Dec. 26, 1967 B. M. SOPHER ETAL 3,360,005

BY-PASS DAMPER DEVICE

Filed Dec. 9, 1963

FIG. 1.

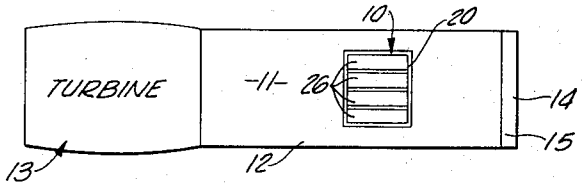


FIG. 2.

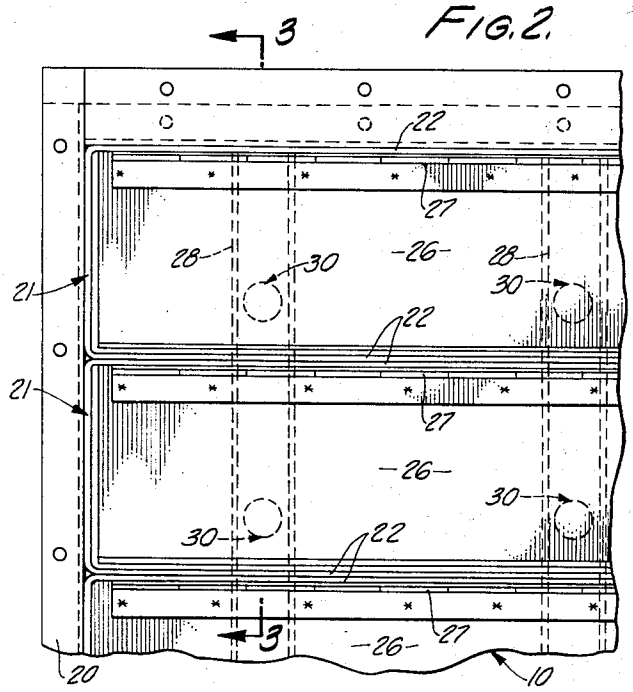


FIG. 3.

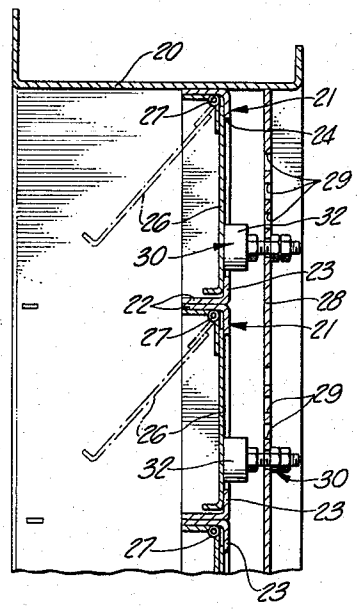


FIG. 5.

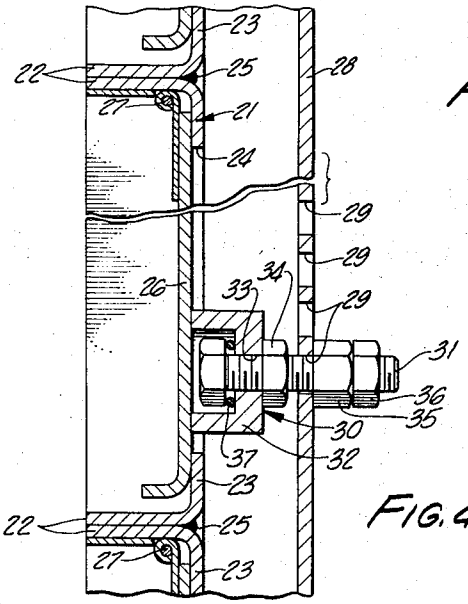
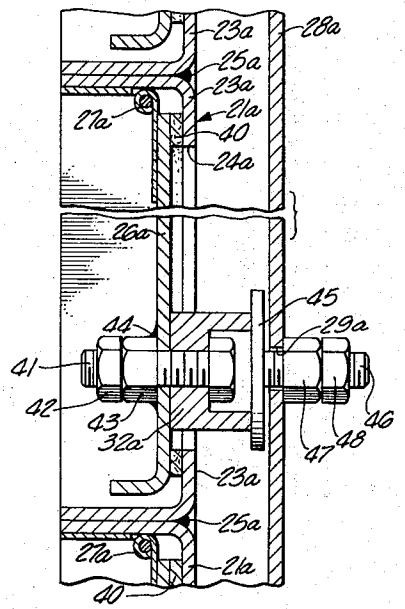


FIG. 4.



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BY-PASS DAMPER DEVICE

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3 Claims. (Cl. 137—512.1)

This invention relates to a normally closed device which opens under predetermined conditions and in particular is directed to an arrangement in an air-using system wherein the normal air supply through certain apparatus may be unintentionally interrupted or terminated and the device of this invention will admit air to the system to supplant the interrupted or terminated air supply.

There are numerous air systems which handle or use a large quantity of air and develop relatively low pressures at the intakes to the systems such as the intakes to gas turbines and large internal combustion engines. These air systems are usually provided with air filtering or cleaning devices at the intakes for removing undesirable particles, moisture or the like from the air being drawn into the particular system as protection for that system. It has been observed that in certain situations the intakes to these air systems may become blocked or at least partially closed such as by an accumulation of frost, snow, leaves and the like in the air filtering or cleaning apparatus provided in the intake to the system. When this blocking or partial closing occurs rapidly or continues un-noticed these systems which use large quantities of air will produce a relatively high suction, i.e., extremely low pressure in the intake area. It has been found that this can cause intake ducting to collapse or components and parts of the intake ducting and air filtering apparatus to become dislodged or broken and then drawn into the air-using system. As a result, extensive damage may be cause to an air system such as turbine, internal combustion engine, or the like.

This problem of damage being caused by clogging of the intake apparatus, such as an air filter, that is intended to prevent damage to the air system has been recognized and as a result devices have been provided for producing an alternate air intake during these adverse situations. In general the present conventional devices are positioned in the intake ducting downstream from the air cleaning or filtering device and are provided with a plurality of louvers, doors or the like for opening upon occurrence of an unusually low intake pressure caused by one of such aforementioned adverse situations. It is only desirable that these louvers open upon occurrence of such adverse situations where the normal air intake path is blocked or abnormally restricted and therefore the louvers of heretofore conventional devices have been spring biased or weighted for continuously being urged toward the closed position. However since these louvers are continually urged in the closed direction an increasing pressure differential will be required to increase the amount of opening of the louvers and yet as the louvers are opened some air will be admitted to thereby reduce the pressure differential and tend to permit the louvers to close. Further it has been found necessary and extremely difficult with these conventional devices to achieve an appropriate compromise whereby the louvers are urged closed by the proper force to result in opening upon the occurrence of a predetermined abnormally low pressure indicating clogging of the normal intake and are urged closed by a sufficient force for the louvers to accomplish an air-tight closure and prevent vibration noises and rattling.

Accordingly, it is an object of this invention to provide a device for use in association with the intake of an air using system for providing an alternate air inlet upon demand for additional air by the air system wherein the closure means are movable between opened and closed positions, are maintained in the closed position by a predetermined high force and yet are maintained in the opened position by a very low continuing force.

Another object of this invention is to provide an air intake by-pass damper device for use with systems using large quantities of air wherein movable dampers are maintained in the closed position predominantly by the force of magnets engaging the dampers only in the closed position whereby a relatively small force is needed to maintain the dampers in an open position compared to the force required to open the dampers.

A further object is to provide a by-pass damper device for intakes of air systems wherein magnetic means maintain pivotally mounted dampers in the closed position and are adjustable in number and in their distance from the pivotal axis of the dampers for permitting free selection of the desired force resistive to opening of the dampers.

Other and more detailed objects and advantages of this invention will appear from the following description and the accompanying drawing wherein:

FIGURE 1 is a schematic illustration of a typical installation employing the device of this invention.

FIGURE 2 is a fragmentary elevation view of a portion of the device of this invention as viewed from the inside of the intake to the air system.

FIGURE 3 is a fragmentary sectional elevational view of the device of this invention taken substantially on the line 3—3 as shown in FIGURE 2.

FIGURE 4 is an enlarged sectional elevation similar to FIGURE 3 and further illustrating certain of the details of the device of this invention.

FIGURE 5 is a sectional elevation view similar to FIGURE 4 illustrating a modified form of the device of this invention.

Referring now in further detail to FIGURE 1, the by-pass damper device, generally designated **10**, of this invention is illustrated as being installed in the sidewall **11** of an intake duct **12** of an air using system **13**, such as the turbine illustrated. Upstream from the location of the device **10** in the intake duct **12** the normal inlet **14** to the system is provided with an air filter **15** or any other type device which normally creates some restriction to air flow into the duct **12** and may create extremely high resistance to air flow upon the occurrence of abnormal conditions such as excessive accumulation of frost, snow, leaves, debris, etc. The exact location of device **10** relative to the turbine and air filter is not critical so long as device **10** will serve as an alternate air inlet to inlet **14** for the turbine or air system **13**.

The device **10** includes a frame **20** which forms a housing for mounting in an opening provided in the sidewall **11** of the intake duct **12**. The frame **20** is appropriately secured to the intake duct **12** by any convenient means (not shown) and cooperates with the opening provided whereby any air passing through the opening in the intake duct **12** must pass within the confines of the frame **20**. A plurality of sub-frames **21**, such as the four shown, are mounted within the frame **20**. Each sub-frame **21** forms a rigid rectangular member having sides **22** and inwardly extending flanges **23** forming an opening **24**. The sub-frames **21** are secured to the frame **20** and to each other by any convenient means such as weld **25** to occupy the entire opening through frame **20**. While four sub-frames **21** have been shown as being positioned vertically one above the other and described as having a

particular structure it is to be understood and will readily appear to those skilled in the art that more or fewer may be used and that other structural arrangements may be employed without departing from this invention.

A louver, door or damper **26** is pivotally mounted in each sub-frame **21** by any convenient means such as a hinge **27** having one portion connected to the sub-frame and the other portion connected to the damper. The damper **26** is of a sufficient size and properly positioned for completely closing the opening **24** when the damper is in the closed position illustrated in FIGURE 4 and by solid lines in FIGURE 3. With respect to the direction of air flow the damper **26** is mounted downstream (or inside) of the flanges **23** forming the opening **24** whereby pivoting of the dampers **26** about the hinge **27** is accomplished by pivoting the dampers inwardly in the direction of air flow as illustrated by the phantom lines in FIGURE 3. While it is not essential to this invention it is preferred that the frame **20** be mounted in a sidewall or the bottom of the intake duct **12** with the hinges **27** along the upper edge of the attached dampers **26** whereby the force of gravity will tend to return the dampers to the closed position. It will be readily appreciated that the frame **20** may be mounted in other positions and any convenient counter-balancing means or light spring biasing means may be provided for urging the dampers **26** to the closed position during normal conditions of intake air pressure differential.

A plurality of vertically extending supports **28** are mounted in and across the front of frame **20** in spaced relation. Each support **28** is provided with a plurality of vertically spaced holes **29** opposite each damper **26**. A plurality of magnetic latch assemblies, generally designated **30**, are provided and at least one magnetic latch assembly **30** is mounted in a hole **29** opposite each damper **26** for engaging that damper in the closed position. The magnetic latch assembly **30** may be constructed in any convenient way such as by securing a bolt **31** to a conventional cup-shaped magnet **32** with the bolt passing through a hole **33** in the magnet and a lock nut **34** clamping the magnet to the bolt. The bolt is passed through a hole **29** and a pair of nuts **35** and **36** are locked together on the bolt for attaching the magnetic latch assembly **30** to the support **28**. The nuts **35** and **36** and lock nut **34** are spaced a greater distance than the thickness of support **28** thereby only loosely connecting the magnetic latch assembly **30** to the support. Further, a resilient rubber ring **37** is positioned between the head of bolt **31** and the magnet **32** to produce a flexible connection between the bolt and magnet. In this manner the entire magnetic latch assembly **30** as well as the magnet **32** itself may adjust to the appropriate position for accomplishing surface contact between the damper **26** and the magnet for producing the maximum magnetic retentive force between the magnet and the damper. The dampers **26** are preferably of an iron base metal susceptible to magnetic attraction or a piece of such metal is provided on each damper **26** adjacent each support **28**.

With the damper **26** engaging the magnet **32** of the magnetic latch assembly **30**, the damper **26** is maintained in the closed position by this magnetic force which completely predominates any force of gravity or spring biasing which tends to urge the damper toward the closed position. When the pressure within the intake duct **12** reaches an abnormally low level such as by reason of extreme clogging of filter **15** the atmospheric pressure will urge the dampers **26** inwardly to their open positions and the continued flow of air through the dampers will maintain them in their open positions. Upon unclogging of filter **15** by maintenance or through melting of the frost or snow, the normal air flow through inlet **14** will resume thereby reducing the quantity of air flow through the device **10** and permitting the dampers **26** to automatically return to their closed positions. The dampers **26** will return to their closed positions provided the gravitational or spring biasing forces acting on the dampers are sufficient to overcome this reduced air flow through the openings **24** of the device **10**. Upon returning to the closed positions the dampers **26** will again be engaged by the magnets **32** for retaining the dampers in this position until re-occurrence of clogging of the inlet **14**.

As described, the supports **28** are provided with a plurality of vertically spaced holes **29** adjacent each damper **26** and these holes permit installation of the magnetic latch assembly **30** in any desired vertical location relative to the hinge **27** of the damper **26**. In this manner the moment of resistive force retaining the damper **26** in the closed position may be adjusted by adjusting the distance from the pivotal axis even though the magnets **32** are of the permanent type and their forces produced cannot be varied for the given magnet. Moreover, since there are a plurality of supports **28** and therefore there may be a plurality of magnetic latch assemblies **30** engaging each damper, it is possible to vary this number of magnetic latch assemblies **30** engaging each damper **26** for producing the desired retentive force. This combination of flexibility of number of magnetic latch assemblies **30** and location of each assembly relative to the pivot hinge **27** produces a versatility of adjustment previously unknown and allows accurate preselection of the desired intake pressure level needed for opening the dampers **26**.

Referring now to FIGURE 5, some modifications in details of construction of the device of this invention are illustrated. The sub-frames **21***a* and supports **28***a* may be substantially the same as sub-frames **21** and supports **28** heretofore described and may be mounted in a frame similar to described frame **20**. Dampers **26***a* are similar to dampers **26** and each is mounted by a hinge **27***a* to the associated sub-frame **21***a*. A gasket **40** may be provided between the flange **23***a* of the sub-frame **21***a* and the damper **26***a* and located for surrounding the opening **24***a* in the sub-frame. The gasket **40** may be secured to either the damper **26***a* or the flange **23***a* of the sub-frame **21***a*. In this manner a completely air tight seal and a more quiet operation may be achieved. It will readily appear to those skilled in the art that a gasket **40** could also be provided with the embodiment illustrated in FIGURES 1–4. A permanent magnet **32***a* is secured to damper **26***a* adjacent a support **28***a* by any convenient means such as a bolt **41** passing through the magnet **32***a* and the damper **26***a* with a pair of nuts **42** and **43** locking the magnet in position. Welding **44** may be used for securing nut **43** to the damper **26***a* to prevent inadvertent releasing of the described nuts, bolt and magnet. A striker plate **45** has a threaded shank **46** for extending through a hole **29***a* in the support **28***a* and a pair of nuts **47** and **48** engage shank **46** for loosely locking the striker plate **45** to the support **28***a*. The striker plate **45** is of an iron base metal for being attracted by the magnet **32***a*. In the closed position of damper **26***a* the magnet **32***a* makes surface contact with the striker plate **45** for producing the magnetic force to retain the damper in this closed position. By this arrangement the magnetic latch assembly **30** of the previously described embodiment is replaced by this cooperating magnet **32***a* and striker plate **45** assembly.

Having fully described our invention it is to be understood that we do not wish to be limited to the specific details herein set forth or to the details of construction illustrated in the drawings, but rather our invention is of the full scope of the appended claims.

We claim:

1. In an air by-pass arrangement for use in an opening in an air supply system, the combination of:

closure means pivotally mounted relative to said opening for positioning to close the opening,

said closure means being pivotable inwardly relative to the opening to an open position for admitting air through the opening,

a bracket means positioned substantially parallel to said closure means in the closed position of the clo-

sure means and extending at a substantial angle to the pivotal axis of the closure means, and magnetic means loosely mounted on said bracket means for engaging said closure means in the closed position of said closure means, and said magnetic means being releasably mounted and movable to various locations along said bracket means for positioning at preselected distances from the pivotal axis of the closure means to produce preselected forces resisting the said movement from the closed position to said open position.

2. In an air by-pass arrangement for use with an auxiliary opening in the intake of an air system normally drawing air from the atmosphere through restrictive means in another opening, the combination of:

a frame for cooperating with said auxiliary opening,

a plurality of dampers pivotally mounted in said frame across said auxiliary opening said dampers cooperating with each other and with said frame for completely closing said auxiliary opening,

said dampers pivotable from said closed position to open positions for admitting air from the atmosphere to the air system,

and a plurality of individual magnetic means loosely mounted in said frame and positioned in laterally spaced relation to each other in association with each said damper for engaging that associated in surface contact relationship damper in the closed position,

each said magnetic means releasably mounted for selectively positioning at varying locations radially spaced from the pivotal mounting of that associated damper for magnetically exerting a predetermined resistive force dependent on said radial spacing to be overcome by the air demand of the air system upon abnormal increase in the air flow restriction by the restrictive means for opening said dampers and admitting the air to the air system.

3. In an air by-pass arrangement for use with an auxiliary opening in the intake of an air system normally drawing air from the atmosphere through restrictive means in another opening the combination of:

a frame for cooperating with said auxiliary opening,

a plurality of dampers pivotally mounted in said frame across said auxiliary opening, said dampers cooperating with each other and with said frame for completely closing said auxiliary opening,

compressible gasket means mounted between said frame and dampers for sealing therebetween,

said dampers pivotable from said closed position to open positions for admitting air from the atmosphere to the air system,

a plurality of individual magnetic means loosely mounted in said frame and positioned in laterally spaced relation to each other in association with each said damper for engaging that associated damper in surface contact relationship in the closed position and compressing said gasket means,

each said magnetic means radially spaced from the pivotal mounting of that associated damper for magnetically resisting the opening of that damper,

and means for adjusting said radial spacing of each individual magnetic means for exerting a predetermined resistive force to be overcome by the air demand of the air system upon abnormal increase in the air flow restriction by the restrictive means for opening said dampers and admitting air to the air system.

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