

- [54] **CONTROL DAMPER CONSTRUCTION**
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- [73] Assignee: **Ruskin Manufacturing Company**, Grandview, Mo.
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Related U.S. Application Data

- [62] Division of Ser. No. 86,697, Nov. 4, 1970, Pat. No. 3,718,081.
- [52] **U.S. Cl.**..... **248/300, 248/14**
- [51] **Int. Cl.**..... **F16m 11/04**
- [58] **Field of Search**..... **248/300, 222, 174, 14; 52/241; 287/20.92 C, 20.92 D, 20.92 Y**

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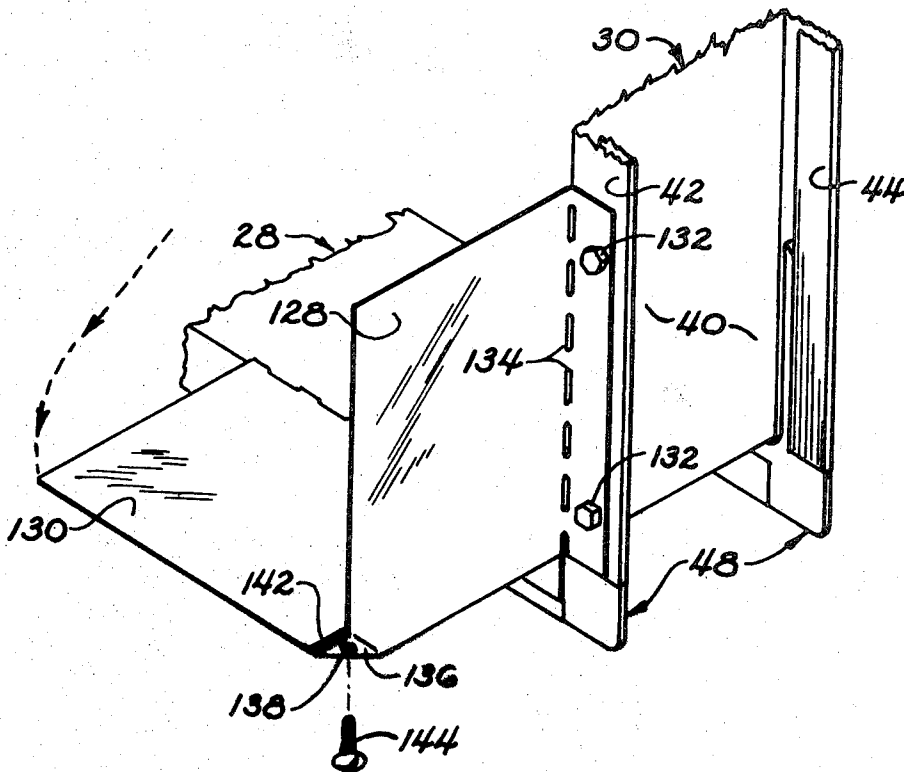
[57] **ABSTRACT**

A foldable motor mount adapted to be secured to a supporting framework is provided. First and second

initially flat planar members are disposed parallel to the longitudinal plane of the framework. Each planar member has a line of weakness presented by a plurality of voids disposed in linear alignment and interrupted by a plurality of integral strength-inducing portions of the member. Each member is bendable along its line of weakness to present complementary interengageable bracket sections when they are moved into perpendicular relationship to the frame. Each member is provided with a tab which extends outwardly to engage the corresponding tab on the other member. The two tabs are secured together by appropriate coupling means to complete the motor mount. The frame is provided with heavy, relatively rigid corner braces which provide added strength to the frame structure. The frame sections are rigidly secured to the braces by deforming a portion of the relative malleable frame section material into appropriate cavities in the corner braces.

Directional control of the damper vane is achieved through a reversible link which is coupled with an arm rigid with one of the axle members and also with an actuating lever. A motor mounting bracket for supporting a prime mover for the actuating lever is provided by a pair of planar members, each of which is secured to the damper frame in a flat disposition and each of which is provided with a line of weakness to allow bending of the planar members into two perpendicular bracket sections which have interengaging tab projections.

2 Claims, 15 Drawing Figures



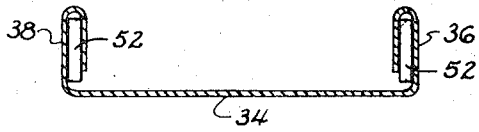


Fig. 2

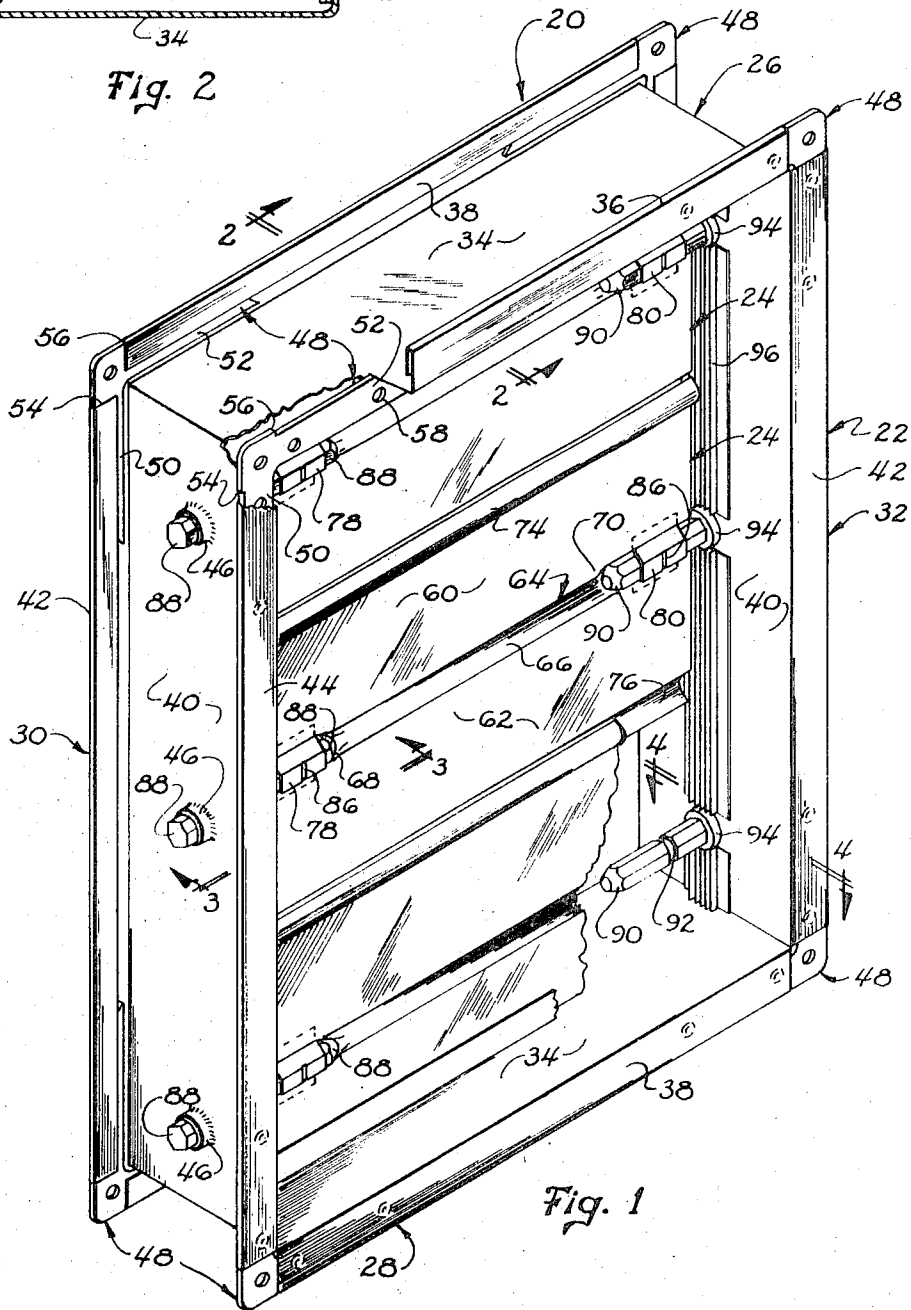
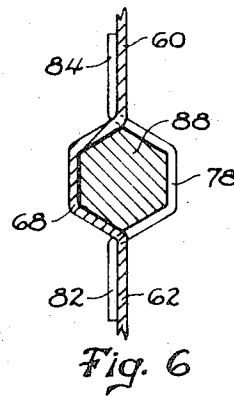
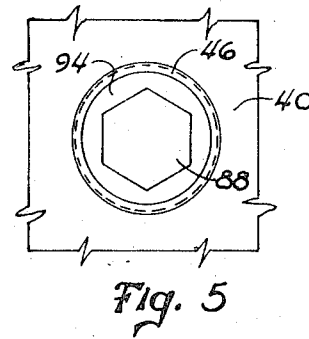
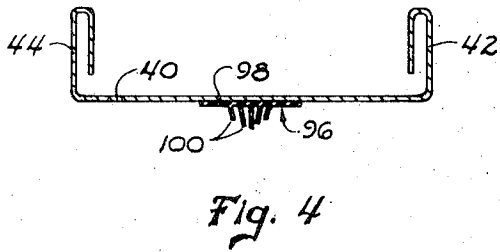
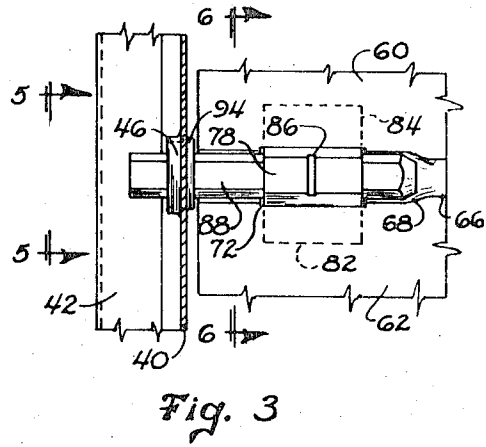
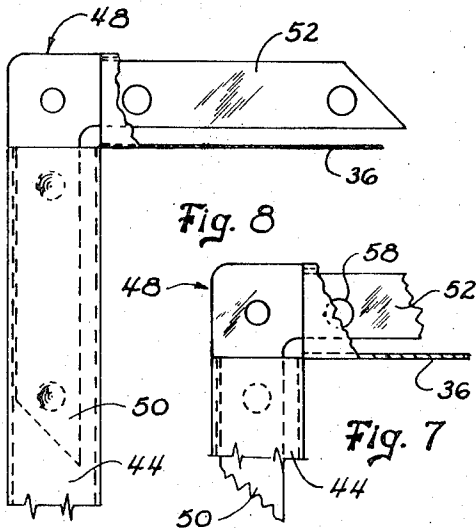


Fig. 1



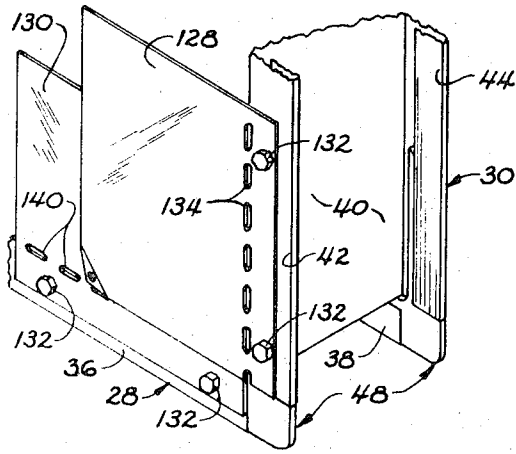


Fig. 13

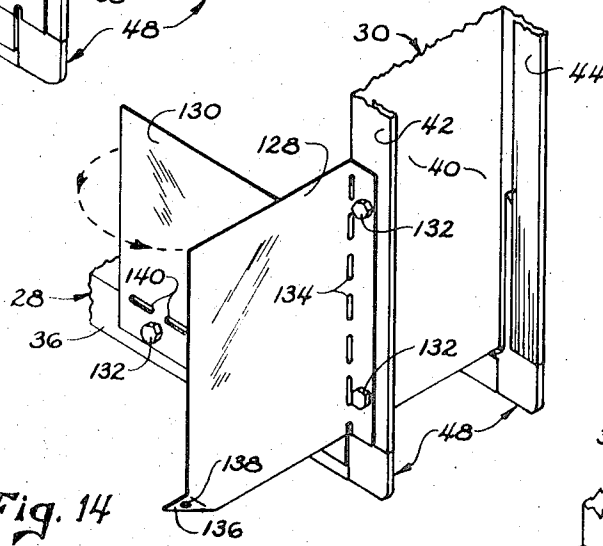


Fig. 14

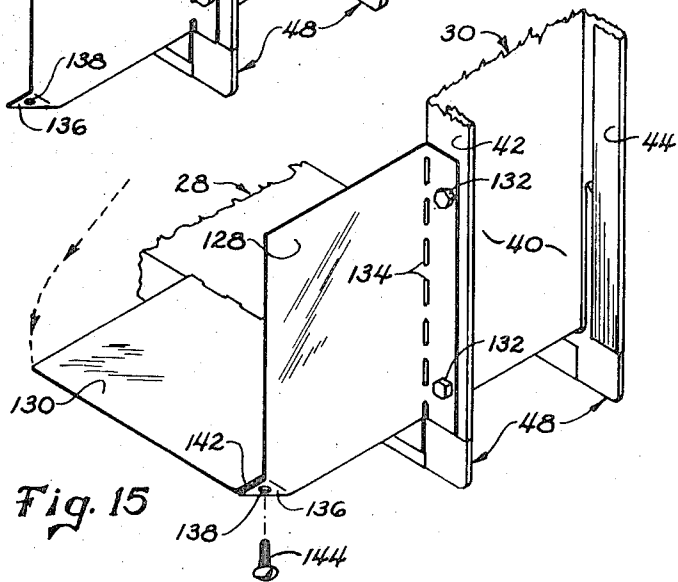


Fig. 15

CONTROL DAMPER CONSTRUCTION

This is a division of application Ser. No. 86,697, filed Nov. 4, 1970 now U.S. Pat. No. 3,718,081.

This invention relates to fluid control apparatus and, more particularly, to a damper for controlling air flow in a building.

Control dampers have gained widespread useage in recent years in building construction because of the need to maintain accurate pressure control while providing adequate ventilation. Since it is contemplated that the control damper will have a useful life approaching that of the building itself, it is desirable to construct the damper in a manner which will permit removal and replacement of parts should this become necessary. On the other hand, it is absolutely essential that the damper be constructed in a sound and sturdy manner so that it does not make disturbing noises after prolonged use.

It has heretofore been found that it is desirable to secure the components of the damper frame by a "staking operation" where two malleable materials are forced into interengagement. An inherent disadvantage of securing components by staking them together is that both components must be malleable to the same degree in order for the staking operation to be successful. Thus, while it would frequently be advantageous to utilize heavier, relatively rigid reinforcing components on a damper frame, this has not been possible without resorting to other types of fasteners such as screws and bolts which have a much greater tendency to loosen and rattle than does two staked metal components.

Another problem previously encountered in control damper construction has been the need to provide mechanism for reversing the direction of rotation of the damper vanes to meet the varying requirements of a ventilation system.

It is, therefore, an object of the present invention to provide a control damper wherein the component parts are rigidly held in place without the use of bolts, screws, rivets or other fastening means which could loosen and rattle.

Another important object of the invention is a control damper which is constructed with relatively thick, rigid reinforcing members which are secured to the lighter-weight frame sections without the use of screws, bolts or rivets.

As a corollary to the above object, an aim of this invention is to provide relatively rigid reinforcing members at each of the corners of the damper frame wherein each member has a plurality of cavities therein for receiving a quantity of the material of the lighter-weight frame sections to effect rigid interconnection of the members and the sections.

A further object of the invention is a damper frame wherein a portion of the frame is formed into an integral outturned collar which presents a bearing surface for receiving the axles which support the damper vane.

An important aim of the present invention is also to provide a damper vane which is mounted on the damper frame by a pair of axle members which are held rigid with the frame by a pair of brackets which are placed in tension when the axle members are in place, but wherein the members are removable to allow replacement and repair of the vane.

Still another aim of the invention is a control damper wherein a damper vane is rotatable between opened

and closed positions and wherein the direction of rotation of the damper vane is controlled by a reversible link coupled with an actuating lever.

Still another object of the invention is a motor mounting bracket for a control damper wherein the bracket is presented by a pair of planar members which are secured to the damper frame in a flat disposition and wherein each member has a line of weakness to allow it to be bent to present a bracket section which is perpendicular to the damper frame.

In the drawing:

FIG. 1 is a perspective view of a control damper constructed according to the teachings of the present invention;

FIG. 2 is an enlarged cross-sectional view taken along line 2—2 of FIG. 1 and illustrating the manner in which the relatively rigid corner braces are received by the side sections of the damper frame;

FIG. 3 is an enlarged cross-sectional view taken along line 3—3 of FIG. 1 and illustrating the manner in which the damper vane is secured to an axle member at one end and the axle member mounted on the damper frame;

FIG. 4 is an enlarged cross-sectional view taken along line 4—4 of FIG. 1 with the axle member which is visible in the latter figure and its associated bearing being removed for purposes of illustration;

FIG. 5 is an enlarged cross-sectional view taken along line 5—5 of FIG. 3;

FIG. 6 is an enlarged cross-sectional view taken along line 6—6 of FIG. 3;

FIG. 7 is an enlarged front elevational view of one corner of the damper frame with the rigid reinforcing brace received by two adjacent frame sections as the assembly would appear prior to the frame sections being deformed into the cavities of the reinforcing brace;

FIG. 8 is an enlarged front elevational view similar to FIG. 7 as the damper frame would appear after a portion of one of the frame sections has been deformed into the underlying cavities of the reinforcing brace;

FIG. 9 is a perspective view of the structure for controlling the direction of rotation of the damper vane and illustrating in phantom the alternative positions of the arm, link and lever which comprise the direction control structure;

FIG. 10 is an enlarged cross-sectional view taken along line 10—10 of FIG. 9 and illustrating the relationship of the damper axle and the transverse arm of the control structure;

FIG. 11 is an enlarged cross-sectional view taken along line 11—11 of FIG. 9 and illustrating the manner in which the actuating lever of the control structure is pivotally mounted upon the damper frame;

FIG. 12 is a perspective view, similar to FIG. 9, with the link of the control structure having been reversed on the transverse arm to effect rotation of the associated damper vane in the opposite direction to that achieved with the apparatus in the position illustrated in FIG. 9;

FIG. 13 is a perspective view showing the motor support in its collapsed or folded state;

FIG. 14 is a perspective view showing the motor support with one element positioned in operating position; and

FIG. 15 is a perspective view showing the complete motor support in its operating position.

Referring initially to FIG. 1, wherein the control damper is designated generally by the numeral 20, it is seen that the damper 20 is comprised of a damper frame which defines a fluid control opening and is designated generally by the numeral 22; and a plurality of damper vanes 24. The damper frame 22 is of a rectangular configuration and includes a pair of opposed end frame sections 26 and 28 and a pair of opposed side frame sections 30 and 32. Each of the sections 26, 28, 30 and 32 is constructed from a relatively light-weight malleable material. As best illustrated in FIG. 2, each of the end sections 26 and 28 is formed with a central planar bight 34 which is integral with a pair of channel-defining sections 36 and 38 at each side of the bight 34. The channel-defining sections 36 and 38 extend longitudinally over the entire length of the bight 34.

Each of the side frame sections 30 and 32 is identical and includes a generally parallel longitudinally extending bight portion 40 which is integral with a pair of opposed channel-defining sections 42 and 44. The bight portions 40 provide a pair of planar support surfaces as will be explained hereinafter. Each of the sections 30 and 32 is also provided with a plurality of integral, out-turned, aperture-defining collars 46. The collars 46 are preferably formed by punching out a portion of the bight portions 40. At the corners of each two adjacent frame sections a pair of relatively thick, rigid brace members 48 are disposed as illustrated in FIG. 1. Each of the members 48 has a pair of legs 50 and 52 with the legs 50 of the members 48 disposed at the upper left-hand corner in FIG. 1, being telescoped within the channels presented by sections 42 and 44 while the legs 52 are telescoped within the channels presented by sections 36 and 38. Each of the members 48 is provided with a pair of shoulders 54 and 56 which extend outwardly from the respective legs 50 and 52 into abutting relationship with the terminal ends of the sections 36, 38, 42 and 44 (FIG. 7). A plurality of cavities 58 which may be through-bores are provided in each leg 50 and 52 of each of the members 48. After the members 48 are disposed with their legs 50 and 52 telescoped within the respective channels of the frame sections so as to underlie a portion of the latter, a quantity of the material which comprises each of the sections 26, 28, 30 and 32 is deformed into the underlying cavities 58 of the members 48. This is best illustrated in FIG. 8 of the drawings. The deformation of the sections 26-32 into the cavities of the members 48 is preferably accomplished by a pressure punch which actually "cold flows" the section material into the cavities. It is important that each of the members 48 be characterized by a greater resistance to deformation than the sections 28-32 and for this reason the members 48 are constructed from a relatively thick, rigid material as is best illustrated in FIG. 2.

Each of the vanes 24 is provided with opposed outwardly extending blade portions 60 and 62 which are joined by a centrally disposed axle portion 64. The axle portion 64 includes a longitudinally extending transversely arcuate intermediate channel-defining section 66 which separates first and second transversely polygonal and channel sections 68 and 70. Each of the channel sections 68 and 70 extends on either side of a vane opening 72. The terminal edges 74 and 76 of the blade portions 60 and 62 respectively are curved to present complimentary sealing lips for engagement with the corresponding lip of an adjacent vane 24.

A pair of retainer components 78 and 80 are inserted through the openings 72 in each of the vanes 24 from the side of the latter opposite the channels presented by sections 66, 68 and 70, with the components 78 and 80 being disposed in bridging relationship to the channels 68 and 70. As best illustrated in FIG. 6, each of the components 78 and 80 is provided with a pair of wings 82 and 84 which provide bearing surfaces for engagement with the side of the vane 24 which is opposite the channel 68. The bridging portion of each of the retainer components 78 and 80 is transversely polygonal and is provided with an inwardly projecting central detent 86.

A pair of identical axle members 88 and 90 which are also transversely polygonal are received within the channel sections 68 and 70 beneath the components 78 and 80. The axle members 88 and 90 are of a size such that a certain amount of force is required to insert them axially within the channel sections 68 and 70 and when received within these sections the members 88 and 90 place the retainer components 78 and 80 under tension with the bearing surfaces of the wings 82 and 84 engaging the blade portions 60 and 62 of the vane 24 (as clearly illustrated in FIG. 6). Each of the axle members 88 and 90 is provided with a centrally disposed circum-scribing groove 92 as clearly illustrated in the lower righthand corner of FIG. 1 for receiving the detent 86 of a corresponding retainer component 78 or 80. Each axle member 90 extends on either side of an internally polygonal, externally circular bushing 94 disposed upon the exposed end of each of the axle members 88 and 90, and the axle members 88 and 90 are in turn inserted into the appropriate apertures presented by collars 46 as best illustrated in FIGS. 3 and 5. The bushing 94 is preferably constructed from a synthetic resin material such as Cycloid to assure a low friction surface for contact with the bearing surfaces presented by each of the collars 46.

The interior surfaces of the bight portions 40 which, together with the bight sections 34 define the outer periphery of the opening presented by the frame 22, are provided with a discontinuous sealing strip 96 for effecting a seal between the edges of the vanes 24 and the frame 22. The configuration of the sealing strip 96 is illustrated in FIG. 4 wherein it is seen that a longitudinally extending base section 98 is provided with a plurality of outwardly projecting longitudinal flanges 100. The sealing strip 96 is preferably constructed from a yieldable synthetic resin material to reduce the tolerance requirements between the ends of the vanes 24 and the frame 22 while still assuring a satisfactory seal.

The structure for controlling the direction of rotation of one of the vanes 24 will now be described with reference to FIGS. 9-12 of the drawings. The structure will be described in the position shown in FIG. 9. The uppermost axle member 90 is provided with a rigid transverse arm 102 which projects from opposite sides of the axle 90. The arm 102 is provided with a pair of openings 104 (FIG. 12) at opposite ends, one of the openings 104 receiving a pivotal coupling 106 which in turn pivotally mounts a link 108 on the arm. The link 108 is, in turn, pivotally coupled with an actuating lever 110 which is pivotally mounted upon the frame section 32 by a nut and bolt assembly 112. A pivotal coupling 114 joins the lever 110 with the link 108. The other opening

in the arm 102 receives a coupling 116 which pivotally mounts a connecting bar 118 on the arm 102.

The next adjacent axle 90 which is immediately below the uppermost axle 90 is provided with a rigid mounting plate 120 which extends to one side of the axle 90 and has a pair of openings 122 the lowermost of which receives a coupling 124 to pivotally mount a second link 126 which is also pivotally coupled with the bar 118.

The actuating lever 110 is coupled with an appropriate size prime mover (not shown) and when the lever 110 is moved downwardly into the position shown in phantom in FIG. 9, the axle 90 and its associated vane 24 are rotated in a clockwise direction into the position illustrated in phantom. This clockwise rotation of the axle 90 and the arm 102 results in a downward movement of the bar 118 which, in turn, exerts a pulling force on the plate 120 through the link 126 to effect rotation of the lower axle 90 and its associated vane 24 in a counter-clockwise direction. Thus, the two adjacent vanes 24 which are associated with the two axle members 90 visible in FIG. 9 are both rotated in a clockwise direction when it is desirable to open the damper 20 to allow for the passage of air thereto.

In the alternative arrangement illustrated in FIG. 12, the link 108 is reversed and secured to the end of the coupling 116. In this manner, when the lever 110 is moved downwardly, the uppermost axle 90 and its associated vane 24 are rotated in a counter-clockwise direction with the axle 90, the arm 102, and the link 108 assuming the positions illustrated in phantom in FIG. 12. Under these circumstances, the lower axle 90 and the plate 120 rigid therewith are rotated in a counter-clockwise direction as the bar 118 is shifted upwardly upon rotation of the arm 102. Thus, the vanes 24 which are rigid with the upper and lower axle members 90 are rotated in opposite directions when it is desirable to open the damper 20 to allow the passage of air therethrough. It is to be noted that the two openings 122 in the plate 120 allow for an adjustment of the effective length of the link 126 depending upon the direction the plate 120 and its associated axle member 90 are to be rotated.

In order to provide a readily accessible mounting bracket for the previously mentioned prime mover which operates the actuating lever 110, a pair of planar members 128 and 130 are each secured at one of their edges to the frame 22 by a plurality of bolts 132 in the manner illustrated in FIG. 13. The planar member 128 is provided with a vertically extending line of weakness 134 formed by a plurality of voids interrupted by a plurality of integral member portions, one of the latter between each adjacent pair of voids. This line of weakness is adjacent the edge of the member secured by the bolts 132. At the opposite edge of the member 128 a tab projection 136 having a centrally disposed aperture 138 extends from the planar surface 128 at an oblique angle. The member 130 is provided with a horizontally extending line of weakness 140 which is adjacent the edge of the member secured by the bolts 132. The member 130 is also provided with a tab projection 142 (FIG. 15) which has a centrally disposed aperture disposed for alignment with the aperture 138. In order to effect substantial savings in packaging the freight, the members 128 and 130 are shipped to a customer in the disposition shown in FIG. 13. When the damper 20 is installed, the member 128 is bent along the line of

weakness 134 to present a first bracket section which is perpendicular to the frame 22 as illustrated in FIG. 14. The member 130 is then bent along the line of weakness 140 to present a second bracket section which is perpendicular to the frame 22 and also perpendicular to the first-mentioned bracket section as illustrated in FIG. 15. With the members 128 and 130 bent into the positions illustrated in FIG. 15, the aperture 138 in the tab 136 is disposed in alignment with the corresponding aperture in the tab 142 thus allowing a coupling means such as a screw 144 to be inserted into the aligned apertures to complete the assembly of the mounting bracket.

When the damper 20 is installed in a building for air control purposes, the opening presented by the frame 22 is selectively opened and closed by rotation of the vanes 24 as required to maintain a desired flow of air or air pressure within the building. Because of the use of the rigid corner brace members 48, the frame 22 is especially strong and is not subject to disrupting noises because of the manner in which the frame sections are secured to the members 48. Similarly, the vanes 24 are precluded from vibrating against the axle members 88 and 90 because of the detents 86 which preclude relative longitudinal movement and the tension exerted upon the retainer components 78 and 80. In addition, since it is necessary to provide the transversely polygonal channel sections 68 and 70 only over a portion of the length of each vane 24, substantial savings in fabrication costs result. Finally, there is no tendency for the axle members 88 and 90 to rattle within the frame 22 because the bearing surfaces for the axle members are provided by the collars 46 which are an integral part of the bight sections 40.

It will also be appreciated that the present invention contemplates a method of rigidly joining a malleable material with a substance having a greater resistance to deformation than said material which includes the steps of forming a cavity in the substance, placing the substance into underlying relationship with the material, and then flowing the material into the cavity.

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

1. A mounting bracket adapted to be secured to a supporting framework, said bracket comprising:
 - a first planar member adapted to be secured to said framework at one edge of said member;
 - said member being characterized by a plurality of voids disposed in linear alignment and interrupted by a plurality of integral portions of said member disposed between adjacent voids;
 - said member being bendable along the line presented by said voids to present a first bracket section perpendicular to said frame and supported by said integral portions;
 - said member having a tab extending from the planar surface of the member
 - a second planar member adapted to be secured to said framework at one edge of said second member;
 - said second member being characterized by a plurality of voids disposed in linear alignment and interrupted by a plurality of integral portions of said second member disposed between adjacent voids;

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said second member being bendable along the line presented by said voids to present a second bracket section perpendicular to said frame and supported by said integral portions;

said second member having a tab extending from the planar surface of the member and disposed for complementary engagement with the tab of the first member when said members are bent to present said bracket sections; and

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coupling means engageable with said tabs of the first and second members when the members are bent to present said bracket sections for holding the latter in rigid interrelationship.

2. The invention of claim 1, each of said tabs being provided with an opening therein and wherein said coupling means comprises nut and bolt means disposed through said openings.

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