

April 9, 1963

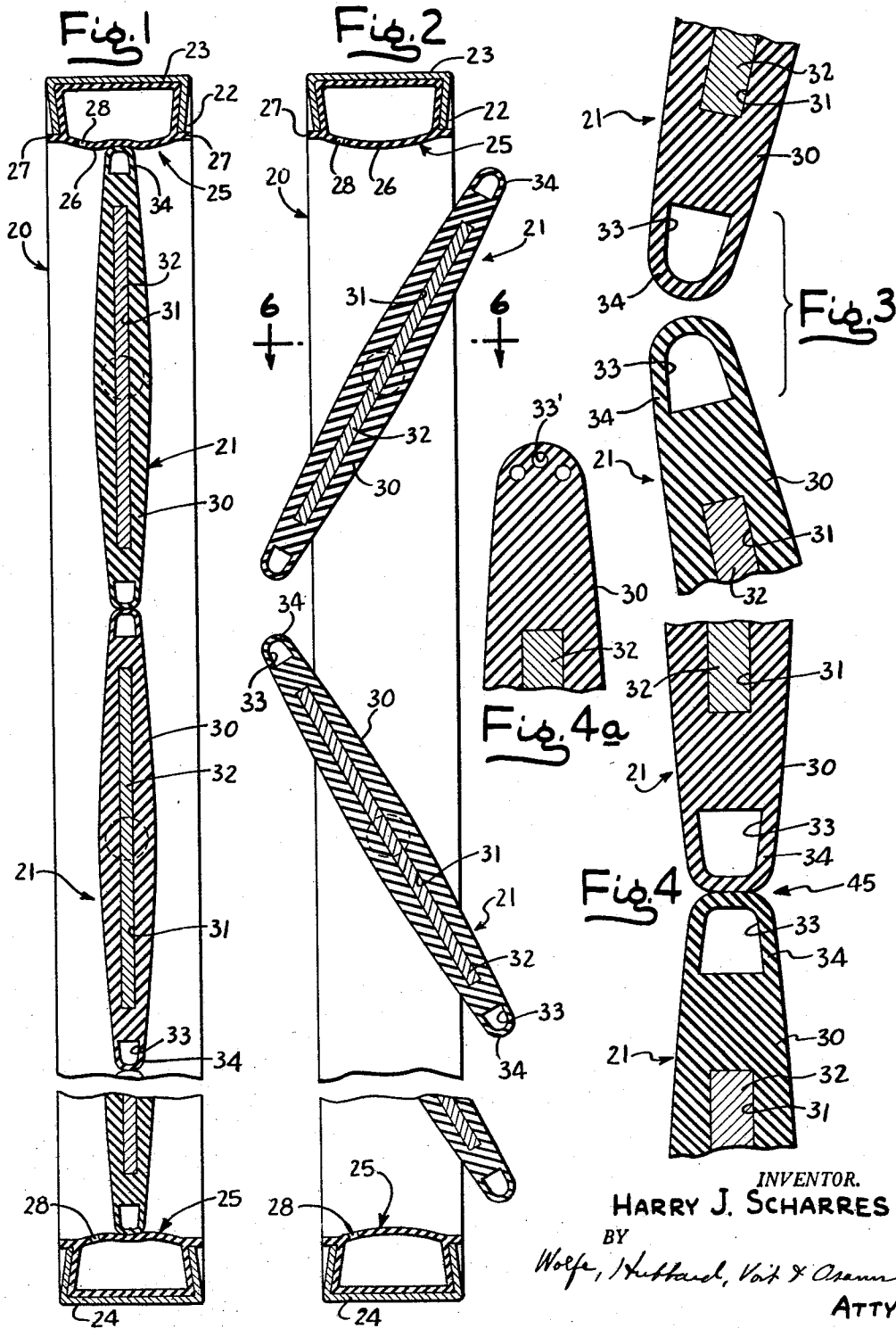
H. J. SCHARRES

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DAMPER ASSEMBLY AND BLADE CONSTRUCTION

Filed Dec. 31, 1959

3 Sheets-Sheet 1



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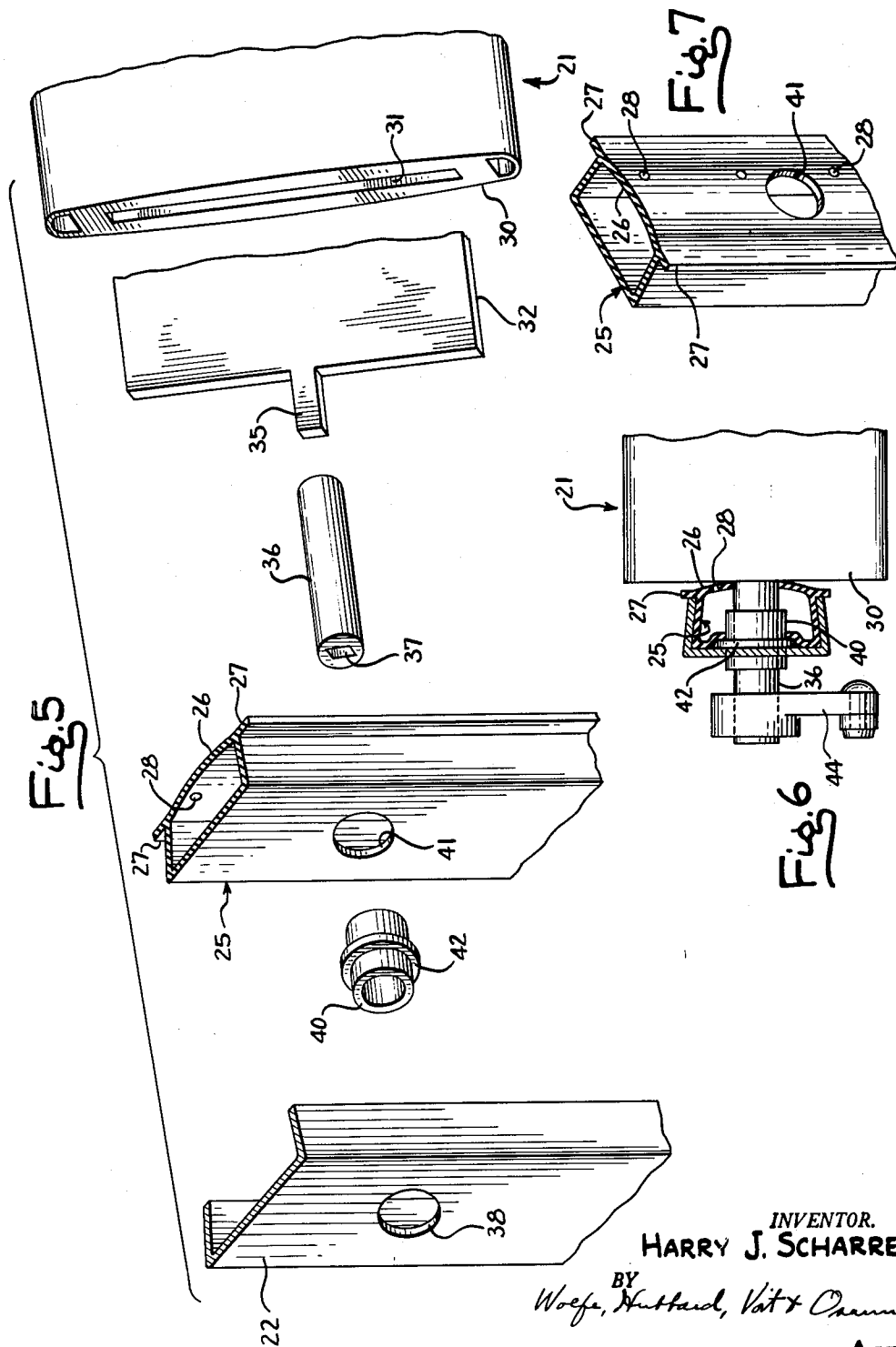
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Fig. 8

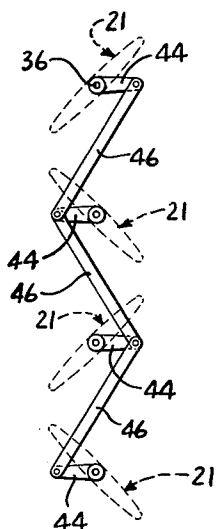


Fig. 9

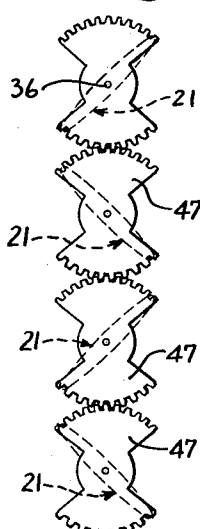


Fig. 10

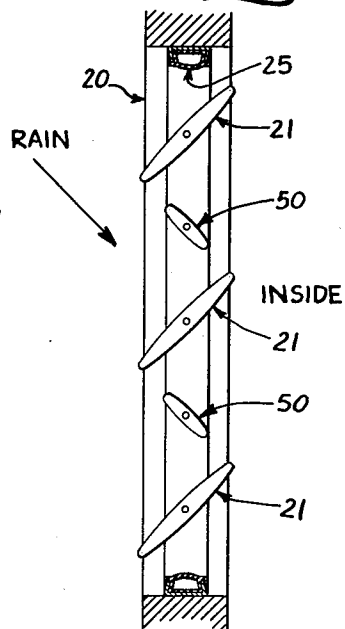


Fig. 11

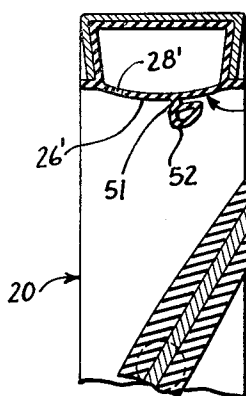


Fig. 12

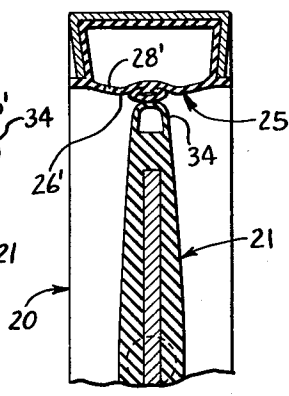
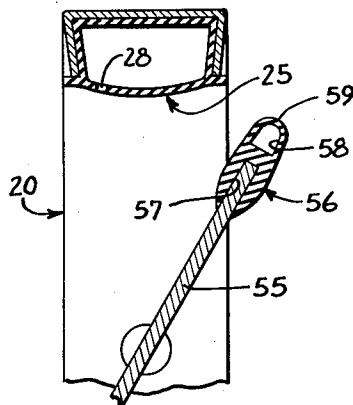


Fig. 13



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3,084,715
**DAMPER ASSEMBLY AND BLADE
CONSTRUCTION**

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The invention relates to improvements in dampers for controlling the flow of air or other gases.

One object of the invention is to provide an improved damper assembly which imposes a minimum resistance to air flow when opened and which is substantially free of leakage when closed.

Another object is to provide an improved damper blade embodying a novel edge construction which affords a substantially airtight seal between adjacent blades or between the end blade of a series and the adjacent frame structure when the blades are adjusted to a closed position.

Still another object is to provide a damper blade having a body portion adapted to be produced economically as an extruded strip of resilient material.

A further object is to provide an improved sealing strip for use in damper assemblies, particularly well adapted for blade assemblies of the above type and capable of cooperating with such blades to produce an effective substantially airtight seal when the blades are adjusted to closed position.

It is also an object of the invention to provide an efficient and dependable damper assembly that can be manufactured economically.

Other objects and advantages of the invention will become apparent from the following detailed description of the preferred embodiment and modifications illustrated in the accompanying drawings in which

FIGURE 1 is a vertical sectional view through a preferred form of damper assembly embodying the features of the invention, the damper blades being shown in closed position.

FIG. 2 is a sectional view similar to FIG. 1 showing the damper blades in partially open position.

FIG. 3 is a fragmentary sectional view on an enlarged scale showing the edges of adjacent blades as they approach a closed position.

FIG. 4 is a fragmentary sectional view similar to FIG. 3, showing the blade edges in fully closed position.

FIG. 4a is a fragmentary sectional view of the blade with a modified edge construction.

FIG. 5 is an exploded perspective view showing details of the frame structure, sealing strip and blade of the assembly illustrated in the preceding figures.

FIG. 6 is a fragmentary transverse sectional view through one side member of the damper assembly frame taken in a plane substantially on the line 6-6 of FIG. 2.

FIG. 7 is a fragmentary perspective view of a section of the improved sealing strip.

FIGS. 8 and 9 are diagrammatic views showing two forms of blade coupling linkage.

FIG. 10 is a vertical sectional view through a modified damper assembly.

FIGS. 11 and 12 are fragmentary sectional views of a modified form of the sealing strip and respectively showing the adjacent damper blade in open and closed positions.

FIG. 13 is a fragmentary sectional view of a modified form of the damper blade in which the resilient strip is confined to the blade edge.

While a preferred form and several modifications of the improved damper assembly and blade construction have been shown and will be described, it is not intended that the detailed character of the disclosure should limit the invention to such particulars. On the contrary, the intention is to cover all modifications and adaptations falling within the spirit and scope of the invention as more

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broadly or generally characterized in the appended claims.

For purposes of illustration the invention has been shown in FIGS. 1-6 as embodied in a damper assembly of the type suitable for use in air distribution, ventilating, pneumatic conveying and comparable systems where it is required to control the air flow through a duct or similar passage. In general, the assembly comprises a frame structure 20 adapted to be fitted in the duct and defining a generally rectangular opening. The frame supports a plurality of damper blades 21 to pivot about spaced parallel axes between open and closed positions. While the blades of the exemplary structure have been shown mounted to swing about horizontal pivots, it will be understood that they may be arranged with their pivots vertically disposed if desired. By reason of the novel features of construction provided by the invention, the improved damper assembly is particularly efficient in operation in that it imposes a minimum resistance to air flow when the blades are in open position and conversely it affords a substantially airtight seal across the frame opening when the blades are swung to closed position.

The frame structure indicated generally at 20 comprises spaced parallel side members 22 connected at their upper and lower end by top and bottom members 23 and 24. The frame members may be welded or otherwise secured together to form a rigid rectangular structure. The members 22, 23 and 24 are preferably channel-shaped in cross section and are assembled with the channels facing inwardly for the reception of sealing strips 25 of resilient material.

In accordance with one aspect of the invention the sealing strip 25 is in the form of a resilient hollow tube of generally rectangular cross section as shown in FIGS. 1, 2, 5 and 7. For use with the particular frame structure illustrated, the tubular sealing strip is dimensioned to fit snugly into the channel member. The side walls of the channel member may be inclined inwardly if desired to assist in retaining the strip in place. Preferably the side walls of the strip are dimensioned so that the face portion 26 is disposed inwardly at side edges of the frame member and the face portion is extended beyond the sides of the strip to define flanges 27 adapted to overlie the edges of the frame member.

The face portion 26 of the sealing strip is also formed so that it bows outwardly a sufficient amount to insure tight sealing engagement with the damper blades. When used in a duct conveying air under pressure the sealing action is augmented by providing openings 28 in the face portion 26 for the entry of pressurized air into the sealing strip. For this purpose the openings are located at the pressurized side of the area engaged by the damper blades when in closed position.

The sealing strip when constructed as above described is particularly efficient in effecting an airtight seal in cooperation with damper blades of the type contemplated by the invention. Moreover, its tubular construction requires a minimum material and enables it to be manufactured at relatively low cost by an extrusion process from rubber or other suitable rubberlike material.

While a damper assembly might utilize a single damper blade 21, it is contemplated that a plurality of blades will be required in most instances. Also, while in some instances, it might be desirable to couple the blades so that they all turn in the same direction at one time, they will usually be arranged in pairs and coupled so that adjacent blades turn in opposite directions. Exemplary means for coupling the blades are shown in FIGS. 8 and 9 and will be described hereinafter.

The damper blades 21 as shown are rectangular and are alike both in dimensions and construction. Each comprises a wide, relatively thin shell or body 30 of rubber or other resilient rubberlike material formed with

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a longitudinal wide, thin slotlike channel 31 for the accommodation of a stiffening member 32. Preferably the body 30 is slightly tapered from its central axis toward each side edge, or, in other words, the strip is formed with opposite side portions symmetrical and tapering gradually toward the side edges. The edges are preferably rounded so that the blade presents a streamlined contour imposing a minimum resistance to air flow edge-wise of the blade.

In addition to the central channel, the body 30 is formed with one or more channels 33 extending along and spaced inwardly from each side edge to define thin resilient walls 34 at the meeting edges of the blades. The single channel 33 shown adjacent each edge is generally thimble-shaped in cross section, although it will be appreciated that other shapes may be employed if desired. Alternatively, the edge portions of the blade may be formed with a plurality of relatively small channels 33' as shown in FIG. 4a. The primary consideration in providing the channels is to make the edge portion of the body relatively soft and resilient and readily deformable to effect a tight seal either with an adjacent blade or with a sealing strip such as the strip 25.

Blade bodies of the type provided by the invention may be manufactured economically in long strips by extruding the material in a plastic state through suitable dies. Individual pieces of the proper length are then cut from the strip to form the damper bodies. As indicated heretofore, the sealing strip 25 may also be manufactured by an extrusion process with individual side, top and bottom members being cut from a longer strip of the cross section shown.

The stiffening member 32 may be of any suitable material affording strength and rigidity. In the preferred form shown, the stiffening member comprises a metal stamping or bar stock of rectangular shape dimensioned to fit within the channel 31 of the resilient body 30. For pivotally supporting the damper blades, the stiffening member is formed with tangs 35 of rectangular cross section projecting at each end. For dampers that pivot about a longitudinal central axis, the tangs are aligned on the center line of the member as shown.

Fitted to each of the tangs 35 is a shaft 36 having an axial passage or socket 37 complementally shaped to receive the tang and effecting a nonrotatable connection between the shaft and the damper member. The shafts at opposite ends of the damper blade are journaled in bearings supported on the side members 22 of the frame structure which are apertured as at 38 for that purpose.

The bearings at opposite sides of the frame are alike, each comprising a tubular element or sleeve 40 of nylon, metal or other suitable material dimensioned to extend through aligned apertures 41 in the front and back walls of the sealing strip 25 and through the apertures 38 in the frame member. An integral flange or collar 42 intermediate the ends of the tubular element is adapted to overlie the inner face of the frame member and extend between the frame member and the inner wall of the sealing strip as shown in FIG. 6 whereby the bearing is retained in place in the assembly. The shaft 36 preferably projects beyond the outer face of the frame member sufficiently for attachment of the linkage for coupling it to an adjacent shutter blade. FIG. 6 shows a crank arm 44 fixed to the projecting end of the shaft 36, the crank arm constituting a part of the coupling linkage to be described later on.

In accordance with one aspect of the invention, the blades 21 are spaced with respect to the upper and lower frame members and with respect to each other in a manner which enables them to coact and effectively seal the opening through the frame structure when the blades are turned to a closed position. Thus, as shown in FIGS. 1-4, the pivots for adjacent blades are spaced apart slightly less than the width of the blade. Consequently, the adjacent edges of the blade engage as they approach

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a coplanar position and the resiliency of the blade edges permits them to be mutually deflected or compressed as indicated at 45 in FIG. 4 to effectively seal the junction between the blades. In the final movement of the blades to closed position the blade edges engage with a rolling action whereby wear is minimized and sealing engagement is insured.

Also, in accordance with the invention, the uppermost and lowermost blades of a series have their pivots spaced from top and bottom sealing strips 25 so that the blade edges engage and deflect the face portions of the sealing strips as shown in FIG. 2. The resilient blade bodies 30 are dimensioned lengthwise so that they engage and deflect the face portions 26 of the adjacent sealing strips as the blades work into closed position. As before mentioned, this sealing action may be augmented by the introduction of pressurized air into the sealing strips through the opening 28. Thus, a substantially airtight seal is effected around the entire periphery of the damper assembly, as well as between adjacent blades as the blades are swung into closed position shown in FIG. 1.

The damper blades 21 may be coupled together by any of the numerous well-known linkages available in the damper art. As indicated previously in damper assemblies utilized for controlling the flow of air or other gases through ducts, the blades are conventionally coupled so that the adjacent blades turn in opposite directions. A linkage suitable for turning the damper blades in the above manner as shown in FIG. 8 comprises a series of rigid links 46 connecting the free ends of the crank arms 44 which are fixed to the respective damper shafts as before explained. To obtain the opposite turning action, the crank arms of the adjacent dampers are arranged to project at opposite sides of the plane through the axis of the dampers. Accordingly, as one damper blade is turned clockwise, the adjacent blade will turn anticlockwise throughout the entire series of blades. The inherent error in compatible rotation in such a linkage can be compensated for by adjusting the linkage to assure almost perfect rolling action at the point of contact of the blades to complete closure.

The adjacent dampers of the assembly may also be coupled for turning in opposite directions by intermeshing gears 47 keyed or otherwise nonrotatably mounted on the damper shafts as shown in FIG. 9. As the damper blades are required to turn through arcs of only 90°, the side portions of the gears may be cut away to present opposed segments as shown. This results in a saving in material and a reduction in the weight of the linkage.

The improved damper blade construction may also be used to form the slats of jalouse structures such as that shown in FIG. 10. In such structures the full width blades 21 are preferably alternated with relatively narrow blades or slats 50. The blades may be coupled so that the wide blades when turned to open position slope downwardly and outwardly. The narrow blades, on the other hand, slope in the opposite direction but the wide blades overlap them effectively to prevent the entry of sun or rain while allowing air to enter freely. The narrow slats 50 which may be of the same construction as the slats 21 cooperate with the latter to seal the opening in the frame when the slats are turned to closed position. The frame 20 and the sealing strips 25 may be precisely like those described heretofore. In this variation the lever and linkage shown in FIG. 8 will have to be adjusted to provide a rolling action at the point of contact.

FIGS. 11 and 12 show a sealing strip 25' of modified construction designed to produce an especially effective seal along the upper or lower edges of adjacent damper blades. The modified sealing strip has a tubular body of rectangular cross section similar to the sealing strip previously described. In the modified strip the face portion 26' is formed with an integral outwardly projecting fin or rib 51 terminating in a beaded edge portion 52 herein shown as tubular. Preferably, the rib 51 is located paral-

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lel to and offset from the center line of the face portion at the side along which the damper moves as shown in FIG. 11. Accordingly, as the damper blade swings to closed position, its resilient edge 34 engages the bead 52 and rolls it back to the center of the sealing strip as shown in FIG. 12. Due to its tubular construction the bead 52 is resilient and accordingly may be substantially flattened while the resilient blade is compressed or deflected so that a tight seal between the parts is insured.

The effective sealing action provided by the improved blade edge construction contemplated by the invention may be realized without constructing the entire blade body of resilient material. Thus, as shown in FIG. 13, a stiffening member 55 similar in construction to the member 32 may serve as the body of the blade while a relatively narrow strip 56 of resilient material affixed to the edges of the member cooperates with the sealing strip 25 or with the edges of adjacent blades to effect the sealing action. The strip 56 as shown is generally oval in cross section, although its shape may vary, depending on the overall width. A narrow slot 57 opening in one edge of the strip is adapted to accommodate the edge of the body member 55. The slot is preferably dimensioned so that the strip is enabled to grip the body member firmly and it may, of course, be cemented to the body member if desired.

The opposite edge of the strip 56 is formed similarly to the edge of the strip 30—that is, it is formed with a longitudinal channel 58 positioned to define a resilient wall 59 at the edge of the strip. Deflection of this thin wall when engaged with the sealing strip 25 or with the edge of an adjacent blade provides an effective substantially airtight seal. Moreover, it eliminates the need for accurately finishing the edges of the strip 30 or holding it to precise dimensions.

When the edge strip 56 is used the blade body member 55 may be made of transparent material instead of metal or other opaque material if desired. Thus, the body member may be made of transparent plastic sheeting or glass. In such cases, the strip 56 may also be made of transparent or translucent material, thus making the structure suitable for use as a closure for doors, windows or other openings through which it is desired to maintain visibility or light transmission.

It will be apparent from the foregoing that the invention provides a novel damper assembly and blade construction presenting distinctive advantages in efficient operation as well as low manufacturing costs. In particular, the invention provides a damper blade and sealing strip symmetrically shaped to permit essential components to be produced by a simple extrusion process at relatively low cost. Furthermore, the improved damper assembly utilizing the improved blade and sealing strip construction is highly efficient in operation as it imposes a minimum resistance to air flow when open and provides a substantially airtight seal when closed.

I claim as my invention:

1. A damper assembly comprising, in combination, a generally rectangular frame including side, top and bottom members of channel shape cross section secured together with the channels facing inwardly, a sealing strip of resilient material supported in each frame member, a plurality of damper blades supported at opposite ends on the side members of the frame for limited rotative movement about axes extending longitudinally and substantially centrally of the blades, each of said blades comprising an elongated generally flat body of resilient material having a thin relatively wide longitudinal channel extending substantially centrally through the body and other channels extending longitudinally of the body adjacent its opposite edges to define thin flexible edge portions, a sheet metal plate disposed in said central channel operative to impart substantial stiffness to the blade, tangs rigid with each end of said plate projecting beyond the respective ends of the body, a shaft nonrotatably coupled to each tang, bearing members supported on the side

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members of the frame for rotatably receiving said shafts, said bearing members being positioned so that the upper edge of the uppermost blade and the lower edge of the lowermost blade engage the sealing strips of the top and bottom frame members and compress them sufficiently to produce an airtight seal when the blades are turned to a closed position, the bearings on the respective side members also being spaced from each other so that the edges of adjacent blades meet with a rolling action as the blades are turned to closed position, and said blade bodies being dimensioned longitudinally so as to frictionally engage the sealing strips of the side members when the blades are in closed position.

2. A damper assembly comprising, in combination, a series of generally rectangular blades each having a pivot axis extending longitudinally substantially centrally of the blade, means supporting said blades to swing about their respective pivots into a common plane, each of said blades including an elongated generally rectangular strip of resilient material having a wide, relatively thin axially extending channel, a rigid stiffening member disposed in said channel, said strip having additional channels disposed parallel to and spaced from opposite edges of said axial channel to define relatively thin walls along the edges of the blades, said blades being spaced apart so that the edges of adjacent blades engage and are mutually deflected from their normal positions as the blades are rotated about their pivots into said closed position.

3. A damper assembly comprising, in combination, a frame defining a rectangular opening, a series of damper blades pivotally supported on said frame to swing between open and closed position, said blades having resilient edge portions, a linkage connecting said blades operative to turn adjacent blades in opposite directions, the pivot axes of said blades being spaced apart less than the width of a blade so that the edges meet with a rolling action and are mutually deflected toward their axes as the blades move into closed position.

4. A sealing strip for damper assemblies comprising, in combination, an elongated tubular member of resilient material having a generally rectangular cross section, an integral outwardly projecting rib extending longitudinally along the outer face presented by one side of the member, and a tubular bead integral with said rib extending along the outer edge of the rib, said rib being offset laterally from the center line of said one side of the member and having sufficient flexibility to permit said bead to be rolled back to said center line.

5. A sealing strip for damper assemblies comprising, in combination, an elongated tubular member of resilient material having a generally rectangular cross section, one longitudinal wall of said member having an integral element substantially centrally of said wall presenting a curved outer face and forming with said wall a substantially thickened region extending longitudinally of the member, said element being hinged by the thin wall sections of said wall laterally of said element.

6. A sealing strip for damper assemblies having a frame member and a damper blade mounted adjacent said frame member, said frame member having a groove with mutually inclined side walls for receipt of said sealing strip, said sealing strip comprising an elongated tubular member of resilient material having a trapezoidal cross section, said tubular member having sides and lateral flanges carried by said sides for engagement with the edges of said groove side walls to anchor the strip in such groove against movement, said member having a face portion comprising substantially a continuation of said flanges and joining the latter and formed so as to bow outwardly for engagement with said adjacently mounted damper blade.

7. A damper assembly as set forth in claim 3 wherein each of said damper blades includes an elongated body pivotally supported on said frame, and longitudinally ex-

tending resilient means carried at the edges of said body and having longitudinal channels to define thin flexible edge portions.

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