

June 2, 1942.

J. E. MAYNARD ET AL

2,284,912

AIR DUCT DAMPER

Filed April 6, 1939

4 Sheets-Sheet 1

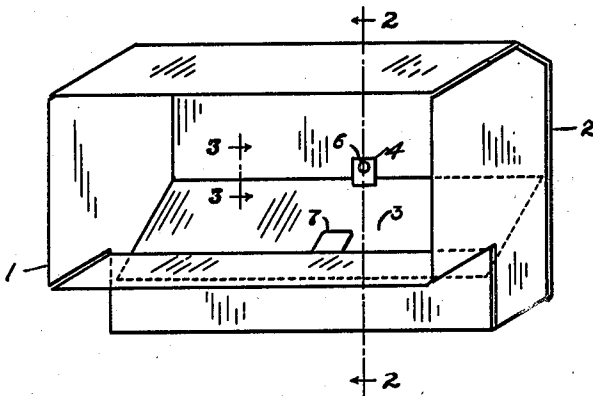


FIG. 1



FIG. 3

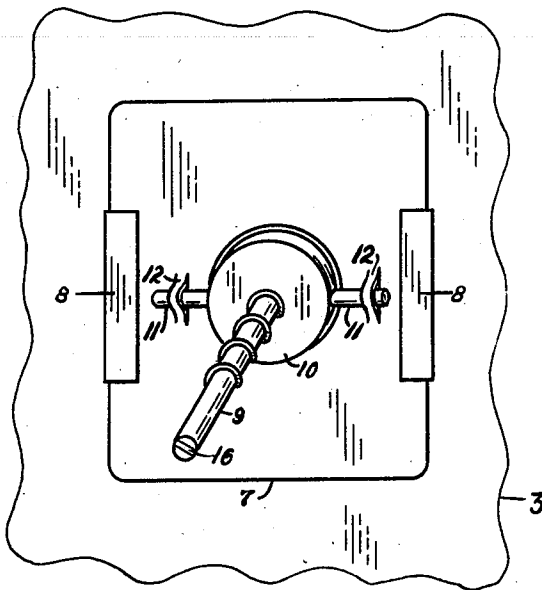


FIG. 4

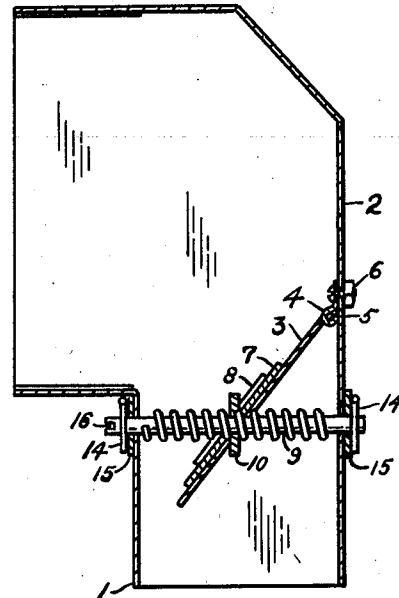


FIG. 2

INVENTOR
J. EARLE MAYNARD
BY PAUL O. COLLINS
O. Z. MCCOY
ATTORNEY

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J. E. MAYNARD ET AL

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4 Sheets-Sheet 2

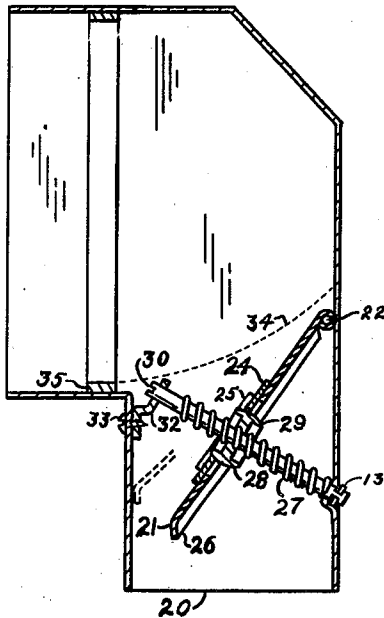


FIG. 5

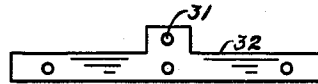


FIG. 6

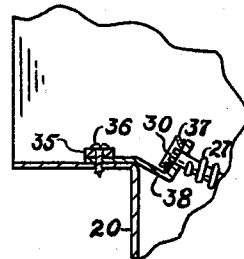


FIG. 7



FIG. 8

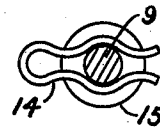


FIG. 9

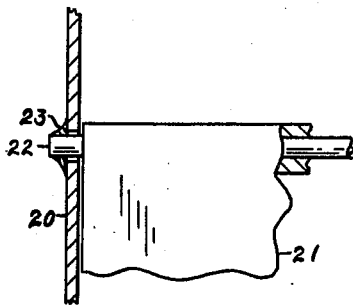


FIG. 10

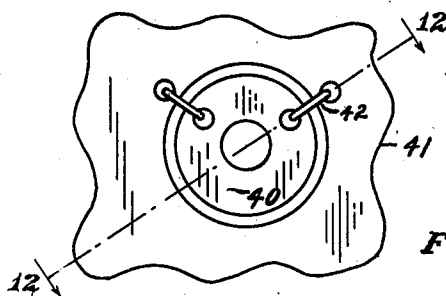


FIG. 11

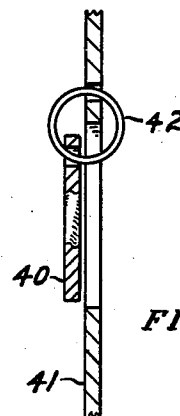


FIG. 12

INVENTOR
J. EARLE MAYNARD
BY PAUL O. COLLINS
O. Z. McCoy
ATTORNEY

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J. E. MAYNARD ET AL

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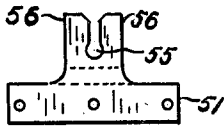


FIG. 14

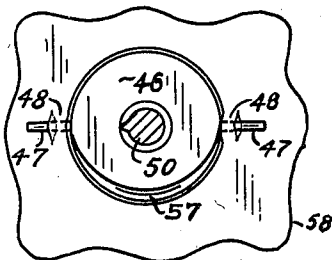


FIG. 15

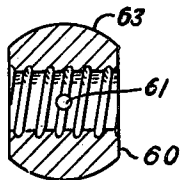


FIG. 17

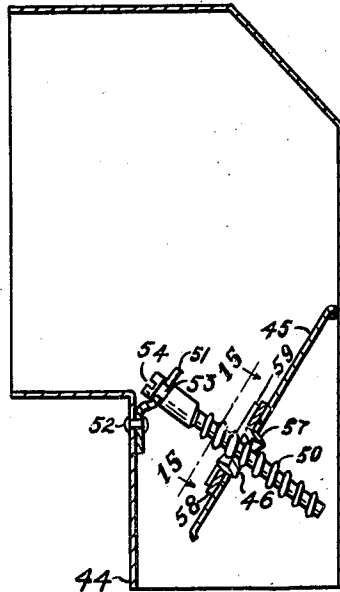


FIG. 13

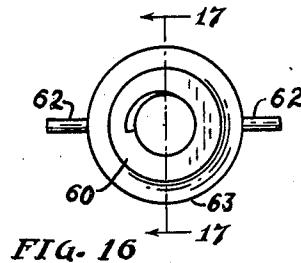


FIG. 16

INVENTOR
J. EARLE MAYNARD
BY PAUL O. COLLINS
O. J. McCoy
ATTORNEY

June 2, 1942.

J. E. MAYNARD ET AL

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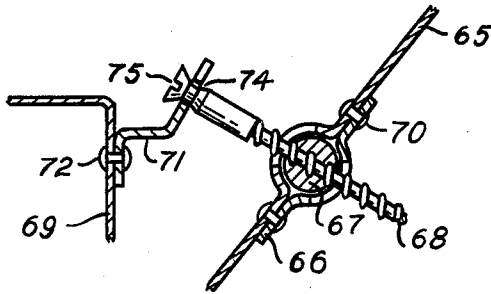


FIG. 18

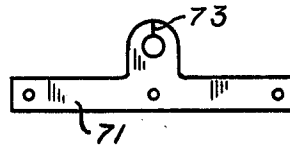


FIG. 20

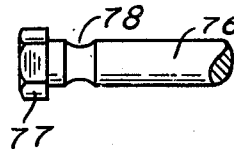


FIG. 21

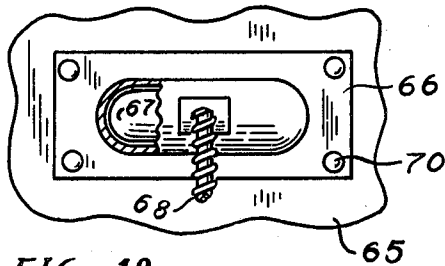


FIG. 19

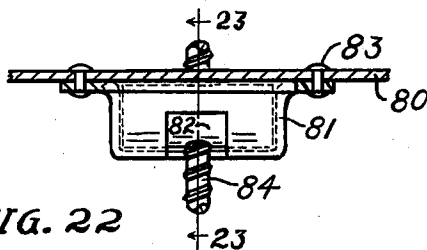


FIG. 22

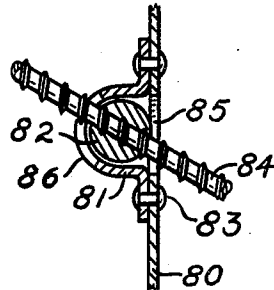


FIG. 23

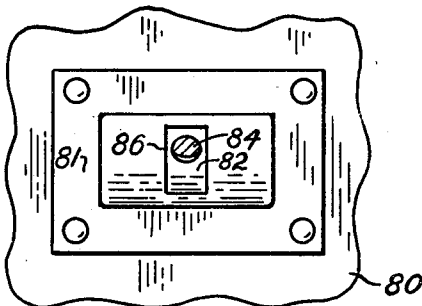


FIG. 25

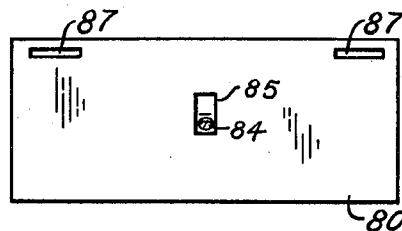


FIG. 24

INVENTOR
J. EARLE MAYNARD
BY PAUL O. COLLINS
O. ZIMMERMAN
ATTORNEY

UNITED STATES PATENT OFFICE

2,284,912

AIR DUCT DAMPER

John Earle Maynard and Paul O. Collins,
Elyria, Ohio

Application April 6, 1939, Serial No. 266,439

11 Claims. (Cl. 98—41)

This invention relates to duct dampers and more particularly to an improved damper construction for use in air conducting systems and the like.

Until the relatively recent developments in air conditioning systems not a great deal of attention has been paid to improvements in air conducting systems and particularly in the damper part of the equipment.

An object of the present invention is to provide an improved damper arrangement for the control of conducted air that introduces a static pressure and an extended plenum chamber in advance of the damper.

Another object is to provide an air conditioning stack head damper in an air duct and the like, that is substantially without objectionable leakage to the outside of the duct and that is substantially free from sound effects caused by the presence of small apertures in the path of the flow of air.

A further object is to provide a damper that is balanced uniformly so that objectionable vibration induced by the dynamic head of the air flow is substantially damped out.

Another object is to provide a damper that eliminates the necessity of having cross dampers that are associated with undesirable turbulence.

Another object is to provide a damper that may be installed or replaced in the stackhead and air outlet without the necessity of removing the air duct and without the necessity of destroying and rebuilding the finish about the installation.

A further object is to provide an improved damper assembly that provides a smoothly working damper that adapts itself for accurate and rapid adjustment and that retains that adjustment over a long period of time.

Another object is to provide a damper arrangement that diminishes the pressure loss ahead of the damper and that tends to reduce the pressure to be maintained in the air duct system.

A further object is to provide air conducting systems with damper arrangements that are adapted for use in the control of heating effects in the winter and cooling effects in the summer with a minimum of effort of adjustment.

Another object is to provide a damper that can be readily installed at convenient locations whereas many prior dampers were located in places that were practically inaccessible.

A further object is to provide a simply constructed damper for air ducts and the like that is adapted for inexpensive and rapid manufac-

ture and installation, that is entirely satisfactory in service, and that is of long life.

With the above and other objects in view that will be apparent to those who are familiar with the art to which the present invention pertains from the following description of adaptations of the invention, suitable illustrative embodiments of the invention are disclosed in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a damper that embodies the present invention mounted in an air duct;

Fig. 2 is an enlarged section taken along the line 2—2 of Fig. 1;

Fig. 3 is an enlarged section taken along the line 3—3 of Fig. 1;

Fig. 4 is an enlarged perspective of the damper operating part of the mechanism that is shown in Fig. 1;

Fig. 5 is a section of an installation wherein the damper operating screw is disposed in angular relation with the side walls of the duct and the central damper aperture is substantially closed at all positions of the damper;

Fig. 6 is a plan view of the strap in which the front end of the damper operating screw in Fig. 5 is journaled;

Fig. 7 is a fragmentary section of the front end journal of the damper operating screw which is provided with a guide for positioning the screw driver blade in the slot in the screw;

Fig. 8 is a plan of a broken washer that seats in a groove in the screw to lock it in position;

Fig. 9 is a plan view of a spring steel locking pin that secures the damper screw in position;

Fig. 10 is a fragmentary view, partly in section, of the damper hinge rod journaled through the side walls of the duct and sealed with drops of solder or the like, against the objectionable loss of air;

Fig. 11 is a fragmentary plan of a modified damper screw nut that swings from the damper on closed links;

Fig. 12 is a section taken along the line 12—12 of Fig. 11;

Fig. 13 is a section of the duct and damper wherein the damper screw is secured at its forward end only;

Fig. 14 is the slotted strap in which the damper screw is journaled in Fig. 13;

Fig. 15 is a plan view of the damper operating means taken from the line 15—15 in Fig. 13;

Fig. 16 is a plan view of a solid damper screw nut;

Fig. 17 is a section taken along the line 17—17 in Fig. 16;

Fig. 18 is a section of the floating screw construction with a modified damper operating mechanism wherein the screw threads through a rod nut that is journaled in depressions in both the damper and a plate that is secured thereto;

Fig. 19 is a perspective view partly broken away of the damper operating mechanism that is shown in Fig. 18;

Fig. 20 is a plan of the slit strap in which the damper screw is journaled in Fig. 18;

Fig. 21 is a fragmentary bolt to replace the screw in Fig. 18;

Fig. 22 is a fragmentary view from above partly in section wherein the damper screw receiving rod nut is journaled in the damper plate;

Fig. 23 is a section taken along the line 23—23 of Fig. 22;

Fig. 24 is a rear elevation of the damper that is shown in Fig. 22; and

Fig. 25 is a fragmentary front elevation of the damper operating mechanism that is shown in Fig. 22.

The air conditioning air duct 1 has a rear wall 2 on which is rotatably mounted in any desired manner the damper 3, as by means of the strap hinge 4. The strap hinge serves as a bearing for the rod 5 over which the rear edge of the damper 3 is rolled and is secured to the rear wall of the duct by suitable means, such as the bolt and nut 6, or the like. In all of the disclosed damper installations, the damper may be mounted in any suitable air conducting line. The damper is well adapted for being mounted in substantially the throat of an air duct, an air conducting trunk line or branch line, or other suitable part of an air conducting means or system.

The slide plate 7 overlies an aperture in the damper 3 and is guided on each of its lateral edges by suitable means, such as the slide plate guides 8 that are preferably, although not necessarily, struck up from the damper 3 to permit movement of the slide plate with respect to the damper.

The damper 3 is adjusted at a desired position in the air duct by the damper screw 9 that makes threaded engagement with the nut 10 that is rotatably mounted in the damper in any suitable manner. In the structure shown, the diametrically projecting pins 11 extend from the nut 10 and are journaled in the straps 12 that are preferably struck out of the slide plate 7. The damper screw 9 is journaled at either end in the front and the back walls of the air duct and suitably secured in position, as by the clamp washers 13 or the clamp pins 14, and with any desired friction assuming means, such as the washers 15. The screw 9 is provided with suitable tool engaging means, such as the screw driver slot 16, or the like, so that the unattached edge of the damper may be moved toward or away from the duct wall 2.

The positioning of the hinge 4, the nut 10, and the screw 9, substantially along the center line of the damper 3 provides a midline support for the damper that opposes in a balanced manner the static air head that is opposed by the damper. This construction provides a nicely operating damper that is noiseless and that has no objectionable vibration in operation. The construction also responds quickly and readily to adjustment and on being adjusted retains its position satisfactorily for indefinite periods thereafter, or

may also be readily and easily readjusted with a minimum of effort.

In the next illustrative structure, the air duct 20 has the damper 21 hinged closely against the back wall thereof by journalling the ends of the rod 22, that is rolled into the upper rear edge of the damper, through the lateral sides of the duct and sealing them therein with any suitable material, such as the lead 23, to avoid sound effects.

The slide plate 24 is guided by the lateral guides 25 that are struck up from the damper 21. The moving edges 26 of the damper 21 may, if desired, be curved slightly so that they make spring pressed wiping actions against the inside surfaces of the air duct by which they are contacted.

The damper 21 is adjustably positioned in the air duct by the threaded interengagement of the screw 27 and the nut 28 that has curved upper and lower surfaces 29 that make closely wiping engagement with the aperture in the slide plate 24 to minimize any sound effects from the presence of undesirable holes therein.

The damper screw is inclined with respect to the front and back walls of the air duct and its end that is remote from the screw driver slot 30 is secured in place by the clamp washer 13. The end of the damper screw in which the screw driver slot 30 is disposed is journaled in the aperture 31 in the strap 32 that is secured to the inner face of the front wall of the air duct by suitable means, such as the metal screws 33. The end of the damper screw in which the screw driver slot 30 is disposed is positioned sufficiently away from the path 34 that is followed by the free end of a register damper that may be mounted in the register damper frame 35 that is secured within the air duct.

This construction provides a damper having a three point or tripod support that is well adapted for the larger installations.

The screw supporting strap may be positioned differently, if desired, as where the strap 38 is disposed beneath the register damper frame 35 and secured in place with suitable means such as the metal screws 36. In any of the constructions, where preferred, the screw driver blade guiding funnel 37 may be mounted on the end of the damper screw so that the blade of a screw driver may more readily be guided into the slot 30.

In the structure that is shown in Fig. 11 of the accompanying drawings the damper screw may thread through the nut 40 that is swung in the nut aperture in the damper 41 by suitable means, such as the endless links or rings 42. The nut 40 may be thin, as shown, where low velocity air currents are used and sound effects are absent, or the nut may be replaced by any other suitable nut that substantially fills the damper aperture, where preferred.

In the air duct and damper arrangement that is shown in Fig. 13, the damper 45 is hinged to the back of the air duct 44 in any desired manner. The damper nut 46 substantially closes the damper nut aperture at all times and eliminates any tendency to produce whistling sounds with high air pressure in the air duct. The damper nut pins 47 may, if preferred, be driven into tapped holes at diametrical opposite positions on the periphery of the nut, as shown, and are journaled beneath the straps 48 that are struck up out of the damper 45, or in other suitable means.

The screw 50 floats in the duct by threading through the damper nut 46 and by being secured

to the duct by the slotted strap 51 that is secured to the air duct by suitable means, such as the rivets 52. The groove 53 in the damper screw 50 adjacent its screw driver slot 54, slips tightly into the journal 55 and the wings 56 are pressed slightly toward each other so that the damper screw 50 cannot escape therefrom.

The upper and lower curved surfaces 57, on the pair of oppositely and axially projecting lips of the damper nut 46, make wiping engagement with the periphery of the aperture in the slide plate 58 that is slidably mounted between the guides 59 on the damper 45.

The nut 60, that is shown in Figs. 16 and 17, comprises a threaded center into which the damper screw is twisted. The nut is tapped along a common diameter, as at 61, and the pair of pins 62 driven into the pin holes 61. The upper and the lower surfaces 63 of the nut 60 are curved properly to make wiping engagement with the periphery of the nut aperture in the slide plate so that the nut closes the nut aperture in the slide plate or damper for substantially all positions of the damper.

Another form of damper operating mechanism is shown in Fig. 18 of the drawings wherein both the damper 65 and the damper plate 66 are depressed to receive and journal the nut 67 therebetween. The nut 67 is substantially cylindrical with rounded ends and is threaded diametrically to receive the screw 68. The damper and the damper plate are both apertured for the screw 68, so that the damper may be positioned without binding at any desired location within the air duct 69. The apertures are as short circumferentially as is practical, to minimize the passage of air around the nut. The plate 66 is secured to the damper by suitable means, such as by the rivets 70.

The screw 68 is journaled in a suitable aperture in the strap 71 that is attached to the duct 69 by the rivets 72, or the like. The screw 68 is mounted in the strap 71 by spreading the wings on either side of the slit 73 sufficiently to admit the groove 74 of the screw therebetween and then the wings are pressed back to their closed position. The screw groove 74 preferably has inclined edges to permit sufficient inclination of the screw with respect to the strap 71 to avoid binding of the screw with the damper in its various positions. Suitable means is provided for causing the rotation of the screw, such as the tool slot 75.

The screw 68 may be replaced by the screw bolt 76, if desired, that may be rotated by the application of a wrench to the screw bolt head 77. The annular depression 78 adjacent the head of the screw bolt 76 may be journaled in the aperture of the strap 71.

The damper 80, that is shown in Fig. 22, carries the damper plate 81 that substantially conforms with the contour of the flat ended rod nut 82. The damper plate 81 is secured to the damper by suitable means, such as by the rivets 83. The nut 82 is rotatably journaled between the damper 80 and the plate 81. The screw 84 threads diametrically thru the nut 82. The damper plate 81 may be replaced, where preferred, by a damper nut strap with or without open end construction, as desired, that may be considered as being shown in section by Fig. 23. Ample clearance for the screw 84 is provided in both the damper and the damper plate by suitable apertures 85 and 86 respectively, that are disposed therein so that binding will not occur

for any position of the damper. The damper may be suspended if desired, by suitable means, not shown, that are disposed in the apertures 87.

It is to be understood that the structures that have been disclosed and described herein may, where practicable, be interchanged or modified for the purpose of gaining advantage in a particular installation and that all structures are submitted for purposes of illustration and explanation and that variations may be made therein without departing from the invention as defined in the appended claims.

What we claim is:

1. A damper assembly, comprising in combination, a damper adapted for being mounted in an air duct, a damper plate substantially overlying an aperture in said damper and in rigid relation with said damper, a cylindrical nut of substantially a uniform diameter thruout its length and apertured diametrically substantially midway between its ends that are rotatably journaled between said damper plate and said damper and said nut assisting in substantially uniformly obstructing the passage of air thru said damper aperture for all adjusted positions of said damper, end portions of said plate engaging the opposite ends of said nut for arresting the axial motion thereof, and damper operating means disposed in said nut aperture for adjusting said damper in said air duct thru its operative engagement with said nut.

2. An air duct damper, comprising in combination, an apertured damper, a cup-shaped damper plate rigidly secured to said damper and substantially overlying the aperture therein, a cylindrical rod nut or substantially uniform diameter thruout its length and rotatably journaled in said damper cup plate and substantially uniformly obstructing the passage of air thru said damper aperture for all adjusted positions of said damper, and damper operating means engaging said rod nut and extending thru said damper plate and damper.

3. A damper mechanism for mounting in an air duct, comprising in combination, a damper screw bolt threaded externally over a part of the length thereof, tool engaging means at substantially an end of said screw bolt, an annular depression groove in said screw bolt adjacent an end thereof, a strap rigidly mountable on a wall of said air duct and having a screw bolt groove journaling aperture opening outwardly of said strap in a screw bolt admitting slit, a pair of bendable portions of said strap adjacent said slit that permit the opening of said slit for the passing of the screw bolt groove therebetween and that serve to restrain the bolt groove from passing thru said slit and out of said strap aperture when the bendable portions of the strap are bent back substantially in the plane of the apertured end of said strap.

4. An air duct damper apparatus, comprising in combination, a screw bolt, a thread of substantially arcuate section extending along a part of screw bolt, a substantially cylindrical rod nut that is of substantially a uniform diameter thruout its length and that is diametrically tapped and threaded substantially midway between the ends thereof for mounting on said screw bolt, a damper plate overlying circumferentially and housing the opposite ends of said nut and journaling the nut therein, a damper to which said damper plate is secured, and a nut end play limiting means at either end of said nut

and adapted for frictionally engaging the opposite ends of said nut for controlling the axial movement of said nut.

5. A damper assembly for being positioned in substantially the throat of an air duct, comprising in combination, a damper for adjusting the rate of air flow in said air duct throat, damper supporting means movably mounting said damper in said air duct, a damper operating means disposed in said air duct and by the manipulation of which said damper may be positioned to regulate the flow of air in said air duct throat, a tool engaging part of said damper operating means by the engagement of which said damper may be adjustably positioned, a damper operating means supporting means having an aperture in which said damper operating means is journaled and a slit opening from said aperture outwardly of said damper operating means supporting means and thru which said damper operating means may be introduced into said aperture, a cylindrical nut of substantially uniform diameter thruout its length mounted on said damper so that both ends of said nut are journaled with respect thereto and diametrically thru which nut said damper operating means extends, and a damper plate that together with said nut substantially overlies said damper aperture and minimizes the passage of air around said nut for all adjusted positions of said damper.

6. A damper mechanism for mounting in an air duct, comprising in combination, a damper screw bolt threaded over a part of its length, tool engaging means at substantially an end of said screw bolt, a screw bolt and supporting strap adapted for being mounted on a wall of said air duct so that a portion extends substantially into said air duct and said screw bolt being journaled in said inwardly extending portion of said strap, a substantially cylindrical nut rotatably mounted on said screw bolt, a damper for adjustably controlling the air flow thru said air duct and apertured for the disposition of said screw bolt therethru, and a damper plate housing said nut and adapted for being secured to said damper and together with said nut substantially uniformly obstructing the passage of air thru said damper aperture for substantially all adjusted positions of said damper.

7. A damper mechanism for mounting in an air duct, comprising in combination, a threaded damper operating screw bolt, a substantially cylindrical nut threading on said screw bolt intermediate the ends of said nut and along substantially a diameter thereof, bolt supporting means in which said screw bolt is journaled, a nut housing means in which said cylindrical nut may rotate and disposed circumferentially outwardly of said nut, and end play arresting means engaging opposite ends of said nut and forming a part of said nut housing means and limiting the axial travel of said nut.

8. An air duct damper apparatus, comprising in combination, a spirally externally threaded screw bolt, a screw bolt supporting means in rigid engagement with a wall of said air duct and in which said screw bolt is rotatably journaled to maintain said bolt in substantially controlled location relative to said air duct, a substantially cylindrical and diametrically apertured nut thread-

ing on said screw bolt, a damper adapted for being regulated by the operation of said screw bolt, and nut housing means in which both ends of said nut are journaled and which is substantially rigidly mounted on said damper whereby said damper may be moved with respect to said air duct by the rotation of said bolt.

9. An air flow regulating device, comprising in combination, a damper that is adapted for being disposed in substantially the throat of an air conducting means and said damper having an aperture disposed therein, a damper mounting means for hingedly securing an edge of said damper to a part of said air conducting means, an externally threaded damper operating means extending into said damper aperture and partially closing said damper aperture to the passage of air therethru in an extent that is substantially the same for all operative positions of the damper, a strap means mountable on said air conducting means for supporting said damper operating means and in which strap means said damper operating means is rotatably journaled, a cylindrical nut that has an internally threaded diametrically extending aperture intermediate the ends thereof for the operative reception of said threaded damper operating means therein, a cylindrical depression in said damper for positioning a part of said nut therein, and a damper plate secured to said damper and having a depression substantially mating with and overlying said damper depression for the journaling of said nut therebetween.

10. An air flow regulating device, comprising in combination, a damper that is adapted for being disposed in substantially the throat of an air conducting line, means hinging said damper to a wall of said line, damper operating means operable thru an aperture in said damper for increasing and decreasing the inclination of said damper with respect to a wall of said air conducting line, a substantially cylindrical diametrically apertured nut engaged by said damper operating means and substantially overlying said aperture in said damper for maintaining a substantially uniform air conduction therethru for substantially all operative positions of said damper, a damper plate overlying a part of said nut so that said nut is journaled therein and rigidly secured to said damper, and a strap secured permanently to a wall of said line and orificed for the journaling of an end of said damper operating means therein and slit for the admission of said damper operating means into said strap orifice.

11. An air duct damper adjusting apparatus, comprising in combination, a screw bolt, a thread of substantially arcuate section extending along a part of said screw bolt, a cylindrical rod nut that is of substantially a uniform diameter thruout its length and that is diametrically tapped and threaded substantially midway between the ends thereof for mounting on said screw bolt, a damper plate overlying and frictionally engaging part of the circumferential face of the nut inwardly of the opposite ends thereof, and a nut and play limiting means adapted for engaging the opposite ends of said nut for limiting the axial movement thereof.

JOHN EARLE MAYNARD.
PAUL O. COLLINS.

CERTIFICATE OF CORRECTION.

Patent No. 2,284,912.

June 2, 1942.

JOHN EARLE MAYNARD, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, first column, line 35, claim 6, for "bolt and" read --bolt end--; and second column, line 66, for "and" before "play" read --end--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 28th day of July, A. D. 1942.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.