

March 3, 1970

F. A. KAUTZ ET AL

3,498,205

ROOFTOP AIR INTAKE UNIT LOUVER

Filed July 26, 1968

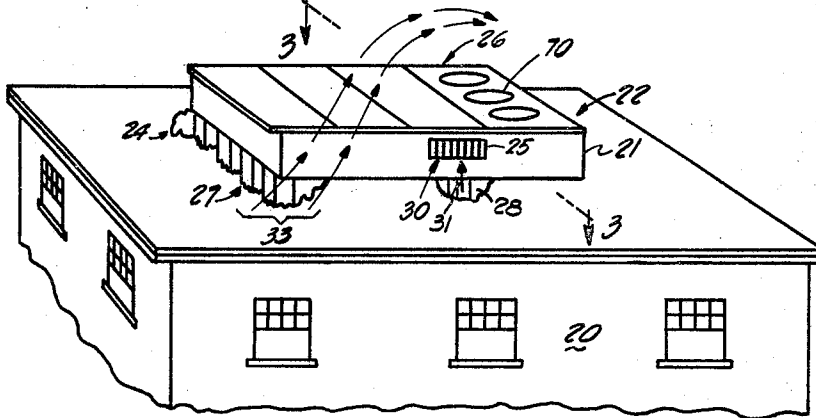


FIG. 1

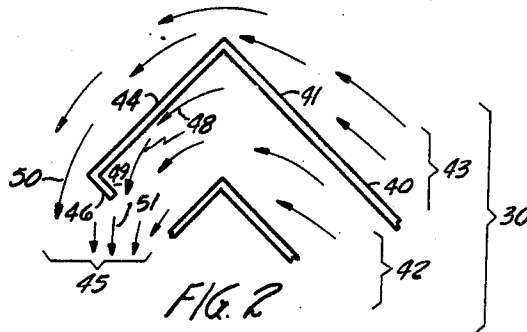


FIG. 2

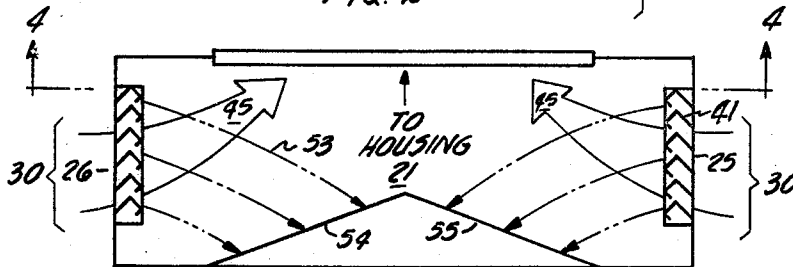


FIG. 3

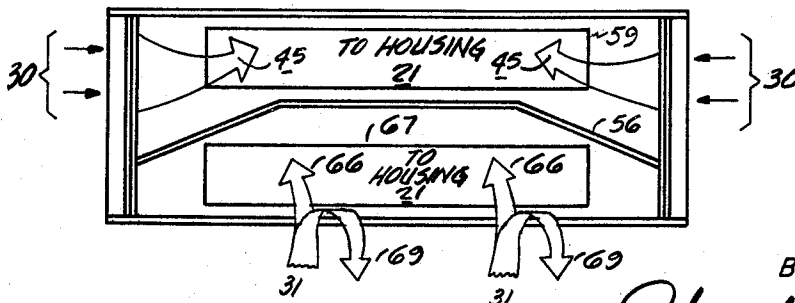


FIG. 4

INVENTORS
F. A. KAUTZ
BY F. A. BREWER
P. P. VANDERNEUT
ATTORNEY

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ROOFTOP AIR INTAKE UNIT LOUVER

Franz A. Kautz, Philadelphia, Forrest A. Brewer, Levittown, and Paul P. Vandernent, Philadelphia, Pa., assignors to International Telephone & Telegraph Corporation, New York, N.Y., a corporation of Delaware
Filed July 26, 1968, Ser. No. 748,094

Int. Cl. F24f 7/02

U.S. Cl. 98—37

2 Claims

ABSTRACT OF THE DISCLOSURE

The air intake of an air conditioning housing has vertical louvers with a somewhat L-shaped cross-section. At the toe-end tip of the lower line of this L-shaped cross-section, the louver is bent upward somewhat as a serif might appear at the toe-end tip of a printed letter L. This serif bent on the louver serves three functions: first, it forms a low speed air foil creating a dead air zone where the louver is not wiped by the on-rushing airstream; second, it forms a gutter for catching the raindrops in the airstream; and third, it tends to bend the airstream and swing it around toward an entrance of an airduct in the housing.

This invention relates to rooftop units having air intake louvers and more particularly to air conditioning units having louvers on more than one side.

For any of many reasons, rooftop or other similarly situated units sometimes have air intakes. For example, engines, air conditioning units, furnaces, filtration systems, mine shafts, and the like, must pump fresh air from the atmosphere into an enclosure, such as a building. While the exact reason for drawing in air is not too relevant, the following description speaks of a rooftop air-conditioner since it exemplifies the problems involved.

In general, the prior art has provided air intakes on only one side of a housing. If the wind blows over the housing, there is a pressure differential with a high pressure building up on the side of the housing which is struck by the wind and a low pressure or partial vacuum forming on the opposite side of the housing. Thus, there would be a natural tendency for fresh air to enter the housing on the high pressure side and to leave it on the low pressure side—without diversion of the fresh air into the housing, as intended. If an air intake is provided on only one side of the housing, there is a problem of insuring an adequate flow into the housing. Sometimes, the single intake is on the low pressure side of the housing and the air naturally wants to flow out of instead of into the building.

Another problem relates to a separation of rain from the inflowing air. If there is a hard driving storm, the raindrops may be driven through the louvers and into the housing with a resulting flooding that may cause equipment failures, hasten the aging of the various components, or required rugged weather resistant components.

Accordingly, an object of the invention is to provide new and improved louvered air intakes. In this connection, an object is to provide a plurality of air intakes on several sides of a housing to insure a full and adequate flow of air into each of the intakes regardless of prevailing wind directions. Here an object is to provide a rooftop housing unit having louvered air intakes which may be located in any position on the housing without regard to the direction of prevailing winds.

Yet another object of the invention is to separate rain and other moisture droplets from the fresh air pulled through the louvered intakes.

Still another object is to provide an air baffling system

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which permits a mixing of outside and inside air in a predetermined ratio regardless of indoor and outdoor pressure differentials.

In keeping with one aspect of the invention, the foregoing and other objects are accomplished by providing a housing having vertical louvers with a somewhat L-shaped cross-section. At the toe-end tip of the lower line of this L-shaped cross-section, the louver is bent upward somewhat as a serif might appear at the toe-end of a printed letter L. This serif bent on the louver serves three functions: first, it forms a low speed air foil creating a dead air zone where the louver is not wiped by the on-rushing airstream; second, it forms a gutter for catching the raindrops in the airstream; and third, it tends to bend the airstream and swing it around toward an entrance of an airduct in the housing. Other parts of the housing are shaped to cooperate with the louvers and drain away the water caught by the gutter action of the serif tip, and to mix the inside and outside air in the desired ratio.

The above mentioned and other features and objects of this invention and the manner of obtaining them will become more apparent, and the invention itself will be best understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of an exemplary building having a rooftop unit constructed as taught herein;

FIG. 2 is a cross-sectional view of the louver showing the L-shape with the serif tip bend at the toe-end of the L;

FIG. 3 is a plan view of the air intake portion of the rooftop unit seen in FIG. 1; and

FIG. 4 is a cross-sectional view of the air intake portion taken along line 4—4 of FIG. 3.

FIG. 1 shows a rooftop air-conditioner as an example of one kind of a unit which might use the invention. In greater detail, an air-conditioned building 20 has a housing 21 mounted on its roof. One end 22 of the housing 21 provides for the intake of air, and the other end 24 provides for the exhaust of the air into the building 20. While it travels through the housing 21, the air is conditioned in any known manner.

On each of its sides, the intake end 22 of the housing 21 includes an open area having a pair of intake louvers 25, 26 therein—the louver 26 being hidden from view in FIG. 1. The output end 24 of housing 21 includes a number of ducts 27 (appearing in a broken section of the roof) for carrying the conditioned air into the various zones of the building. This air returns to the housing 21 via a duct 28. The problem is to draw a fresh stream of air 30 through the louvers 25, 26 on each side of the housing and to mix it, in a proper ratio, with a stream of air 31 returning from the inside of the building. The return air was previously pumped into the building at 27. The problem is complicated because the prevailing wind (shown by arrows 33) is blowing strongly against the side of the housing having the louver 25 and is building a pressure there. The wind is sweeping over the side having the louver 26 and is building a slight vacuum there.

The invention teaches that the louvers at 25 and 26 should be made in the form of a series of vertical slats having a generally L shaped cross-section (FIG. 2). In greater detail, one side 40 of the slat 41 represents the upright arm of the L, and it is placed facing into the stream of air 30, thereby splitting it into a plurality of individual airstreams 42, 43. The lower arm 44 of the L forms the other side of the slat 41, positioned at the exit side of the louver where the split airstreams 42, 43 merge to reform single airstream 45. At the toe-end tip 46 of the louver arm of the L, the side 44 is bent to form a side or gutter positioned much as a serif is positioned at the lower right corner of an L—printed as a capital

letter. Hence, for convenience of expression this part 46 of the louver is hereinafter called the "serif tip" at the toe-end of the louver slat.

Upon inspection, it should be apparent that the side 44 and the serif tip 46 form a low speed air foil. The airstream 43 flowing over the top side of slat 41 wipes the edges whereas the airstream 42 flowing under the lower side of slat 41 tends to travel over a more or less straight line, leaving a dead air corner area 49 free of a wiping action. Also, the raindrops and other particles in the airstream 42 are relatively heavy, and they will tend to turn slower than the gaseous parts of the airstream. Thus, the inertia of these heavy particles causes them to strike the inner edge of the serif tip 46 in the dead air region 49, and then to run downwardly under the force of gravity.

The velocity of the airstream represented by the individual arrows 48—which is impeded by the serif tip—is reduced slightly as compared with the velocity of the unimpeded airstream represented by the individual arrow 50. Also, the unwiped dead air in the space in front of the serif tip 46 tends to be compressed a little and to have a slightly increased air pressure. These factors combine to bend or deflect the airstream 45 as shown by the curving arrows 51. As best seen in FIG. 3, the airstream is, therefore, directed in an arc flowing into the housing 21. Likewise, the airstream flowing in through louvers 26 is similarly deflected into the housing 21. Thus, there is no appreciable flow of air from the intake louver on the side having the highest outside atmospheric pressure and across the open area to the intake louver on the side having the lowest pressure. While the water particles are primarily trapped in the gutters formed by the serif tips 46 on the toe-ends of the louvers, some such particles may be carried along by the airstream which does not impinge upon tip 46—such as is indicated by the arrow 50. When this happens, the heavier water drops tend to continue in a line, as indicated at 53, to splash against wall baffles 54, 55 and then to run down the wall. The floor 56 of the open area on the intake end of the housing 21 is slanted or sloped so that the water striking baffles 54, 55 runs off to the outside of the housing. It has been found that an air intake constructed as described above separates air and water very efficiently so that almost no free water enters the housing 21.

To provide for the mixing of outside and return air, the open area at the intake end of the housing 21 is divided into two parts by the floor 56. The outside airstreams 30, 45 enter the louvered intake at 25, 26 deflect and flow above the floor 56 and through an opening 59 to the housing 21. The return air 31, from inside of the building 20 flows—in part 66—upwardly and into the space 67 below the floor 56 and then into housing 21.

The entry into spaces 59 and 67 is controlled by dampers which may be opened or closed in any degree by suitable servo motors (not shown) driven responsive to any environmental sensors. Thus, for example, dampers in opening 59 may be opened relatively widely, and dampers in opening 67 may be opened much less widely to provide an in-housing mix of say 75% outside air and 25% inside air. An exhaust fan drives the remainder 69 of the returning airstream 31 outwardly from the space beneath the floor 56 to the atmosphere. Other supplemental fans (such as 70—FIG. 1) may dispose of this airstream 69 in any suitable manner—as by dissipating it into the atmosphere for example.

While the principles of the invention have been described above in connection with specific apparatus and applications, it is to be understood that this description is made only by way of example and not as a limitation on the scope of the invention.

We claim:

1. A rooftop air conditioner unit housing comprising an open area within the housing, said area having louvers on at least two sides, a plurality of baffles disposed adjacent to and below said louvers, said louvers comprising a plurality of slats having spaced parallel orientation for splitting an incoming stream of air into a plurality of separate airstreams, each of said slats having a generally L-shaped cross-section and a serif bend at the toe-end tip of the L-shaped cross-section, said slats being positioned with respect to said airstreams so that the serif bend intercepts heavy particles in the airstream and deflects said particles toward said baffles, said separate airstreams then being combined and flowing into the air conditioning unit free from said heavy particles.

2. A rooftop air conditioner according to claim 1 wherein the slats of each said louver are disposed vertically and said baffles comprise a slanted floor below said slats for draining away water which is intercepted by said serif bend.

References Cited

UNITED STATES PATENTS

532,452	1/1895	Elwell	98—37
1,896,656	2/1933	Anderson	
2,737,876	3/1956	Smith	98—42
3,348,466	10/1967	Lane et al.	98—121
3,358,580	12/1967	Freese et al.	98—121
3,413,905	12/1968	Johnson	98—37

WILLIAM E. WAYNER, Primary Examiner

U.S. Cl. X.R.

55—443; 98—121