Sept. 25, 1962 L. C. PELLEGRINI 3,055,284

DAMPERS

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FIG. 1

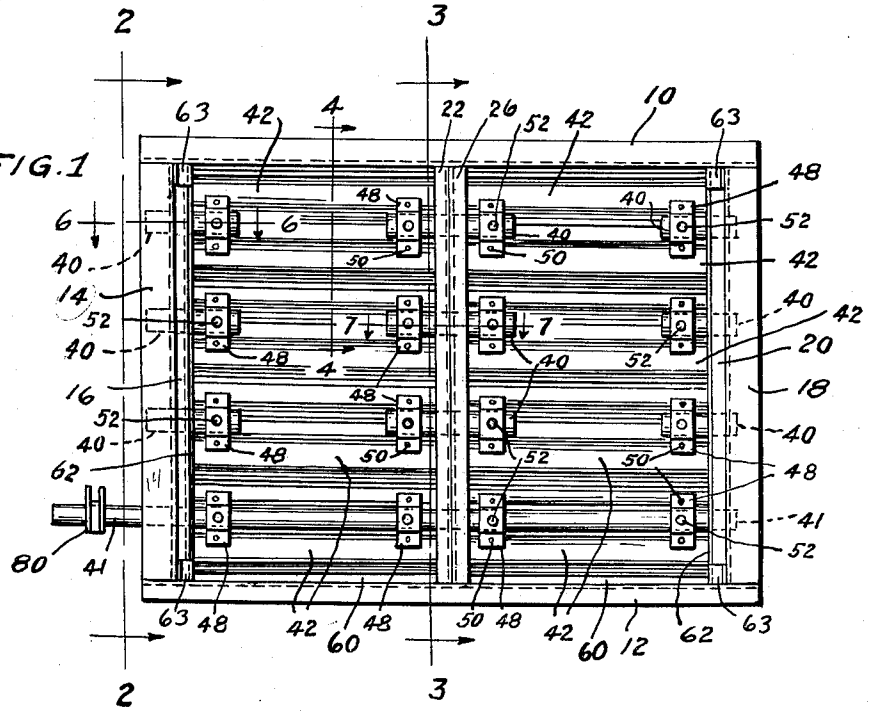


FIG. 2

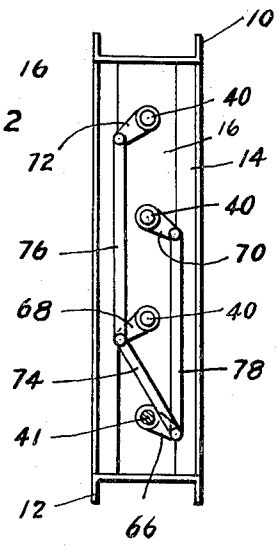
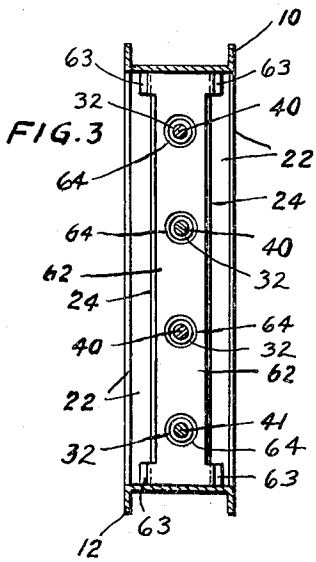


FIG. 3



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FIG. 4

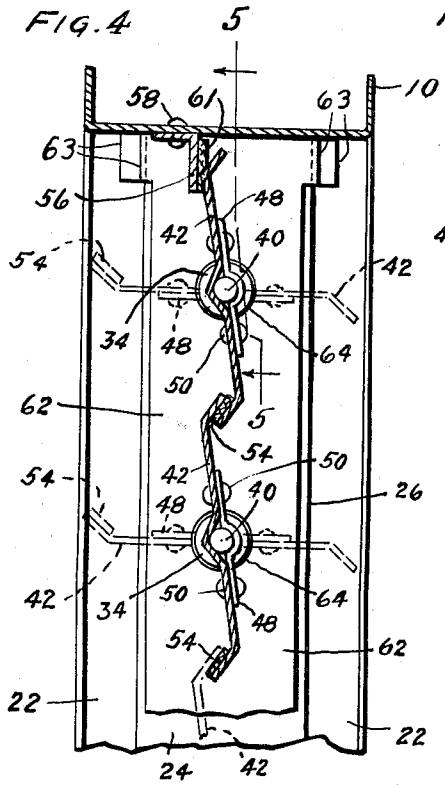


FIG. 5

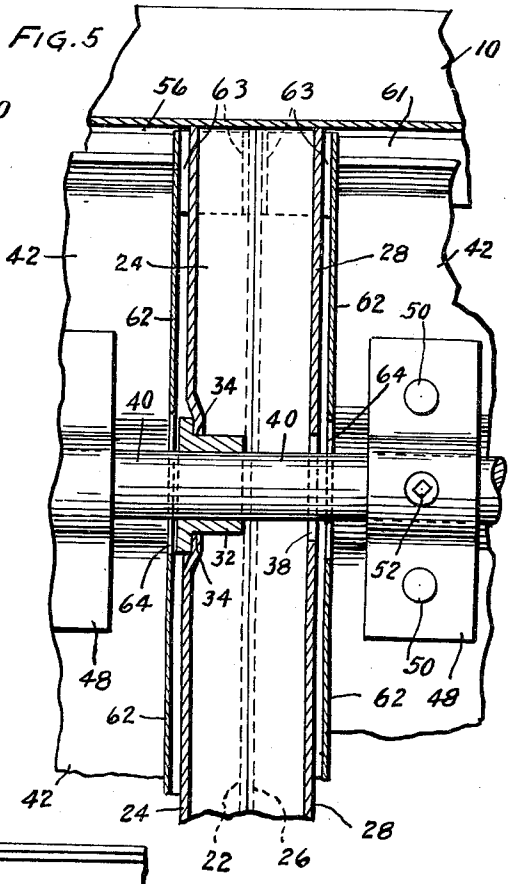


FIG. 6

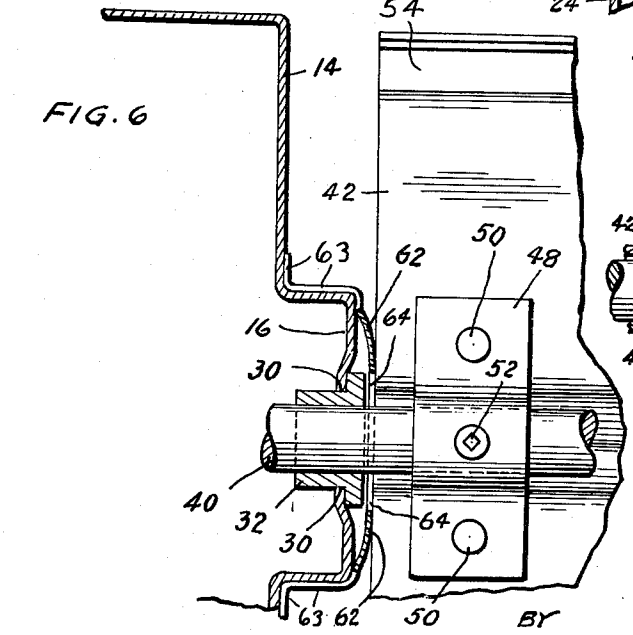
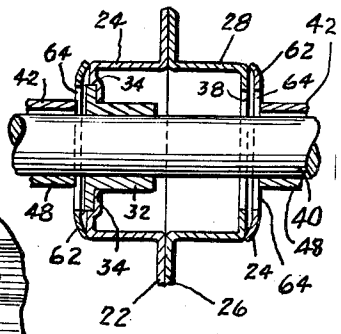


FIG. 7



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DAMPERS

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2 Claims. (Cl. 98—110)

This invention relates relates to improvements in dampers. More particularly, this invention relates to improvements in dampers which can prevent the passage of air through them when they are closed.

It is therefore an object of the present invention to provide an improved damper which can prevent the passage of air through it when it is closed.

In the heating and ventilating field, it is frequently desirable to mount dampers adjacent heat-exchanging surfaces and to use those dampers to permit or prevent the flow of air over those heat-exchanging surfaces. For example, in heating and ventilating installations where a heating coil and a cooling coil are disposed adjacent each other and are interposed between a blower and a duct that receives heated or cooled air, respectively, from those coils, it is desirable to dispose dampers adjacent those coils to control the flow of air through those coils. The damper adjacent the heating coil will be closed and the damper adjacent the cooling coil will be opened whenever cool air is desired in the duct; and, conversely, the damper adjacent the heating coil will be opened and the damper adjacent the cooling coil will be closed whenever warm air is desired in the duct. If those heating and ventilating installations are intended to operate with low air velocities and pressures, leakage of air through the closed dampers can be tolerated, but if those installations are intended to operate with high air velocities and pressures, leakage of air through the closed dampers cannot be tolerated. Consequently, it would be desirable to have a damper that could prevent the passage of air through it even though that damper is used in a heating and ventilating installation that is operated with high air velocities and pressures. The present invention provides such a damper; and it is therefore an object of the present invention to provide a damper that can prevent the passage of air through it even though that damper is used in a heating and ventilating installation that is operated with high air velocities and pressures.

The damper provided by the present invention is enabled to prevent the passage of air through it when it is closed because the vanes of that damper are sealed to each other and to the frame of the damper whenever those vanes are in closed position. Yieldable strips are secured to the elongated edges of the vanes of the damper, and the adjacent elongated edges of adjacent vanes of the damper will coact to compress those yieldable strips whenever those vanes are in closed position. In doing so, those yieldable strips preclude the passage of air between those adjacent elongated edges of those adjacent vanes. Yieldable strips are also interposed between the elongated edges of the endmost vanes of the damper and the frame angles of the damper, and those yieldable strips preclude the passage of air between those endmost vanes and those frame angles whenever those vanes are in closed position. In addition, sealing members bridge the spaces between the frame of the damper and the ends of the vanes of the damper, and those sealing members preclude the passage of air between that frame and those ends of the vanes whenever those vanes are in closed position. The yieldable strips and the sealing members thus coact with the frame and vanes of the damper to prevent the passage of air through that damper when the vanes are closed. It is therefore an object of the present invention to provide a damper wherein yieldable strips seal the elongated edges of the vanes and wherein sealing members bridge the spaces between the frame of the damper and the ends of the vanes.

To assure a full and positive seal between the elongated edges of adjacent vanes, the present invention bends those edges so they coact with the central areas of those vanes to subtend obtuse dihedral angles. Because of those bends, any air that tended to leak between the adjacent elongated edges of adjacent vanes of the damper would not only have to leak past the sealing strips but would also have to change direction twice. The overall result is that substantially no leakage occurs between the adjacent elongated edges of adjacent vanes of the damper. The bent edges of the vanes make it desirable to rotate alternate vanes of the damper in opposite directions; and yet it is important to provide a simple linkage to effect rotation of all of the vanes of the damper. It is therefore an object of the present invention to provide a simple linkage that effects opposite rotation of the alternate vanes of a damper.

Other and further objects and advantages of the present invention should become apparent from an examination of the drawing and accompanying description.

In the drawing and accompanying description a preferred embodiment of the present invention is shown and described but it is to be understood that the drawing and accompanying description are for the purpose of illustration only and do not limit the invention and that the invention will be defined by the appended claims.

In the drawing:

FIG. 1 is a front elevational view of one form of damper that is made in accordance with the principles and teachings of the present invention,

FIG. 2 is a sectional end view of the damper of FIG. 1, and it is taken along the plane indicated by the line 2—2 in FIG. 1,

FIG. 3 is a vertical section through the damper of FIG. 1, and it is taken along the plane indicated by the line 3—3 in FIG. 1,

FIG. 4 is a vertical section, on an enlarged scale, through the damper of FIG. 1, and it is taken along the plane indicated by the line 4—4 in FIG. 1,

FIG. 5 is a vertical section on a still larger scale, through the damper of FIG. 1, and it is taken along the plane indicated by the line 5—5 in FIG. 4,

FIG. 6 is a horizontal section, on the scale of FIG. 3, through the damper of FIG. 1, and it is taken along the plane indicated by the line 6—6 in FIG. 1, and it shows the vanes in open position, and

FIG. 7 is a part of a section on a smaller scale, through the damper of FIG. 1, and it is taken along the plane indicated by the line 7—7 in FIG. 1.

Referring to the drawing in detail, the numeral 10 denotes a channel which constitutes the top of the frame for a damper which is made in accordance with the principles and teachings of the present invention. A channel 12 constitutes the bottom of that frame; and the channels 10 and 12 are the same size and they are in vertical registry. However, the flanges of the channel 10 project upwardly whereas the flanges of the channel 12 project downwardly.

The left-hand end of the frame for the damper is closed by a channel-like formed member 14 which has an offset 16. The cross section of the channel-like formed member 14 is shown particularly by FIG. 6. The flanges of the channel-like formed member 14 project to the left from the web of that member, whereas the offset 16 of that member projects to the right from that web. The right-hand end of the frame, of the damper provided by the present invention, is closed by a channel-like formed member 18 which has an offset 20. The channel-like formed member 18 is identical to the channel-like formed

member 14, but it has its flanges extending to the right whereas the flanges of the channel-like formed member 14 extend to the left. Also, the offset 20 of the channel-like formed member 18 extends to the left whereas the offset 16 of the channel-like formed member 14 extends to the right.

The channels 10 and 12 are reinforced intermediate their lengths by a shallow, channel-like formed member 22 and by a shallow, channel-like formed member 26. The channel-like formed member 22 has an offset 24, and the channel-like formed member 26 has an offset 28. The configurations of the channel-like formed members 22 and 26 are best shown by FIG. 7. It will be noted that the offset and flanges of the channel-like member 22 extend to the left whereas the offset and flanges of the channel-like formed member 26 extend to the right. The channel-like formed members 14, 18, 22 and 26 coact with the channels 10 and 12 to provide a rigid and sturdy frame for the damper.

A plurality of vertically alined openings are formed in the offset 16 of the channel-like formed member 14. In the particular embodiment shown, there are four openings 30; and those openings define a vertical line intermediate the vertical edges of the offset 16. Similar openings are provided in the offset 20 of the channel-like formed member 18; and the openings in the offset 20 are in register with the openings 30 in the offset 16. Openings 34 are provided in the offset 24 of the channel-like formed member 22, and openings 38 are provided in the offset 28 of the channel-like formed member 26. The openings 34 and 38 in the offsets of channel-like formed members 22 and 26 are in register with the openings in the offsets 16 and 20 of the channel-like formed members 14 and 18, respectively.

Shouldered bushings 32 are pressed into the openings 30 in the offset 16 of the channel-like formed member 14, into the openings 34 of the offset 24 of the channel-like formed member 22, and into the openings in the offset 20 of the channel-like formed member 18. However, no shouldered bushings are pressed into the openings 38 in the offset 28 of the channel-like formed member 26. As indicated particularly by FIGS. 5 and 6, the webs of the offsets 24 and 16 are dented-in slightly adjacent the shoulders of the shouldered bushings 32 to minimize the extent to which those shoulders project outwardly beyond the faces of those offsets. Similar denting-in of the web of offset 20 of channel-like formed member 18 is also provided.

The shouldered bushings 32, in the three uppermost openings in the webs of offsets 16, 24 and 20, accommodate and rotatably support short pivots 40. Those pivots are short lengths of round rod, and they rotate freely relative to those shouldered bushings. The shouldered bushings, in the lowermost openings in the webs of offsets 16, 24 and 20, accommodate an elongated pivot 41. That pivot is a long section of round rod, and it rotates freely relative to those shouldered bushings. The short pivots 40 that are supported by the shouldered bushings in the openings 34 in the web of offset 24 also project through the three uppermost openings 38 in the offset 28. Similarly, the elongated pivot 41 projects through the lowermost opening 38 of offset 28.

The numeral 42 denotes vanes which are generally rectangular in elevation. The elongated edges of those vanes are bent at forty five degrees to the central areas of those vanes; and, as indicated particularly by FIG. 4, the upper edges of those vanes are bent to the right whereas the lower edges of those vanes are bent to the left. This arrangement forces any air that tends to leak between the adjacent elongated edges of adjacent vanes to change direction twice, and hence it helps resist such leakage.

Each of the vanes 42 is provided with a V-shaped bend adjacent the longitudinally-extending center-line thereof, and those V-shaped bends accommodate the short pivots 40 and the elongated pivot 41. As a result, the planes of the vanes 42 substantially pass through the axes of the pivots 40 and 41.

The numeral 48 denotes securing plates and those securing plates have transversely-extending concave recesses adjacent the centers thereof. Those recesses accommodate those faces, of the pivots 40 and 41, which are abutted by the plates 48 when the V-shaped bends of the vanes 42 abut the opposite faces of those pivots. The vanes 42 and the plates 48 have openings therethrough which are in register with each other; and those registered openings accommodate fasteners 50, like rivets, which permanently secure the plates 48 to the vanes 42. Set screws 52 extend through threaded openings in the plates 48 and lock the vanes to the pivots 40 and 41.

The numeral 54 denotes elongated strips of yieldable sealing material which are carried by the lower edges of the three uppermost vanes 42. The lowermost vane 42, could, if desired, have its lower edge equipped with a yieldable strip 54; but, in the particular embodiment shown, such a strip is not provided. Instead, a yieldable sealing strip 60 is mounted on an angle, not shown, which is secured to, and projects upwardly from, the web of the channel 12. Fasteners, not shown, are used to secure that angle to that web. Similarly, a yieldable sealing strip 61 is secured to an angle 56 that is secured to, and projects downwardly from, the web of the channel 10. The angle 56 is secured to that channel by fasteners 58, as shown particularly by FIG. 4.

When the vanes 42 are in the positions shown by FIGS. 1 and 4, the adjacent elongated edges of the adjacent vanes are sealed by the yieldable strips 54. The upper elongated edge of the uppermost vane 42 is sealed to the frame by the yieldable sealing strip 61, and the lower edge of the lowermost vane 42 is sealed to the frame by the yieldable sealing strip 60. In this way, air is kept from passing between the adjacent elongated edges of adjacent vanes and is kept from passing between the elongated edges of the vanes and the frame.

To facilitate rotation of the vanes 42 relative to the channel-like formed members 14, 18, 22 and 26, a small space or gap must be provided between the ends of these vanes and the webs of the offsets of these channel-like formed members. These spaces or gaps must be bridged if the damper provided by the present invention is to be capable of substantially preventing the leakage of air through it when it is closed. These spaces or gaps are bridged by elongated, thin, flexible members 62; and these members are preferably formed of resilient material. Steel, silicon copper, tempered copper, brass, Phosphor bronze and other materials can be used in making the members 62. These members are formed to have a truly arcuate cross section, but they can assume the somewhat flattened arcuate cross section shown by FIGS. 6 and 7.

Ears 63 are formed on the members 62; and those ears are normally spaced apart distances less than the widths of the offsets on the channel-like formed members 14, 18, 22 and 26. However, those ears can be spread apart to telescope along, and to resiliently engage, the sides of those offsets. The restoring forces within those ears help maintain the elongated members 62 in assembled relation with the offsets of the channel-like formed members 14, 18, 22 and 26.

Holes 64 are provided in the members 62; and those holes are larger than, but are in register with, the pivots 40 and 41. The flexible members 62 are mounted with their concave faces confronting the webs of the offsets of the channel-like formed members 14, 18, 22 and 26; and, as a result, the convex faces of the elongated flexible members confront and engage the ends of the vanes 42. The engagement between the opposite ends of the vanes 42 and the convex faces of the sealing members 62 is such that those convex faces are, in part, flattened, as shown particularly by FIGS. 6 and 7. The flattening in

FIG. 7 is more pronounced than is the flattening in FIG. 6, because the central portions of the convex faces of the elongated members **62** are forced closer to the webs of the offsets of the channel-like formed members **14**, **18**, **22** and **26** as the vanes **42** are rotated from the open position of FIG. 6 to the closed position of FIG. 7. This further flattening of the central portions of the convex faces of the members **62** is due to the fact that the openings **64** in those members define shallow arcuate notches in those convex faces as those members are viewed along their elongated edges, and because the vanes **42** will be in register with the deepest portions of those notches whenever those vanes are in open position. The central portions of the faces of the elongated members **62** will bow outwardly as far from the webs of the offsets of the channel-like members **14**, **18**, **22** and **26** as the ends of the vanes **42** will permit; and hence those central portions will bow further outwardly when those vanes are in register with the deepest portions of the notches defined by the openings **64**, as when the vanes **42** are open, than they will bow when those vanes are at the edges of those notches, as when the vanes **42** are closed. The overall result is that the central portions of the faces of the elongated members **62** move relative to the frame as the vanes **62** move, and those central portions will resiliently abut and provide seals with the ends of those vanes whenever those vanes are in closed position.

When the vanes **42** are in closed position, as shown particularly by FIG. 5, the convex faces of the elongated flexible members **62** will resiliently abut, and form a sealing engagement with, the opposite ends of the vanes **42**. The flexible members **62** are narrower than the webs of the offsets of the channel-like formed members **14**, **18**, **22** and **26**, and hence the elongated edges of those flexible members will abut those webs and form seals therewith. Hence, substantially no air can leak past the opposite ends of the vanes **42**. The resilient nature of the flexible members **62** permits the vanes **42** to rotate freely relative to those members, and yet enables those members to substantially prevent the passage of air between themselves and the vanes **42**. The convex configuration of the elongated members **62** is helpful in keeping the vanes **42** from jamming or binding against the members **62** as those vanes rotate into closed position.

The numeral **66** denotes a crank arm which is fixedly secured to one end of the elongated pivot **41**. A similar crank arm **68** is secured to the outer end of the lowermost pivot **50** which is adjacent the left-hand end of the damper frame, a crank arm **70** is secured to the outer end of the second lowermost pivot **40** which is adjacent the left-hand end of the damper frame, and a crank arm **72** is secured to the outer end of the uppermost pivot **40** which is adjacent the left-hand end of the damper frame. A connecting rod **74** extends between the outer ends of crank arm **66** and of crank arm **68**. As shown particularly by FIG. 2, the crank arm **66** extends to the right of the vertical line defined by the axes of pivots **40** and **41** whereas the crank arm **68** extends to the left of that line. Consequently, rotation of the crank arm **66** in the counter clockwise direction in FIG. 2 will cause clockwise rotation of the crank arm **68**. This is desirable because it causes the lowermost vane **42** to rotate in a direction which is opposite to the direction of rotation of the second-lowermost vane. In addition, the counter clockwise rotation of the crank arm **66** will cause the connecting rod **74** to rotate in the counter clockwise direction at the beginning of its rotation, and it will cause that connecting rod to rotate in the clockwise direction at the end of its rotation.

A connecting rod **78** extends from the outermost end of the crank arm **66** to the outermost end of the crank arm **70**. This connecting rod causes the crank arms **66** and **70** to rotate in unison and to rotate between the same angular positions. A connecting rod **76** extends between the outer end of the crank arm **68** and the outer end of the crank arm **72**. That connecting rod connects the crank arms **68** and **72** for conjoint rotation and holds those crank arms for rotation through the same angles. As a result, rotation of the crank arm **66** in the counter clockwise direction will cause counter clockwise rotation of the crank arm **70**, and will simultaneously cause clockwise rotation of the crank arms **68** and **72**. The overall result is that adjacent vanes rotate in opposite directions. An operating crank arm **80** is secured to the pivot **41**, and that operating crank arm will be suitably rotated to effect opening and closing of the damper.

Whereas the drawing and accompanying description have shown and described a preferred embodiment of the present invention, it should be apaprent to those skilled in the art that various changes may be made in the form of the invention without affecting the scope thereof.

What I claim is:

1. In a damper that has a frame, a plurality of pivots that are rotatably supported by said frame, a plurality of damper vanes that are supported by and that rotate with said pivots, said damper vanes extending outwardly beyond opposite sides of said pivots, said damper vanes being selectively rotatable into and out of and between open position and closed position, said damper vanes having the opposite ends thereof spaced from said frame, sealing members that are disposed adjacent said opposite ends of said damper vanes and that are adapted to abut said opposite ends of said damper vanes whenever said damper vanes are in closed position, said sealing members being elongated, resilient, metal strips that are arcuate in cross section and that have spaced openings therein for receiving said pivots, each of said strips having both of its elongated edges abutting said frame and thereby substantially preventing the passage of air between said frame and said strips, the arcuate faces of said strips being yieldably movable relative to said frame and yieldably engaging said opposite ends of said damper vanes whenever said damper vanes are in closed position to substantially prevent the passage of air between said frame and said opposite ends of said damper vanes whenever said damper vanes are in closed position, said sealing members projecting inwardly and outwardly, respectively, of the inner and outer faces of said damper vanes whenever said damper vanes are in closed position and engaging substantially all portions of said opposite ends of said damper vanes whenever said damper vanes are in closed position, and sealing strips that are interposed between the adjacent elongated edges of said damper vanes to substantially prevent the passage of air between those elongated edges whenever said damper vanes are in closed position.

2. In a damper that has a frame, a plurality of pivots that are supported by said frame, a plurality of damper vanes that are supported by said pivots, said damper vanes extending outwardly beyond opposite sides of said pivots, said damper vanes being rotatable into and out of and between open position and closed position, said damper vanes having the opposite ends thereof spaced from said frame, and sealing members that are disposed adjacent said opposite ends of said damper vanes whenever said damper vanes are in closed position, said sealing members being elongated resilient strips that are arcuate transversely of said strips and that have the elongated edges thereof abutting said frame to provide inner seals and outer seals with said frame and thereby substantially prevent the passage of air between said frame and said strips, said strips having spaced openings therein for receiving said pivots, the arcuate surfaces of said strips being biased into engagement with said opposite ends of said damper vanes whenever said damper vanes are in closed position to substantially prevent the passage of air between said frame and said opposite ends of said damper vanes whenever said damper vanes are in closed position, said sealing members projecting inwardly and outwardly, respectively, of the inner and outer faces of said damper vanes whenever said damper vanes are in

closed position and engaging substantially all portions of said opposite ends of said damper vanes whenever said damper vanes are in closed position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,137,426	Thompson	Nov. 22, 1938
2,142,616	Otto	Jan. 3, 1939
2,331,758	Barnett	Oct. 12, 1943
2,394,059	Hite	Feb. 5, 1946
2,863,374	Hinden	Dec. 9, 1958
2,884,848	Perlin	May 5, 1959
2,997,939	Snyder et al.	Aug. 29, 1961

FOREIGN PATENTS

464,409	Italy	July 2, 1951