

Nov. 13, 1962

A. H. EBERHART
AIR DISTRIBUTING DEVICE

3,063,357

Filed Nov. 25, 1960

2 Sheets-Sheet 1

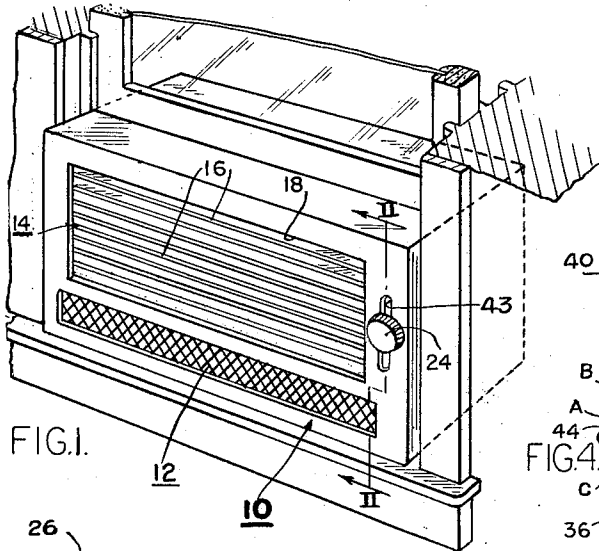


FIG. 1.

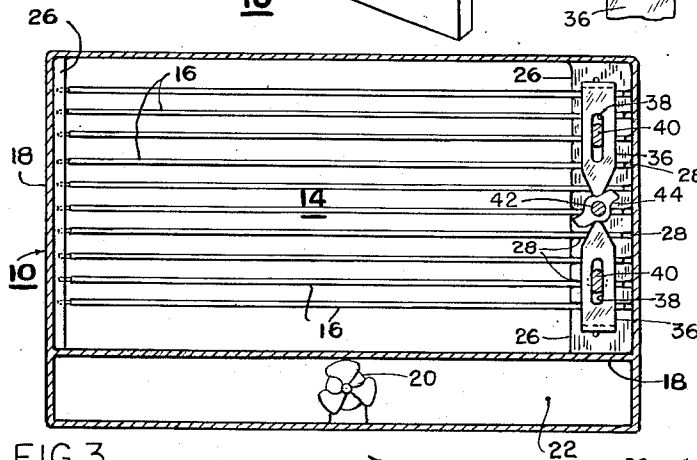


FIG. 3.

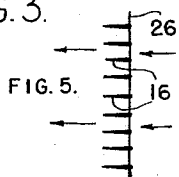


FIG. 5.

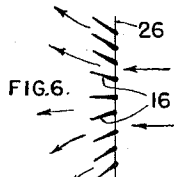


FIG. 6.

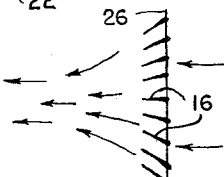


FIG. 7.

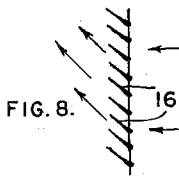


FIG. 8.

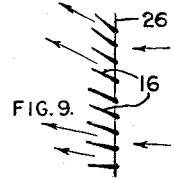


FIG. 9.

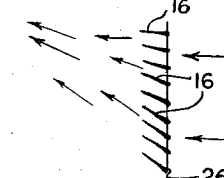


FIG. 10.

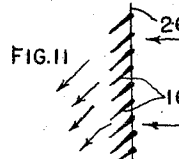


FIG. 11.

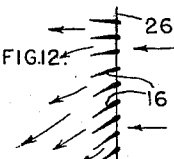


FIG. 12.

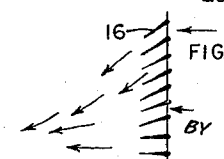


FIG. 13.

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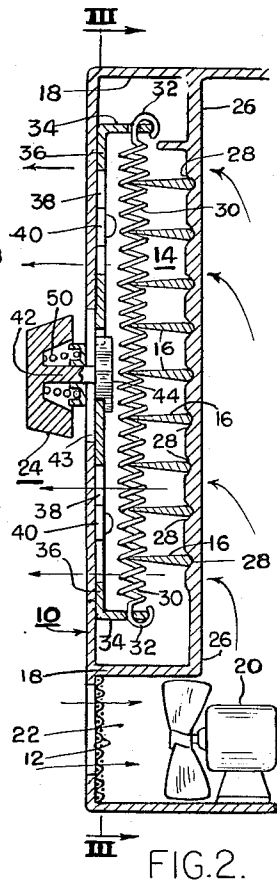


FIG. 2.

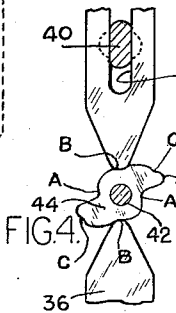


FIG. 4.

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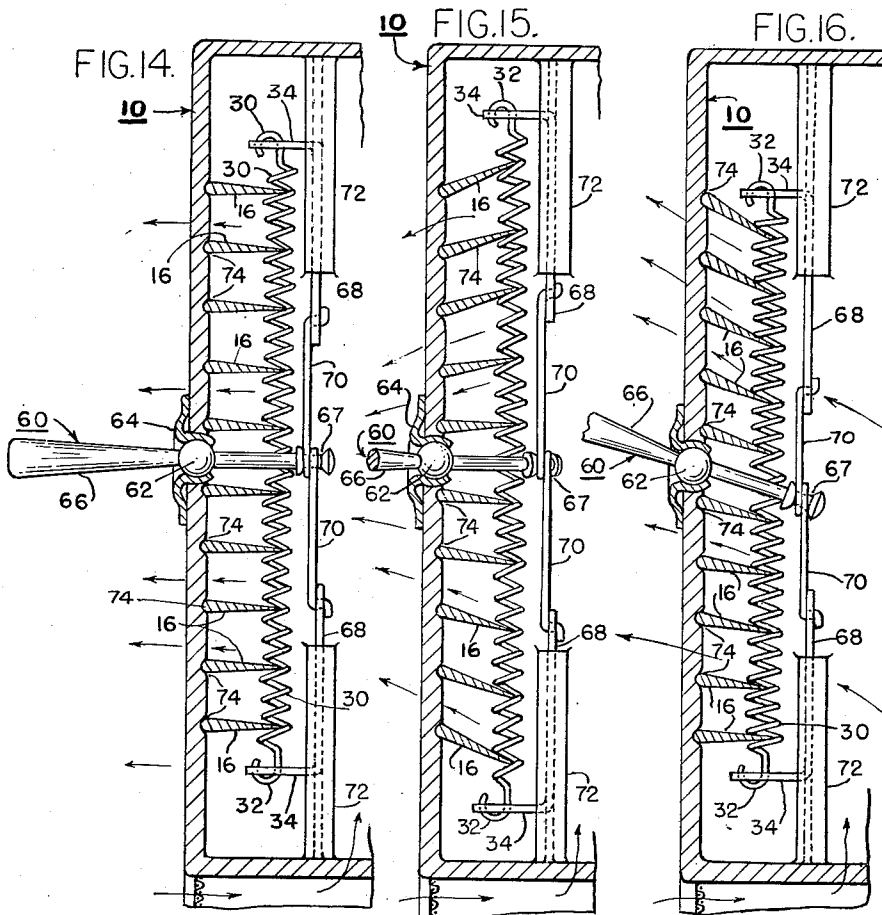
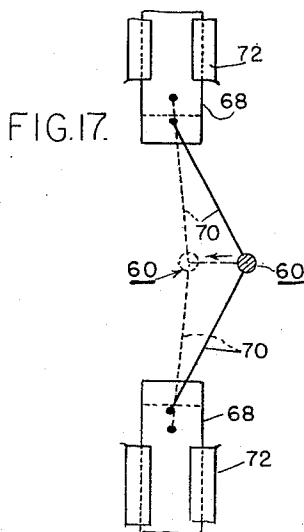
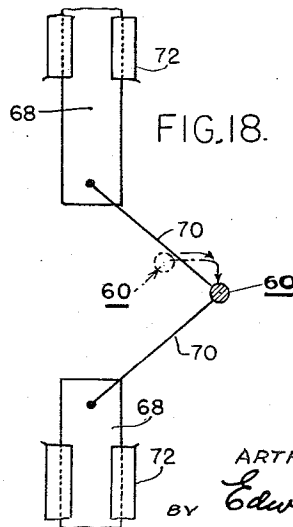
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AIR DISTRIBUTING DEVICE

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2 Sheets-Sheet 2



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3,063,357

AIR DISTRIBUTING DEVICE

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5 Claims. (Cl. 98-40)

This invention relates to air distributing devices, especially those of the type employed in fans, air conditioners, and the like.

Air distributing devices of the type set forth are commonly positioned in an air stream at the outlet of an air passage for influencing the air flow pattern to suit the size, configuration and particular needs of the conditioned region. To this end, spaced, parallel louvers or deflectors are usually employed to control the direction and dispersion of air being discharged.

Older air distributing devices having adjustable louvers have limitations from the standpoint of convenience, complexity and cost of manufacture, or because they are limited in the adjustments that can be made to influence the air flow pattern.

The air distributing device disclosed herein was invented to overcome the disadvantages of older devices outlined above, and it utilizes spaced, parallel louvers. Each louver is mounted for pivotal movement about an axis extending longitudinally thereof. Furthermore, each louver is connected to its neighbor at spaced locations along the length of a resilient member which spans the louvers, in such a manner that adjacent louvers are moved into edgewise convergence, or divergence, or parallel relationship with respect to the direction of air movement, depending upon the amount of tensile force applied to the resilient member. Varying the tensile force applied to the resilient member varies its overall length; and likewise its distance between adjacent louvers is simultaneously varied. For this purpose the resilient member is connected at its ends to brackets which are movable toward and away from each other so as to elongate or shorten the resilient member as desired, and to lengthen or shorten the distance between elongated edges of adjacent louvers.

When the louvers converge in the direction of air movement, the air flow pattern comprises converging air streams flowing through a confined region for a greater range of penetration than parallel air streams. On the other hand, when the louvers diverge in the direction of air movement the air streams will diverge and have a shorter range of penetration than parallel air streams.

Whether the air flow comprises convergent, parallel, or divergent air streams, it is desirable to be able to direct the air either generally upwardly, generally downwardly, or in horizontal direction. For this purpose the brackets are capable of being moved, not only toward and away from each other, but also of being linearly shifted with respect to the axes of the louvers, up and down, for example, in the plane of the louvered opening. This provision superimposes a like, edgewise, angular inclination on the individual louvers, but without appreciably altering their angular inclination to each other.

The various objects, features and advantages of the invention as will be apparent from the following description and claims taken in connection with the accompanying drawings, forming a part of this application, in which:

FIG. 1 is a front perspective view of air conditioning apparatus having an air distributing device constructed and arranged according to the invention;

FIG. 2 is a vertical sectional view taken along line II-II of FIG. 1;

FIG. 3 is a vertical sectional view taken along line III-III of FIG. 2;

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FIG. 4 is an enlarged fragmentary view of the apparatus of FIG. 3;

FIGS. 5 to 13 are schematic views showing the positions of the louvers as they are employed to obtain various air flow patterns contemplated by the invention;

FIGS. 14 to 16 are views similar to FIG. 2, but showing the invention in modified form with the louvers in various positions;

FIG. 17 is a diagrammatic view of the mechanism employed in the modified form of the invention illustrated in FIGS. 14 to 16, the portion shown in solid lines corresponding to positions of parts shown in FIG. 14, and the portion shown in dotted lines corresponding to the positions of parts shown in FIG. 15; and,

FIG. 18 is a view similar to FIG. 17, the positional relationship of parts corresponding to that of FIG. 16.

The invention, as shown, is applied to a room air conditioner mounted in an open window of a building. It includes a cabinet 10 having an air inlet grille 12, the parts of which are stationary, and an air outlet grille 14. The grille 14 comprises a plurality of vertically spaced, horizontally elongated louvers, or deflectors, 16 which are each mounted for pivotal movement about an axis extending longitudinally thereof and encompassed by a frame 18.

As best seen in FIG. 2, air is drawn into the inlet grille 12 by air moving apparatus 20, then moved through an air passage 22 and discharged through the outlet grille 14. Depending upon the angular inclination of the louvers 16, the moving air can be dispersed or confined as it leaves the grille 14. As is well known, louvers positioned in the path of moving air at the outlet of an air passage will divide the air into several air streams which will flow in parallel relation to each other if the louvers are parallel to each other. Or, if the louvers converge in the direction of air movement the air streams will penetrate far into the conditioned region. If the louvers diverge in the direction of air movement, the air streams will diverge and penetrate into the conditioned region a relatively short distance.

In the interest of convenience for the user, the present invention contemplates adjustment of the angular inclination of the louvers by the use of a single knob 24 at the front of cabinet 10.

Again referring to FIGS. 2 and 3, it will be noted that adjacent the outlet of the air passage 22 there is an upright member 26 arranged internally on each of the opposite side walls of the cabinet 10. These members 26 are each similarly provided with vertically spaced, V-shaped grooves 28 which open forwardly, i.e., toward the conditioned region. Corresponding grooves of the members 26 receive the rear edge of each louver 16 so that the latter is mounted for pivotal movement about a horizontal axis thereof. These axes are fixed.

The front edge of each louver is held captive at spaced locations along the length of a helical tension spring 30 between adjoining turns or coils thereof. The spring 30 vertically spans the outlet of the air passage 22, and preferably it is located behind frame 18 so as to be out of sight. Opposite ends of the spring 30 are provided with hooks 32 respectively received in openings in horizontal flange portions 34 of a pair of vertically slidable brackets 36. The latter are movable independently of one another and provided with a vertically elongated slot 38 in which is received a stationary guide lug 40, preferably of rectangular cross section. The slot 38 and lug 40 are sized and arranged to permit limited sliding movement of the bracket 36 in vertical direction.

It will be noted in FIG. 2 that, between each pair of louvers 16, there is an equal number of coils or turns of spring 30. Whether the spring 30 is stretched or relaxed, therefore, there will be uniform distances between the front edges of neighboring louvers. However,

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these distances can be varied depending upon the extent to which the spring 30 is stretched or allowed to contract. The positional relationship of the louvers 16 in FIG. 2 corresponds to the schematic view of FIG. 5, wherein they are arranged in parallel relationship for directing the moving air as a whole in a horizontal direction. In this position of the louvers 16, the brackets 36 and the ends of spring 30 are held apart in opposition to the inherent bias of the spring in its tendency to contract, or shorten itself. The manner in which the ends of spring 30 are positioned will now be described in detail.

The knob 24 is mounted on the forward end of a rotatable shaft 42. The latter extends rearwardly through and beyond a vertically elongated slot 43 formed in the front wall of the cabinet 10. And mounted on the rear end of shaft 42 is a cam 44 which is rotatable therewith. The cam 44 has radial cam surfaces 46 which are disposed between, and engageable with, the mutually facing ends of the brackets 36, these ends being tapered and rounded to provide a follower on each bracket. The cam 44 is held in slidable contact with the inner surface of the front wall of cabinet 10 by means of a compression spring 50 interposed between the knob 24 and the front wall of the cabinet.

The cam surfaces 46 have opposite sides which are duplicates, relative to a diametrical and perpendicular line passing through the rotational axis of the shaft 42. The cam surfaces 46 are such as to move the brackets 36 apart in one direction of rotation, and to permit the brackets to move towards each other in the opposite direction of rotation. For the sake of illustration, the cam surfaces 46 will be described as having detent notches A, B and C therein corresponding, respectively, to low, medium and high spots thereon. As shown in FIGS. 2 and 4, the bracket followers are in engagement with a "medium" spot position on cam surface 46, this position corresponding to the louvers 16 being in edgewise parallel relationship for directing air horizontally, in parallel air streams, as shown schematically in FIG. 5. It will also be noted that the spring 30 has been stretched in the position of FIG. 2 so that the forward edges of adjacent louvers 16 are spaced apart approximately to the same extent as their pivotal axes.

Counterclockwise rotation of the shaft 42 moves the bracket followers out of detent notches B and places them in engagement with the detent notches C at high spots on the cam surfaces 46. This action moves the brackets 36 further apart and stretches the spring 30 so that the distance between the forward edges of adjacent louvers will be greater than the distance between their pivotal axes. This position of the louvers 16 corresponds to FIG. 6 of the schematic views wherein the moving air is dispersed by dividing it into diverging air streams.

When the shaft 42 is rotated so that each bracket follower is in engagement with the cam surface 46 at the low spot A, the spring 30 contracts, thus reducing the distance between the forward edges of neighboring louvers 16 to less than the distance between their pivotal axes. Air will now be discharged through the outlet grille 14 in converging air streams, as shown schematically in FIG. 7.

It can be appreciated that dispersed air flow pattern projects a shorter distance into the conditioned region than an air flow pattern comprising parallel air streams. Conversely, a convergent air stream will penetrate further into the conditioned region than parallel air streams. However, it may be desired, not only to obtain parallel, convergent or divergent air streams, but also to direct the air streams generally upwardly into the conditioned region, as in FIG. 8 for parallel air streams, as in FIG. 9 for divergent air streams, and as in FIG. 10 for convergent air streams.

Likewise, it may be desired to direct the air generally downwardly into the conditioned region, as in FIG. 11 for parallel air streams, as in FIG. 12 for divergent air streams, and as in FIG. 13 for converging air streams.

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In order to direct the air flow either generally upwardly or generally downwardly, therefore, the brackets 36 are both shiftable up and down until one of the lugs 40 engages the abutment surface at the end of its slot 38.

The brackets 36 may be moved upwardly or downwardly from the position shown in FIG. 2 by manual movement in a corresponding direction of the knob 24 in slot 43. Movement of the knob 24 upwardly, for example, moves the upper bracket 36 upwardly; and the lower bracket is moved in the same direction by the upwardly directed force received from the upper bracket through the spring 30. When the brackets 36 are thus shifted the louvers 16 can be moved to any of the positions shown in FIGS. 8, 9 and 10 by rotation of knob 24. The brackets 36 may be moved similarly, but downwardly, for positioning the louvers in any of the positions shown in FIGS. 11, 12 and 13. The shifting of the brackets 36 in either direction can be accomplished without varying the length of spring 30, or the angular inclination of the louvers 16.

Modification

A modified form of the invention is shown in FIGS. 14 to 16, wherein like numerals are employed to designate parts similar to the embodiment of the invention previously described. This modified form of the invention employs a lever 60 instead of a knob 24, and requires no slot 43, to adjust and shift the louvers 16. Lever 60 includes a ball 62 providing a spherical surface intermediate the ends thereof, this ball being received in a socket 64 carried by the front wall of the cabinet 10. The lever 60 also includes a handle portion 66, extending forwardly of the cabinet 10, by which the lever can be manipulated; and it further includes a portion which extends into the cabinet and is provided at its inner end with an annular groove 67. The lever 60 is connected to a pair of vertically movable brackets 68 by a pair of rigid links 70. The brackets 68 perform the same function as the brackets 36 of the previously described embodiment, and they are received respectively in vertical trackways 72 which constrain the brackets to move vertically.

A pivotal connection is provided between each link 70 and the lever 60, one end of each link being looped about the annular groove 67 in the inner end of lever 60 and retained therein. The other end of each link 70 is pivotally connected to its associated bracket 68, as by a hook and eye connection. Referring to the portions shown in solid lines in FIG. 17, it will be noted that the inner end of the lever 60 is horizontally displaced from a region between the mutually facing, spaced ends of the brackets 68, and that each link 70 extends between the groove 67 and the end of its associated bracket 68 at an acute angle to the path of vertical movement of the brackets 68. This angular disposition of the links 70 is provided so that, when the lever 60 is pivoted in its ball and socket joint to move the inner end of the lever 60 to the left, to the position shown in dotted lines in FIG. 17, the angular inclination of the links 70 with the mentioned vertical path of movement will be reduced and the brackets 68 moved apart. Horizontal movement of the lever 60 in the opposite direction increases the mentioned angular inclination and pulls the brackets 68 toward each other. It can be appreciated, therefore, that the pivotal connections at the ends of the links 70 are provided to permit these changes in angular inclination.

When the lever 60 is pivoted in its ball and socket joint for movement in a vertical path, there is involved no change in angular inclination between the links 70 and the path of movement of the brackets 68. The links 70 here serve only to provide a rigid connection between the inner end of the lever 60 and the ends of the brackets 68, so that upward movement of the inner end of lever 60 produced by depressing the handle portion 66 thereof downwardly moves both brackets 68 upwardly. Thus,

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the same upward shift of the brackets 68 is obtained here as is obtained when the knob 24 of the previously described embodiment is moved upwardly in the slot 43, and for the same purposes appertaining thereto.

Another distinction between the embodiment of FIGS. 1 to 4 and the embodiment of FIGS. 14 to 18 is that the spring 30 engages the rear, longitudinal edges of the louvers 16, and the forward edges of the louvers are received in rearwardly opening grooves 74 formed on the inner side of the front wall of the cabinet 10. With this arrangement, stretching of the spring 30, as shown in FIG. 15, places the louvers 16 in converging relationship relative to the direction of air movement, whereas in the embodiment of FIGS. 1 to 3, stretching of the spring 30 made the louvers 16 diverge with respect to the direction of air movement. Conversely, in the modified form of the invention shown in FIG. 16, allowing the spring 30 to contract places the louvers 16 in diverging relationship relative to the direction of air movement.

Referring now to FIG. 17, the position of the links 70 shown in solid lines corresponds to the position of parts shown in FIG. 14. Movement of the handle portion 66 of the lever 60 horizontally to the right moves the links 70 to the dotted line position of FIG. 17 to move the brackets 68 apart and place them in the position shown in FIG. 15.

It is also possible to place the louvers 16 in converging or diverging relationship and to shift the brackets 68 with one simple movement of the lever 60. Referring, for example, to FIG. 18, the inner end of the lever 60 has been moved from a neutral position, toward the right and downwardly in order to position the parts as illustrated in FIG. 16, a view corresponding to FIG. 9 of the schematic views. In this last described position air is dispersed and directed generally upwardly. This is accomplished because the horizontal movement of the lever 60 changes the angular inclination of the links 70 so that the brackets 68 are moved toward each other as previously described; and the vertical component of movement of the lever 60 shifts the brackets 68 downwardly.

It can be seen, therefore, that the present invention provides means for influencing the air flow pattern to control the direction and dispersion of air being discharged from an opening in a manner thought to be most simple, effective and convenient.

While the invention has been shown in several forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof.

What is claimed is:

1. In a grille for distributing air discharged through an opening, at least three elongated air directing louvers extending across said opening, means supporting each of said louvers for pivotal movement into various edge-wise angular inclinations, the pivotal axis of each of said louvers extending lengthwise thereof and being generally parallel to the pivotal axis of its neighboring louver, resilient means connected at spaced locations along the length and intermediate the end thereof to the respective longitudinal edges of at least three of said louvers, and means for positioning the ends of said resilient means a greater or smaller distance apart to vary the spacing between said corresponding longitudinal edges of neighboring louvers, the edgewise angular inclination of each of said louvers to its neighbors being varied in relation to the distance the ends of said resilient means are apart.

2. In a grille for distributing air discharged through an opening, a plurality of elongated louvers extending across said opening, means supporting each of said louvers for pivotal movement into various edgewise angular inclinations with respect to the louver adjacent thereto, the pivotal axis of each of said louvers extending lengthwise thereof and being generally parallel to the pivotal axis of its adjacent louver, and means for simul-

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aneously adjusting the spacing between corresponding longitudinal edges of adjacent louvers comprising: resilient means including a helical tension spring extending transverse to the axes of said louvers and being connected at spaced locations along the length thereof to respective louvers at their said corresponding longitudinal edges, movable members connected to the ends of said spring and means for mounting said members for relative movement toward and away from each other for varying the overall length of said spring, the spacing between adjacent louvers at said corresponding longitudinal edges being varied in relation to the overall length of said spring for varying the edgewise angular inclination of each of said louvers to its adjacent louver.

3. In a grille for distributing air discharged through an opening, a plurality of elongated louvers extending across said opening in spaced and generally parallel relationship, each of said louvers being mounted for pivotal movement about a fixed axis which extends lengthwise thereof, resilient means of variable length extending longitudinally in a direction transverse to the axes of said louvers and being connected respectively at spaced locations along the length thereof to corresponding longitudinal edges of neighboring louvers, and means connected to end portions of said resilient means for varying the overall length thereof, the spacing between said corresponding edges of neighboring louvers being varied uniformly and simultaneously in relation to the overall length of said resilient means, and for moving said resilient means in a direction transverse to the longitudinal extent of said louvers without varying the overall length of said resilient means.

4. A grille for distributing air discharged through an opening comprising: a plurality of elongated louvers at said opening arranged in generally parallel relationship, each of said louvers being mounted for pivotal movement about an axis extending lengthwise of said louver and adjacent one longitudinal edge thereof, an elongated spring having its longitudinal axis extending transverse to the axes of said louvers and adjacent the other longitudinal edges of said louvers, said spring comprising a series of coils lying in helical formation about the longitudinal axis thereof, said other longitudinal edges of adjacent louvers being respectively received at spaced locations along the length of said spring between adjoining coils, there being an equal number of coils between each pair of coils which receives an edge of one of said louvers, and a pair of brackets connected to respective end portions of said spring, means for mounting said brackets for relative movement toward and away from each other in a direction parallel to said spring axis for shortening and lengthening said spring, respectively; a cam mounted between said brackets for rotation and for linear movement parallel to said spring axis, follower surfaces on at least one of said brackets engageable with said cam and movable relative the other of said brackets in response to rotation of said cam, said brackets being also movable in the same direction parallel to said spring axis for moving said spring therewith in response to linear movement of said cam in such direction, the shortening of said spring moving said louvers simultaneously into converging relationship with each other relative to the direction of air movement, the lengthening of said spring moving said louvers simultaneously into diverging relationship with each other relative to the direction of air movement, and the movement of said spring simultaneously moving said other edges of said louvers transverse to the axis of said louvers.

5. A grille for distributing air discharged through an opening comprising: a plurality of louvers at said opening arranged in generally parallel relationship, each of said louvers being mounted for pivotal movement about an axis extending lengthwise of said louver and adjacent one longitudinal edge thereof, an elongated spring hav-

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ing its longitudinal axis extending tranverse to the axes of said louvers and adjacent the other longitudinal edges of said louvers, said spring comprising a series of coils lying in helical formation about the longitudinal axis thereof, said other longitudinal edges of adjacent louvers being respectively received at equally spaced locations along the length of said spring between adjoining pairs of coils, a pair of brackets connected to end portions of said spring, means for mounting said brackets for independent movement toward and away from each other in a direction generally parallel to said spring axis, a lever extending generally in the direction of air movement and having one end thereof displaced from a region between said brackets, means providing a ball and socket swivel support for said lever intermediate the ends thereof, a rigid link pivotally connecting each of the neighboring ends of said brackets to said one end of said lever, the distance between adjacent ends of said brackets be-

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ing varied in relation to the angular inclination of said links relative to the direction of movement of said brackets and the length of said spring being varied in relation to the distance between said brackets, whereby the angular inclination of said louvers relative to the direction of air movement is controlled by movement of said lever generally in a direction parallel to said spring axis and the angular inclination of said louvers relative to each other is controlled by movement of said lever generally in a plane parallel to the longitudinal extent of said louvers.

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