Nov. 25, 1958 M. M. GRACER 2,861,597

AIR GUIDE DEVICE

Filed June 23, 1953 2 Sheets-Sheet 1

Fig. 1.

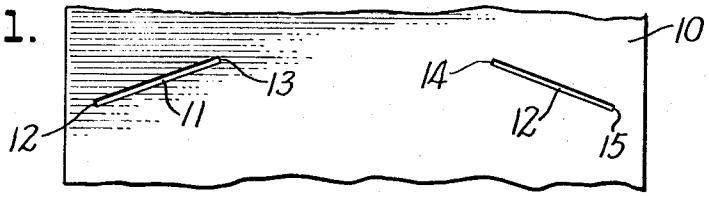


Fig. 2.

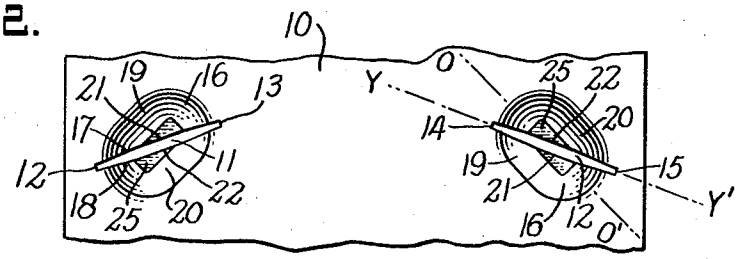


Fig. 3.

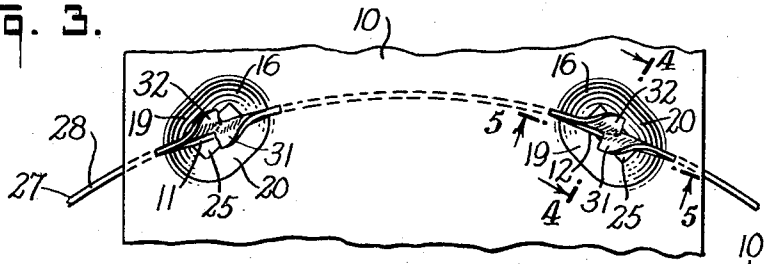


Fig. 6.

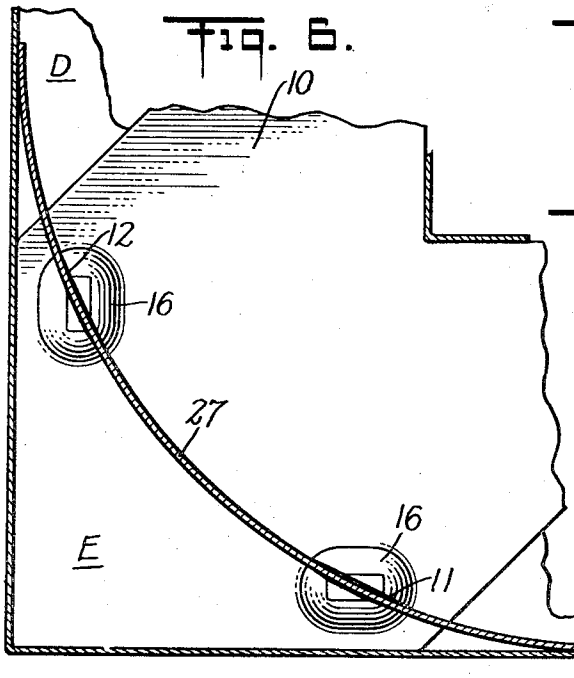


Fig. 4.

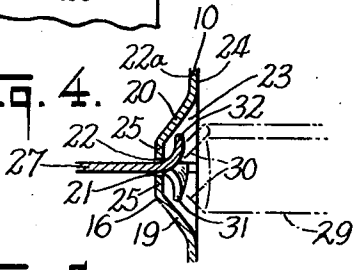
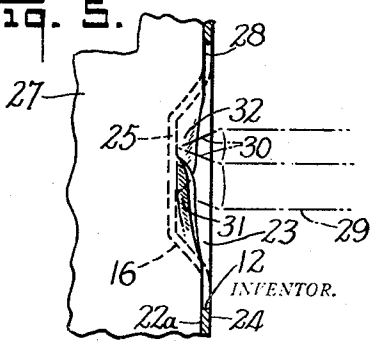


Fig. 5.



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AIR GUIDE DEVICE

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Fig. 7.

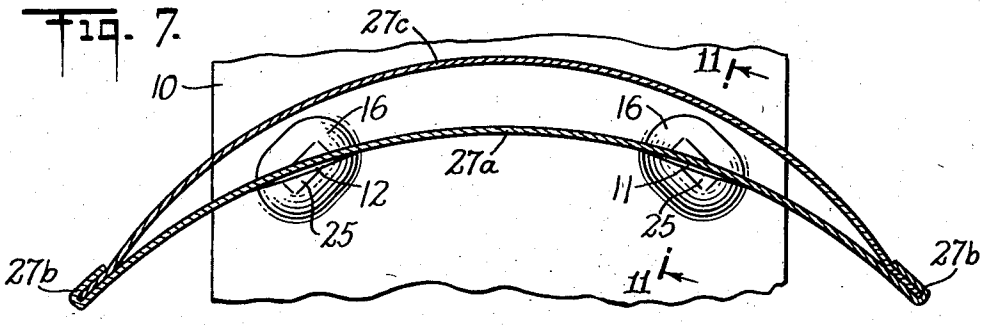


Fig. 11.

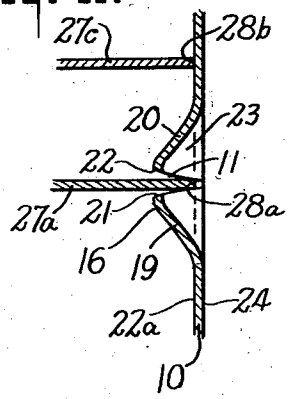


Fig. 8.

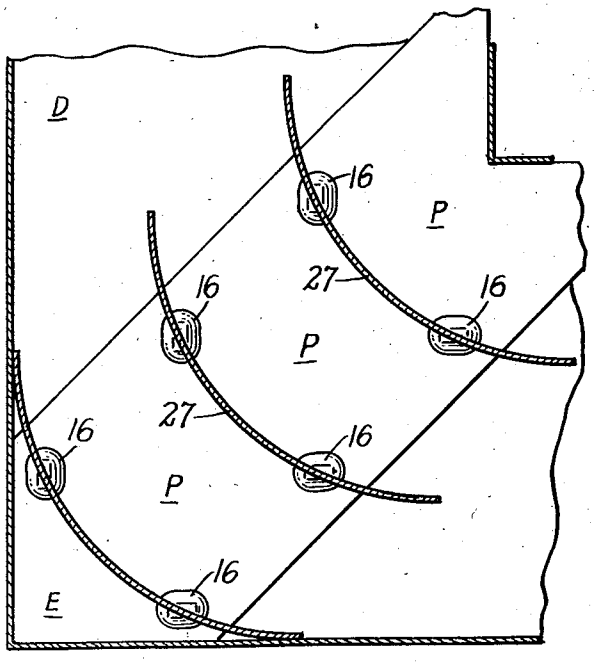


Fig. 9.

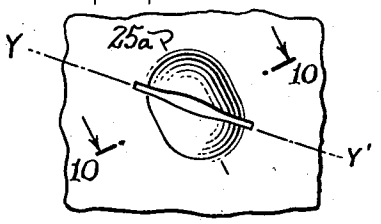


Fig. 10.



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AIR GUIDE DEVICE

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Application June 23, 1953, Serial No. 363,640

6 Claims. (Cl. 138—39)

This invention relates to duct constructions of ventilating and air conditioning systems and more particularly to the assembly of supporting rails, and for vanes or blades for attachment thereto of these elements, and still more particularly to a method of uniting vanes to the blade rails employed in ducts of ventilating and air conditioning systems.

It is an object of this invention to provide a vane or blade supporting rail and method for making the same used in elbows or turns of ducts in ventilating and air conditioning systems, in which the blades are assembled with the rails assuring silent operation, ease of joining whereby simple assembly tools may be employed to construct and install the same and in which either single or double vaned blades may be employed, utilizing simple metal stampings of low cost without sacrificing rigidity of construction.

The invention has for its object the provision of a blade rail and method in which blades or vanes may be assembled in elbows or turns of ducts of ventilating and air conditioning systems characterized by the provision of a blade rail made from flat stock, into which is formed slitted protrusions in which the blade or vane may be arcuately supported, and further characterized by so forming the slit and protrusion to serve as a guide for efficiently and simply uniting the blade to the rail by simple expedients, and still further characterized by the formation of vane retaining protrusions facilitating the temporary union of the vanes and rails as well as to effect an engagement assuring silence of operation and eliminating any looseness of fit causing air vibratory noises in the ventilating or air conditioning systems.

Still further objects of this invention reside in the provision of a blade rail to which blades may be quickly and efficiently united by the formation of flat stock sheet metal and forming thereon joint outlining protrusions susceptible of formation by simple metal stamping dies, to effect in such parts edge guides for the blades holding the same in predetermined arcuate position, with minimum clearances to prevent wind rattles and consequent noises, and to provide for a method of assembly of the blades and rails requiring no expensive soldering, welding, or blazing operations to assure rigidity of union.

To attain these objects and such other objects as may appear herein or be hereinafter pointed out, reference is made to the accompanying drawings, forming a part hereof, in which—

Figure 1 is a fragmentary plan view of a sheet metal stock for a blade rail at the initial stages of production;

Figure 2 is a similar view at the final stage thereof;

Figure 3 is a similar view showing the joint formed with the blade attached thereto;

Figure 4 is a section taken on the line 4—4 of Figure 3, illustrating the working tool in position;

Figure 5 is a section taken on the line 5—5 of Figure 3;

Figure 6 is a sectional view of a duct with a blade rail and blade in position;

Figure 7 is a sectional view of a rail in accordance

with my invention as applied to a double layered blade;

Figure 8 is a sectional view of a duct with a plurality of blades in position in accordance with my invention;

Figure 9 is a fragmentary plan view of a protrusion for another embodiment of my invention;

Figure 10 is a section taken on the line 10—10 of Figure 9;

Figure 11 is a section taken on the line 11—11 of Figure 9.

Making reference to the drawing, it is contemplated by my invention to provide blade rails which are angularly positioned in the elbows or turns of ducts in ventilating or air conditioning systems to support one or several blades normally thereto, thereby to effect an efficient circulation of the air projected through the ducts in accordance with well known principles of air circulation. For this purpose, a pair of rails edgewisely support one or more blades which are arcuately formed to assume a shape influencing an efficient air circulation.

In accordance with this invention, a blade rail serves as the medium for supporting the blades in butt-joint contact by the formation of a joint angularly positioned to hold the blade in predetermined arcuate position. Accordingly in the method contemplated by me, a strip of flat stock sheet metal forming the rail **10** is initially stamped to form angularly directed slots **11** and **12** which are positioned in relation to the longitudinal axis of the rail **10** and to each other to have the ends of the slots **12, 13, 14** and **15** substantially fall on the arc, defining the desired curvature of a blade in the duct of the elbow or corner of the ventilating system. Upon formation of a rail **10** with a plurality of slits **11, 12** arranged in rows over the length of the blade, the stock so produced is then subjected to a stamping operation to form a localized protrusion **16** preferably of generally ovoid outline with the longest axis intersecting the axial line of the slot at an acute angle. The stamping die which is chosen to form the protrusion **16** is calculated to raise edges defining the walls **17** and **18** out of the plane of the rail **10** to form the off-sets **19** and **20** and opposed edges **21** and **22**, distended in dimension with relation to the ends of the slots thereby to progressively taper the dimensions of the edges **20** and **21** to a more constricted size adjacent the face of the rail **10** at the ends **12, 13, 14** and **15** of the slots previously described. The protrusion thus made forms upstanding walls on the front face **22***a* and a socket **23** on the rear face **24**. In the more specific embodiment involving the formation of the protrusion, I employ a stamping die which outlines a guide seat **25** of elongated dimensions, the long axis of which O—O′ is positioned with regard to the axis Y—Y′ of the slot (**11** or **12**) by an angle which is acute with relation to each other and preferably an angle of between 30 to 45°. The protrusion on the front face and the socket on the rear face is made by a stamping die employing a male and female die, backed by a pressure pad calculated to spread the edges **21** and **22** of the slot from each other to contour the slot in the tapering dimension previously described, as well as to form the outline comprising the angle guide and working tool or chisel seat as will be apparent from the description which proceeds.

With the formation of the protrusions as described, assembly of the blade with relation to the rail is effected by positioning the blade **27** with edge **28** directed into a pair of slots **11** and **12**, contoured or protruded in accordance with the manner already described. The tapered walls of the protrusion extending from the ends of the slot initially will wedge the blade **27** up to the point where the edge **28** contacts the flat front face **22***a* of the rail. A close tolerance of fit is thereby provided, permitting the use of stock of sheet metal of various thick-

nesses within limits without the necessity of accurately relating the stock available to the dimensions of the slot in the protrusions.

A slight blow of the hammer at the point where the protrusions envelope the blade will provide a binding fit, clamping the parts together temporarily with sufficient engagement frictionally to facilitate handling and to take up any play, causing rattling by reason of the hand contouring of the blade **27** to the arcuate position. With a pair of rails **10** thus assembled and sandwiching the blades therebetween in number as found desirable, final union may be effected at the joints.

It will be observed that the protruding portion of the edge **28** in the socket **23** of a rail exposes a short segment of a web angularly extending in the socket **23** with respect to the guide **25**. In the assembled portion of the rail and blades, a simple metal working tool such as a chisel **29**, preferably one which has its working edge **30** ground to about 90° cutting edge, is positioned to have the axis of the cutting edge arranged in parallelism to the axis O—O' of the angle guide or chisel seat. In this position a blow of the hammer to the web shears it to split the web into oppositely folded segments **31** and **32** to the limits of engaging the side walls of the socket portion **23** of the rear face.

A quick shearing action of the chisel as its reaches the chisel seat along the guide line O—O' may cause the chisel to engage the wall of the socket **23** as the folded segments **31—32** are formed to press the rail into contact with the blade edge **28**. Where the sheet metal of the blade **27** makes a close fit with the slot, further engagement is assured to take up any play tending to cause rattling movement. The completion of the union of the blade and the rails permits the assembly of the rails and blade into a duct D shown in Figure 6 by the usual procedure in the elbow E.

Setting a pair of rails and the proper number of blades in position may be effected without fear of dislodging or loosening the connection between the blades and the rails, no riveting, notching, brazing or spot-welding or any special tools being required to assure the production of a rattle-free assembly, the union at the joints being effected by the method described without distortion of the blades or special edge contouring of the protruding web or folded sections on the rear face of the rail.

By the formation of a rail as described, providing a flat abutting surface for the blade, either single blades may be employed or double blades may be employed without changing the rail or multiplying the protrusions to take care of the double sheets of a double-layered blade.

This is exemplified in Figure 7 wherein the rail **10** is shown with the protrusions **16** as initially described. In this embodiment, however, the blades **27***a* are extended to hold at the ends by a folded edge **27***b* the second layer **27***c* of greater curvature, to secure the known and desirable aerodynamic benefits in blades of this construction.

As will be observed from an inspection of Figure 11, the forward blade segment **27***a* enters the slot **11** of the protrusion to extend the edge **28***a* to the rear face thereof. The rearward plate **27***c* has its edge **28***b* in butt-joint contact with the face **22***a* of the rail.

Thus, by the construction described, no special preparation need be made of a rail **10** to adapt it for use with a single-layered blade or a double-layered blade in the ventilating and air circulating systems in which these devices are to be used.

In Figure 8 the rail **10** supporting a plurality of blades **27** is shown in the elbow of a duct, the protrusions which hold the blades offering no obstructing influence to the circulation of air and the entire passage P between the blades being negligibly altered by the localized protrusions which form the edge joints for the blades.

While I have shown in the prior embodiments the employment of a protrusion having a slot outlined by the flattened offsets **25**, outlining chisel guides and seats with the arrangement that the slot defining walls are angularly related to the chisel guide and seat at an acute angle, I may make the protrusion for a chisel seat as shown in Figures 9 and 10, employing however an indexing guide **25***a* extending angularly with relation to the axis Y—Y' of the slot for an acute angle, as previously described in the first embodiment, to wit, at an angle between 30 to 45° to each other. The indexing line **25***a* serves as a guide for the chisel edge **30** to effect the desirable shearing action, to fold the segments **31** and **32** in effective locking relation to the rear surface of the protrusion.

While I have described the formation of the portrusions in the sequence of, first, stamping the sheets with the slot **11** before die-stamping to form the protrusions, in that the use of two-part dies with pressure pads, spreads the wall defining the slot **11** to the desirable funnel or tapering shape arrangement, useful in frictionally wedging the blade thereinto, it will be understood that the locking joint or slot formed in the protrusion may be effected by a sequence of operations involving first forming the protrusion and then forming the slots by a die or saw-cut. This latter procedure, however, is deemed to be less desirable in that there is a tendency to form a slot whose walls are uniformly spaced from each other and thereby to lose the benefits of the frictional wedging action and driving fit connection.

By the provision of a rail having the funnel shaped or wedge shaped slot extended across the protrusion, a rail having minimum air resistance is furnished, providing a preliminary union of the butt end of the blade when driven into the funnel shaped slot, thereby permitting sheet metal to be used for the blade within wide tolerances of its thickness. Further, by providing an angularly directed chisel guide and seat, effective shearing action of the locking joint may be secured without distortion characteristic of a peening hammer and the necessity for using special tools. A better gripping action is thereby secured, wedging the sheared web segments into forming engagement, stiffening the sheet metal at the point of engagement and minimizing wind rattling action which is experienced in cold joints.

Furthermore, by maintaining the rail preponderantly flat, single or double sheeted blades may be employed, the rail serving effectively as a support for either form of blade which may be selected.

Accordingly, large economies in assembly as well as in the parts thereof are achieved.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is:

1. A blade rail for the purposes described comprising sheeted metal formed with spaced apart, localized protrusions outlining an angular slot with respect to the longitudinal axis of the rail, positioned to coincide with a predetermined arc, the walls of each of which slots taper from the base of the protrusion forwardly from the face of the sheet where by the forcing of a blade into the slots of the protrusions to effect a but-joint engagement to each side of the protrusions, a preliminary frictional union of the butt end of the blade is effected within the slots, and thereby permitting sheet metal to be used for the blade within wide tolerances of thickness, and minimizing wind rattling action when the projecting end of the blade is bent into engagement with the protrusion.

2. An elongated rail of flat stock sheet material having parallel longitudinal edges, said rail having a plurality of localized protrusions formed therein extending away from the face of said rail on one side thereof, said rail having a plurality of narrow spaced slots cut across said protrusions, said slots being arranged in at least two laterally spaced longitudinal rows, which rows are parallel to each other and to the longitudinal edges of said

rail, each of said rows being positioned close to a different one of said longitudinal edges, the slots in each row being parallel to each other and at an angle to the slots in the other row so that if lines were drawn through said slots, these lines would intersect at a point on said rail between said slots, the rail having preponderantly flat areas between the protrusions running along the longitudinal edges of the rail, thereby minimizing the obstructing influence to the circulation of air in the passage between blades which may be affixed therein and being negligibly altered by the localized protrusions which form the edge joints for the blades, the flat surface between protrusions thereby permitting single or double sheeted blades to be engaged with the rail, without increasing the number of slotted protrusions where double sheeted blades are employed.

3. An elongated rail in accordance with claim 2, wherein said slots of said rail have a funnel-shaped contour, flaring from the base of the protrusion to the outer portions thereof, whereby a preliminary union of the butt end of the blades may be secured when driven into the funnel-shaped slots.

4. An air guide device comprising a plurality of curved guide blade members arranged in mutually spaced relationship to each other, said guide blade members being rectangular in shape, with smooth, straight top and bottom edges, a top rail having a plurality of downwardly extending projections formed therein and a bottom rail having a plurality of upwardly extending projections formed therein, each of said rails being of strip material having parallel longitudinal edges, said top rail and bottom rail having a plurality of spaced narrow elongated slots cut entirely across said projections, and said slots being funnel-shaped flaring from the base of the projections adjacent the faces of the rails outwardly, said projections and said guide blade members intersectcing within said slots so that portions of the top and bottom edges of said guide blade members project through said slots and are wedged into said slots, said guide blade members being secured to said rails by having the portion of said blades which project through said slots in a bent-over projection, said narrow elongated slots being formed in laterally spaced longitudinal rows comprising a first row of slots posistioned close to one of said longitudinal edges, substantially parallel therewith, and a second row of slots positioned close to the other of said longitudinal edges, substantially parallel therewith, said first and second rows of slots being positioned substantially parallel to one another, the slots in each row being parallel to one another and at an angle to the slots in the other row so that if lines were drawn through said slots, these lines would intersect at a point laterally between said slots.

5. An air guide device in accordance with claim 4 wherein said projections are localized to provide preponderantly flat areas between projectcions longitudinally of said rail, whereby single or double sheeted blades may be employed without increasing the number of the slots and the air passage between the blades being negligibly altered by the localized protrusions which form the edge points for the blades.

6. An air guide device comprising a plurality of curved guide blade members arranged in mutually spaced relationship to each other, said guide blade members being rectangular in shape, with smooth, straight top and bottom edges, a top rail having a plurality of downwardly extending projections formed therein and a bottom rail having a plurality of upwardly extending projections formed therein, each of said rails being of strip material having parallel longitudinal edges, said top rail and bottom rail having a plurality of spaced narrow elongated slots cut entirely across said projections, said projections and said guide blade members intersecting within said slot so that portions of the top and bottom edges of said guide blade members project through said slots and are wedged into said slots, said guide blade members being secured to said rails by having the portion of said blades which project through said slots in a bent-over projection, said narrow elongated slots being formed in laterally spaced longitudinal rows comprising a first row of slots positioned close to one of said longitudinal edges, substantially parallel therewith, and a second row of slots positioned close to the other of said longitudinal edges, substantially parallel therewith, said first and second rows of slots being posistioned substantially parallel to one another, the slots in each row being parallel to one another and at an angle to the slots in the other row so that if lines were drawn through said slots, these lines would intersect at a point laterally between said slots, said projections being localized to provide preponderantly flat areas between projections longitudinally of said rail, whereby single or double sheeted blades may be employed without increasing the number of the slots and the air passage between the blades being negligibly altered by the localized protrusions which form the edge points for the blades.

References Cited in the file of this patent

UNITED STATES PATENTS

898,276	Sloan	Sept. 8, 1908
1,996,596	Smith	Apr. 2, 1935
2,110,201	Cornell	Mar. 8, 1938
2,216,046	Peck	Sept. 24, 1940
2,264,897	Becker	Dec. 2, 1941
2,292,246	Steffens	Aug. 4, 1942
2,396,826	Callan	Mar. 19, 1945
2,826,221	Speiser	Mar. 11, 1958

FOREIGN PATENTS

481,927	Canada	Mar. 25, 1952