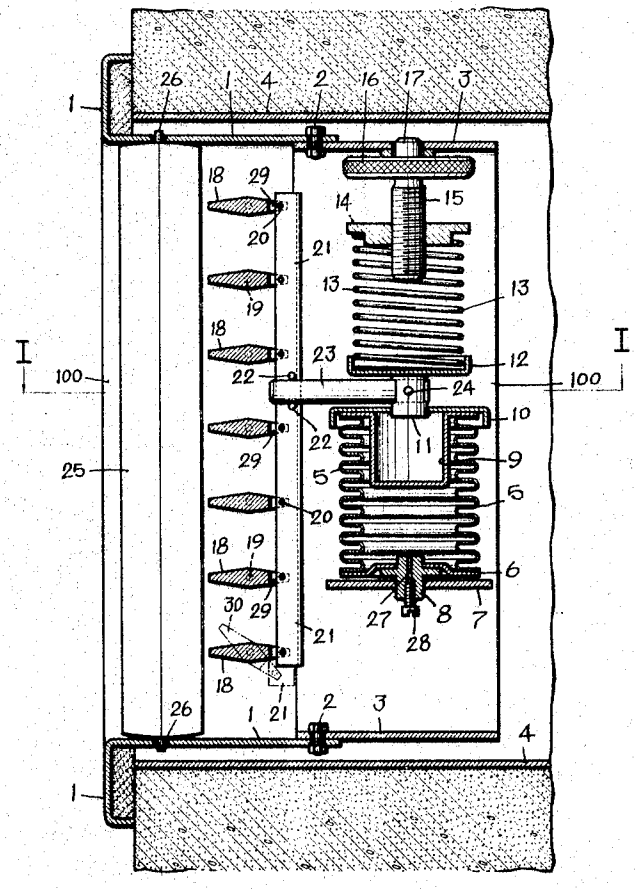
Jan. 17, 1967 YOSHIAKI IWATA 3,298,298

GRILLE DEVICE IN AIR-CONDITIONING

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FIG. 1



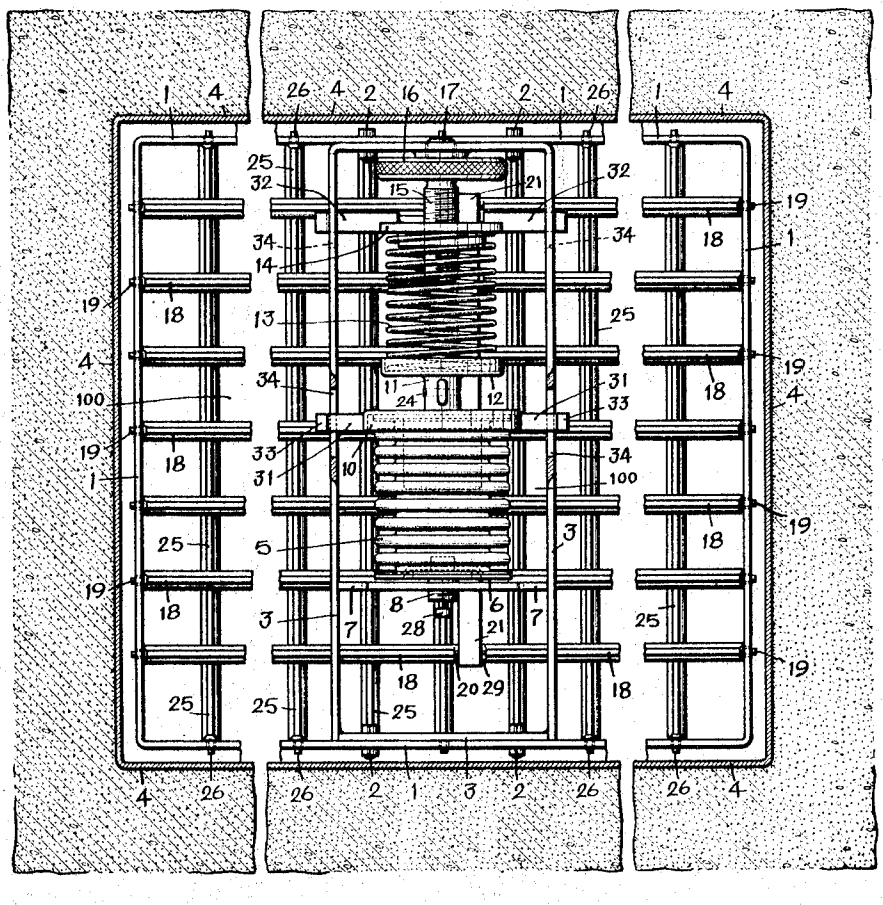
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GRILLE DEVICE IN AIR-CONDITIONING

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FIG. 2



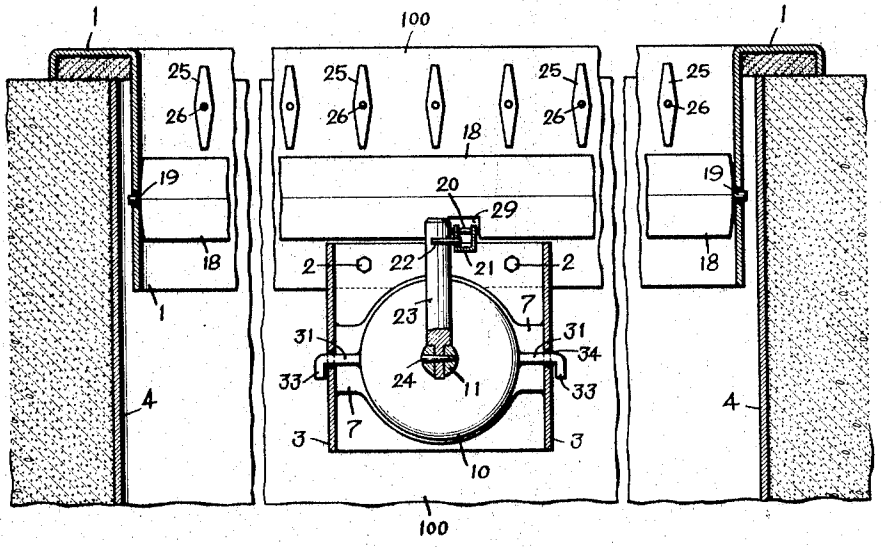
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FIG. 3



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FIG. 4

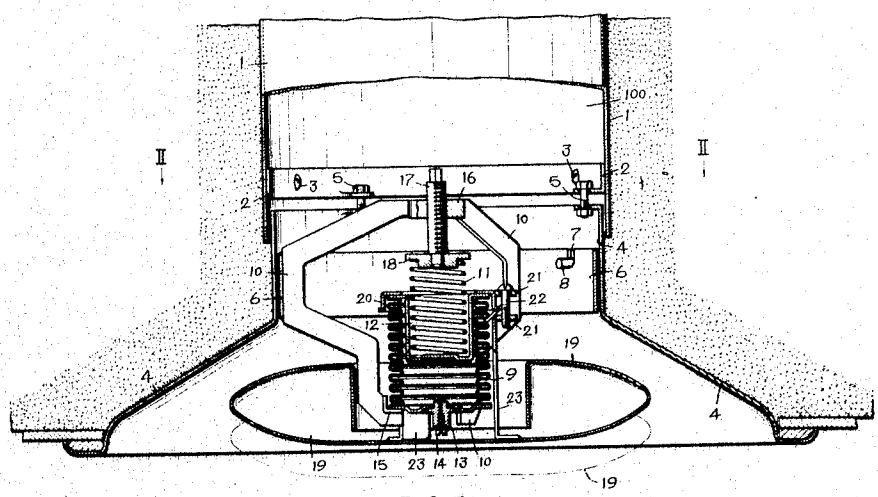
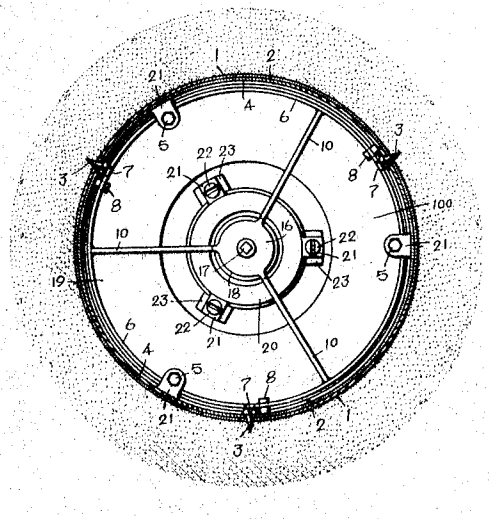


FIG 5



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Patented Jan. 17, 1967

3,298,298

GRILLE DEVICE IN AIR-CONDITIONING

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Filed Mar. 10, 1964, Ser. No. 350,786
2 Claims. (Cl. 98—40)

The present invention is concerned with improvements in the register of an air conditioning unit and has particular reference to a device of this character which automatically controls the direction of treated air supply to the interior of a centrally air conditioned building in response to the temperature change between hot and cold.

In the air conditioned space, due to the specific gravity of air layers changing with temperature, warmer air moves upwardly and stays near the ceiling of the room while cooler air moves downwardly toward the floor. To more or less control the flow of treated air from ductwork connecting to a central air-conditioning equipment or from a room-mounted unit, it has been the practice to manually change the position of the discharge grille in the register and orient the air flow in the direction desired. This practice is tedious work involving time and labor when the grille segments to be adjusted are large in number.

It is the principal object of the present invention to provide simple, novel means for automatically directing the flow of treated air toward places in the room where air-conditioning is more effectively served.

It is another important object of the invention to provide a device of this character which is easily mounted in ductwork and which is capable of automatic adjustment between selected upward and downward positions.

It is a further object of the invention to provide improved means which controls the direction of the air conditioned air flow by expansion and contraction of a gas-sealed compartment in response to the varying temperature of the air.

Other objects and features of the invention will be apparent from the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a vertical cross-sectional view of a register device of a wall-mounted type embodying the invention;

FIG. 2 is a rear view of the device of FIG. 1;

FIG. 3 is a horizontal sectional view partly broken away and taken on the line I—I of FIG. 1;

FIG. 4 is a vertical cross-sectional view of a register device of a ceiling-mounted type which is another embodiment of the invention, and

FIG. 5 is a horizontal sectional view taken on the line II—II of FIG. 4.

Referring to FIGS. 1, 2 and 3 wherein the register system of the invention is generally designated at **100**, the reference numeral **1** designates a framing or bracket member anchored at one end to the wall of a building near the opening of a ductwork and secured at the other end by bolts **2** to a generally rectangular unit casing of channel-form **3**. Designated at **4** is a duct framework terminating at the edge of the wall. The unit casing of channel-form **3** has journalled therein the operative mechanisms of the invention and communicates with the discharge end of ductwork (not illustrated). Designated at **5** is a gas bellows having gas sealed therein and which is seated across a washer **6** onto a bellows receptacle **7**. The bellows receptacle **7** is in threaded engagement with a bellows adjusting screw **8** and is secured to the unit casing **3**. The bellows **5** is secured in place by a support member **9** and has mounted thereon a cap **10** which is connected across a shaft member or neck **11** to a lower spring seat **12** carrying thereon an end of a helical spring **13**. This spring is carried at the other end thereof by

an upper spring seat **14** which is in threaded engagement with a spring adjusting screw **15**. The screw **15** has integrally formed therewith a wheel **16** which is provided with a head **17** fitting snug in the upper wall of the unit casing **3**.

There are provided a plurality of slate of bar members **18** which extend horizontally in spaced-apart relation and substantially to the full length of the rectangular casing **3** and which are pivoted centrally by pins **19** to the side wall of the framework **1**. The horizontal bar members **18** are rotatably connected across pins **20** to a vertical guide bar or lever **21** which is in turn connected by a pair of rollers **22** to a horizontal rod lever **23** which is secured by stop pin **24** to the shaft member **11** connecting the helical spring **13** and bellows **5**.

There are also provided a plurality of vertical bar members **25** which are pivotally connected by pins **26** at both ends to the wall of the framing **1**. These vertical bar members **25** are in crossed relation with the horizontal bar members **18**, so that the assembly would appear like a grille when viewed from the front of the unit, as this is schematically illustrated at FIG. 2.

With this construction, the device of the invention will function as follows:

It will be appreciated that the register unit generally designated at **100** is in neutral position as shown in FIG. 1. Assuming that the room is being heated, the treated warm air supply from air-conditioning equipment flows through the ductwork into contact with the discharge unit **100** and thereafter enters the room. The bellows **6**, which has previously been filled with a suitable gas through an inlet **27** and sealed by a plug **28**, expands in contact with the warm air and lifts the horizontal lever **23** against the tension of the helical spring **13**. The horizontal lever **23** moves upwardly with the vertical guide lever **21**, whereupon all of the horizontal bar members begin to tilt about their respective pins **19**. In this instance, it will be appreciated that the vertical guide lever **21** tends to slide slightly toward the front of the unit, for which purpose a pair of rollers **22** are adapted to permit such movement of the guide lever **21** with minimum friction with the horizontal lever **23**. For the same purpose, each of the horizontal bar members **18** is provided with an oblong groove **29** to permit the pin **20** to move therein.

Thus, the flow of treated air is directed downwardly toward the floor by the arrangement of the horizontal slat members **18** as these are inclined face down and all in a parallel and equally spaced apart relation. As a result, the room is effectively air-conditioned to give maximum comfort to the occupants. The manner in which the horizontal grille members **18** incline in response to the expanding action of the bellows **5** is shown with the bottom member **30** as an example.

Conversely, when the air-conditioning is provided to cool the room atmosphere during hot seasons, the gas-sealed bellows **5** contracts in contact with cold air coming through ductwork. This contraction of the bellows **5** causes a lowering of the horizontal lever **23** which in turn causes the vertical lever **21** to descend. Consequently, the horizontal slat members or air flow guide members **18** move clockwise about pins **19** all at the same time and assume up-face positions thereby causing the flow of cold air to advance upwardly toward the ceiling of the room which would otherwise descend collectively toward the floor on account of its gravity being greater than the room air.

However, when the bellows **5** shrinks due to contraction of the gas contained therein in contact with cold atmosphere, it does not shrink as quickly as it expands in contact with hot air. That is, the action of a bellows is known to draw a hysteresis curve. In order to main-

tain the bellows action uniform, according to the invention, the helical spring **13** is adapted to control the contracting tendency of the bellows **5**.

Reference to FIG. 2 shows how the unit is secured as a whole within the opening of the ductwork. The unit is centrally supported by a horizontal beam member **31** which is hooked with bends **33**, illustrated in FIG. 3, to the unit casing **3**. The upper portion of the unit is kept in slidable engagement with the vertical wall of the casing **2** by means of another beam member **32** to the casing **3**. Here, it will be appreciated that the central beam member **31** is disposed to be slidable vertically along grooves **34** formed in the unit casing **3** in response to the expansion and contraction of the bellows **5**.

In order to obtain the desired angle of each of the horizontal slat members **18** in view of the specific circumstances of the room to be air conditioned, the bellows **5** may be initially adjusted by means of the screws **8** and/or the tension of the helical spring **13** may be similarly adjusted by turning the wheel **16**.

The foregoing example of the register device is one of the preferred embodiments of the invention which is suitable for mounting in the opening of a ductwork located at the side wall of a building.

FIG. 4 illustrates another preferred embodiment of the invention which is a ceiling-mounted type register device communicating with ductwork laid in the ceiling of a building.

The register unit generally designated at **100** comprises a ring **2** secured by screws **3** to the internal peripheral wall **1** of the ductwork, an annular tapered air deflector **4** attached at the lower flared peripheral end thereof to the ceiling and fastened at the upper circular flanged portion thereof by bolt means **5** to the ring member **2** and an inner ring member **6** having a plurality of grooves **7** formed in equally spaced apart relation around the peripheral edge thereof, as more clearly shown in FIG. 5, said grooves **7** being adapted to engage the corresponding projections or pins **8** extending from the circular portion of the annular air deflector **4**. Each groove **7** in the ring **6** is curved horizontally like an L form so that when the ring **6** is inserted and turned slightly clockwise, the grooves **7** lock the pins **8** in place so as to retain the inner ring **6** in place. The rings **2** and **4** are provided peripherally with flange members **21** of a lug terminal shape, as shown in FIG. 5, to which the bolt means **5** is used to join the circular portion of the air deflector **4** to the supporting ring **2**.

Designated at **9** is a bellows which is supported by three arms **10** extending radially from an annular head **16** and welded to the inner ring **6**. These three equally divided arms **10** are fixedly connected at one end thereof with a bellows seat **15**, while the annular head **16** is in threaded engagement with an adjusting screw **17** fixedly connected to a spring washer **18** and adapted to adjust the tension of a helical spring **11**. To hold the bellows **9** securely in place, the helical spring **11** is inserted about halfway into the bellows body, for which purpose the spring **11** is journalled in a spring receptacle **12**. Similarly as in the case of the register device shown in FIG. 1, the bellows **9** is filled with a gas through a gas injecting hole **13** and sealed with a threaded plug, **14**.

Designated at **19** is a disc or air current control member which is secured to the bellows cap **20** by means of flange members **21** fastened together with a fixing screw **22**, one of said flange members is welded to a vertical support member **23** extending from the disc **19**.

The function of the above register device described in connection with FIGS. 4 and 5 is practically the same as that of the first example illustrated in FIGS. 1 through 3, inclusive. Basically, the action of the bellows **9** is utilized to elevate and lower the disc **19**.

The use of the spring **11** is intended to eliminate the time lag inherent in the bellows action.

With this construction, it will be appreciated that the bellows **9** expands in contact with warm supply air and causes the disc **19** to ascend from the position of FIG. 4 so that the air velocity is directed downwardly toward the floor of a building. Conversely with cool air supplied during hot season, the bellows **9** contracts causing the disc **19** to descend and guide the air flow in the horizontal direction.

While a few specific forms of the invention have been described in some detail, it is to be understood that the invention is not limited to the precise constructions described. On the contrary, the invention is not to be regarded as limited except insofar as possible limitations are included within the terms of the accepted claims in which it is the intention to claim all novelty inherent in the invention as broadly as is permissible in view of the prior art.

Having thus described the invention, what is now claimed and desired secured by Letters Patent is:

1. In an air-conditioning system in which treated air is discharged through a ductwork apparatus for automatically adjusting the direction of the discharged air upon change in the temperature of the air comprising a bellows having gas sealed therein and positioned in the ductwork, a lever extending laterally of said bellows, a plurality of equally spaced horizontal slats pivotally mounted in the ductwork, a second lever pivotally connected to said slats, a pair of rollers rotatably mounted on said second level, one end of said first lever slideably extending between said rollers providing a sliding and operative connection between said levers, means adjustably supporting said bellows at one end, a pair of caps connected to the opposite end of said first lever, said bellows having its other end seated in one of said caps and adjustable resilient means having an end seated in the other of said caps and tending to move said first lever opposite end in a direction opposite to the direction of expansion of said bellows.

2. In an air-conditioning system in which treated air is discharged through a ductwork opening in a ceiling apparatus for automatically adjusting the direction of the discharged air upon change in the temperature of the air comprising an annular outwardly tapered air deflector, means supporting said air deflector in the ductwork outlet opening, an air current control member, a plurality of arms positioned within said air deflector means, a bellows having gas sealed therein and supported at one end by said arms, a cap seated on the other end of said bellows, means connecting said cap to and positioning said air current control member laterally of and within said air deflector, resilient means mounted at one end on said cap, means adjustably connecting the opposite end of said resilient means to said arms, a plurality of pins affixed to and extending laterally within said air deflector, a ring positioned within said air deflector and having a plurality of L-shaped slots each detachably receiving one of said pins therein providing a detachable connection therebetween and said arms being affixed to said ring.

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