

[72] Inventor **Milton Hinden**
Massapequa, N.Y.
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 [73] Assignee **Duro-Dyne Corporation**
Farmingdale, N.Y.

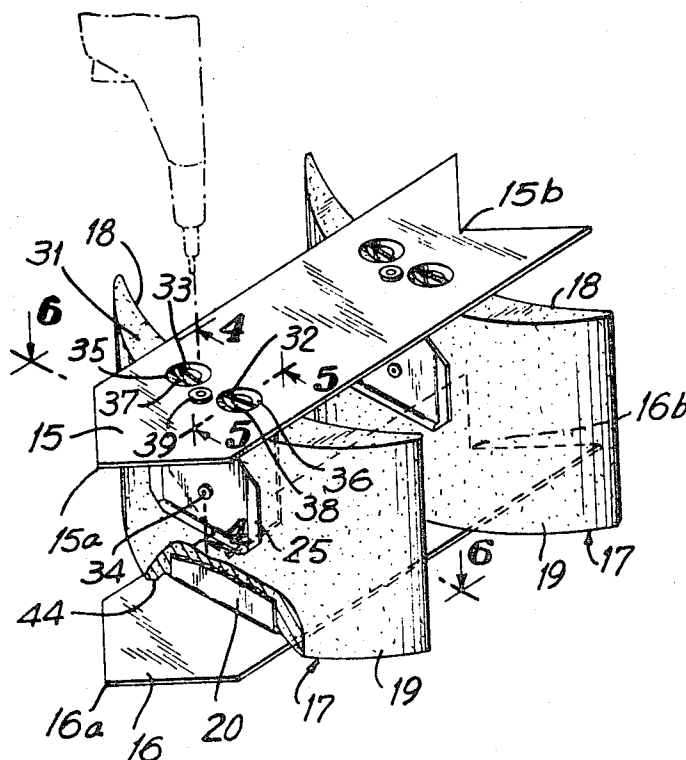
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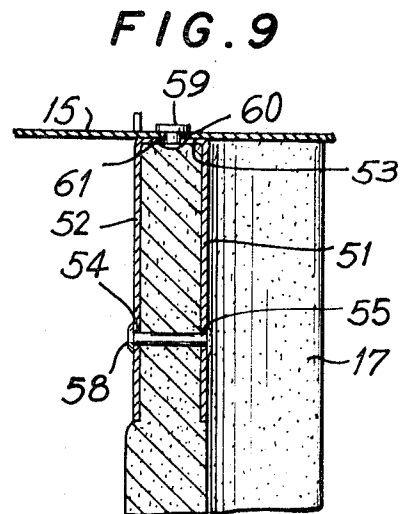
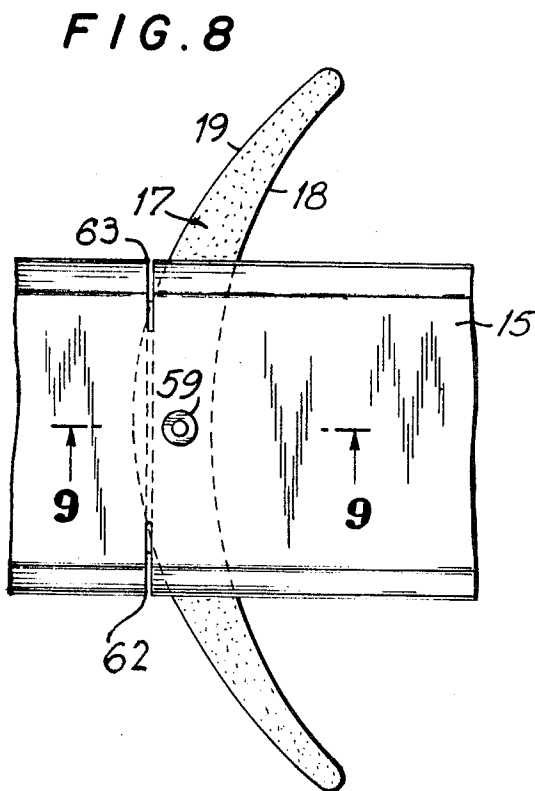
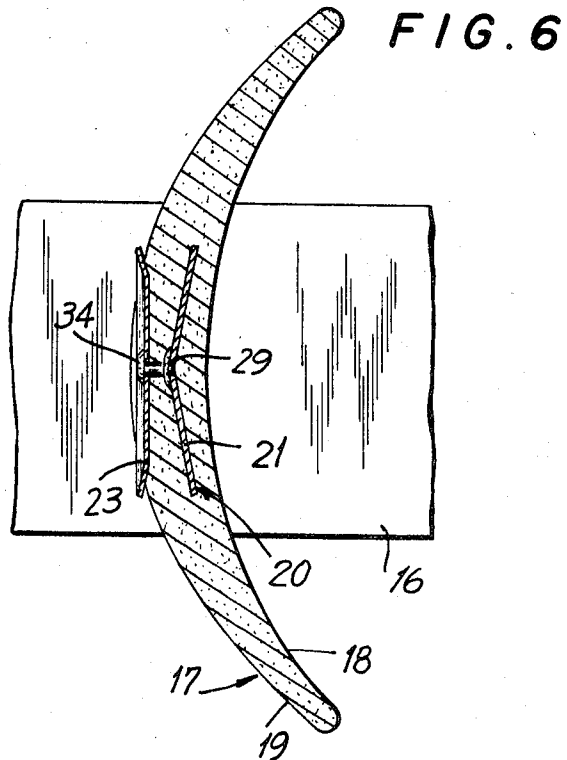
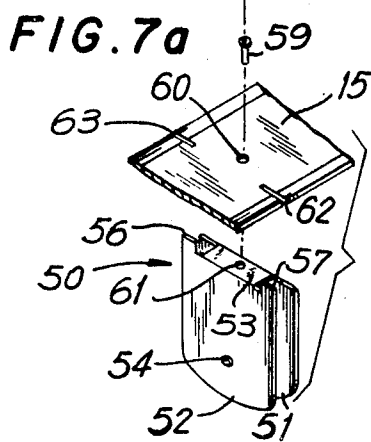
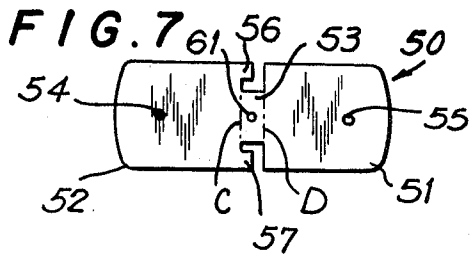
Primary Examiner—Herbert F. Ross
Attorneys—Mark T. Basseches and Paula T. Basseches

[54] **AIR TURNING ASSEMBLY**
9 Claims, 10 Drawing Figs.

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138/37, 98/121
 [51] Int. Cl..... **F15d 1/04**
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 137/574; 251/127; 181/49, 50, 63; 110/97;
 98/110, 121

ABSTRACT: An air turning assembly and bracket for holding readily compressible fibrous air turning vanes within an air conduit. The assembly is characterized by a compression bracket for holding the fibrous vanes in position between supporting parallel rails, and connection between the vane and brackets being such as to minimize wind resistance and prevent the transmission of vibration and noise to the duct assembly.





INVENTOR
MILTON HINDEN

BY

M. H. Hinden

ATTORNEY

AIR TURNING ASSEMBLY

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is in the field of air conditioning and heating conduits, and more particularly relates to an air turning assembly for use in the duct work of an air conditioning or heating system.

2. The Prior Art.

As is well known, the existence of sharp bend, such as right angle bends in ducted systems, materially increases turbulence and reduces the flow of air. Despite this fact, it is often necessary to provide L, T and like connections between ducts. In order to reduce the flow losses inherent in conveying air around bends, it is customary to install air turning guides in the duct in the area of the bends. Such guides generally take the form of a plurality of vanes or blades having curved surfaces which gradually follow the direction of the bend. An example of such air turning assembly is disclosed in U.S. Pat. No. 2,959,195. These turning devices materially reduce turbulence and frictional losses by smoothly conducting the air around the bend.

In the past, the vane components of such air turning assemblies have been fabricated of single or double shaped thicknesses of sheet metal supported between parallel rails. The units are installed by attaching parallel rails to opposite walls of the duct.

Such sheet metal air turning devices, while materially increasing the efficiency of the system, create a number of problems, principally the introduction of rattling and whistling sounds into the ducted system. Specifically, the repeated cycling of air through the system subjects the vanes to stresses and relaxations which, in the course of time, loosen the connections effected between the blades and the rails, with the result that during air flow, the vanes flutter and rattle within the duct. It will be readily appreciated that any vibrations created as a result of the loosened connections above mentioned will be transmitted throughout the duct system in the form of noise.

In similar fashion, the existence of sharpened corners and edges of the vanes themselves, as well as the presence of sheet metal screws and the like in the air system may create whistles and like sounds, which are similarly transmitted throughout the duct system.

It is important to observe that, since the conventional air turn assemblies are fabricated entirely of metallic parts, any sound within the system is readily transmitted by the vanes, rails and ducts in the fashion of a sounding board, with the result that the sounds appear to be amplified within the duct system and, of course, are introduced into any room or subdivision serviced by or disposed adjacent the ducts.

SUMMARY OF THE INVENTION

The present invention may be summarized as directed to a novel air turning assembly which is comprised of a series of fibrous vane components mounted between parallel rails. The fibrous vanes will not generate or transmit sound even in the event of some looseness in the connection of the vanes within the ducts.

Further, in the air turning system the fibrous vane components form the sole connection between the parallel rails and, hence, when the rails are fastened to opposite walls of a duct, the air turn assembly will act to damp any vibrations introduced into the duct system from other sources.

The vanes are fabricated of a compressible material, preferably a fiber glass which has been impregnated with a resinous material for purposes of providing shape and stability. Preferably the impregnated fiber glass is molded to an aerodynamically desirable shape. The vane material is rather fragile and exhibits a marked tendency to crumble and disintegrate. The fastening means normally employed in the mounting of ordinary vanes have been found unsuitable for

use with the fiber glass vanes, since the stresses to which the vanes are subjected cause a rapid breakdown of the vane material.

In accordance with the invention, the vanes are mounted to the rails through the use of intermediate metal brackets, which brackets incorporate legs which include a mass of the fibrous vane material therebetween. Attachment between the legs and the vanes is effected through a compression fastener extending between the legs of the brackets and penetrating the vane, the fasteners tending to draw the legs toward each other and indent them into the material of the vanes, so as to preserve, to a maximum degree, the aerodynamic integrity of the shaped vane surfaces while clampingly supporting the vane.

Accordingly it is an object of the invention to provide an improved air turning assembly.

A further object of the invention is the provision of an improved air turning assembly of the type described which damps vibrations within the duct assembly proper.

A still further object of the invention is the provision of a mounting bracket for an air turning assembly wherein the blades or vanes may comprise a readily compressible and relatively fragile fibrous material unsuited for mounting by conventional means.

Still a further object of the invention is the provision of an assembly of the type described in which the mounting of the blades is effected without material interference with the aerodynamic configurations of the blades.

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

FIG. 1 is a perspective view of an air turning assembly in accordance with the invention;

FIG. 2 is a sectional view through a duct assembly elbow showing the manner in which the turning assembly is incorporated therein;

FIG. 3 is a plan view of a first embodiment of a metal bracket blank adapted to form the connection between the air turning vanes and a supporting rail;

FIG. 4 is a magnified section taken on the line 4—4 of FIG. 1;

FIG. 5 is a magnified section taken on the line 5—5 of FIG. 1;

FIG. 6 is a horizontal section taken on the line 6—6 of FIG. 1;

FIG. 7 is a plan view of a modified form of blade support bracket;

FIG. 7a is an exploded perspective view, on a slightly enlarged scale, of the bracket illustrated in FIG. 7, illustrating the manner of attachment of the bracket to a rail;

FIG. 8 is a section similar to FIG. 6 through the embodiment illustrated in FIG. 7a;

FIG. 9 is a section taken on the line 9—9 of FIG. 8.

In accordance with the invention, there is shown in FIG. 2 a duct assembly 10 including an elbow portion 11, conditioned air, i.e. heated or cooled air, being conducted in either direction between the legs 12 and 13 of the duct assembly.

The air turning assembly 14 is located within the elbow 11, the assembly including upper and lower mounting rails 15 and 16, respectively, which are attached by conventional means to the opposed parallel walls of the duct system 10. As is conventional, the ends 15a, 15b, and 16a, 16b of the rails 15 and 16, respectively, are formed at angles so as to fit diagonally within the elbow 11.

A plurality of blades 17 are mounted between the rails, the blades forming aerodynamic curved surfaces, to reduce turbulence at the elbow and conduct the air smoothly through the duct system 10 in a well known manner. Thus, the blades 17 includes a concave inner surface 18 and a convex outer surface 19.

The blades of the present invention preferably comprise pressed or molded fiber glass shapes impregnated with a resinous binder material, to provide a degree of stiffness and prevent shredding. While the consistency of the blades may

acceptably vary within a wide range, it is preferred, for effective damping, that the blade material be impregnated to a degree which renders the same structurally stable but not so hard or rigid as to form an efficient conductor of sound vibrations.

By way of illustration, an acceptable blade material which has been satisfactorily tested comprises fiber glass impregnated with resin, the finished or molded blades being readily compressible by the application of manual pressures. A one half inch thickness of the tested material may, by the application of moderately heavy manual pressure, be depressed about three sixteenths of an inch. It will be readily appreciated that the hardness or compressibility factor is by no means critical.

The resultant material is very light in weight and, as will be readily understood, will be unable to form an anchor for conventional fastener elements, such as nails, sheet metal screws, rivets or the like.

Normally the blades 17 may be severed from an extended length of blade material molded in situ, the length of blades severed obviously being dependent upon the transverse dimension of the duct.

In order to mount the blades there are provided blade support brackets 20, see FIG. 3, which preferably comprise thin gauge sheet metal. Ideally, the brackets are stamped from sheet metal stock in the form shown and shipped in the essentially flat condition depicted in FIG. 3. It is, of course, feasible for the brackets to be supplied in the bent condition shown in FIGS. 1, 4 and 5.

Immediately prior to use, the bracket 20 is bent along the lines A—A and B—B at right angles, to define an essentially U-shaped configuration. The U includes a first leg 21 terminating in a depending point 22, and a second leg 23. The leg 23 may include a border or rim portion 24 having slightly bent up flanges 25, 26, 27, which flanges, in the folded condition of the blank, turn outwardly with respect to the U conformation. When the folding steps are carried out in the manner set forth, it will be observed that there remains an attachment portion 28 which forms the branch of the U.

The leg 21 of the U is formed with an anchoring aperture 29, a comparable aperture 30 being formed in the leg 23. The apertures 29 and 30 are formed so as to be equidistant from the fold lines A—A, and B—B, so that, in the bent configuration, the apertures 29 and 30 will be coaxially aligned.

The U-shaped bracket is applied to the blade 17 in the manner shown in FIG. 1, by forcing the point 22 of the leg 21 of the bracket into the body of the blade material. The leg is inserted into the body of the material until the branch 28 abuts against and forms an end stop at the upper edge 31 of the blade.

In this position the leg 23 of the bracket 20 will engage against the convex face 19 of the blade 17. It will be further observed that when the leg 21 is folded along the line A—A, there is defined a pair of tabs 32, 33 which will project at a level beyond the level of the branch 28.

As hereinafter described, the tabs will engage within complementary slots formed in the rails and lock the blades against angular movement relative to the rails.

In order to secure the bracket 20 to the blade 17, it is merely necessary to pass a compression fastener through the spaced but coaxially aligned apertures 29, 30.

As a preferred form of fastening mechanism, there may be mentioned the well known "pop" rivet or blind rivet apparatus which comprises a rivet member headed at one end 34 and including a narrow shank portion. As is well known, a mandrel is inserted through the shank, the shank being enlarged, after insertion into position, by mechanically drawing the mandrel through the shank toward the headed end 34.

In the embodiment of FIG. 1, the shank of the fastener is passed through the aperture 30, and thereafter through the aperture 29, until the head 34 of the rivet lies against the leg 23. Thereafter, the mandrel is drawn outwardly through the head 34 of the rivet, enlarging and turning the shank, in the

well known manner, such that the enlargement of the shank lies against the outer face of the leg 21 adjacent the aperture 29.

As is well known, the setting of a rivet of the blind rivet type involves the application of considerable pressures which, in the instant case, will tend to draw the legs 21 and 23 toward each other, pressing between them the mass of material of the blade included between the legs. Thus, referring to FIG. 4, it will be seen that the pressure developed by setting of the rivet has indented the leg 23 into the convex face 19 of the blade 17 so as to clear the leg from the air stream. It will therefore be observed that air passing about the blades will not be impeded by, or encounter the edges of the leg 23.

It will further be observed that the mass of blade material between the legs 21 and 23 will be tightly compressed between said legs. Thus, the attachment of the bracket to the blade is effected primarily by a clamping action rather than by an affixation force which depends upon an anchoring in the substance of the blade material.

As seen in FIGS. 1 and 5, the vanes 15 and 17 are provided with transversely spaced dimples 35 and 36, which dimples have formed thereacross slot members 37, 38. The slots 37, 38 are angularly related to the rail axis in such manner that when the tabs 32, 33 project outwardly therethrough, the blade is held in a desired angular relation with respect to the vane.

The final attachment of the bracket 20 to the vane 15 is effected by a further blind riveting operation.

As shown in FIGS. 1 and 4, the head 39 of a rivet 40 is disposed against the outer face of the rail 15, the shank passing through a complementary aperture 41 formed in the rail and the registering aperture 42 formed in the bridge portion 28 of the U-shaped bracket. When the mandrel is set in the manner previously described and as well known in the art, the shank of the rivet is outwardly deflected, as shown at 43, FIG. 4, tightly clamping the bridge 28 against the under surface of the vane 15.

It will be readily recognized that the interengagement of the tabs 32, 33 and the slots 37, 38 prevents any angular relative movement between the blade and the vane, outward movement between the vane and the blade being prevented by the rivet 40.

It will be further understood that the lower surface 44 of the blade 17 (as viewed in FIG. 1) is held against the rail 16 by a further bracket 20 applied in the identical manner. While two blades have been shown as applied between the rails 15, 16, it will be understood that any number of blades may be secured in a single air turning assembly, depending upon the diagonal extent of the elbow portion 11 of the duct.

Since the two brackets 20 utilized to secure any given blade between the rails 15, 16 are preferably spaced apart, i.e. there is no metal-to-metal contact between the upper and lower brackets, it will be appreciated that the rails 15 and 16 are secured together solely through the agency of the fiber blades. Thus, when the rail 15 is secured to one wall of the duct and the rail 16 to the opposite wall of the duct, the air turn assembly provides a damping effect on vibrations generated within the duct system since, as noted, there is no metal-to-metal contact between the opposed walls in the area spanned by the air turning assembly.

While it is appreciated that other fastening means may be used to connect the legs 21, 23 and generate the desired compressive force, it is preferred to employ a blind rivet apparatus since no portion of the rivet shank will remain in the air stream.

There is shown in FIGS. 7 to 9 a second embodiment of bracket assembly for supporting the blades 17 to the rails. In accordance with this embodiment, a metal blank 50, FIG. 7, includes leg portions 51, 52, joined by a central bridging portion 53. When the leg 52 is folded about the fold line C and the leg 51 about the fold line D, the parts assume the U-shaped configuration shown in FIG. 7a. In this configuration, aperture 54 in the leg 52 is aligned with the aperture 55 in the leg 51 and tabs 56, 57 project upwardly from the leg 52.

The bracket of this embodiment is secured to the blade 17 by placing the legs 51, 52 against the opposed faces of the blade 17, rather than inserting one of the legs into the mass of the blade, as is the case with the previously described embodiment. The connection between the bracket and the blade is effected by passing a blind rivet 58 through the aligned apertures 54, 55, and causing the rivet to be set. In the setting procedure the compressive forces exerted against the legs 51, 52 cause an indentation of the fibrous blade material—see FIG. 9. As a result of such indentation, the metallic leg portions 51, 52 do not interfere with the aerodynamic configurations of the concave and convex faces of the blade.

As in the prior described embodiment, the bracket 50 carrying the blade 17 is secured to a rail member 15 by a further blind riveting operation. For this purpose, rivet 59 is passed through an aperture 60 in the rail which is disposed in registry with aperture 61 formed in the bridge portion 53 of the bracket. The rivet is set as shown in FIG. 9, tightly urging the portion 53 against the inner face of the rail 15.

The rail is provided at its marginal edges with spaced slots 62, 63, tabs 56, 57 being received within the slots. Thus, the interengagement of the tabs and slots prevents any angular relative movement between the bracket and the rail, the bracket being held against bodily movement relative to the rail by the rivet 59.

From the foregoing it will be appreciated that, in accordance with the above described invention, molded fiber glass blades are securely connected to blade holding rails without the use of adhesive or fastening elements which depend for their connection on the rigidity or structural strength of the blade material. When secured to the spaced parallel rails, it will be observed that there is no metal-to-metal contact linking the rails to each other. Accordingly, when one rail is secured to a first duct wall and a second rail to a second duct wall, the air turning assembly acts to damp vibration within the duct assembly.

Since the connection between the fibrous blades and the brackets is effected by a compression of the brackets against the material of the blades, there is no substantial danger of this connection loosening or deteriorating in use.

The operations of forming the brackets from the stamped-out blanks and connecting the brackets to the blades and rails may be readily carried out in the field, the sole equipment required to effect the connection being a blind riveting tool.

The rail segments may be severed from extended lengths of stock material provided with spaced-apart, stamped-out slots and apertures as shown, the operator in the field merely severing a desired length of punched-out stock and, through the use of tin shears, cutting the requisite configurations for fitting into the elbow.

As previously noted, individual blades may be cut from extended lengths of stock blade material, the nature of the fibrous blade material being such as to permit cutting by a regular hand saw.

From the foregoing it will be seen that there is provided a

functionally and structurally improved air turn assembly.

Having thus described the invention and illustrated its use, what is claimed as new and is desired to be secured by Letters Patent is:

1. In an air turning assembly comprising parallel spaced vane support rails with a plurality of fibrous vane members mounted between said rails, mounting means for said vanes comprising a metallic bracket member having spaced parallel leg portions and a back portion, an aperture in each said leg portion, the apertures of said legs being in registry with each other, said leg portions being positioned with respect to a vane to include a mass of vane material between said legs, connector means extending through said apertures and said included mass of said vane for compressing said mass between said legs, and fastener means for securing said back portion to said rail.

2. The device of claim 1 wherein said back portion and said rail include complemental locator seats and tabs, said seats and tabs being in registry in the mounted position of said bracket on said rail and preventing relative movement of said parts in the plane of said rail.

3. The device of claim 2 wherein said seats and extensions are laterally offset from said fastener means.

4. The device of claim 1 wherein one of said legs includes a sharpened point portion at its distal end, said one leg and point being inserted into the mass of said vane material.

5. The device of claim 4 wherein said connector means comprises a blind rivet, the formed end of said rivet being disposed adjacent the aperture in said one leg and concealed within the mass of said vane, the headed end of said rivet being engaged against said other leg of said bracket member.

6. An air turning assembly comprising a pair of spaced parallel vane support rails, a plurality of readily deformable, compressible, fibrous air turning vanes mounted between said rails, said vanes having a mounted bracket connected to each end, the brackets of each vane being fixed to a different rail, said brackets each including a pair of legs embracing a mass of said fibrous material, an aperture in each said leg, said apertures being coaxially located, and a compression fastener member spanning said legs and clamping and compressing said mass of material therebetween, thereby to indent said legs with respect to the air flow surfaces of said vanes.

7. An air turning assembly in accordance with claim 6 wherein said compression fastener member comprises a blind rivet.

8. An air turning assembly in accordance with claim 6 wherein said brackets and said rails include interfitting slot and tab means for locking said brackets against movement relative to said rails.

9. An air turn device in accordance with claim 6 wherein one of said legs includes a sharpened point portion, said one leg being inserted into the mass of said vane, said fastener means comprising a blind rivet having a formed end engaged against said one leg and a headed end engaged against the other leg of said bracket, said formed end being concealed within the mass of said vane.

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