrespective of whether such fresh air enters through an air supply duct or through an open window, can be continuously maintained only by also providing for the relief of an equivalent amount of air. Accordingly, the amount of entering air is in a large measure controlled by the resistance of the path through which the air is relieved. In many mechanical ventilating systems for private homes, hotels, office buildings and marine installations, fresh air is supplied to individual rooms or groups of rooms by separate branch ducts but means for withdrawal are provided only from centralized areas such as hallways, corridors, staircases, and the like. Our improved door is of special value and application in installations of this type.

Our door comprises essentially an outer frame, adapted to receive and house standard household finishing hardware, and side-panels spaced apart by panel-supporting walls which extend from the inner edges of the frame to the outer edges of the side-panels thereby forming an elongated chamber extending substantially the full length of the door. The width of the panel-supporting walls or the shape of the side-panels or both are so co-ordinated that the internal transverse cross-sectional area of the chamber between the side-panels substantially exceeds the transverse cross-sectional area of those portions of the door which extend above and below the side-panels. At the bottom of one-side panel and at the top of the other, openings are provided which have cross-sectional areas substantially equal to the internal cross-sectional transverse area of the chamber included between the side-panels, thereby providing a channel of relatively large cross-sectional area which extends substantially the entire length of the door and opens adjacent the bottom of the door on one side and adjacent the top of the door on the other. The length of this channel therefore is substantially greater than its maximum transverse dimension. The interior of this channel is lined by a sound-absorbing material, a relatively thick layer of felt, asbestos, or other fibrous material; for example.

In its preferred form a plurality of longitudinal partitions are provided in the chamber at spaced intervals and both sides of these partitions are also covered with sound-absorbing material. Such partitions furnish support for the side-panels and also serve to divide the chamber within the door into a plurality of parallel channels in which the ratio of maximum transverse dimension to length is decreased.

In one installation in a building provided with mechanical ventilation the rate of flow of air through an open doorway of average size was 600 cu. ft. per minute. A door embodying our invention was installed in this doorway. In this particular door the distance between the inner surfaces of the sound-absorbing lining on the side-panels varied from approximately 3½ inches at the point of greatest thickness to approximately 2 inches at the edge of the chamber. The overall internal width of the chamber was slightly in excess of 2 feet. With this door in the closed position the rate of flow through the door was reduced only to approximately 530 cu. ft. per minute. With an exceedingly slight readjustment of the pressure differential it was found possible to exhaust air through this door, in the closed position, at a rate well in excess of 600 cu. ft. per minute. In this installation only one longitudinal partition was provided and notwithstanding the slight difference between the rate of flow of air through the doorway when the door was in the open and the closed positions, the door when closed greatly reduced the transmission of audible sound and eliminated the transmission of articulate sound to the extent of making eavesdropping exceedingly difficult if not impossible.

In a door of this type increasing the number of longitudinal partitions has the effect of

further increasing the resistance of the flow of air and thus decreasing the rate of air flow for a given pressure differential. However, it increases the degree of sound absorption both by increasing the amount of sound absorbing material within the door and by increasing the ratio of length to maximum transverse dimension in any one channel extending through the door.

The accompanying drawing illustrates one form of door embodying our invention, and our invention will be further described in connection therewith.

In the drawing Fig. 1 is an enlarged transverse section taken along the line 1—1 of the door shown in elevation in Fig. 3. Fig. 2 is an enlarged vertical section of the door shown in Fig. 3. Fig. 4 is an enlarged detail showing an arm and segment arrangement which serves to position the damper. The same refernce numeral is used to designates the same part in all figures.

The door illustrated in the drawing comprises an outer frame 1, of ordinary construction and thickness so as to accommodate standard household hardware such as hinges, locks, and the like. Panel-supporting walls 2 are attached to the inner edges of the frame 1 and to the outer edges of the relatively thin side-panels 3. Louvered openings 4 are provided at the upper end of one of the side-panels and at the lower end of the other side-panel. Longitudinal partitions 5 extend between the side-panels 3 and from the upper to the lower horizontal panel-supporting wall. Horizontal battens 7 are provided at spaced intervals to give additional support to the relatively thin side-panels 3. The inner surfaces of the side-panels 3, both sides of the partitions 5, and the inner surfaces of the panel-supporting walls 2, all are covered with a layer of piano felt approximately ½ inch thick, or other equivalent sound-absorbing material. In the door illustrated in the drawing a recess 12 is provided in one stile of the door frame to accommodate arm 10 which is attached to one end of shaft 9. This shaft extends the entire width of the chamber and supports damper panels 8 mounted in the vertical channels. Notched-segment 11 is provided to co-operate with a projection at the outer extremity of arm 10 to maintain the damper in the desired position.

While the provision of a damper is not essential, we have found it to be desirable particularly where the pressure differential between opposite sides of the closed door is subject to considerable variation, as otherwise excessive draft may at times be encountered. Moreover, a damper is desirable from the standpoint of providing means for preventing flow of air through the door in the event of fire. The sound-absorbing lining, if a combustible material is selected, should be subjected to fire-proofing treatment.

While the construction illustrated in the drawing is one employing a wooden frame and wooden side-panels, it will of course be apparent that sheet metal or other material may be used, particularly for the exterior shell of the door panel. Likewise, it will be understood that various other modifications may be made without departing from the spirit of our invention. These flat side-panels may be used in lieu of the bowed side-panels illustrated in the drawing. However, the use of flat side-panels necessitates increasing the width of the vertical panel-supporting walls 2 in order to maintain any given transverse cross-sectional area for the chamber included between the side-panels, and the bowed construction illustrated in the drawing has been found to give less appearance of bulkiness. Similarly, ornamental grilles of any desired type may be substituted for the louveres 4, so long as care is taken to maintain the aperture area at least substantially as great as the transverse cross-sectional area of the longitudinal channels included between the side-panels. Similarly, the number of longitudinal partitions may be varied to suit the requirements of any particular installation, and the damper and its actuating mechanism, if provided, may assume various forms and be made operable from either side or from both sides of the door if desired. Likewise, one side-panel may be so secured as to be removable to permit access to the chamber within the door for cleaning or replacing the sound-absorbing materials.

We claim:

1. A door comprising an exterior frame surrounding an opening, said frame consisting of relatively narrow upper and lower horizontal members and relatively narrow elongated vertical members adapted to receive and house standard household hardware, panel-supporting walls attached to the inner periphery of said frame and extending outwardly from the plane of the frame, side-panels spaced apart and attached at their edges to said panel-supporting walls and cooperating therewith to form a chamber, the internal thickness of which substantially exceeds the thickness of said frame, an opening at the upper end of one of said side-panels and another opening at the lower end of the other side-panel, said openings having a cross-sectional area at least substantially as great as the internal transverse cross-sectional area of said chamber, thereby forming a normally substantially unobstructed channel of relatively large cross-sectional area extending from the upper edge of the lower horizontal frame member to the lower edge of the upper horizontal frame member and opening on opposite sides of said door, the length of said channel substantially exceeding its maximum transverse dimension, and a sound-absorbing lining on the inner surface of said channel.

2. A door comprising an exterior frame surrounding an opening, said frame consisting of relatively narrow upper and lower horizontal members and relatively narrow elongated vertical members adapted to receive and house standard household hardware, panel-supporting walls attached to the inner periphery of said frame and extending outwardly from the plane of the frame, side-panels spaced apart and attached at their edges to said panel-supporting walls and cooperating therewith to form a chamber, the internal thickness of which substantially exceeds the thickness of said frame, an opening at the upper end of one of said side-panels and another opening at the lower end of the other side-panel, said openings having a cross-sectional area at least substantially as great as the internal transverse cross-sectional area of said chamber, thereby forming a normally substantially unobstructed channel of relatively large cross-sectional area extending from the upper edge of the lower horizontal frame member to the lower edge of the upper horizontal frame member and opening on opposite sides of said door, the length of said channel substantially exceeding its maximum transverse dimension, longitudinal partitions extending between said side panels and dividing said channel into a plurality of parallel channels of lesser maximum transverse dimensions, and a

lining of sound-absorbing material in each of said parallel channels.

3. A door comprising an exterior frame surrounding an opening, said frame consisting of relatively narrow upper and lower horizontal members and relatively narrow elongated vertical members adapted to receive and house standard household hardware, panel-supporting walls attached to the inner periphery of said frame and extending outwardly from the plane of the frame, side-panels spaced apart and attached at their edges to said panel-supporting walls and cooperating therewith to form a chamber, the internal thickness of which substantially exceeds the thickness of said frame, an opening at the upper end of one of said side-panels and another opening at the lower end of the other side-panel, said openings having a cross-sectional area at least substantially as great as the internal transverse cross-sectional area of said chamber, thereby forming a normally substantially unobstructed channel of relatively large cross-sectional area extending from the upper edge of the lower horizontal frame member to the lower edge of the upper horizontal frame member and opening on opposite sides of said door, the length of said channel substantially exceeding its maximum transverse dimension, a sound-absorbing lining on the inner surface of said channel, a damper in said channel and means operable exteriorly of said channel for changing the position of said damper.

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