May 22, 1956 R. H. AUFDERHEIDE 2,746,416

FILTER CLOGGING INDICATOR

Filed June 23, 1954

Fig. 1

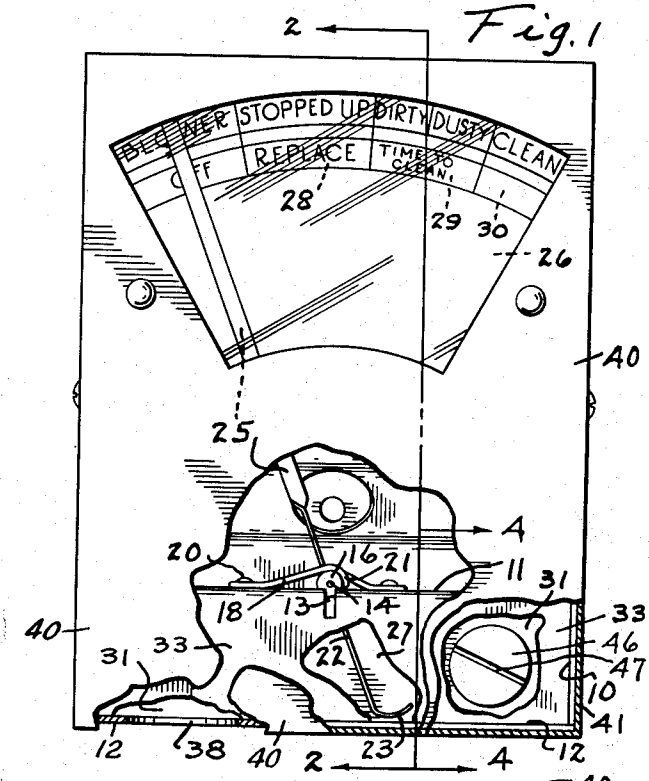
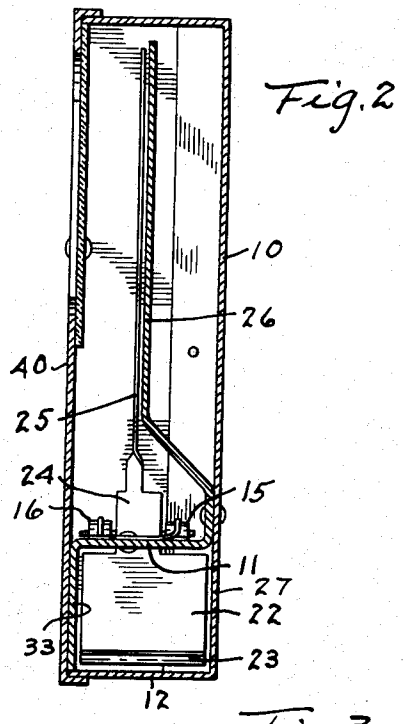


Fig. 2



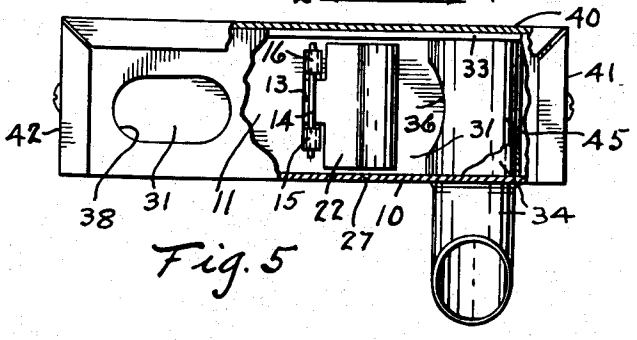
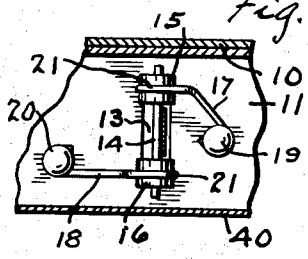


Fig. 5

Fig. 3



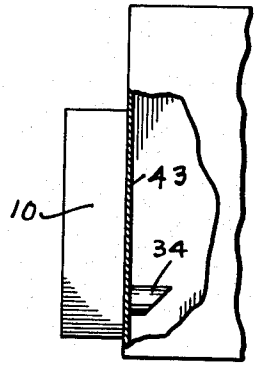


Fig. 6

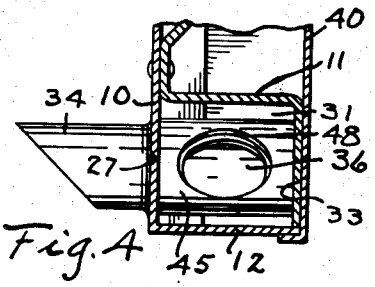


Fig. 4

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FILTER CLOGGING INDICATOR

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4 Claims. (Cl. 116—117)

This invention relates to a device for giving a visual indication of the degree of clogging of an air filter in a hot air heating system. In warm air furnaces, it is customary to have a filter inserted in the duct leading into the furnace on the intake side of a fan which discharges air into a plenum chamber for distribution into the warm air ducts, the filter being at the cold air intake from the various spaces being heated. Filters located in such places are subject to being clogged by lint and dirt being taken from the spaces, and when the filter becomes too seriously clogged, then the fan or blower is unable to deliver the proper pressure in the pleunm chamber to effect the carrying of the warm air into the spaces for heating. The circulation of the air from the cold air ducts over the heating areas in the furnace and back into the spaces to be heated is seriously impaired by a dirty filter.

By use of my device, the condition of the filter is readily determined simply by a glance at the indicating part of the device so that the filter itself does not have to be pulled out and inspected to determine its actual condition of dirt coverage or penetration.

My device also lends itself to easy installation on the furnace and may be produced at a relatively low cost. The use of the device embodying the invention generally means the difference between a very ineffective and a most efficient heating system because the condition of the filter is made apparent at a glance whereas a dirty filter is generally allowed to remain in that condition over too long a period of time.

These and many other objects and advantages of the invention will become apparent to those versed in the art in the following description of one particular form of the invention, as illustrated in the accompanying drawing, in which,

Fig. 1 is a view in front elevation and partial section of a structure embodying the invention;

Fig. 2 is a vertical section on the line 2—2 in Fig. 1;

Fig. 3 is a view in detail in top plan and transverse section of the mounting of the shiftable vane;

Fig. 4 is a detail in vertical section on the line 4—4 in Fig. 1;

Fig. 5 is a view in bottom plan of the device in partial section; and

Fig. 6 is a view in side elevation and partial section on a reduced scale of the device as mounted on a plenum chamber.

A housing generally indicated by the numeral **10** is formed to have a horizontally disposed transverse partition **11** spaced above the floor **12**. An opening **13** is provided through the partition **11**, and a shaft **14** is rockably mounted substantially centrally across this opening by having its end portions carried in bearing beads **15** and **16**. These beads **15** and **16** are of a diameter somewhat larger than the width of the opening **14** so that by a limited circumferential portion thereof in each instance, these beads **15** and **16** are held against rolling out of the opening, and this positioning is maintained

by means of hold down clip wires **17** and **18**, Fig. 3, which have end portions rockably carried under rivet heads **19** and **20**. The other end portions of these wire clips **17** and **18** are curved as at **21**, Fig. 1, to rest over the top sides of the beads **15** and **16** so as to retain them in position.

A vane **22** is secured by an upper end to the shaft **14** and this vane **22** is thus free to rock with the shaft **14** supported through the beads **15** and **16**. The lower end portion of the vane **22**, Fig. 1, is preferably carried to within close proximity with the floor **12**, and has a lower rounded lip **23** extending from the lower end portion in an arcuate manner. The lip **23** is turned generally around and slightly upwardly.

The upper portion of the vane **22** terminates in a generally rectangular plate **24**, Fig. 2, from which extends a needle or finger **25** to the uppermost portion of the housing **10**, so that the pointer **25** is free to rock as the vane **22** may be rocked under the partition **11**. The pointer **25** as described extends above the partition **11**, and sweeps with a clearance over the dial **26** which is mounted on the back wall **27** of the housing **10**, to extend upwardly and outwardly therefrom in a substantially vertical plane.

The upper portion of the dial **26** carries certain indicia thereon as illustrated in Fig. 1, such that when the vane **22** and the pointer **25** are in their normal positions of rest which positions are as those indicated in Fig. 1 when the furnace blower is not in operation. In these positions, the pointer **25** will be over the indicia indicating that the blower is off. Then there is a circumferential area **28** carrying the wording in the present instance of "Stopped Up" and "Replace." When the pointer **25** is over that area **28**, the indication is when the furnace is running that the filter is in that state of clogging with dust wherein it should be replaced. Then next adjoining the area **28** is a third area **29** carrying the wording "Dirty Dusty" and "Time to Clean." In other words, when the pointer **25** is over the area **29**, the indication thereby given is that the filter should be cleaned so that it can be continued in use. Then the last area **30** to the right of the area **29** is that area over which the pointer **25** will go when the filter is new and is clean so that the minimum and normal resistance to air is had in flowing therethrough.

Since the partition **11** extends entirely horizontally across the housing **10**, there is the lower compartment **31** defined between that partition, the back wall **27**, the floor **12**, and a front wall **33** turning downwardly from the partition **11** into contact with the floor **12**. The vane **22** may rock in that compartment **31**. At one end of the compartment **31**, there is a tube **34** carried across the compartment to have an inner closed end **35** and an opening **36** on its side within the compartment. The tube **34** extends outwardly from the back wall **27** a distance and is preferably terminated in a diagonal plane. This tube **34** is located out of the permissible travel of the vane **22**.

On the other side of the vane **22**, the compartment **31** continues with the same cross-sectional area to the opposite side of the housing **10**. In that portion of the compartment **31**, there is provided a window **38** through the floor **12**. A front cover **40** with sides **41** and **42** is attached to the housing **10** to complete the structure.

The structure above described is mounted on the furnace in any suitable position where it is subjected to the discharge side of the blower. Normally this would be the plenum chamber, as illustrated in Fig. 6, which receives the discharge of the blower of the furnace. The housing **10** is mounted against the outside wall **43** of the plenum chamber to have the tube **34** extending inwardly thereof so as to place the compartment **31** into com-

munication with the pressure in the plenum chamber. When the blower is not in operation, the pressure in the plenum chamber as well as in the compartment 31 will be substantially atmospheric pressure. When the blower is put into operation, the plenum chamber will normally be pressurized so that the pressure therein will be transmitted to the compartment 31, so that the vane 22 is tended to be rocked by its lower end toward the window 38. The air tends to discharge through the tube 34, the window 36, and around the vane 22 which is somewhat loosely carried within the compartment 31, and then out the window 38 into the atmosphere. The rate of flow of the air from the plenum chamber through the compartment 31 in the manner just described will determine the degree of rocking of the vane 22, and correspondingly the degree of rocking of the pointer 25.

When air is restricted in flow through the filter, the blower cannot exert as much pressure in the plenum chamber as it would when the filter is clean, and consequently the pressure in the plenum chamber will vary in accordance with the degree of clogging of the filter. In this manner, the positioning of the pointer 25 will be influenced by the pressure in the plenum chamber.

Each furnace system will vary in respect to the air pressures therein independently of the filter restriction depending upon several factors, including among others, the length of the air ducts, the cross-sectional area of the ducts, and filter construction. Also there will of necessity be different locations at which my indicator may be applied, the location not always being at the plenum chamber.

To correlate the indicator with the individual furnace system, I provide means for varying the effective size of the opening 36 out of the tube 34 to control the travel of the needle 25. One particular form of such means consists of a tubular sleeve 45 which surrounds and frictionally engages that portion of the tube 34 which will extend across the compartment or tunnel 31. This sleeve 45 is closed at its front end by the closure head 46 which carries a slot 47 thereacross as a means by use of a tool such as a screw driver to revolve the sleeve 45 circumferentially around the tube 34. The sleeve 45 has an opening 48 along one side with a surrounding margin conforming in shape and extent to coincide with the margin of the tube opening 36 when the sleeve 45 is so turned. This gives maximum air flow from the tube 34 through the compartment 31.

By revolving the sleeve 45, the effective area of the opening 36 may be varied from that full size to a reduced or fractional size, whereby the indicator may be calibrated from its front side after installation to give a needle travel in accordance with the actual furnace filter condition, so that the sweep of the finger will remain within the confines of the dial, and also whereby but one indicator dial or card 26 is required for all installations.

While I have herein shown and described my invention in the one particular form, it is obvious that structural changes may be employed without departing from the spirit of the invention, and I therefore do not desire to be limited to that precise form beyond the limitations which may be imposed by the following claims.

I claim:

1. An indicator for indicating degree of air flow through a filter in the air intake conduit of a blower in a forced air flow type heating furnace, indicating only during operation of the blower, comprising a housing; a vane rockably supported on an axis transversely extending across the upper side of the housing to have the vane hang downwardly and swing freely therein; a needle extending generally upwardly from and fixed in relation to said vane to swing therewith; an indicia card traversed by said needle within the limits of swinging of said vane; a tube entering said housing to one side of said vane and open from its outer end, and further having an opening within the housing; means adjustably varying the area of said opening within the housing for individual furnace conditions; said tube by its outer end connecting to said furnace on the discharge side of said blower; said housing having an opening on the other side of said vane removed from said tube and discharging into the atmosphere; said vane and needle being in effect an integral unit and of distributed weight from said axis to induce by gravity a return of the needle always to an end position on said card when said blower is inoperative.

2. The structure of claim 1 in which said vane by its lower end approaches closely to the floor of said housing and turns up therefrom by an arcuate portion on the vane side toward said tube.

3. The structure of claim 1 in which said housing is rectangular and has a transverse slot across its upper side; a pair of spaced apart beads resting above and across the margins of said slot; a shaft rotatably carried by ends inserted in said beads; means maintaining said beads in position over the slot; said axis coinciding with the axis of said shaft, and said vane being fixed to said shaft.

4. The structure of claim 1 in which said tube opening is through its circumferential side and said adjustable means comprises a closed end sleeve having a side opening and telescoping revolubly with said tube within said housing to have said tube and sleeve opening selectively register circumferentially upon revolving the sleeve in respect to the tube.

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