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3,456,574

LOUVER ASSEMBLY AND CONTROL MEANS

Filed Oct. 11, 1967

2 Sheets-Sheet 1

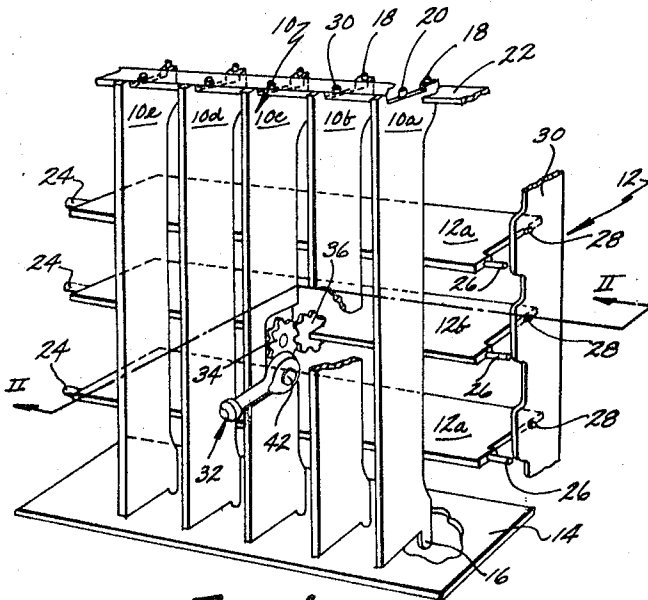


FIG. 1.

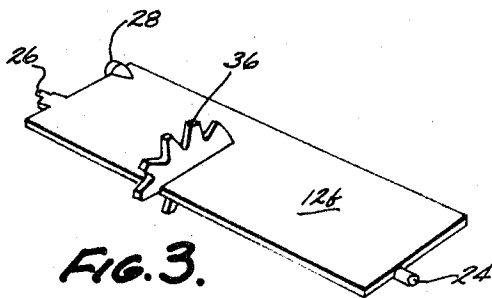


FIG. 3.

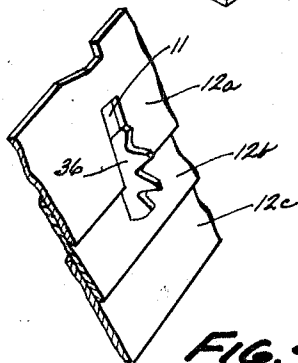


FIG. 4.

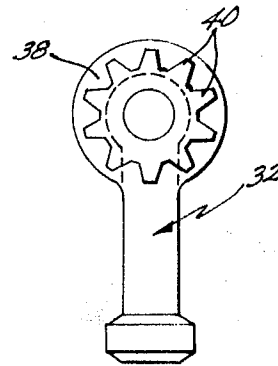


FIG. 6.

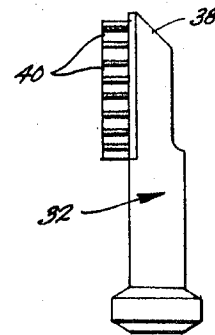


FIG. 5.

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2 Sheets-Sheet 2

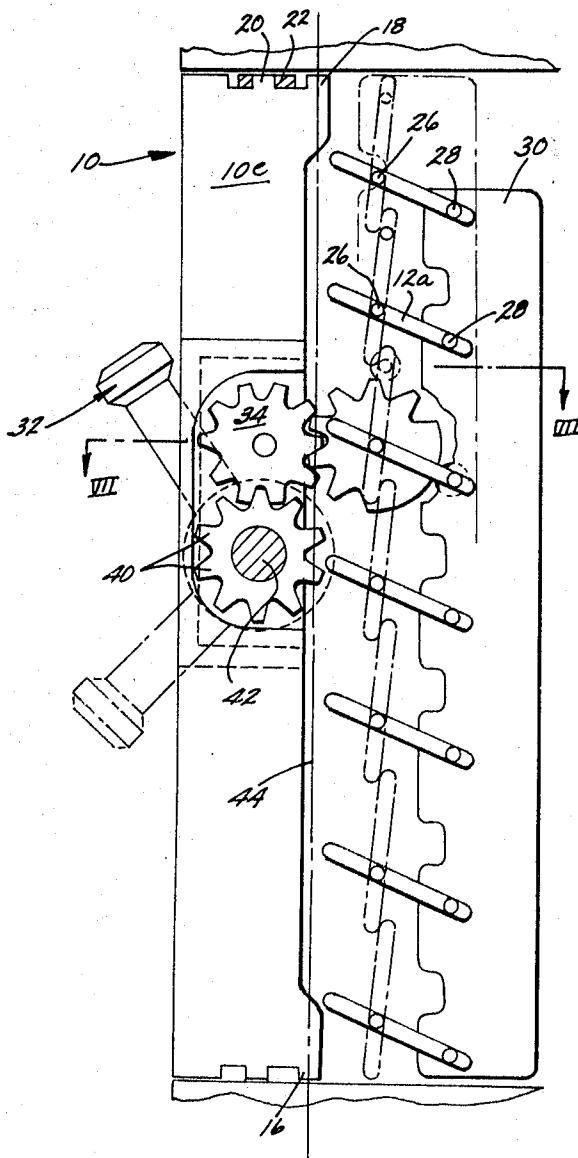


FIG. 2.

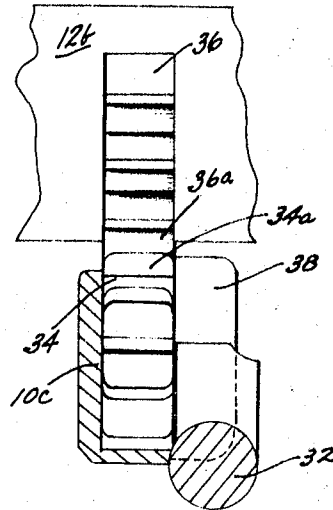


FIG. 7.

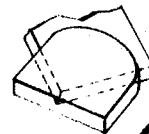


FIG. 8

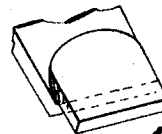


FIG. 9

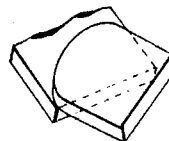


FIG. 10

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LOUVER ASSEMBLY AND CONTROL MEANS
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12 Claims

ABSTRACT OF THE DISCLOSURE

A louver assembly of the type having ganged sets of both horizontal and vertical louver vanes or slats, in which each such set is longitudinally pivotal to change the direction of air passing through the assembly, and which has a single operating handle or lever for pivoting either or both such sets of vanes, wherein the operating handle is secured to one of the sets of vanes and pivots the same longitudinally when the handle is swung, and wherein the operating handle may be pivoted with respect to the aforesaid first set of vanes and when so pivoted operates to turn a gear train having a gear element attached to the second set of vanes, to thereby longitudinally pivot the latter.

BACKGROUND

Louver assemblies having longitudinally pivotal blades or vanes have been in use for a considerable length of time in connection with ducted and other air-transferring systems, particularly ventilating and heating systems. Initially, louvers with a single set of vanes arranged generally parallel to each other were provided, some or all of the vanes of which were longitudinally pivotal to change the direction of air flowing through the assembly. Subsequently, a second set of louver vanes was provided arranged immediately before or behind the first such set and generally perpendicular thereto, and various control systems were utilized by which some or all of the vanes in either set could be adjusted by longitudinal pivoting movement.

More recently, the increasing popularity of home and automotive air-conditioning systems has greatly accentuated the need for a two-way (i.e., two sets of mutually perpendicular louver vanes) louver assembly which is readily and simply controllable, preferably by a single operating lever or other such member, to direct air in any desired direction, whether upwardly, downwardly, or to one side or the other, or any combination of such movements. The present invention provides such a louver assembly, based on a unique and novel gearing arrangement, in conjunction with the design of the pivotal louver vanes themselves. The structure provides extreme ease and simplicity of operation over an extremely wide range of adjustability; yet, the structure of the invention itself is relatively simple in nature, lending itself readily to production requirements and at the same time not being subject to operational difficulties or malfunction.

SUMMARY

The louver assembly of the invention has ganged sets of horizontal and vertical (i.e., mutually perpendicular) vanes which are each pivotal about a longitudinal axis by manipulation of a single operating or control member. In accordance with the invention, the control member is attached directly to one of the louvers in the first such ganged set thereof, so that by swinging the control member in either of two directions the said first set of louvers may be similarly swung or pivoted; also, the control member is arranged to operate a gearing means coupled to the second such set of louvers, so that movement of the

control member in a direction different from that which swings the first set of louvers rotates or pivots the second set of louvers through the aforesaid gearing means. Thus, either or both sets of mutually perpendicular louvers may be pivoted at a given instant to provide adjustment of air flowing through the assembly in all possible directions, by means of a single control member, in what is in essence a single compound movement of such member.

DRAWINGS

- FIG. 1 is a fragmentary perspective view of the louver assembly, drawn on a reduced scale;
FIG. 2 is a greatly enlarged fragmentary sectional elevation taken through the compound vertical plane II—II of FIG. 1;
FIG. 3 is a perspective view showing details of the controlling louver vane in one set thereof;
FIG. 4 is a fragmentary perspective view of the louver vane of FIG. 3 and the vanes on either side thereof, shown in a closed position;
FIG. 5 is an enlarged plan view of the operating member;
FIG. 6 is a side elevation of the control member of FIG. 5;
FIG. 7 is a fragmentary sectional plan view taken through the compound horizontal plane VII—VII of FIG. 2;
FIG. 8 is a fragmentary perspective view showing a pair of the meshed teeth of the operating gears of the louver assembly in a first operative position;
FIG. 9 is a fragmentary perspective view showing the meshed teeth of the operating gears of FIG. 8 in a second operative position; and
FIG. 10 is a fragmentary perspective view showing the meshed teeth of the operating gears of FIGS. 8 and 9 in a third operative position.

PREFERRED EMBODIMENT

The overall general nature of the present louver assembly can be seen in FIG. 1, which shows the first or vertical set of louver vanes 10 (including vanes 10a, 10b, 10c, etc.), and a set of horizontal vanes 12 (including vanes 12a, 12b, 12c). As illustrated, the first set of vanes 10 and the second set of vanes 12 are arranged in a mutually perpendicular fashion, while each single vane in each set is generally parallel to the other vanes in that set. Each of the vanes in the two sets has a pair of integral pivot pins projecting from the opposite ends thereof, so that each vane or blade may be mounted between end plate members, such as is illustrated at 14, and will then be longitudinally pivotal therebetween. For example, each of the vanes in the first set 10 thereof has a bottom pivot pin member 16 which fits into an individual hole in end plate 14; similarly, each vane in this set also has a top pivot pin 18, which will be received within an appropriate hole in a similar top end plate member (not illustrated), such that the vanes 10 will then be longitudinally pivotal between oppositely-disposed end plates. Further, the vanes in the first set 10 thereof each have a ganging pin element 20 at one end (for example, the top) over each of which fits an interconnecting member 22 having equally spaced holes therein for the pin elements 20. Member 20 thus serves to interconnect the various louver vanes in this set and thereby gang them together in a manner whereby they will remain spaced and coordinated throughout their pivotal movement.

As illustrated, the horizontal vanes in the second set 12 thereof similarly have integral pivot pins 24 and 26 at their respective opposite ends, which pins are intended to be received within appropriate bearing holes in lateral end plate members similar to member 14 noted previously. Further, each of the various vanes 12 has a

ganging pin element 28 similar in nature and function to pin element 20 noted previously and receivable within appropriate holes formed in a vertical interconnecting member 30, which performs a function similar to that of member 22 just noted.

As further illustrated in FIG. 1, a single control member or operating handle 32 is provided for moving each of the two sets of vanes 10 and 12, either separately or simultaneously. Since the various vanes in each set thereof are ganged together for simultaneous movement, movement of any one such vane will move the entire set of which it is a part. The vanes in the first set 10 thereof are moved by a direct connection of the control member 32 to vane 10c, such that (referring to FIG. 1) if member 32 is swung horizontally, it will push or pull vane 10c in a longitudinally pivotal movement, about an axis passing through the integral pivot pins 16 and 18 of this vane which, as stated previously, are received within appropriate stationary end plate members.

The vanes in the second set 12 are moved by the control member 32 through a gearing means, including an idler or intermediate gear 34 which is rotatably secured to vane 10c and a gear segment 36 which is attached to vane 12b. More specifically, the control member or operating handle 32 (FIGS. 2, 5, and 6) comprises a somewhat elongated lever-like member having a generally flat, circular end extremity 38. Extending laterally from this end extremity are a number of gear teeth 40 arranged in a circular locus and forming in effect a gear which is integral with the operating handle. This gear meshes with the idler gear 34 when the operating handle is attached to vane 10c, accomplished by a pivot pin 42 which passes through the center of the circular locus on which the teeth 40 are arranged. Pivot pin 42 holds handle 32 securely to vane 10c, such that this vane will be swung laterally upon corresponding swinging movement of the operating handle. Preferably, vane 10c has a recessed area of a depth corresponding to the thickness of the idler gear 34 and the teeth 40 on the operating handle, so that the outer or exposed side of idler gear 34 is generally flush with the adjacent side of vane 10c.

The gear segment 36, and its placement upon vane 12b, is best seen in FIGS. 2, 3, 4, and 7. In effect, segment 36 comprises a gear which is mounted on vane 12b perpendicular thereto and with the plane of the vane intersecting that of the gear along a radius of the latter. As will be understood, such a construction may readily be accomplished by slotting the gear to fit the vane or vice versa, but since operating stresses on the gear are not great in a louver assembly such as the present one, the gear segment and vane may readily be integrally molded or die-cast of a desired alloy, such as one of the zinc base die-casting alloys commonly in usage. It is important to note, however, in connection with the gear segment 36 and vane 12b that the longitudinal pivot axis of the vane, extending from integral pivot pin 24 to the opposite such pin 26, should pass directly through the rotational center of the gear segment.

As indicated previously, the plane of idler gear 34 and that of vane 10c upon which this gear is mounted are substantially coincident, and when the first set of vanes 10 is in its centered position (i.e., neither swung to the right nor left), the intermeshed idler gear 34 and gear segment 36 are substantially coplanar (FIG. 7). When the first set of vanes 10 is swung laterally, however, the relative alignment of idler gear 34 and gear segment 36 changes, and these two gears become meshed at increasingly acute angles. This relationship is shown in FIGS. 8, 9, and 10, where a tooth 34a of idler gear 34 is shown engaging a tooth 36a of the gear segment 36. In FIG. 8, the vane 10c has been swung laterally toward the left as seen in FIG. 1; in FIG. 9 vane 10c is in a centered position; and in FIG. 10 vane 10c has been swung toward the right. For this purpose, it is desirable that the teeth 34a of idler gear 34 be at least slightly rounded, the

degree of which is exaggerated somewhat in FIGS. 7 through 10.

It is very important that the point of coincidence of the respective pitch diameters of intermeshing idler gear 34 and gear segment 36 or, more accurately, pitch lines, since a gear rack may also be used as at least one of these gear members falls somewhere on the longitudinal pivot axis of vane 10c. A preferred form of this relationship is illustrated in FIG. 2, where the line of action of the idler gear and the gear segment coincides with this pivot axis, which is shown as a centerline and designated by the numeral 44. It should be understood, however, that while the aforementioned point of pitch line coincidence will of course always be on the line of action of idler 34 and gear segment 36, and while this point of coincidence must in accordance with the invention fall on the point axis of vane 10c, it is not essential that the line of action and the point axis coincide in the manner illustrated. As stated, this is to be preferred, but it is enough if the line of action and pivot axis merely intersect at the aforesaid point of coincidence. This basic relationship provides complete freedom of relative pivotal movement between idler gear 34 and gear segment 36, and their respective vanes as well, limited only by the specific configuration which is chosen for the shape of the gear teeth and, of course, the mutual contact of the vanes themselves. As previously stated, it is also important that the longitudinal pivotal axis of vane 12b in the second set of vanes pass through the center of rotation of gear segment 36, since this makes the pivotal movement of the second set of vanes a free and unrestricted movement.

As illustrated in FIG. 4, it is desirable that a slot 112 be formed in the trailing edge of vane 12a in order to clear gear segment 36 when the second set of vanes 12 has been pivoted to the extent where the individual vanes begin to lie in closely overlapping relationship. A similar such slot should also be formed in vane 12c if it is desired that the second set of vanes be pivotal to the opposite such overlapping relationship, generally shown in phantom in FIG. 2, which also illustrates the position of the vertical ganging or interconnecting member 30 for the second set of vanes 12 when such vanes are in the aforesaid closely overlapping or closed relationship.

It is entirely conceivable that upon examining the foregoing disclosure, those skilled in the art may devise embodiments of the concept involved which differ somewhat from the embodiment shown and described herein, or may make various changes in structural details to the present embodiments. For example, the inventor specifically contemplates an arrangement wherein the idler gear 34 is eliminated for greater simplicity and economy of manufacture. Also, the operating handle 32 may be eliminated and the teeth 40 located thereon extended slightly beyond the front edge of vane 10c to provide a finger-operated wheel for controlling the louver vanes. Additionally, the gearing means provided by the teeth 40 and the idler 34 could be replaced by a rock instead of a gear wheel, so that the control of the vanes 12 would be effected by a sliding movement of such rock along vane 10c. Since these and other such alternative arrangements are clearly within the scope of the invention, all such changed embodiments or variations of the invention as utilize its underlying concepts and clearly incorporate its spirit to be considered as within the scope of the invention.

I claim:

1. In a louver assembly, of the type having ganged sets of horizontal and vertical louver vanes which are each pivotal longitudinally to change the direction of air passing through the assembly, and which has a single operating member for pivoting either or both of said sets of vanes in selectable combinations of horizontal and vertical movement, the improvement comprising: means connecting said operating member to one of said sets of vanes such that said member when moved will push on such vanes

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to pivotally swing them; said connecting means further allowing relative movement in a predetermined direction of said member with respect to said one set of vanes; means defining at least some gear teeth attached to said operating member; and intermediate gear means between such gear teeth and the other of said sets of vanes and operative such that said operating member when so moved with respect to said one set of vanes will act on said other set of vanes through said teeth and said gear means to pivot said other set of vanes longitudinally.

2. The improvement in a louver assembly recited in claim 1, wherein said gear means includes at least two gear elements, said elements being meshed at a point of pitch line intersection which lies substantially upon the pivotal axis of said one vane in said one set thereof.

3. The improvement in a louver assembly recited in claim 1, wherein said gear means includes a gear segment secured to one of the louver vanes in said other set thereof.

4. The improvement in a louver assembly recited in claim 3, wherein said gear segment comprises in essence a circular gear portion mounted on said one vane in said other set generally perpendicular to such vane, with said vane lying in a plane which is coincident with a radius of said gear portion.

5. The improvement in a louver assembly recited in claim 4, wherein said one vane has a longitudinal pivot axis passing through the center of rotation of said gear portion.

6. The improvement in a louver assembly recited in claim 3, wherein the locus of said gear teeth attached to said operating member is circular in character, and wherein said means connecting said operating member to said one set of vanes comprises a pivot pin element extending from said member on a line passing through the center of said circular locus and anchored to one of the vanes in said one set thereof.

7. The improvement in a louver assembly recited in claim 6, wherein said gear means further includes at least

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one idler gear meshed between said gear teeth and said gear segment to drive one from the other thereof.

8. The improvement in a louver assembly recited in claim 7, wherein said idler gear is rotatably mounted upon said one vane in said one set thereof.

9. The improvement in a louver assembly recited in claim 8, wherein said idler gear and said gear segment mesh at a point of pitch line intersection which lies substantially upon the pivotal axis of said one vane in said one set thereof.

10. The improvement in a louver assembly recited in claim 9, wherein said gear segment comprises in essence a circular gear portion mounted on said one vane in said other set generally perpendicular to such vane, with said vane lying in a plane which is coincident with a radius of said gear portion.

11. The improvement in a louver assembly recited in claim 10, wherein said one vane has a longitudinal pivot axis passing through the center of rotation of said gear segment.

12. The improvement in a louver assembly recited in claim 7, wherein said idler gear is meshed with one of said gear segment or said gear teeth at a point of pitch line intersection which lies substantially upon the pivotal axis of said one vane in said one set thereof.

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U.S. Cl. X.R.

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