

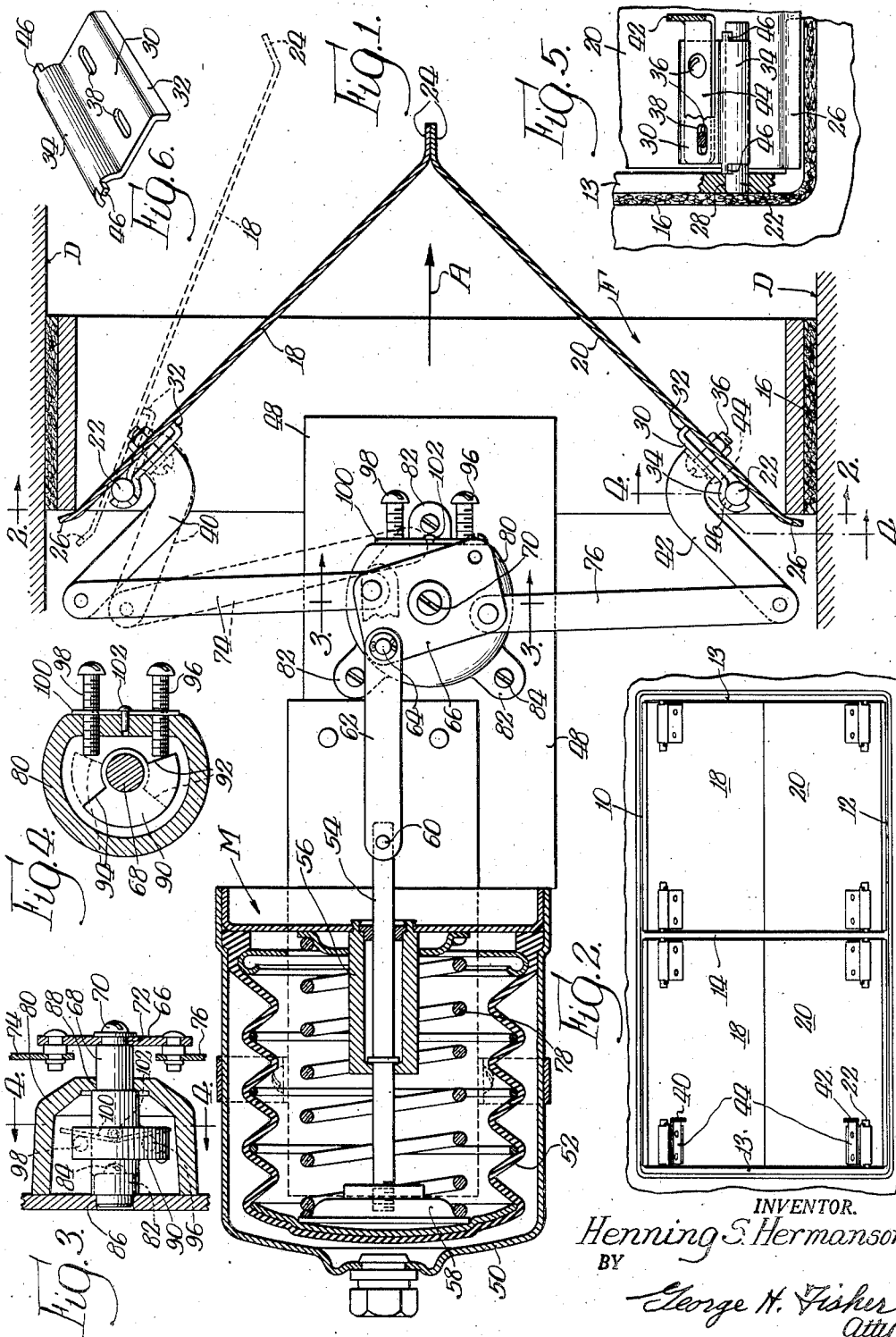
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DAMPER STRUCTURE

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DAMPER STRUCTURE

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My present invention relates to a damper structure designed for volume control on zoned air conditioning systems and the like.

One object of the invention is to provide a damper structure having simple and inexpensive adjusting means for the open and closed positions of the damper blades, and for pintles of the damper blades, so that the blades can be properly positioned in their frame and relative to each other.

Another object is to provide adjusting means for the open and closed positions of the damper blades, which means is conveniently accessible from the front of the damper structure when the damper blades are open.

Still another object is to provide clamping elements for the pintles of the damper blades, which permit a considerable range of adjustment of the blades relative to each other and relative to their supporting frame, so as to insure proper closing of all dampers and proper clearance relative to the frame to prevent any dragging action during operation which would be detrimental to the functioning of the dampers.

Another object is to provide adjustable clamping elements for the pintles relative to the damper blades and to provide damper operating arms carried directly by the clamping elements.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my damper structure whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawing, wherein:

Figure 1 is a sectional view through the damper structure embodying my invention, and showing a pneumatic motor connected therewith for operating the same.

Figure 2 is a sectional view on the line 2-2 of Figure 1 showing the damper frame in rear elevation, this figure being on a reduced scale relative to Figure 1.

Figure 3 is a sectional view on the line 3-3 of Figure 1 showing a rock shaft housing and associated parts.

Figure 4 is a sectional view on the line 4-4 of Figure 3, showing a stop cam and screw arrangement within the rock shaft housing.

Figure 5 is an enlarged view of the lower left corner of Figure 2, and;

Figure 6 is a perspective view of the clamp element used in connection with my damper structure.

On the accompanying drawing I have used the

reference character F to indicate in general a rectangular frame. The frame F has a top element 10, a bottom element 12, end elements 13 and a cross bar 14. The frame may be formed of flat bar or sheet metal stock, the bar 14 being formed of the same material and welded, or otherwise suitably secured at its ends between the top and bottom of the frame F.

The frame F is adapted to be mounted in a duct D with packing material 16 surrounding it to seal the space between the inner surface of the duct and the outer surface of the frame.

Upper and lower damper blades 18 and 20 are mounted in the frame F, two of the blades 18 on opposite sides of the cross bar 14 and two of the blades 20 also on opposite sides of the cross bar. The blades 18 and 20 are hinged by means of pintles 22 and are substantially flat plates provided with terminal flanges 24 lying closely adjacent to each other in the closed positions of the dampers as shown in Figure 1. Adjacent the rear edges of the damper plates, flanges 26 are provided to overlap the rear edges of the frame F, the direction of air flow being as indicated by the arrow A in Figure 1.

The pintles 22 are rotatable in perforations 28 formed in the end members 13 of the frame and in the cross bar 14 (see Figures 2 and 5). Two of the pintles extend through the cross bar and four through the frame ends as illustrated in Figure 2, where the damper is formed in two sections. Obviously, one section only need be provided for a relatively short frame, whereas a longer frame can have three or more sections if desired.

The pintles 22 are adjustably clamped to the damper blades 18 and 20 by clamp plates 30. The clamp plates 30 are each provided with a supporting flange 32 and a half-cylindrical portion 34, the flanges 32 contacting the damper blades, and the portions 34 contacting the pintles as shown in Figure 1. Clamp bolts 36 are utilized for effecting the clamping action and extend through slotted openings 38 of the clamp plates (see Figure 5).

Two of the clamping plates as shown at the left of Figure 2 are provided with upper and lower damper actuating arms 40 and 42 respectively, or rather these arms are connected to the damper blades by the same clamp screws 36 thereby eliminating the necessity of separate attaching means for the arms relative to the blades. The arms have foot portions 44 through which the clamp bolts extend. The clamp plates 30 are also provided with spacer lugs 46 for a purpose which will hereinafter appear.

The frame F has secured thereto, an extension 48 for supporting a motor M, such as one of the kind shown in my copending application, Serial No. 419,917, filed November 21, 1941, now Patent No. 2,372,273. The motor M may consist, for instance, of a housing 50 and a flexible bellows 52 which may have compressed air introduced between them to react on the housing and the bellows, and thereby result in collapse of the bellows for moving the damper blades from the normally closed position of Figure 1 to an open position or to intermediate positions if intermediate values of pressure are applied to the motor. The operative connections between the motor M and the damper blades consist of the following:

A bellows rod 54 extends slidably through a guide 56 of the housing 50, having a head 58 on its inner end to be acted upon by the bellows, and a pivot 60 at its outer end. A link 62 extends from the pivot 60 to another pivot 64. The pivot 64 is carried by a damper actuating element 66 in the form of a plate secured to a rock shaft 68 by a screw 70. The rock shaft 68 is preferably provided with an other-than-round shouldered portion 72 to insure against relative movement between the rock shaft and the plate 66.

The plate 66 is operatively connected by links 74 and 76 to the damper actuating arms 40 and 42. For return of the dampers from open to closed positions when the air is exhausted from the housing 50, the motor M has a return spring 78 mounted therein.

The rock shaft 68 is journaled in a rock shaft housing 80 secured as by three lugs 82 and screws 84 to the frame extension 48. The frame extension has a perforation 86 and the housing 80 has a perforation 88 for journaled the rock shaft. Within the housing, a stop element or cam 90 is provided on the rock shaft and has a closed position stop shoulder 92, and an open position stop shoulder 94. Threaded in the housing 80 for the respective stop shoulders 92 and 94 are stop screws 96 and 98. A friction wire 100, initially straight, is bent to the position shown in Figure 3 by means of a mounting screw 102 to provide friction against the screws 96 and 98 and thereby retain them in any position to which they are adjusted, thus preventing them from becoming loosened under vibration.

My damper structure has a number of advantages, particularly from an installation and adjusting standpoint. The frame F is usually mounted in a duct D adjacent its discharge end into a room or the like back of an ornamental grille, the position of the frame being such with respect to the grille as to just permit clearance of the front edges 24 of the damper blades when the dampers are open. In the initial installation of the damper blades, it is quite important to secure the proper clearance between the side edges of the blades, and the frame elements 13, as well as the cross bar 14. This is accomplished by shifting the clamp plates 30 relative to the damper blades so that the clamp plates just contact at their spacer lugs 46 with the members 13 and 14 while both side edges of the damper blades have equal clearance with respect to the members 13 and 14. The blades of course are properly cut to be slightly less than the distance between the frame elements 13 and 14 with allowance made for any slight twisting of the frame when installed in the duct.

Another adjustment accomplished at the factory by the clamp plates 30 is that of matching the closed position of one set of dampers with the

next one. One set may be closed as in Figure 1, while the clamp screws are still loose, and then the next set closed. The clamp screws of both sets may then be tightened. When they are tightened, then subsequent closing movement will result in equal closure of all damper sections. The clamp screws 36 also provide for a slight final adjustment after installation if found necessary as when the frame is installed in a slight twist and the dampers are consequently thrown out of alignment.

The stop screws 96 and 98 are so located with respect to the frame and the dampers that they are readily accessible through the frame between the dampers when the dampers are open. If a grille is mounted in front of the dampers, a long shank screw driver can be inserted through it for this purpose without removing the grille. This facilitates adjusting the damper blades for maximum opening and for either a minimum position or full closed position as desired at the other limit of motion. The blades can be opened and the stop screw 98 adjusted until the positions of the dampers are at the required spacing between the flanges 24. The screw 96 may then be adjusted, while the motor is exhausted, thus moving the blades away from closed position to the desired minimum closed position.

The adjustment features of my damper structure are particularly adaptable to dampers of the type illustrated which afford streamline flow as distinguished from flow in which turbulence is caused by butterfly types of dampers. The resulting structure is relatively noiseless, and the desired volume of delivery is secured by proper adjustment of the damper blades during installation. By means of the features disclosed in my specification, such adjustments are readily made in a minimum of time, and with a minimum of inconvenience, the stop screws 96 and 98 being conveniently accessible without the necessity of removing a grille. The clamp screws constitute a convenient factory adjustment prior to delivery of the damper to the job.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope without sacrificing any of the advantages thereof.

I claim as my invention:

1. In a damper structure, the combination of a frame, damper blades hinged therein adjacent opposite sides of the frame, a rock shaft journaled on said frame intermediate the hinge connections, a damper control element mounted on said rock shaft, links operatively connecting said damper control element to said damper blades, a motor connected with said damper control element to rock said rock shaft, a stop cam on said rock shaft, and a pair of stop screws coacting therewith and mounted on said frame for access through the frame and said damper blades when the damper blades are open, one of said stop screws engaging said cam in the open positions of the damper blades and the other stop screw engaging said cam in the closed positions thereof.

2. In a damper structure, the combination of a substantially rectangular damper frame, a damper blade hinged therein, a rock shaft journaled on said frame, a damper control element mounted on said rock shaft, means operatively connecting said damper control element to said

damper blade, a motor for rocking said rock shaft, a stop element on said rock shaft and a pair of stop screws coacting therewith and mounted for access through said frame and said damper when open, one of said stop screws engaging said stop element in the open position of the damper and the other stop screw engaging said stop element in the closed position of the damper.

3. A damper structure comprising the combination of a frame, a damper blade hinged therein, a rock shaft journaled on said frame, a damper control element mounted on said rock shaft, a motor mounted on said frame, links operatively connecting said damper control element to said motor and to said damper blade, a stop cam on said rock shaft, and a pair of stop screws coacting therewith for engaging said cam in the open and closed positions respectively of said damper structure.

4. A damper structure comprising the combination of a substantially rectangular frame, substantially rectangular damper blades hinged therein adjacent opposite sides of said frame, said damper blades in their closed positions inclining away from the air stream and toward each other and having lips at their outer extremities substantially in contact with each other in the closed positions of the blades, a housing mounted on said frame, a rock shaft journaled in said housing, a damper control element on said rock shaft, link connections between said element and said damper blades, a stop cam on said rock shaft within said housing, and stop screws threaded in said housing for alternately engaging said cam in the open and closed positions respectively of the damper blades.

5. In a damper structure, the combination of a frame, damper blades hinged therein adjacent opposite sides of the frame, a housing supported by said frame, a rock shaft journaled in said housing, a damper control element on said rock shaft, operative connections between said element and said damper blades, a stop element on said rock shaft within said housing, stop screws threaded in said housing for alternately engaging said stop element in the open and closed positions respectively of the damper blades, said stop screws being located with respect to said damper blades whereby they are accessible between the plates when the blades are in their open positions.

6. A damper structure comprising the combination of a frame, damper blades hinged therein adjacent opposite sides of the frame, said damper blades in their closed positions inclining away from the air stream and toward each other and having lips at their outer extremities substantially in contact with each other in the closed positions of the blades, a rock shaft, operative connections between said rock shaft and said damper blades, a stop on said rock shaft, and stop screws for alternately engaging said stop in the open and closed positions respectively of the damper blades, said stop screws being located with respect to said damper blades whereby they are accessible between the blades when the blades are open.

7. In a damper structure, the combination of a substantially rectangular frame having a cross bar, pairs of damper blades on opposite sides of said cross bar, hinge means for said damper blades comprising pintles journaled in the ends of the frame and in said cross bar, clamp plates on said damper blades for clamping said pintles

thereto in positions effecting alignment of the blades on opposite sides of said cross bar with each other, damper operating arms carried by said clamp plates, a rock shaft journaled on said frame, link connections between said rock shaft and said damper operating arms, a motor operatively connected with said rock shaft, a stop element on said rock shaft, and stop screws coacting therewith and threadedly carried by said frame for adjustably limiting the open and closed positions of the damper blades.

8. In a damper structure, the combination of a substantially rectangular frame having a cross bar, damper blades on opposite sides of said cross bar, hinge means for said damper blades comprising pintles journaled in the ends of the frame, other pintles independent of said first pintle, said other pintles extending through said cross bar and journaled therein, clamp plates on said damper blades for frictionally clamping said last pintles to said damper blades in positions effecting alignment of the blades on opposite sides of said cross bar with each other, a rock shaft journaled on said frame, operative connections between said rock shaft and said damper blades, and a motor operatively connected with said rock shaft.

9. In a damper structure, the combination of a frame, damper blades in said frame, hinge means for said damper blades comprising pintles journaled in the frame and lying against the faces of the damper blades, clamp plates on said damper blades for adjustably clamping said pintles thereto, said clamp plates having seats opposite said damper blade faces to receive and frictionally engage said pintles, damper operating arms carried by said clamp plates, a rock shaft journaled on said frame, operative connections between said rock shaft and said damper operating arms, and a motor operatively connected with said rock shaft.

10. In a damper structure, the combination of a frame, damper blades in said frame, hinge means for said damper blades comprising pintles journaled in the frame, clamp plates on said damper blades for adjustably clamping said pintles thereto, damper operating arms carried by said damper blades, a rock shaft journaled on said frame, operative connections between said rock shaft and said damper operating arms, and a motor operatively connected with said rock shaft, said clamp plates having spacer lugs to project beyond the edges of said damper plates and engage said frame in all positions of the damper blades, said clamp plates having slot and clamp screw connections with said damper blades to permit of adjustment of the edges of the damper blades relative to said spacer lugs.

11. In a damper structure, the combination of a frame, damper blades in said frame, hinge means for said damper blades comprising pintles journaled in the frame, clamp plates on said damper blades for adjustably clamping said pintles thereto, damper operating arms carried by said damper blades, a rock shaft journaled on said frame, operative connections between said rock shaft and said damper operating arms, and a motor operatively connected with said rock shaft, said clamp plates having spacer lugs to project beyond the edges of said damper blades and engage said frame in all positions of the damper blades.

12. A damper structure comprising the combination of a substantially rectangular frame, pintles journaled therein adjacent opposite sides

of the frame, damper blades mounted in said frame against said pintles, friction clamp elements for adjustably clamping said pintles to said damper blades, damper actuating arms for said damper blades, a rock shaft journaled relative to said frame, a motor for actuating said rock shaft, operative connections between said rock shaft and said damper actuating arms, stop screws cooperating with said rock shaft to limit its rocking positions in the closed and open positions of the damper blades, said stop screws being located within the outline of said frame and adjustable from the front of the frame through said damper blades when they are in their open positions.

13. A damper structure comprising the combination of a frame, pintles journaled therein, damper blades mounted in said frame against said pintles, clamp elements for adjustably clamping said pintles to said damper blades, said clamp elements having spacer lugs for engaging said frame to limit end play of said damper blades in all positions thereof, damper actuating arms for said blades, a rock shaft journaled relative to said frame, a motor for actuating said rock shaft, and operative connections between said rock shaft and said damper actuating arms.

14. A damper structure comprising the combination of a frame, pintles journaled therein adjacent opposite sides of the frame, damper blades mounted in said frame, clamp elements for clamping said pintles to said damper blades, said clamp elements having spacer lugs engaging said frame in all positions of said damper blades relative thereto, and a motor operatively connected with said damper blades for opening and closing them.

15. A damper structure comprising the combination of a frame, pintles journaled therein adjacent opposite sides of the frame, damper blades mounted in said frame, clamp elements for clamping said pintles to said damper blades, said clamp elements having spacer lugs engaging said frame in all positions of the blades, a motor operatively connected with said damper blades, for opening and closing them, and stop screws cooperating with said operative connections to limit the dampers in their closed and open positions, said stop screws being adjustable from the front of the frame when said damper blades are in their open positions.

16. In a damper structure, the combination of a support including a frame, a damper blade hinged in said frame adjacent opposite sides thereof, a rock shaft journaled on said support, a damper control element mounted on said rock shaft, a link operatively connecting said damper

control element to said damper blade, a motor connected with said damper control element to rock said rock shaft, and means for limiting movement of said rock shaft in one direction, said means being adjustable and mounted on said support behind said damper blade for access through said frame and said damper blade when the damper blade is open.

17. In a damper structure, the combination of a support including a substantially rectangular damper frame, a damper blade hinged in said frame, a rock shaft journaled on said support, a damper control element mounted on said rock shaft, means operatively connecting said damper control element to said damper blade, a motor for rocking said rock shaft, a stop element on said rock shaft, and a stop screw coacting therewith and mounted behind said damper blade for access through said frame and said damper blade when open, said stop screw engaging said stop element in one limit position of said damper blade.

18. A damper structure comprising the combination of a support including a frame, a damper blade hinged in said frame, a rock shaft journaled on said support, a damper control element mounted on said rock shaft, a motor mounted on said support, links operatively connecting said damper control element to said motor and to said damper blade, stop means on said rock shaft, and a pair of adjustable stop elements coacting therewith for engaging said stop means in open and closed positions respectively of said damper structure, said adjustable stop elements being located behind said damper blade and accessible for adjustment through said frame from the front thereof when said damper blade is open.

19. A damper structure comprising the combination of a substantially rectangular frame, substantially rectangular damper blades hinged therein adjacent opposite sides of said frame, said damper blades in their closed positions inclining away from the air stream and toward each other and having lips at their outer extremities substantially in contact with each other in the closed positions of the blades, a housing supported by said frame behind said damper blades, a rock shaft journaled in said housing, a damper control element on said rock shaft, operative connections between said element and said damper blades, and motion limiting means for said damper blades in desired open and closed positions thereof, said motion limiting means being supported by said housing and accessible for adjustment through said frame from the front thereof when said damper blades are open.

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