

Oct. 10, 1933.

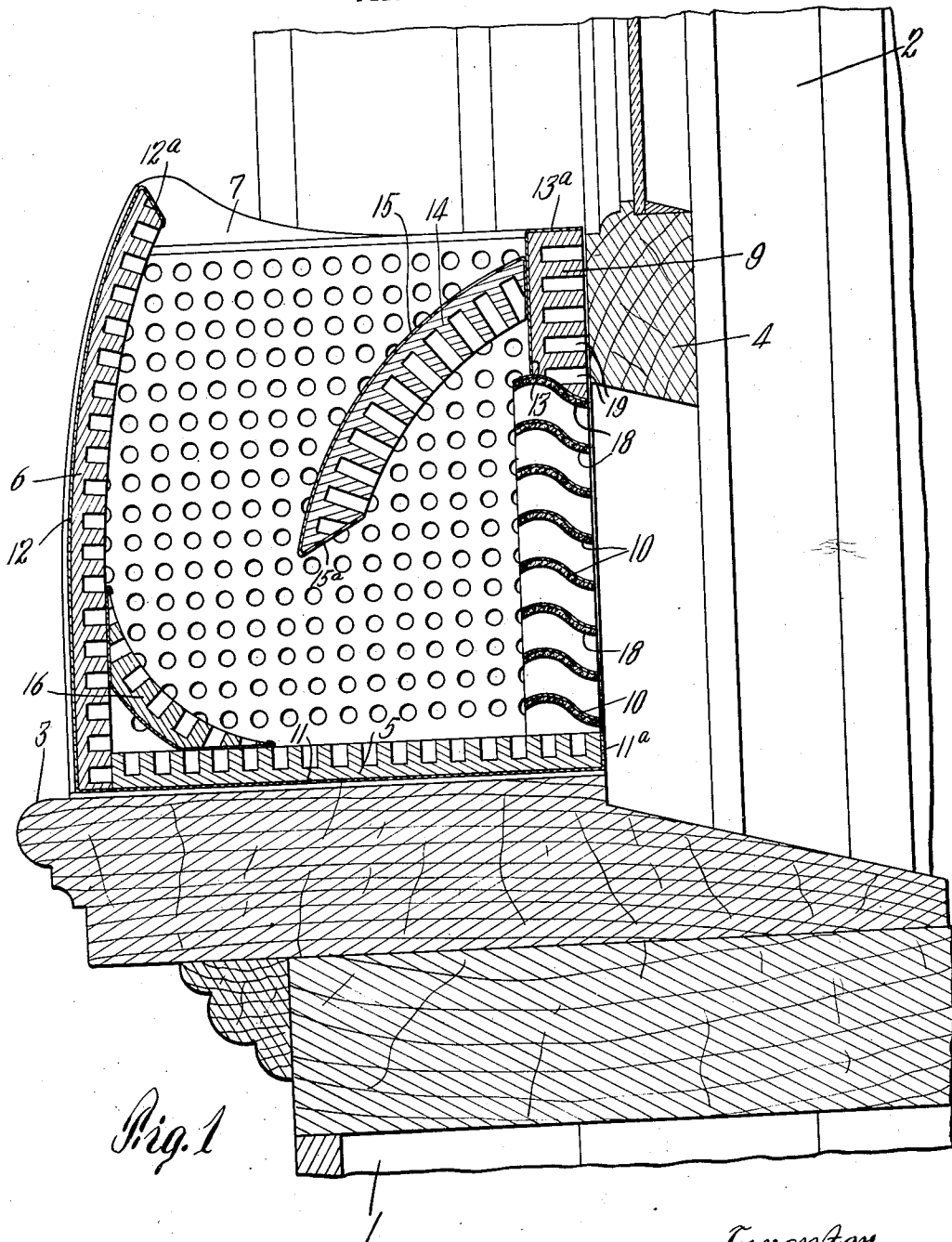
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1,929,595

SOUND INTERCEPTING VENTILATOR

Filed Oct. 22, 1931

4 Sheets-Sheet 1



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SOUND INTERCEPTING VENTILATOR

Filed Oct. 22, 1931

4 Sheets-Sheet 2

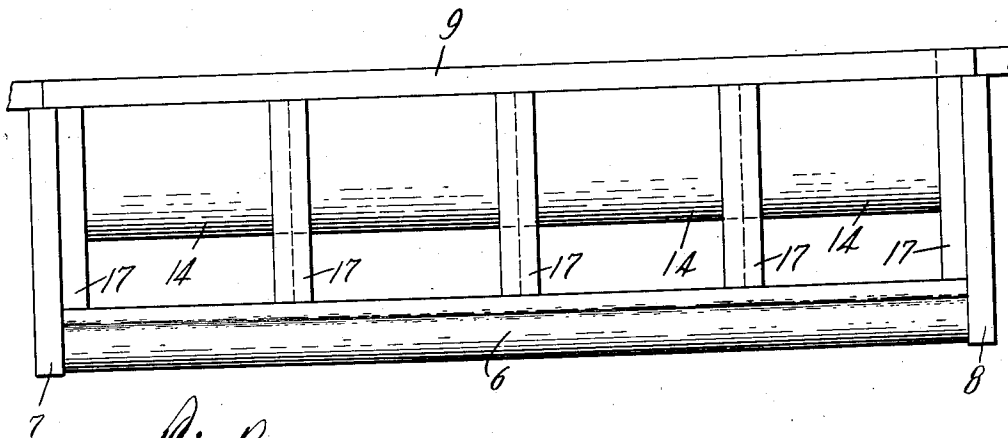


Fig. 2

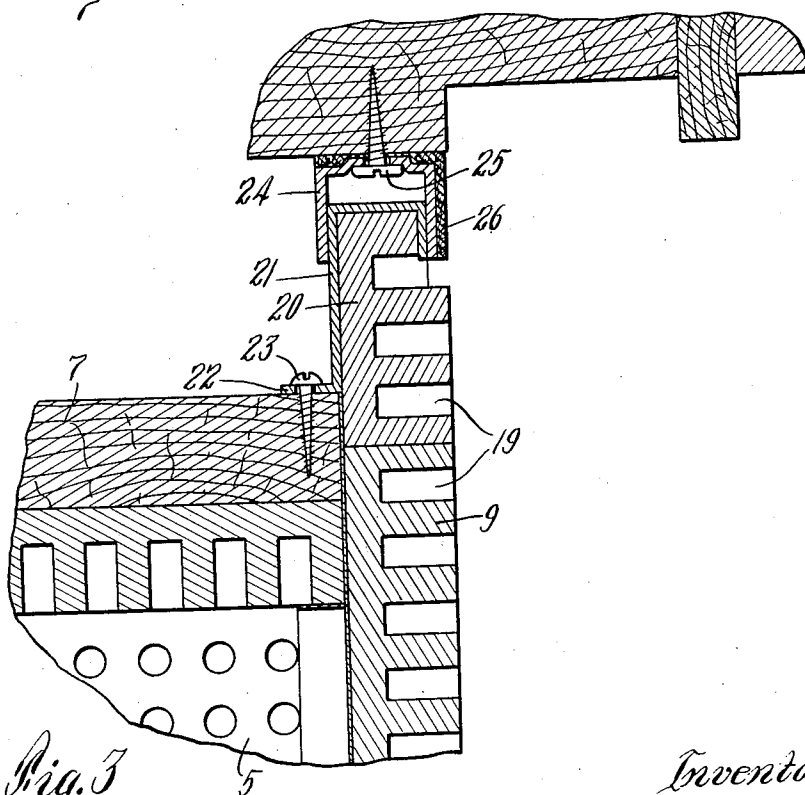


Fig. 3

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SOUND INTERCEPTING VENTILATOR

Filed Oct. 22, 1931

4 Sheets-Sheet 3

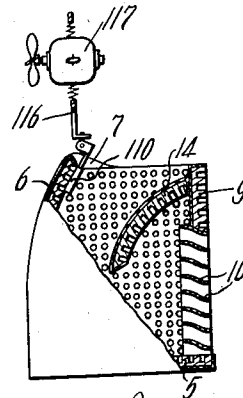
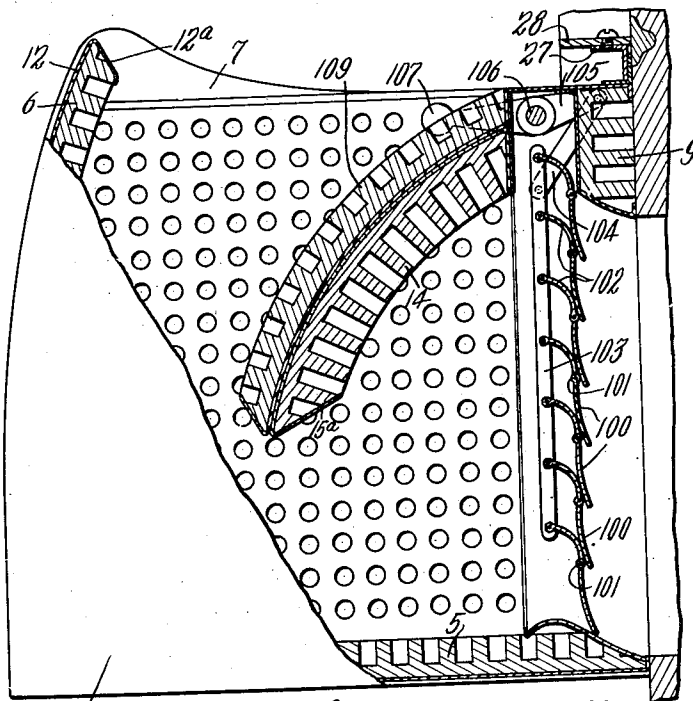


Fig. 6

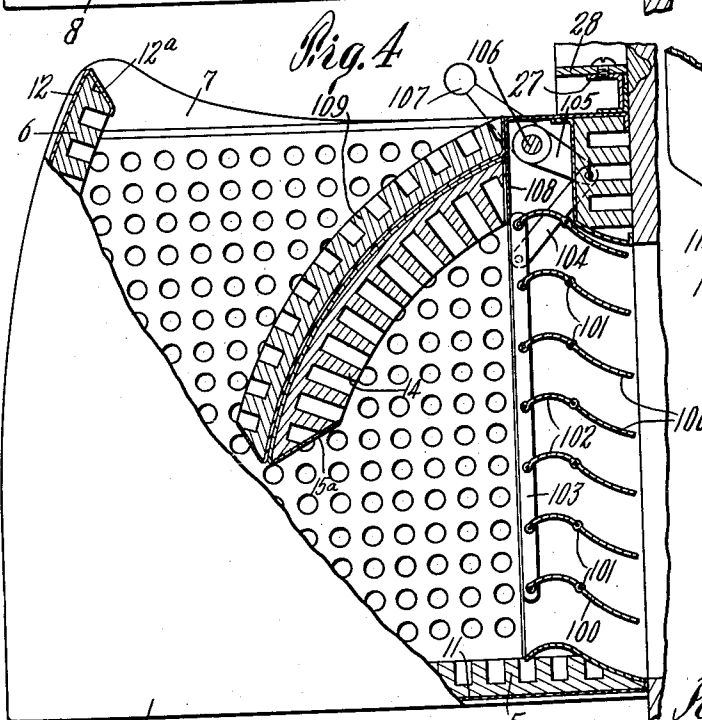


Fig. 5

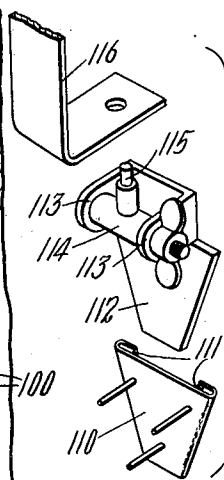


Fig. 7

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4 Sheets-Sheet 4

Fig. 8

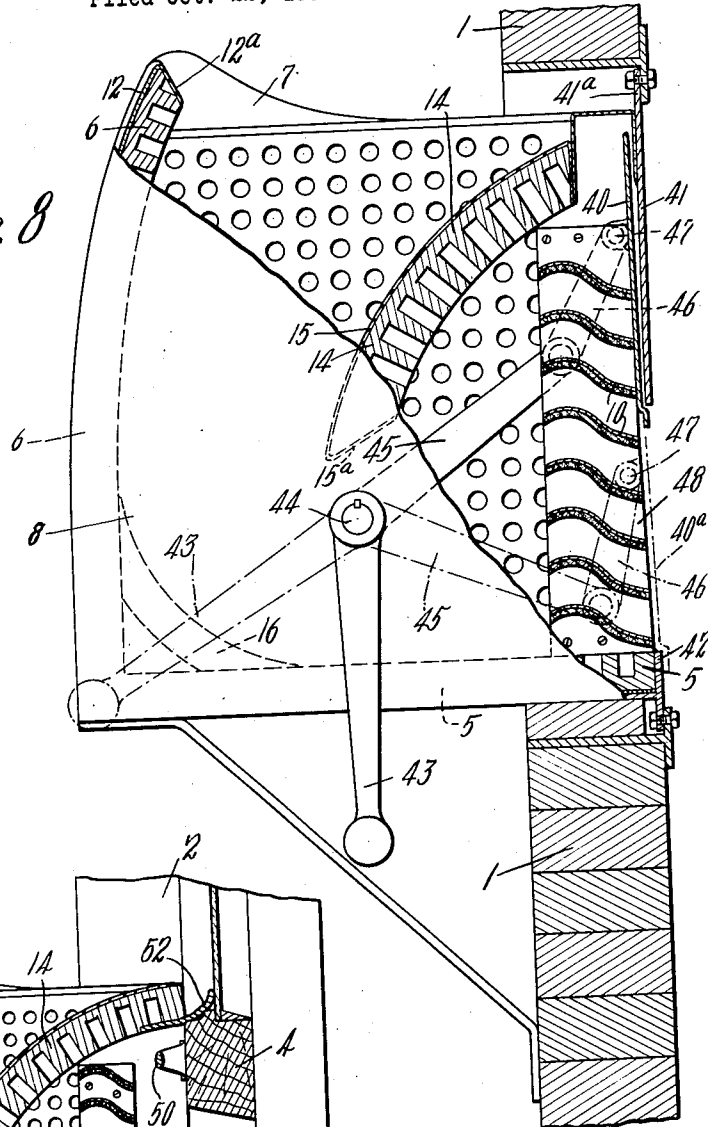
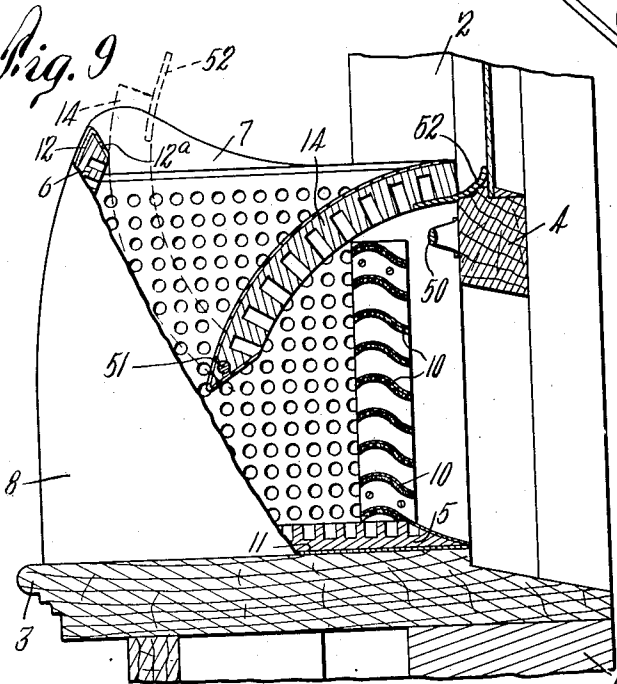


Fig. 9



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UNITED STATES PATENT OFFICE

1,929,595

SOUND INTERCEPTING VENTILATOR

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Application October 22, 1931. Serial No. 570,342

16 Claims. (Cl. 38—99)

This invention relates to devices and apparatus adapted to be placed across a ventilating opening in the wall of a building, whether such opening is a space between the frame of a window and a partially opened sash, or a special opening in the wall provided for ventilation only; which, while permitting sufficient flow of air for ventilation of the adjacent room or apartment, will obstruct and largely prevent entrance into the room of noises from outside the building. Its main purposes are the same as those expressed in the patent to J. F. Newsom, 1,655,194, January 3, 1928; and it has in addition the further purpose and object of providing a sound obstructing ventilator which may be made as a single unit structure and be applied wholly inside of the window sashes, when used in connection with an ordinary window opening, or wholly at the inside of the wall when applied to a ventilating opening of other character; and to embody in such unit improved means for the exclusion of sound from the room. Another object is to make such unit readily applicable to and removable from the wall opening, adapting it for placement on a window-sill; to afford an adequate sound seal between the ventilator and the rail of a partially opened window sash; and to provide means for adapting ventilator units of standard dimensions to window openings of different widths, so that passage of sound between the ends of the ventilator and the sides of the window embrasure will be prevented notwithstanding considerable disparity between the length of the ventilator and the width of the embrasure.

These and other objects of the invention, together with the principles and characteristics of the novel means in which the invention consists and by which such objects are accomplished, are explained in the following specification with reference to certain illustrative embodiments of the invention.

In the drawings which supplement such illustration,—

Fig. 1 represents a vertical section through a window opening and part of the wall of a building, showing a sound obstructing ventilator made according to this invention applied to the window-sill adjacent to the bottom rail of the raised lower sash;

Fig. 2 is a plan view of the ventilator shown in Fig. 1;

Fig. 3 is a fragmentary horizontal section on a larger scale showing in detail that phase of the invention which resides in means for adapting the ventilator to window embrasures of different

widths so as to prevent passage of sound between the ends of the ventilator and the sides of the embrasure;

Fig. 4 is a vertical transverse section through a form of ventilator embodying the said invention but modified for mounting adjacent to other ventilation openings than windows;

Fig. 5 is a similar view showing in open position the shutters or louvers with which this modified device is equipped, and which in Fig. 4 are shown closed;

Fig. 6 is a sectional view of the apparatus equipped with an electric fan for inducing air flow and for giving direction to the current of air within the room;

Fig. 7 shows details of a mounting for adjustably and demountably securing the fan on the ventilator.

Figs. 8 and 9 are similar views of further modifications.

Like reference characters designate the same parts wherever they occur in all the figures.

The embodiment of the sound obstructing ventilator shown in Figs. 1, 2 and 3, is adapted to be placed on a window-sill inside of the window and in close proximity to the bottom rail of a raised lower sash. The reference numeral 1 designates the wall of a building, 2 designates a window frame contained in an embrasure of the wall, 3 the inner sill of the window, and 4 the bottom rail of the window sash, which is shown in raised position, suitably high, to cooperate with the sound obstructing ventilator in admitting air and excluding sound. The ventilator is essentially a box having a bottom 5, rear wall 6, end walls 7 and 8, and a sound seal 9 across the upper part of its front side. It is open at the top and open also at the front below the sound seal, except for louvers or vanes 10 which may be placed horizontally across and within the open front to exclude rain and to some extent baffle and absorb sound vibrations.

For the purposes of the present description the front of the device is considered to be the side which faces outwardly with respect to the building, and the rear or back is the part extending within the room away from the plane of the window sash, when the apparatus is in place. Like terms designate corresponding parts in the modification, later described, which is applied to special ventilating openings other than windows.

The bottom and walls of the ventilator are preferably lined with sound absorbing material, or made with a sound absorbing construction, and the sound seal 9 is of such material and con-

struction. I have found to be excellent for this purpose and have illustrated in the drawings a material known commercially as Acousti-Celotex, which is made of compressed bagasse in the form of tiles or slabs of substantial thickness ($\frac{3}{4}$ " more or less) and is perforated or partially penetrated from one side by numerous closely spaced holes. In the standard commercial form of this material the holes are about $\frac{3}{8}$ " in diameter and spaced about $\frac{1}{2}$ " apart on centers, in regular rows. This material has remarkable sound absorbing properties, in that sound waves striking its surface are broken up by the holes, such of the vibrations as impinge on the surfaces between the holes are largely absorbed into the porous structure of the material, and the vibrations transmitted into the holes are likewise absorbed into the enveloping porous material. Slabs of the sound insulating material are applied to sheet metal plates 11, 12 and 13, which reinforce the material and provide the structural parts of the bottom and rear walls, and the sound seal 9. The insulating material at exposed edges of these walls is protected by bent over lips of the sheet metal, as shown at 11a, 12a, and 13a. The end walls are preferably made of substantially thick wooden slabs in order to provide adequate bulk for inexpensive assembling with the metal of the other walls, and also to enhance the rigidity of the entire structure. Linings of the same sound absorbing material are preferably applied to these walls also.

An intermediate vane 14 is mounted in the interior of the ventilator and extends from a junction with the front or sealing wall 9 in a diagonal direction toward the bottom and rear of the ventilator, in position to prevent direct passage of sound waves from the entrance to the open top of the ventilator. This vane, or baffle as it may be called, partially reflects and largely absorbs the sound vibrations entering from the upper part of the front opening, and traveling upward from the lower part of the opening. It terminates far enough from the bottom and rear wall of the reflector to leave a large and unobstructed passage for flow of ventilation air. It is preferably made of similar construction to the rear wall, that is, of a plate or backing 15 of sheet metal having a protecting lip 15a, and a body or lining of sound insulating material. It may be of curved formation substantially as shown, for the better performance of its intended functions, but this is not essential. At the junction between the bottom and rear walls is a guide 16 which extends across the angle between these members for the purpose of deflecting and guiding the flowing air in a smooth path and preventing eddy formation. This guide may be of the same sound absorbing material above described, and is preferably given a curved formation in order to enhance its guiding ability. However, in place of the specific construction described, the bottom and rear walls may be formed so as to merge into one another on a wide curve. Their external or backing parts of sheet metal may be made in one piece whether they meet at a distinct angle as shown or merge on a curve as above described.

It will be noted that the rear wall rises vertically in an intermediate part of its height, and is inclined or curved forwardly in its uppermost part. By this means it is enabled to reflect downward and toward the entrance opening such of the sound vibrations as pass the obstructing vane and impinge on the front wall and are not absorbed by the porous lining thereof.

In the interior of the ventilator and extending transversely between the front wall and the intermediate obstructor 14 are partitions 17 which interrupt the continuity of the ventilator lengthwise and divide its interior into cells, preventing the propagation lengthwise of the ventilator of such sound vibrations as pass upward from the lower edge of the intercepting vane. It is a peculiarity of sound transmission that when sound waves impinge on an interceptor placed in the path of the waves, new foci for propagation of the sound are established at the exposed edges of the interceptor. Thus the exposed lower edge of the interceptor vane 14 becomes the locus of new focal points from which sound travels in spherical waves. The partitions 17 and end walls of the reflector intercept, absorb and reflect the laterally spreading waves emitted from the focal edge of the interceptor, and allow to escape into the room only a small proportion of such secondary waves. As all the direct sound waves are intercepted by the vane 14 and the rear wall, only a modicum of sound enters the room. But there is little obstruction to the direct flow of air, but rather an inducement to such flow, at least where the air in the room is warmer than that outside, for the air passage around the vane turns upward toward the outlet and the change of direction of the flowing air is only about 90° for that coming through the lower and larger part of the entrance, and through an angle only slightly greater than 90° as to air from the upper part of the entrance.

The louvers may be curved suitably to obstruct and reflect downward, and to some extent outward, sound traveling in an upward direction from the outside; and they may be lined or covered on either or both faces with a lining 18 of felt or other suitable sound absorbent, so as to diminish the quantity of sound to be absorbed in the interior of the ventilator. These louvers are mounted at their ends in any suitable manner, as by attachment directly to the end walls of the ventilator, or by attachment in a secondary frame set into the entrance opening.

An important factor of the invention resides in means to prevent passage of sound waves between the front of the ventilator and the bottom rail of the window sash, and between the ends of the ventilator and the sides of the window opening or embrasure in the wall. Unobstructed spaces at these points, even of a small area, would considerably nullify the efficiency of the sound obstructor otherwise, for the volume of sound passing an obstruction is not proportional to the area of the opening through which it passes. That is, assuming that the sound interceptor covers, say, 95% of the area of an opening, the sound which will enter the remaining 5% of the area is much greater than 5% of the total volume which would enter if the opening were entirely uncovered.

Sound passage between the ventilator and the sash is prevented by the seal 9, and entrance between the ends of the ventilator and the bounding surfaces of the window opening is prevented by a lock or adapter, later described.

The sound seal is made of a porous material having recesses or pits 19 in the side next to the window sash; conveniently and preferably the Acousti-Celotex material previously described. Its surface next to the sash is preferably separated from the sash rail slightly to avoid rubbing and injury when the sash is raised and lowered. Sound vibrations rising through the intermediate space are reflected in part back and forth between the sash rail and the sealing member, interfering

with the vibrations which are not thus reflected, and becoming entrapped in the pits 19 and eventually absorbed by the pores and fibers of the sealing member. This sound seal allows to pass through the intermediate spaces only a small proportion of the noise which would pass through an equal space between two smooth wooden or metal surfaces, other things being equal.

Merchandising efficiency and economy require that the ventilators be made in standard or stock sizes differing in length from one another by perhaps two inches more or less, rather than in sizes to fit closely between the sides of all window casings. Window openings in buildings and the casings or frames in which the sliding sashes of the window are mounted vary greatly in width and have practically all values within a wide range. Even windows of nominally the same width in the same building may actually vary by as much as $\frac{1}{4}$ " or more. But a space of as much as $\frac{1}{4}$ " wide between the ventilator and the window frame would admit entirely too great a volume of external noise, while to make the ventilators fit closely in all windows would virtually require each ventilator to be custom made for its particular window, and would add greatly to their cost. Moreover, the dimensions of wooden window frames change appreciably with temperature and humidity variations in the weather. To avoid these difficulties, I have invented a sound lock or adapter which can be inexpensively made in varying widths to close spaces between ventilators of any length and window embrasures or casings of any width, and includes also an overlapping joint to accommodate variations in width of the opening due to changing weather conditions and to secure the ventilator releasably in place.

A suitable and preferred form of such adapter or lock is shown in detail in Fig. 3. A sealing wing 20 is applied to each end of the ventilator to extend horizontally in continuation of the seal 9, and vertically throughout the full height of the ventilator. These wings are preferably of the same construction as the seal 9 and are closed on the back and outer edge by a sheet metal shell 21, which also overlaps somewhat the forward face of the wing, and has a flange or lugs 22 adapted to be secured to the adjacent end wall of the ventilator by screws 23 or equivalent fastenings. The adjacent edges of the seal 9 and adapter wing 20 abut together as shown. The outer edge of the wing has a sliding fit in a channel or guide 24 which is secured to the side of the window casing by screws or the like 25. The angle of such guide between the window casing and sash is covered with a facing 26 of felt or other suitable sound absorbent material. The surface of the absorber 26 is substantially in the same plane with the front face of the sealing member 9 and the main part of the adapter wing 20, the latter being suitably cut back or rabbeted on the forward side of its outer extremity to fit the channel. Wing members to suit different conditions may be made in stock widths differing from one another by, say, 1" or less, and the remaining differential between the standard ventilator and different window openings is taken care of by the overlap between the wing and the guide channel, such overlap being susceptible of having any desired width or range.

The wing and channel together constitute a mechanical lock whereby the ventilator may be slipped into and out of position and secured immovably in place, and a sound lock or seal which functions similarly to the seal 9 in preventing and baffling the progress of sound into the room along

the side rail of the window sash, whether the sash is open or shut. By the use of inexpensive adapter wings of different widths, ventilators of a given length may be fitted to windows of many different widths, throughout a wide range, with adequate sound excluding properties. In applying and removing the ventilator it is necessary only to slide it down or up respectively in the guide channel.

The modification shown in Figs. 4 and 5 is like the construction before described in the main essentials, but differs in the following respects. It has movable louvers or shutters adapted to be closed so as to prevent air flow, and it may be of greater length than the width of the opening and thus need not be equipped with the end seals or locks; although it may be provided with these also, and with a bottom seal of similar character, to cooperate with the seal 9 at the top in providing a sealing frame completely surrounding the opening. It may be secured to the wall of the building in any desired and suitable way, as by a flange or lip 27, made as a part of the ventilator structure and screwed or bolted to a ledge 28 which is anchored in or on the wall above the opening therein. The louvers 100 are pivoted at their ends on horizontal axes to the end walls of the ventilator structure, or to the sides of a metallic frame set into the front side of the ventilator, their pivot trunnions being shown at 101. Each louver is provided with a rear extension 102 connected pivotally to a bar 103, parallel to the vertical plane in which all the louver axes 101 are located. This bar is coupled by a connecting rod 104 with a rocker arm 105 on a rock shaft 106 to which a handle 107 is connected. There may be two such bars, connecting rods and rocker arms, one at each end of the louvers, or more than two, located at convenient intervals apart, all of the rocker arms being secured to the same rock shaft. It will be readily apparent that the connections described are effective upon raising or lowering the handle 107 to open the louvers as shown in Fig. 5, or close them as shown in Fig. 4. The seal 9 provides a stop for the louvers in open position, and the louvers are preferably so formed that when thus stopped they have a downward and outward inclination so as to shed rain; and the rear extensions are preferably curved in such a way as to reflect downwardly, and more or less outwardly, sound vibrations impinging on them from an outside source at a lower level. This formation of the extensions also gradually deflects the entering air currents so that a minimum of disturbance is caused in the air flow by striking the interceptor vane. When closed, the outer extremities of the several louvers overlap and contact with the mid parts or rear extensions of those immediately beneath. They may be covered on either or both surfaces with felt, rubber or other sound absorbing material, which serves also as a seal to exclude air and water when the louvers are closed.

The interceptor vane is mounted at the rear of the louver operating mechanism, on a plate 108 which extends lengthwise of the ventilator structure.

Figs. 4 and 5 show further a covering 109 of sound absorbent material on the back of the interceptor vane. This is an optional addition for absorbing largely the small fraction of sound waves which may be reflected from the lining of the rear wall against the interceptor. This same addition may be obviously applied to the corresponding interceptor vane of the forms of the

invention shown in Figs. 1, 8 and 9, and in other possible embodiments.

The ventilator shown in Fig. 8 is adapted to be fixed permanently across a ventilation opening in a wall other than an ordinary window, like the modification shown in Figs. 4 and 5, but it differs from the latter in having a sliding shutter, instead of pivoted louvers, for closing the opening. It is like the form shown in Fig. 1 in that it has stationary louvers for excluding rain. The shutter is shown at 40 and is adapted to move vertically between a raised position, shown by solid lines, behind a stationary plate 41, and a lowered position 40a, shown by broken lines, wherein its lower edge overlaps the rim 42 of the ventilator bottom, and its upper edge is overlapped by the stationary plate. This stationary plate is secured to the ventilator structure, and its extended edge shown at 41a serves as a means for securing the ventilator to the casing of the opening in which the ventilator is set.

Movement of the shutter between opened and closed positions is effected by a handle crank 43 secured to the protruding end of a shaft 44 which is journaled in the end walls of the ventilator, and two arms 45 which are secured to said shaft inside, and adjacent to the ends, of the ventilator structure, said arms being coupled to the shutter by links 46 and pivots 47. Links 46 and the extremities of arms 45 travel in narrow upright spaces between the end walls of the ventilator box and a frame 48 in which the louvers 10 are mounted, such frame being secured to the ventilator structure in any suitable way and being designedly made and positioned to leave such spaces. The front edges of the frame 48 provide a guide for the shutter, which is supplemented in the upper part by the fixed plate 41. In other particulars, except for the omission of the sound seal at the forward side of the ventilator, this structure is essentially like that shown in Fig. 1.

Fig. 9 shows a modification of ventilator adapted to accommodate a window sash which is equipped with handles 50 on the bottom rail for convenience in raising it. In this case, in order to give room for movement of the handles and to permit access to them while the ventilator is in place, the sound seal 9 of Figs. 1, 4 and 5 is omitted, the louvers are set back within the forward opening of the ventilator, and the interceptor vane is attached only by means of a pivot rod 51 which passes longitudinally through it near its rear and lower edge. The rod is mounted at its ends in the end walls of the ventilator. Thus the vane may swing to a rearward position, the limit of which is shown by broken lines, where it gives access to the sash handles 50, and to a forward position where its outer edge is adapted to bear on the side rails of the sash, and a flexible sealing strip 52 (of rubber, felt or other suitable material) is adapted to make contact with the window pane, as shown by full lines.

It is to be understood that the specific material which I have described as a preferred sound absorbent material or lining for the sound obstructing members of the ventilator is not the only material which I may use for that purpose. On the contrary I may use any material, now known or which may be hereafter discovered, having sound absorbing properties, within the scope of the protection which I claim for the invention.

While the construction of the ventilator is

adequate alone ordinarily to provide sufficient ventilation, it may be desirable at times to induce air flow mechanically and to give a desired direction to the air issuing from the ventilator. Accordingly I have provided as a further phase of the invention, means for mounting an electric fan on the rear wall, which is shown in Fig. 6, and may be applied to the embodiments shown in any of the other figures. The fan mount comprises a socket member 110 bolted to the rear wall 6, such socket member being conveniently a sheet metal plate having downwardly convergent side edges curled over to provide channels 111. A bracket holder 112 fits removably in the socket and supports spaced apart lugs 113 in which is a horizontal pivot 114 carrying a vertical pivot 115 by which a fan bracket 116 is held with ability for angular movement. The upper part of the fan bracket is enlarged to form a circular ring within which the fan motor 117 is supported and centered by springs so as to eliminate mechanical vibrations which might cause noise. By adjustment of the fan bracket about the horizontal and vertical pivots 114 and 115 any desired direction is given to the discharged air current.

What I claim and desire to secure by Letters Patent is:

1. A sound obstructor for placement on the inner sill of a window across but wholly behind the opening between such sill and the raised lower sash of the window, comprising end members, a longitudinal member connected to and extending between the upper parts of the end members in position to lie close beside the bottom rail of such raised sash and constructed to provide a sound seal, an interceptor vane extending downwardly and rearwardly from said longitudinal member across the upper part only of the space between said rail and window sill, and a rear wall secured to the end members across the space between them from top to bottom thereof and spaced to the rear of the rearmost part of said vane; said members, vane and rear wall constituting a self-contained detachable unit having a continuous air passage open from the front to the top of the space between the vane and rear wall.

2. A sound intercepting ventilator structure for application to the wall of a building across a ventilating opening in said wall, said structure comprising enclosing walls and being open at the front side and at the top, and having a sound seal at its front side composed of porous material, the outer surface of which is adapted to occupy a plane parallel and near to, but out of contact with, the adjacent surface of the part which forms the upper boundary of such opening, and said porous material having deep pits extending inward from said outer surface.

3. An appliance for obstructing sound while admitting air through the space between a raised lower sash of a window and the casing of such window, comprising a box-like structure applicable to the inside window sill having a front opening and a top opening, sound obstructing rear and end walls, a sound seal above its front opening beside and out of contact with the bottom rail of the raised sash above such front opening having means for absorbing sound vibrations entering the intervening space, and extension sealing means between the ends of the structure and the sides of the window casing cooperating therewith and with the sash to exclude sound.

4. An appliance for obstructing sound while admitting air through the space between a raised lower sash of a window and the casing of such

window, comprising a box-like structure applicable to the inside window sill having a front opening and a top opening, sound obstructing rear and end walls, a sound seal above its front opening co-

operative with the bottom rail of the raised sash above such front opening, and extension sealing means between the ends of the structure and the sides of the window casing cooperating therewith and with the sash to exclude sound, said extension sealing means comprising lateral extensions from the ends of the structure and vertical guides attached to the window casing in interlocking slidable engagement with said extensions, the outer surfaces of said guides and extensions being substantially in the same plane with the first named seal and of substantially the same vertical extent as the height of the appliance.

5. A sound obstructing air admitting structure applicable to a window opening between the sides of the window casing, a vertical guide attached to the window casing having an outer surface of sound absorbent character adjacent to the plane of a window sash in such casing, and a sound obstructing extension from the end of said structure having a slidable, overlapping and interlocking engagement at its outer extremity with said guide and having an outer surface of sound absorbing quality in substantially the same plane with the before named outer surface of the guide.

6. A sound obstructing air admitting ventilator comprising a box-like structure adapted to be mounted across a ventilating opening in a wall, having a front opening in register with the wall opening and a top opening for emission of air, and an interceptor vane within the ventilator extending in a direction between the upper forward part of the ventilator and the lower rearward part thereof, but terminating short of the latter part, said vane having on its back a covering of sound absorbent material in position to receive the impingement of sound waves reflected from the rear wall of the ventilator.

7. In a ventilator as set forth in claim 6, the interceptor vane having on its back an absorbent body of fibrous material formed with pits for absorption of sound waves.

8. In a ventilator as set forth in claim 6, the interceptor vane provided on both sides with coverings of sound absorbent material, that on the side next to the front opening being adapted to absorb sound waves entering the said opening, and that on the opposite side being adapted to absorb sound waves impinging on it by reflection from the rear wall of the ventilator.

9. In a ventilator as set forth in claim 6, the interceptor vane constructed on both opposite sides of compressed fibrous material having relatively deep pits extending inwardly from the outer surface.

10. A window ventilator comprising a box-like structure having an open top and an open front, and interior means for obstructing the traverse of sound from the front to the top opening, louvers mounted in the open front of the ven-

tilator, a shutter arranged to travel across the forward extremities of said louvers, and means for moving said shutter from one position to another.

11. A window ventilator comprising a box-like structure having an open top and an open front, and interior means for obstructing the traverse of sound from the front to the top opening, louvers mounted in the open front of the ventilator, a shutter arranged to travel across the forward extremities of said louvers, and a fixed plate extending across a part only of the front opening of the reflector, behind which the shutter may be withdrawn, and beyond which it may be projected to complete the covering of such front opening.

12. A sound obstructing ventilator adapted to be placed across a window opening between the bottom of a raised window sash and the sill of the window and comprising a box-like structure having end and rear walls, a front opening and a top opening, and a sound-intercepting vane located wholly above the bottom of such front opening so as to leave an air passage beneath it and pivoted on a longitudinal line adjacent to its lower and rear extremity in the middle part of the transverse area of the ventilator, said vane when in normal position extending upwardly and forwardly toward the sash.

13. In a ventilator as set forth in claim 12, the interceptor vane having a sealing or packing strip projecting from its forward extremity and adapted to exclude passage of sound between said edge and the window sash.

14. A sound obstructor for the ventilating opening of a window comprising a box having bottom, front and end walls, adapted to be placed on a window sill across the opening between such sill and a raised lower sash, the box having a front opening in register with the window opening and a top opening for emission of air, and an interceptor vane extending from the transverse middle part of the box outward and upward and being substantially equal in length to the interior length of the box, said vane being pivoted adjacent to its inner edge to the box structure and extending at its outer edge substantially to the frame of the window sash, when in normal position, and having a sealing flap projecting from its outer edge to the window sash, said vane being movable forwardly about its pivot to permit access to the bottom rail of the sash.

15. A sound absorbing ventilator applicable over a ventilation opening in a building wall having a rear sound obstructing wall and an electric fan demountably attached to the upper edge of said rear wall.

16. A sound obstructing ventilator and fan combination as set forth in claim 6 and comprising further a socket connected with the ventilator wall, a bracket holder detachably contained in said socket, and a bracket pivotally connected with said holder and having vibration quenching means for the electric fan.

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