

[54] **BUTTERFLY DAMPER**

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FOREIGN PATENTS OR APPLICATIONS

162,381 9/1933 Switzerland138/46

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 [58] Field of Search138/37-46

[57]

ABSTRACT

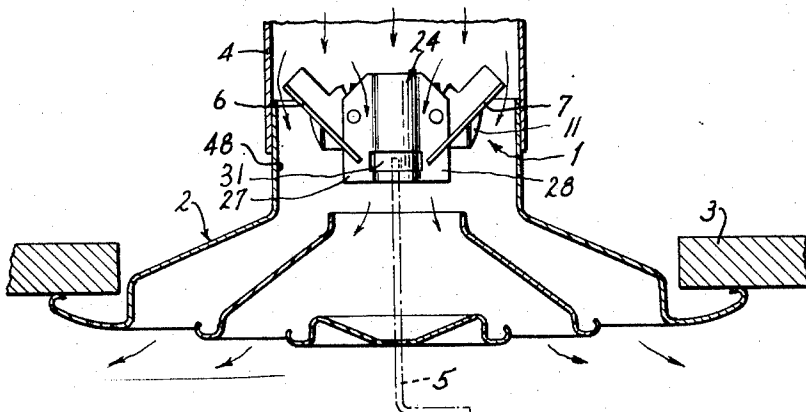
A butterfly damper is operated by a worm gear mounted on the blades of the damper, the blade assembly being separably mountable on the neck of a discharge unit.

[56] **References Cited**

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2,390,150 12/1945 Johnson et al.138/46

9 Claims, 5 Drawing Figures



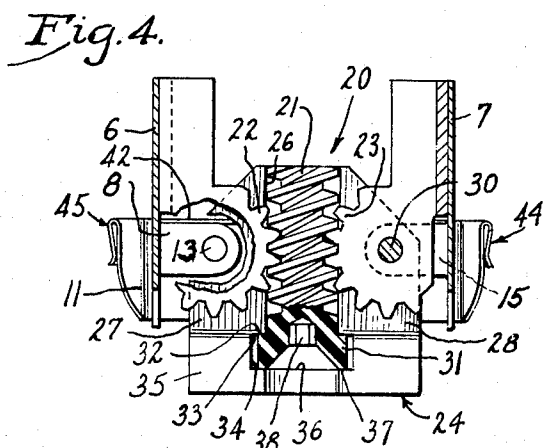
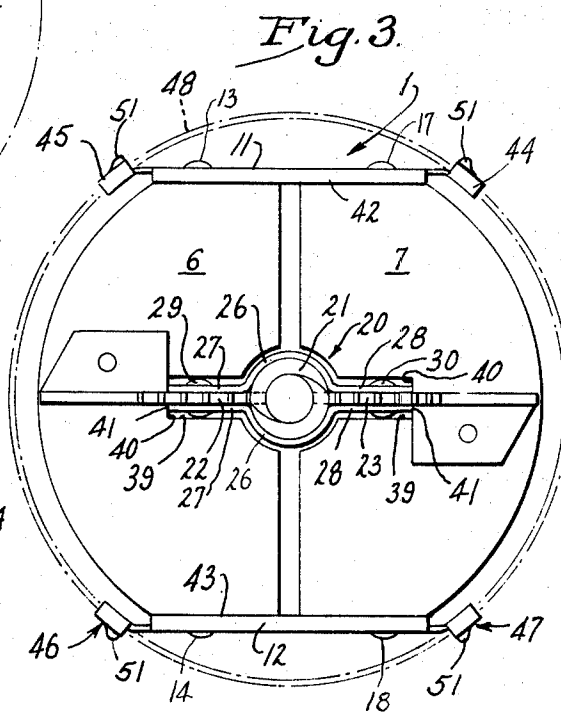
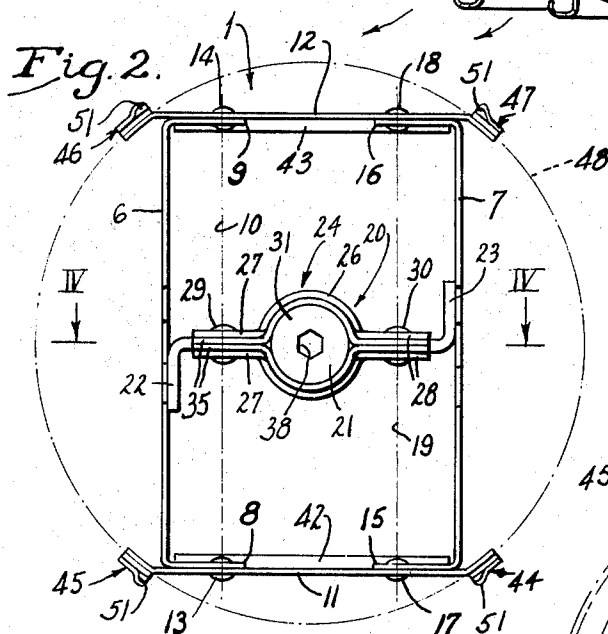
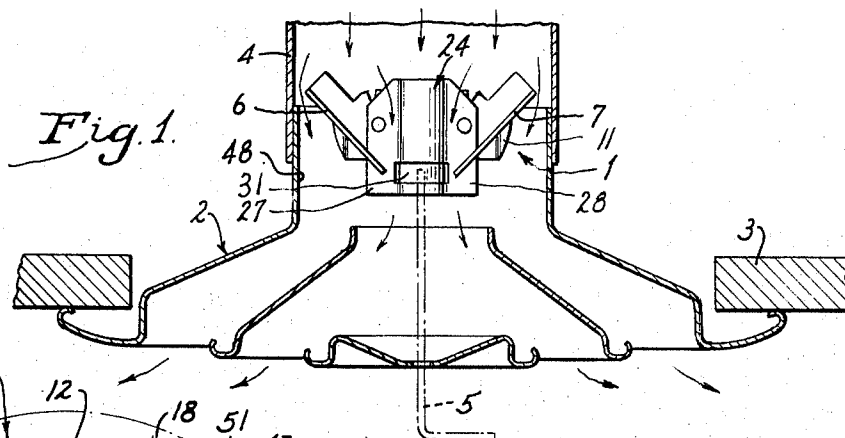
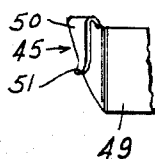


Fig. 5.



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BUTTERFLY DAMPER

BACKGROUND OF THE INVENTION

This invention pertains primarily to air distribution systems and specifically to dampers used to balance air flow through ducts to discharge units, but could be employed in any fluid distribution system.

In air distribution systems employed to heat or cool a controlled space, several discharge units are frequently supplied with air from the same supply duct. Because the discharge units are usually on branch ducts at different distances from the source of the air and having different pressure losses, the flows from the discharge units would be unequal, resulting in drafts and non-uniform temperature in the controlled space. Such conditions are eliminated, or reduced, by installing dampers in the ducts or in the discharge units to balance the flow from the discharge units. Dampers for such use do not have to close tight, but merely reduce the flow of air to the extent desired. Once the dampers are properly adjusted, there is ordinarily no need for further adjustment.

Butterfly dampers have been used for this service. They are frequently fastened to the end of the duct at the discharge end, as by screws and are adjusted from the discharge end, being accessible through the face of the discharge unit, which may be a diffuser or grille. The adjusting means itself created considerable interference to the flow of air through the damper.

SUMMARY OF THE INVENTION

This invention provides a damper that introduces low resistance to flow of fluid therethrough when open. It also provides a unitary damper assembly easily and quickly mounted on or removed from a duct or fixture. It further provides novel mounting means for the adjusting mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional elevation, showing the damper assembly mounted in a ceiling diffuser connected to an air supply duct and showing how the damper is adjusted.

FIG. 2 is a plan view of the damper assembly in open condition as seen from the bottom in FIG. 1.

FIG. 3 is a plan view of the damper assembly in closed condition as seen from the top in FIG. 1.

FIG. 4 is a sectional view, partially broken away, taken substantially along line IV—IV in FIG. 2.

FIG. 5 is a perspective view of one of the attachment clips on the damper assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

While a description is presented for only one embodiment, it will become readily apparent to those skilled in the art that many modifications and substitutions can be made without departing from the intent of the invention, the scope of which is defined only by the claims.

As shown in FIG. 1, a damper assembly 1 is mounted on a diffuser 2 mounted in a ceiling 3. The diffuser is connected to an air supply duct 4, the air flowing from the duct past the damper assembly 1 and through the diffuser 2 as indicated by the arrows. An adjusting key 5 is ordinarily not present, but is employed during adjustment of the damper position. In FIG. 1 the damper is shown in an intermediate position so that it restricts the flow of air to some extent.

FIG. 2 shows how little restriction is presented to air flow when the damper is fully open, while FIG. 3 demonstrates the maximum restriction when the damper is in fully closed position. As previously indicated, it is not necessary to stop the flow of air, the clearances shown could be reduced if desired, but they allow for tolerances in both the damper assembly 1 and the diffuser 2 to which it is attached.

The damper assembly 1 comprises a pair of damper blades 6 and 7. The blade 6 has integral ears 8 and 9, loosely mounted for rotation about an axis 10 on supporting means 11 and 12 respectively. The axis 10 is defined by a pair of pivots 13 and

14, which together with the supporting means 11 and 12 form a pivotal support for the blade 6. In like manner ears 15 and 16 on blade 7 rotate about pivots 17 and 18 defining an axis 19.

A means 20 for rotating the blades 6 and 7 about their axes 10 and 19 is provided by a worm gear 21 meshing with a pair of gear sectors 22 and 23 rigidly mounted upon the blades 6 and 7 respectively. The sectors are in the same plane and each is perpendicular to the blade to which it is affixed. The centers of the gear sectors 22 and 23 are on the axes 10 and 19 respectively. Means for supporting the worm gear 21 comprises a pair of opposed positioning members 24, each of which has a semicylindrical portion 26 cradling the circumference of the worm gear 21, and flange portions 27 and 28 extending outwardly from the semicylindrical portion in substantially a diametral plane. The flange portions 27, with the sector 22 sandwiched between them, are joined together on axis 10 by a rivet 29, about which the sector is free to pivot. The flange portions 28, with sector 23 sandwiched between them, are similarly joined together on axis 19 by a rivet 30, about which the sector 23 is free to pivot. The semi-cylindrical portions 26 fit closely enough around the worm 21 to prevent substantial lateral movement of the worm, but loosely enough to permit free rotation of the worm. On the end of worm gear 21 is a head 31 of larger diameter than the gear so that an inwardly facing shoulder 32 is formed on the underside of the head. This shoulder engages an end surface 33 on the semicylindrical portion 26 to prevent longitudinal movement of the gear 21 in one direction. A window 34 in an extension 35 of the positioning member 24 provides clearance for the head 31 and also an abutment 36, in the form of a semi-circular surface to engage an outwardly facing shoulder 37 on the head 31 to prevent longitudinal movement in the other direction. It will therefore be seen that the worm gear is restrained from both longitudinal and lateral translation, but is freely rotatable about its axis. Rotation of the worm gear 21 is accomplished by engagement means, shown here as a socket 38 in the head 31 into which the adjustment key 5 may be inserted to turn the gear clockwise or counterclockwise as required. As shown in FIG. 4, the sectors 22 and 23 are identical and the worm 21 is of double helix variety so that the positions of the blades 6 and 7 are always symmetrical. If the head 31 is rotated clockwise as seen in FIG. 2, the dampers 6 and 7 will be moved by sectors 22 and 23 toward closed position when a right hand worm is employed as in FIG. 4. A slot 39 in each blade 6 and 7 provides clearance for the positioning members 24 and the end 40 of each slot 39 is so located as to abut against the edges 41 of the flange portions 27 and 28 to prevent rotation of the blades beyond fully closed position. If the head 31 is rotated counterclockwise, the dampers 6 and 7 will be moved toward open position. Flanges 42 and 43 on the supporting means 11 and 12 respectively are located for abutment by the blades 6 or 7 or by the ears 8, 9, 15, and 16 to prevent rotation of the blades beyond fully open position.

Spring clips 44 and 45 on opposite ends of supporting means 11 and clips 46 and 47 on supporting means 12 are adapted to separably mount the damper assembly 1 on the diffuser 2 by being clamped over the edge of the neck 48 of the diffuser before it is inserted into the end of the duct 4 as shown in FIG. 1. In this embodiment the clips are integral with the supporting means 11 and 12, which are made of sheet spring material, the flanges 42 and 43 serving as stiffeners for the supporting means. The spring clip 45 is shown in perspective in FIG. 5 as comprising a relatively rigid base 49 and a resilient flap 50 bent from the plane of the base by more than 180° around an internal diameter exceeding the thickness of the neck 48. At the end of the flap 50, where the separation from the base 49 is less than the thickness of the neck 48, is a tab 51 angled outwardly from the plane of the flap to form a cam surface adapted to engage the edge of the neck and deflect the flap outwardly to accommodate the thickness of the neck between the base and the flap as the damper assembly 1 is pressed downwardly to mount it upon the diffuser 2. The

resilience of the flaps enables the spring clip 45 to grip the neck 48 between the flap 51 and base 49 until they are separated by application of a substantial separating force. Clip 47 is identical to clip 45, while clips 44 and 46 are of symmetrical form.

Note that the neck 48 fits inside the duct 4, and that the neck is actually a continuation of the duct 4, being a part of the diffuser 2 only for convenience in installation. The assembly 1 is therefore separably mounted in the duct. If the diffuser 2 were mounted with the neck 48 inside the duct 4, the damper assembly 1 would be mounted on the end of the duct by spring clips facing in the opposite direction from that shown. Once again the damper assembly would be mounted in the duct.

I claim:

1. A damper for regulating flow of a fluid through a duct comprising first and second blades pivotally supported in said duct on respective first and second axes, and means for rotating said blades about the axes to regulate flow of said fluid, said means mounted solely upon the blades within said duct.

2. A damper according to claim 1, said means comprising first and second gear sectors affixed to the respective blades and pivoted about said respective axes, and a worm gear supported and engaged by both of said sectors.

3. A damper according to claim 2, further comprising 25

means for supporting the worm gear for rotation in a fixed position, said means pivotally mounted on both of said sectors at the respective axes.

4. A damper according to claim 3, said supporting means comprising a pair of opposed positioning members restraining the worm gear from both lateral and longitudinal motion.

5. A damper according to claim 4, each said positioning member comprising a semi-cylindrical portion cradling the circumference of said worm gear, and first and second flange portions extending outwardly from the semicylindrical portion in a substantially diametral plane.

6. A damper according to claim 5 characterized by a shoulder on said worm gear and a surface on at least one of the positioning members engagable to prevent longitudinal movement of said worm gear.

7. A damper according to claim 2, said worm gear comprising an engagement means whereby the gear may be rotated.

8. A damper according to claim 1, additionally comprising means pivotally supporting the blades on said axes to form a unitary assembly for insertion within said duct.

9. A damper according to claim 8, said pivotal supporting means comprising spring clips engagable with an edge of said duct to separably mount the assembly within said duct.

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