4-10-2001

# MOTORIZED INSULATED DAMPER ASSEMBLY FOR FURNACE SYSTEMS

William Max Kirk
*University of Nebraska-Lincoln*, mkirk@wsu.edu

Timothy Wentz
*University of Nebraska-Lincoln*, twentz1@unl.edu

US006213117B1

(12) **United States Patent**
**Kirk et al.**

(10) **Patent No.: US 6,213,117 B1**
(45) **Date of Patent: Apr. 10, 2001**

(54) **MOTORIZED INSULATED DAMPER ASSEMBLY FOR FURNACE SYSTEMS**

(75) Inventors: **William Max Kirk**, Denton; **Timothy Gardner Wentz**, Lincoln, both of NE (US)

(73) Assignee: **Board of Regents of University of Nebraska**, Lincoln, NE (US)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **08/941,805**

(22) Filed: **Oct. 3, 1997**

**Related U.S. Application Data**

(60) Provisional application No. 60/036,391, filed on Jul. 24, 1997.

(51) **Int. Cl.**[7] ............................ **F23L 11/00**; F23L 13/00; F23L 3/00

(52) **U.S. Cl.** ................................ **126/285 R**; 126/285 B; 126/112; 126/85 B; 454/333; 236/1 G

(58) **Field of Search** ............................ 126/285 R, 285 B, 126/112, 110 A, 110 R, 85 B, 77, 15 R, 307 A, 292, 293; 454/333, 353, 347, 265, 266, 251, 252; 236/1 G

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | |
|---|---|---|---|
| 1,767,869 | 6/1930 | Baumgarten | 454/347 |
| 1,828,016 | 10/1931 | Andres | 454/353 |
| 1,879,342 * | 9/1932 | Lauter | 126/112 |
| 2,039,948 * | 5/1936 | Best | 126/110 A |
| 2,224,705 | 12/1940 | Stringer | 126/285 B |
| 2,467,018 * | 4/1949 | Eggleston | 454/251 |
| 2,579,395 * | 12/1951 | Pfautsch | 454/353 |
| 2,800,853 | 7/1957 | Spear | 454/353 |
| 2,856,484 | 10/1958 | Fairbanks | 126/285 B |
| 2,962,218 * | 11/1960 | Dibert | 126/110 R |
| 3,004,484 | 10/1961 | Lorenz | 454/333 |
| 3,821,924 | 7/1974 | Walters | 126/286 |
| 3,964,377 * | 6/1976 | Chapman | 454/353 |

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

| | | |
|---|---|---|
| 278510 | 10/1951 | (CH) . |
| 720542 | 12/1954 | (GB) . |

OTHER PUBLICATIONS

IN–FORCER™ brochure, "The Cost–Effect Cure for Poor Indoor air Quality Due to Negative Pressure in Too–Tightly Constructed Homes," dated 1992.

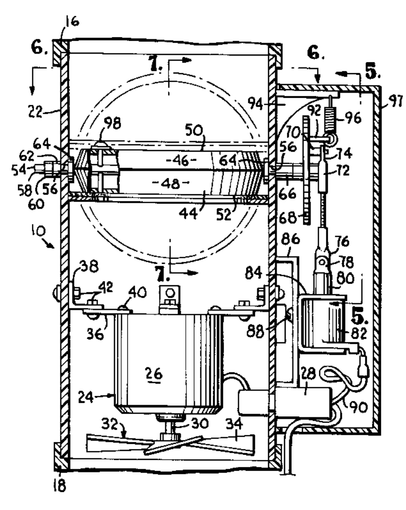
IN–FORCER™ brochure, "The Cost–Effective, Safe Way to Ensure Adequate Adequate Combustion Air for Gas and Oil–Fired Heating Equipment," dated 1992.

*Primary Examiner*—Ira S. Lazarus
*Assistant Examiner*—Josiah C. Cocks
(74) *Attorney, Agent, or Firm*—Shook, Hardy & Bacon L.L.P.

(57) **ABSTRACT**

A damper unit is provided that is adapted to be positioned in a furnace duct line. The damper unit has a housing which is in communication with a fresh air source and a furnace system. The housing has a damper blade which is moveable between an open position which allows air flow through the housing and a closed position which prevents air flow through the housing. The blade is coupled with a solenoid so that when the solenoid is activated the blade is moved to an open position allowing air flow through the housing. Further, a fan is located in the housing adjacent the damper blade. The fan operates to move air into and out of the housing and across the damper blade when the damper blade is in its open position. In one embodiment, a pair of sealing ridges are provided on the interior of the housing. When the damper blade is in a closed position, it is in abutting relationship with the sealing ridges so that air flow across the closed damper blade is substantially prevented by the damper blade and the sealing ridges.

**27 Claims, 3 Drawing Sheets**



U.S. PATENT DOCUMENTS

| | | | | |
|---|---|---|---|---|
| 4,121,562 | * | 10/1978 | Grott | 126/85 B |
| 4,122,835 | | 10/1978 | Bowen, Jr. et al. | 126/286 |
| 4,141,336 | * | 2/1979 | Fitch | 126/112 |
| 4,193,541 | * | 3/1980 | Scheildweiler | 126/285 B |
| 4,206,744 | * | 6/1980 | Mahoney et al. | 126/285 R |
| 4,249,883 | * | 2/1981 | Woolfolk | 236/1 G |
| 4,292,950 | * | 10/1981 | Schossow | 126/112 |
| 4,372,196 | | 2/1983 | Henderson | 454/353 |
| 4,537,117 | * | 8/1985 | Cvaestany et al. | 454/338 |
| 4,777,928 | * | 10/1988 | Ellis | 126/112 |
| 4,920,866 | * | 5/1990 | Hoban | 454/251 |
| 5,012,793 | * | 5/1991 | Guzorek | 126/85 B |
| 5,056,500 | * | 10/1991 | Evens | 126/285 B |
| 5,385,299 | * | 1/1995 | Zawada | 126/110 R |

* cited by examiner

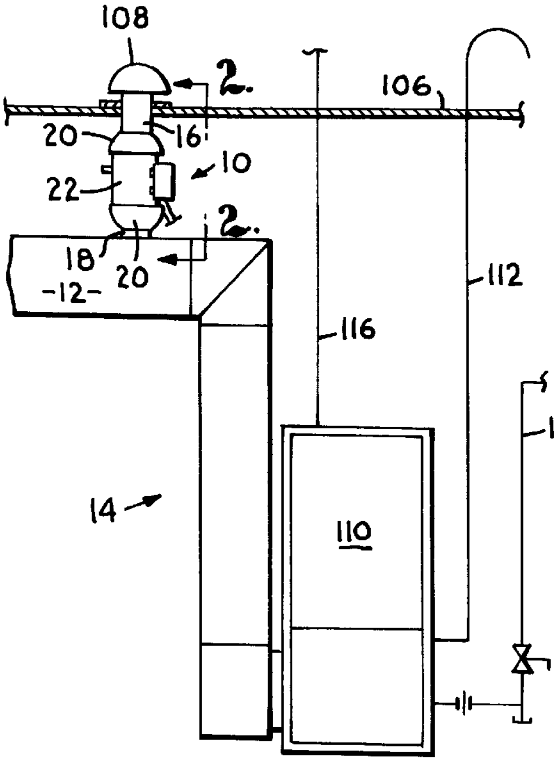
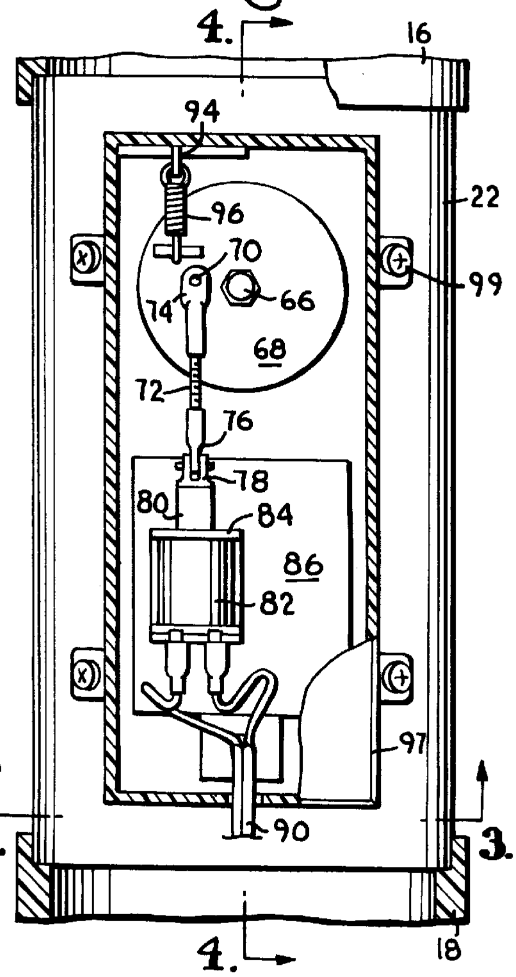



Fig.1.

Fig.2.



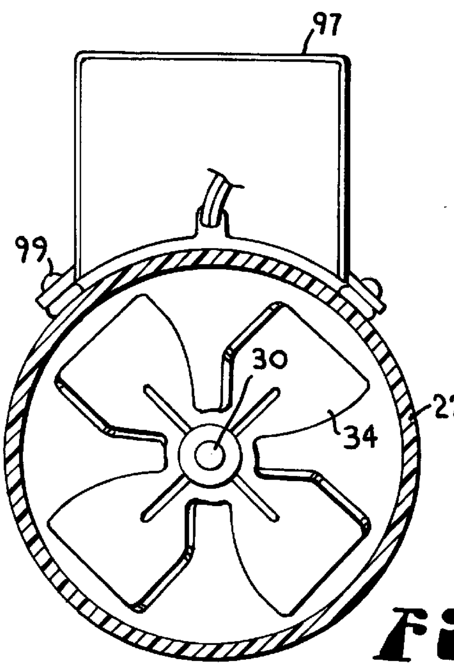




Fig.3.

**Fig.4.**

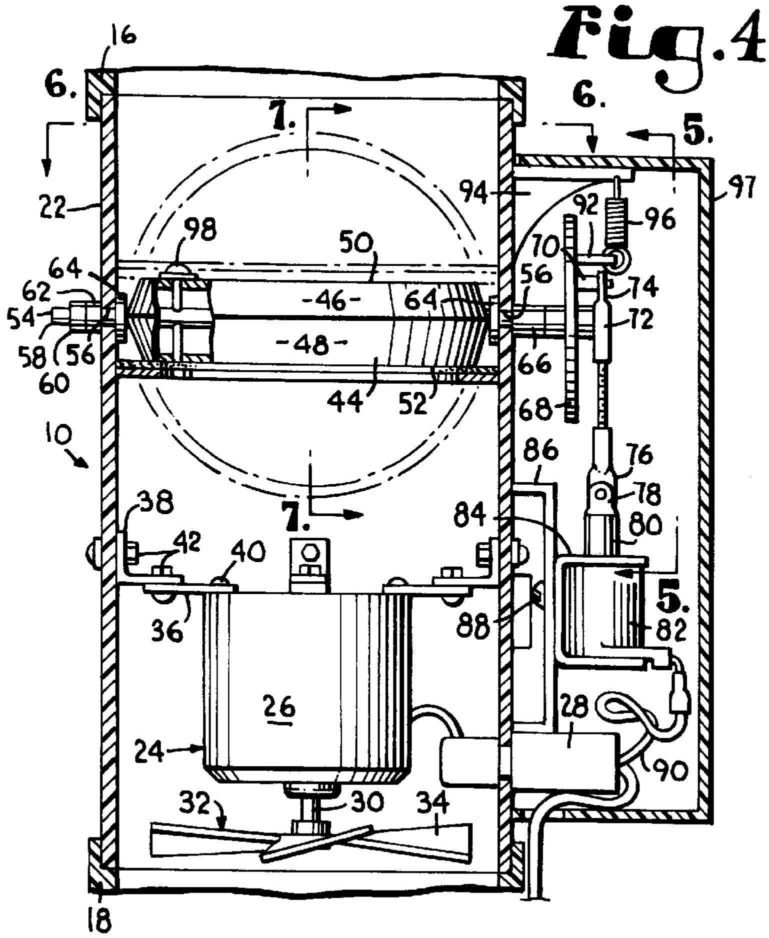



**Fig.5.**

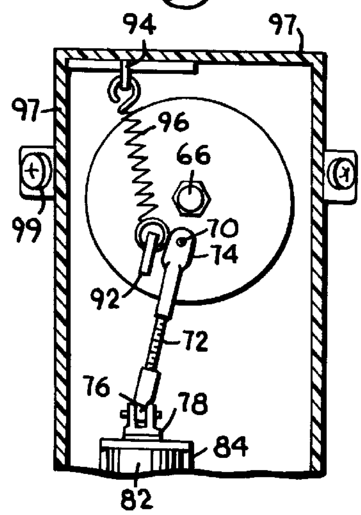



**Fig.6.**

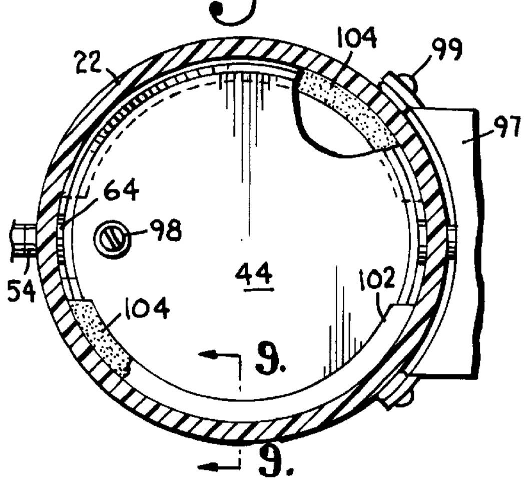



**Fig.7.**

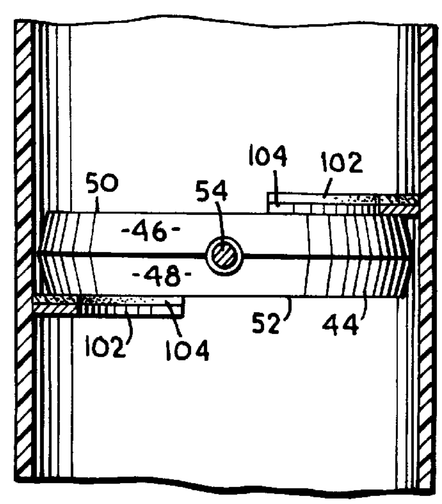


Fig. 8.

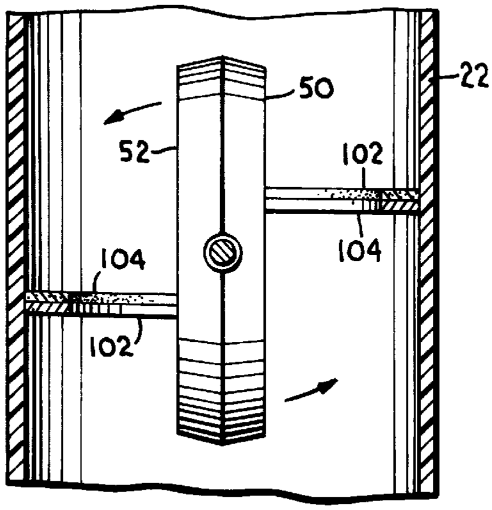



Fig. 9.

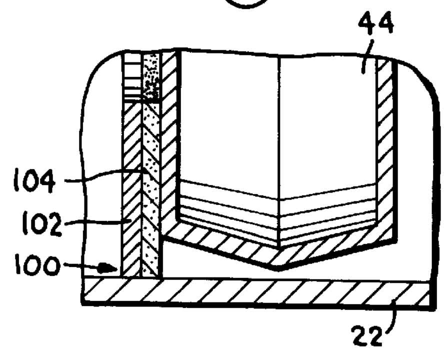



Fig. 10.

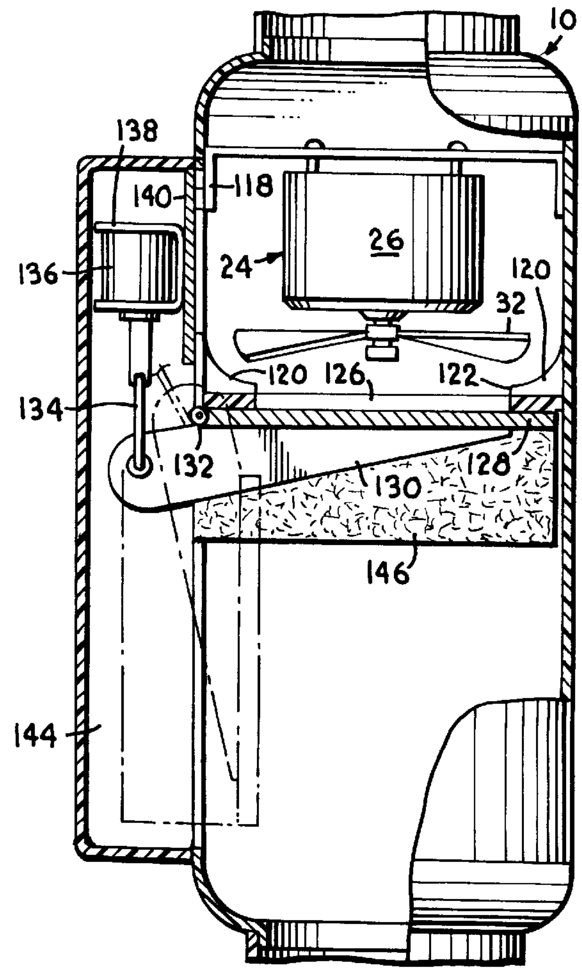
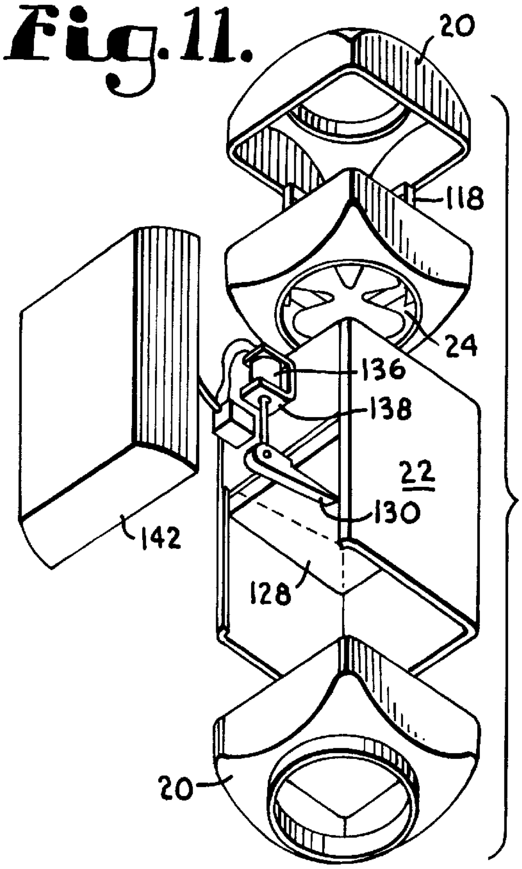



Fig. 11.



# MOTORIZED INSULATED DAMPER ASSEMBLY FOR FURNACE SYSTEMS

This application claims the benefit of U.S. Provisional Application No. 60/036,391, filed Jan. 24, 1997.

## BACKGROUND OF THE INVENTION

The present invention relates in general to furnace dampers, and more specifically, to furnace dampers which can selectively provide fresh air to a furnace while the furnace is in operation, and which can be effectively sealed when the furnace is not in operation.

Newer technologies in home construction have resulted in homes which are more and more "air tight." As a result, these homes are more completely closed and do not allow fresh air to flow into the structure. However, research has shown that a certain amount of fresh air flow is needed to dilute man-made household pollutants which may exist in a home, such as formaldehyde found in paints, volatile organic compounds found in sealants, and toluene found in binders. In order to combat these pollutants, efforts have been made in the area of furnace filter designs to improve the quality of indoor air. However, due to maintenance problems and certain design limitations, these furnace filters do not adequately remove harmful pollutants.

In general, when fresh air flow is increased, the indoor air quality is also increased. At least in part due to these concerns regarding the introduction of fresh air into modern homes, changes were made in the 1991 Uniform Mechanical Code (UMC) provisions regarding fresh air introduction for furnaces with respect to air supply. The UMC now requires that a fresh air intake of 15 cubic feet per minute (cfm) per person be supplied by an outside source. Section 706 of the UMC states:

> Circulating air shall be taken from outside the building or from the conditioned space, or both. Heating systems regulated by this code and designed to replace required ventilation shall be arranged to discharge into the conditioned space not less than the amount of outside air specified in the Building Code.

A typical ventilation standard which is used by many engineers is the American Society of Heating, Refrigeration, and Air-Conditioning Engineers Standard 62-1989. This standard recommends 0.35 air changes per hour, but not less than 15 cfm per person fresh air flow.

Attempts have been made to meet this standard by providing a "passive" fresh air system. This passive fresh air system utilizes an air duct that connects an outside air source to the return air duct of the furnace system via a fresh air supply duct. In this passive fresh air system, fresh air is drawn into the return air duct simply from the suction generated by the main blower fan of the furnace. Thus, these passive systems have been designed to rely upon the main blower fan of the furnace to provide the required amount of suction so that a minimum of 15 cfm per person of fresh air is drawn into the return air duct of the furnace system. This passive system does not regulate the amount of fresh air actually entering the system and does not ensure that the standard of 15 cfm per person of fresh air is being met.

Along with the above disadvantages, the passive fresh air systems being used do not prevent fresh air from flowing into the return air duct of the furnace when the main blower fan of the furnace is not operating. Thus, unwanted outside air can enter the return air duct of the furnace system even when the main blower fan of the furnace is not in operation. Unwanted cold air increases the amount of heating the



furnace must accomplish, which in turn increases the overall energy costs to the consumer. Further, the entrance of cold air into the return air duct in extremely cold environments can result in damage to pipes which may exist in and around the furnace.

Additional problems also exist when excess cold air enters the return air duct of the furnace system. The cold air may cause the products of combustion (principally carbon monoxide, carbon dioxide and water vapor) to condense on the inner surface of the heat exchanger. This condition creates an environment in which the combustion gasses begin to condense out and cause the formation of carbonic acid. This carbonic acid may damage the interior of the furnace through corrosion, causing a reduction in the useful life of the furnace. If a sufficient amount of corrosion takes place, a health hazard may exist if cracks form in the heat exchanger. The existence of cracks in the heat exchanger can cause the heating chamber to fracture which may allow carbon monoxide to mix with the heated air in the room, or to be exhausted improperly. As is well known, carbon monoxide poisoning can lead to illness and sometimes death.

Therefore, an electrically controlled damper is needed which can inject the proper volume of fresh air into the return air duct of a furnace system. Further, an electrically controlled damper is needed which will substantially prevent unwanted fresh air from entering the return air duct when the furnace is not in operation.

## SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide an electrically controlled damper which operates to inject the proper volume of fresh air into the return air duct of a furnace system when the furnace is in operation.

It is a further object of the invention to provide an electrically controlled damper which will substantially prevent unwanted fresh air from entering the return air duct of the furnace system when the furnace is not in operation.

It is another object of the invention to provide a damper which allows communication between a fresh air source and a furnace system and which can be effectively insulated from the fresh air source when the damper is in a closed position.

According to one aspect of the present invention, the foregoing and other objects are achieved by a damper unit adapted to be positioned in a furnace duct line. The damper unit has a housing which is in communication with a fresh air source and a furnace system. The housing has a damper blade which is moveable between an open position which allows air flow through the housing and a closed position which prevents air flow through the housing. The blade is coupled with a solenoid so that when the solenoid is activated the blade is moved to an open position allowing air flow through the housing. Further, a fan is located in the housing adjacent the damper blade. The fan operates to move air into and out of the housing and across the damper blade when the damper blade is in its open position.

In another aspect of the invention, a pair of sealing ridges are provided on the interior of the housing. When the damper blade is in a closed position, it is in abutting relationship with the sealing ridges so that air flow across the closed damper blade is substantially prevented by the damper blade and the sealing ridges.

Additional objects, advantages, and novel features of the invention will be set forth in part in the description which follows, and in part will become apparent to those skilled in the art upon examination of the following, or may be learned from practice of the invention. The objects and advantages of the invention may be realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

## BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings which form a part of the specification and which are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views:

FIG. **1** is a partially schematic perspective view of a furnace system using the motorized damper according the present invention;

FIG. **2** is a side elevation view taken along line **2**—**2** of FIG. **1**, with parts being partially broken away to show particular features of construction;

FIG. **3**. is a sectional view taken along line **3**—**3** of FIG. **2**;

FIG. **4** is a sectional view taken along line **4**—**4** of FIG. **2**, with the blade shown in an open position in broken lines;

FIG. **5** is a partial sectional view taken along line **5**—**5** of FIG. **4**, with the actuating means shown in a position such that the damper blade would be open;

FIG. **6** is a sectional view taken along line **6**—**6** of FIG. **4** with parts being broken away to show particular details of construction;

FIG. **7** is a sectional view taken along line **7**—**7** of FIG. **4**, with the damper blade shown in its closed position;

FIG. **8** is a view similar to FIG. **7** with the damper blade shown in an open position;

FIG. **9** is an enlarged sectional view taken along line **9**—**9** of FIG. **6**;

FIG. **10** is a side elevational view of an alternate embodiment of the present invention with parts being broken away to show particular details of construction; and

FIG. **11** is an exploded perspective view of the embodiment shown in FIG. **10**.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in greater detail and initially to FIGS. **1**, **2** and **4**, a damper in accordance with the present invention is represented broadly by the numeral **10**. Damper **10** is used to couple a return air duct **12** of a furnace system **14** with air from outside the building or structure. Damper **10** is typically coupled to return air duct **12** via duct sections **16** and **18**. Located on opposite ends of damper **10** are partially spherical end caps **20**. End caps **20** operate to couple duct sections **16** and **18** with damper **10**.

Referring more particularly to FIGS. **2** through **4**, damper **10** includes an outer housing **22** to which end caps **20** are attached. Preferably, in this embodiment, housing **22** is cylindrically shaped. Located within housing **22**, and attached thereto is a fan **24** sized to deliver a desired amount of fresh air into furnace system **14**. Fan **24** is used to move air through damper **10**, as is more fully described below. Fan **24** is equipped with a motor **26** which is operably connected to an electrical supply **28** and a controller (not shown). Attached to a shaft **30** of motor **26** is a fan blade **32**. Fan blade **32** is shown in FIG. **3** having four fins **34**, although more or less fins could be used. Fan **24** is held within housing **22** via mounting arms **36** and angle brackets **38**. Mounting arms **36** are fixed to motor **26**, such as by screws **40**. Mounting arms **36** are coupled to angle brackets **38** with bolts **32** and angle brackets **38** are coupled to housing **22** with bolts **42**. This method of attachment of fan **24** allows motor **26** to be replaced should it malfunction.

In operation, fan **24** cooperates with a damper blade **44** which is pivotally mounted to housing **22**. Damper blade **44** has an upper section **46** and a lower section **48** which are each in the shape of a truncated cone. Upper section **46** and lower section **48** are oriented relative to each other so that the diameter existing where upper section **46** and lower section **48** meet is slightly greater than the diameter existing at a top surface **50** of upper section **46** and a bottom surface **52** of lower section **48**. Upper section **46** and lower section **48** form a hollow interior which may contain an insulating material (not shown). Alternatively, damper blade **44** can be made from a solid block of plastic material. Extending through damper blade **44** is a cylindrical pivot pin **54**. Pivot pin **54** extends through a pair of opposing through holes **56** in housing **22**. Through holes **56** may be fitted with bearings or bushings, which are not shown. A first end **58** of pivot pin **54** is held in place with a nut **60** and washer **62**. Disposed in the interior of housing **22** along pivot pin **54** and on opposing ends of damper blade **44** are a pair of washers **64**. The end of pivot pin **54** opposite first end **58** is threaded into a crank shaft **66** located exteriorly of housing **22**. The crank shaft **66** is rigidly secured to a circular crank **68** as best seen in FIGS. **4**, **5** and **6**, and which is more fully described below.

Crank **68** has extending therefrom a linking pin **70** which is rigidly secured to crank **68**. Linking pin **70** is used to secure a connecting rod **72** to crank **68**. Connecting rod **72** has a first end **74** which is pivotally connected through linking pin **70** to crank **68**. Connecting rod **72** has a second end **76** which is pivotally connected to a coupling **78** on a solenoid shaft **80** of a solenoid **82**. Solenoid **82**, connecting rod **72** and crank **68** are used to impart a pivoting motion on damper blade **44**. Solenoid **82** is held in place relative to housing **22** with a holding bracket **84** and a spacer bracket **86** as best seen in FIG. **4**. Holding bracket **84** may be secured to spacer bracket **86** via rivet **88** and spacer bracket **86** may be held in place on housing **22** with any suitable attachment means such as by an adhesive or welding. Solenoid **82** is connected to an electrical supply and a controller (not shown) via wires **90**.

Located adjacent linking pin **70** on crank **68** is an eyelet **92**. Eyelet **92** is rigidly secured to crank **68**, such as by welding. Extending between eyelet **92** and a support **94** is an extension spring **96** as best seen in FIGS. **2**, **4** and **5**. Extension spring **96** operates to bias damper blade **44** to a closed position. A protective cover **97** is secured to housing **22** and over solenoid **82**, connecting rod **72** and crank **68**. Cover **97** is secured to housing **22** with screws **99**, although other attaching means could be used.

As shown in FIG. **4**, damper blade **44** is in its closed position. In this position solenoid **82** is not energized. Thus crank **68**, extension spring **96** and connecting rod **72** are in position as shown in FIGS. **2** and **4**. When it is desired to open damper blade **44**, solenoid **82** is energized and crank **68**, connecting rod **72** and extension spring **96** will assume the position shown in FIG. **5**. When solenoid **82** is energized, a rotating motion is imparted upon pivot pin **54**. Damper blade **44** is secured to pivot pin **54** through a connecting bolt **98** so that damper blade **44** rotates with pivot pin **54**. Thus, with solenoid **82** energized, damper blade **44** will assume a position as best seen in FIG. **8**. In this position, air is permitted to flow through housing **22**.

When solenoid **82** is de-energized, damper blade **44** will return to a closed position caused by extension spring **96**, as best seen in FIG. **7**. In the closed position, damper blade **44** is in abutting relationship with a pair of sealing ridges **100**. Ridges **100** are constructed from a rigid seal support **102** and a sealing material **104**. Material **104** may be secured to support **102** through any suitable attaching means, such as by an adhesive. As best seen in FIG. **6**, sealing ridges **100** are generally semi-circular in shape, but do not extend to a full semi-circle. This is necessary to allow damper blade **44** to pivot to its open position as best seen in FIGS. **7** and **8**. The outer-most diameter of damper blade **44** is sized to allow clearance between the outer diameter and housing **22** as best seen in FIG. **9**.

In use, as best seen in FIG. **1**, damper **10** is placed in furnace system **14** intermediate return air duct **12** and the exterior of the structure. Duct section **16** extends from damper **10** through a roof **106**, and has a protective end cap **108** thereon. Furnace system **14** is provided with a furnace **110** to which is coupled an air supply source **112**, a gas supply source **114** and return air duct **12**. Air supply **112** and return air duct **12** supply furnace **110** with the necessary combustion air and gas supply source **114** supplies furnace **110** with combustion gasses. Furnace **110** is also equipped with a vent **116** which extends beyond roof **106**.

In use, damper **10** is coupled to a controller so that damper **10** will supply fresh air to return air duct **12** when furnace **110** is in operation. More specifically, when the main blower fan of furnace **110** is in operation, a signal is sent to solenoid **82** which activates solenoid **82** and retracts solenoid shaft **80**. This retraction of solenoid shaft **80** operates through connecting rod **72** to rotate crank **68**. The rotation of crank **68** effects a pivoting motion on pivot pin **54** and therefore a pivoting motion on damper blade **44**. The damper blade in its open position can best be seen in FIG. **8**. In this open position, air is allowed to pass through housing **22** and into return air duct **12**. Further, when solenoid **82** is energized a signal is simultaneously sent to fan **24** to activate the fan and turn fan blade **32**. Thus, not only will damper blade **44** be in an open position, but fan **24** will be operating to pull air from the exterior of the structure into return air duct **12**. When the main blower fan of the furnace ceases to operate, solenoid **82** is de-energized, as is fan **24**. Spring **96** will then return damper blade **44** to a closed position. Damper blade **44** cooperates with sealing ridges **100** to prevent air flow through housing **22**. Thus, damper **10** operates to inject a desired volume of fresh air to the return air duct of a furnace system when the main blower fan of the furnace is in operation. Further, damper **10** will prevent unwanted fresh air from entering the return air duct of the furnace system when the furnace is not in operation.

An alternative embodiment of damper **10** is shown in FIGS. **10** and **11**. In this embodiment endcaps **20** are again used on either side of a housing **22**. In this embodiment, housing **22** defines a portion which is only surrounded on three sides, as can best be seen in FIG. **11**. Further, in this embodiment housing **22** is generally rectangularly shaped. In this embodiment, fan **24**, and more particularly motor **26**, is held within housing **22** near an upper end thereof with mounting arms **118**. Mounting arms **118** are secured to housing **22** such as by welding or bolts. Disposed interiorly of housing **22** below fan **24** is a lip **120** which extends completely about the interior perimeter of housing **22**. Lip **120** defines a central opening **122** which is slightly smaller than the diameter of fan blade **32**. Lip **120** has a lower surface **124** on which is secured a sealing gasket **126**. Disposed immediately below gasket **126** is a damper blade **128**.

Damper blade **128** is generally rectangular and operates to completely seal opening **122** when damper blade **128** is in abutting relationship with sealing gasket **126**. Damper blade **128** is fixedly secured to a lever arm **130** which is in turn hingedly connected to housing **22** at a pivot point **132**. Lever arm **130** is pivotally connected to a connecting link **134** which is in turn pivotally connected to a solenoid **136**. Solenoid **136** is secured to housing **22** via a holding bracket **138** and a spacer bracket **140**. A cowling **142** is placed on housing **22** to cover solenoid **136**, connecting link **134** and lever arm **130**. Cowling **142** defines an interior space **144** which allows damper blade **128** to pivot to an entirely open position as best seen in broken lines in FIG. **10**. Further, damper blade **128** may have secured thereto a layer of insulation **146**. Cowling **142** may be sized so as to allow blade **128** with insulation **146** thereon to pivot to a completely open position. When damper blade **128** is pivoted to its completely open position, damper blade **128** is completely away from the opening **122** formed in lip **120**. In this manner, damper blade **128** can be pivoted so as to not interfere with the overall cross-sectional area of housing **22**. In this embodiment, fan **24** is located on the exterior side of damper blade **128** so that when fan **24** is activated and damper blade **128** is pivoted to its open position, air will be pushed through opening **122** and across damper blade **128**. The invention as shown in this embodiment is used as described above for the previous embodiment of damper **10**.



Therefore, the invention provides a damper which can meet the current requirements of the Uniform Mechanical Code for providing fresh air to a furnace system. Further, the damper of the present invention provides an electrically controlled damper which is designed to seal off and insulate a fresh air intake duct from the outside environment when the furnace is not in operation.

From the foregoing, it will be seen that this invention is one well-suited to attain all the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

Since many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

We claim:

**1**. A damper unit adapted to be positioned in communication with a furnace at a furnace duct line for selectively providing fresh air to an indoor environment, comprising:

- a housing having an inlet opening in spatial communication with a fresh air source and an exit opening in spatial communication with the furnace duct line;
- a damper blade disposed completely in said housing and moveable between an open position which allows the passage of air through said housing and a closed position which blocks the flow of air through said housing;
- means for actuating said blade between its open and closed positions; and
- a fan disposed in said housing adjacent said blade, said fan operating to move air into said housing, across said blade in its open position, out of said exit opening, and into the furnace duct line wherein said actuating means and said fan are electrically connected to the furnace to be simultaneously operated in conjunction therewith.

**2**. The unit of claim **1** wherein said blade includes an insulative layer which serves to insulate the furnace duct line interior from the exterior environment when said blade is in its closed position.

**3**. The unit of claim **1** wherein said blade and said fan are operated simultaneously such that, when said blade is in its open position, said fan is operating and, when said blade is in its closed position, said fan is not operating.

**4**. The unit of claim **3** wherein said actuating means includes a solenoid.

**5**. The unit of claim **1** wherein said housing and said blade are generally rectangular in shape, said blade pivotally mounted to said housing along one edge of said blade for movement between said open and closed positions.

**6**. The unit of claim **5** wherein said actuating means includes a lever mounted to said blade, said lever being operatively connected to a solenoid such that operation of said solenoid actuates said blade between its open and closed positions.

**7**. The unit of claim **5** wherein said housing has a relief area for receiving said blade in its open position such that said blade in its open position does not affect the cross-sectional area of the air flowing through said housing.

**8**. The unit of claim **1** wherein said housing and said blade are generally circular in shape, said blade being pivotally mounted to said housing generally about an axis extending in diametrical fashion across said blade.

**9**. The unit of claim **8** wherein said actuating means includes a solenoid used to actuate said blade to its open position.

**10**. The unit of claim **8** further comprising a pair of generally semi-circular sealing ridges extending from an interior surface of said housing, said sealing ridges longitudinally offset from one another such that when said blade is in its closed position one of said ridges engages one side of said blade and the other of said ridges engages the other side of said blade.

**11**. The unit of claim **1** further comprising a sealing ridge disposed in said housing for engaging said blade in its closed position so as to seal the furnace interior from the outside environment.

**12**. The unit of claim **1** wherein said blade in its open position is generally parallel to the longitudinal axis of said housing.

**13**. The unit of claim **1** wherein said fan is located in said housing between said inlet opening and said blade.

**14**. The unit of claim **1** wherein said fan is located in said housing between said blade and said exit opening.

**15**. A damper unit adapted to be positioned in communication with a furnace at a furnace duct line for selectively providing fresh air to an indoor environment, comprising:

a housing having a passageway therethrough, said passageway having an inlet opening in spatial communication with a fresh air source and an exit opening in spatial communication with the furnace duct line;

blocking means, disposed completely in said housing and electrically connected to the furnace, for selectively blocking said passageway to allow and block passage of air therethrough; and

forcing means, disposed in said housing and electrically connected to the furnace, for forcing air through said passageway and into the furnace duct line;

wherein said blocking means and said forcing means operate cooperatively with each other and the furnace such that said passageway is open when said forcing means is actuated and the furnace is operating and wherein said passageway is blocked when said forcing means is not actuated and the furnace is not operating.

**16**. The unit of claim **15** wherein said blocking means includes a centrally pivotal damper blade that aligns with the longitudinal axis of said passageway when said blocking means allows passage of air.

**17**. The unit of claim **15** wherein said blocking means includes a damper blade pivotally mounted to said housing along one edge of said blade.

**18**. The unit of claim **15** further comprising a sealing means for sealing said passageway when said passageway is blocked.

**19**. A damper unit adapted to be positioned in communication with a furnace at a furnace duct line for selectively providing fresh air to an indoor environment, comprising:

a housing having an inlet opening in spatial communication with a fresh air source and an exit opening in spatial communication with the furnace duct line;

a damper blade disposed completely in said housing and moveable between an open position which allows the passage of air through said housing and a closed position which blocks the flow of air through said housing;

means for actuating said blade between its open and closed positions;

a fan disposed in said housing adjacent said blade, said fan operating to move air into said housing, across said blade in its open position, out of said exit opening, and into the furnace duct line wherein said actuating means and said fan are electrically connected to the furnace to be simultaneously operated in conjunction therewith; and

a pair of sealing ridges extending from an interior surface of said housing, said sealing ridges longitudinally offset from one another such that when said blade is in its closed position one of said ridges engages one side of said blade and the other of said ridges engages the other side of said blade.

**20**. The unit of claim **1** wherein said blade is in its open position and said fan is operating when the furnace is operating and said blade is in its closed position and wherein said fan is not operating when the furnace is not operating.

**21**. The unit of claim **1** wherein said actuating means and said fan are directly connected together with the furnace.

**22**. The unit of claim **21** wherein said actuating means and said fan are connected to the furnace by physical wiring.

**23**. The unit of claim **15** wherein said blocking means and said forcing means are directly connected together with the furnace.

**24**. The unit of claim **23** wherein said blocking means and said forcing means are connected to the furnace by physical wiring.

**25**. The unit of claim **19** wherein said actuating means and said fan are directly connected together with the furnace.

**26**. The unit of claim **25** wherein said actuating means and said fan are connected by physical wiring.

**27**. A damper unit adapted to be positioned in communication with a furnace at a furnace duct line for selectively providing fresh air to an indoor environment, comprising:

a housing having an inlet opening in spatial communication with a fresh air source and an exit opening in spatial communication with the furnace duct line;

a damper blade disposed completely in said housing and moveable between an open position which allows the passage of air through said housing and a closed position which blocks the flow of air through said housing;

an actuator capable of moving said blade between its open and closed positions; and

a fan disposed in said housing adjacent said blade, said fan operating to move air into said housing, across said blade in its open position, out of said exit opening, and into the furnace duct line wherein said actuator and said fan are electrically connected to the furnace to be simultaneously operated in conjunction therewith.

* * * * *