May 28, 1946. W. H. HOPPMANN, JR., ET AL 2,400,880

ADJUSTABLE VENTILATION TERMINAL

Filed Dec. 21, 1942 3 Sheets-Sheet 1

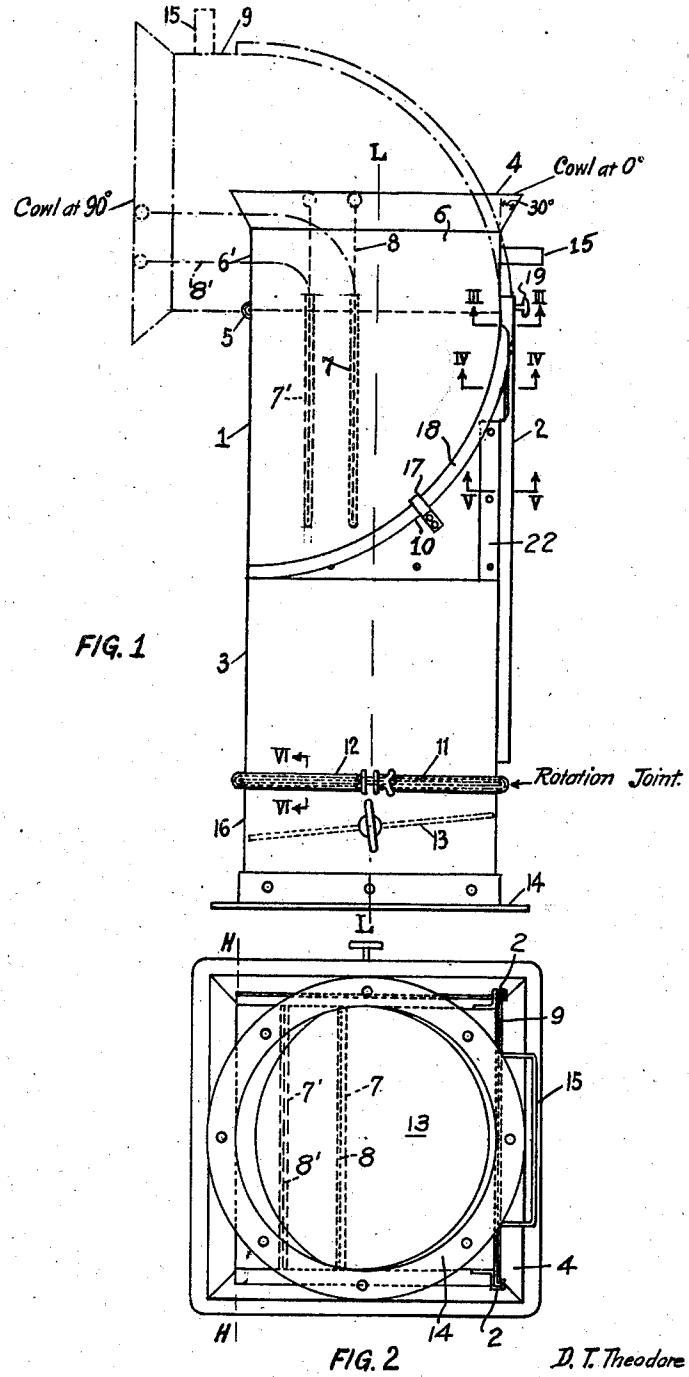


FIG. 1

FIG. 2

INVENTOR
D. T. Theodore & W. H. Hoppmann Jr.
BY
ATTORNEY

May 28, 1946. W. H. HOPPMANN, JR., ET AL 2,400,880

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Filed Dec. 21, 1942 3 Sheets-Sheet 2

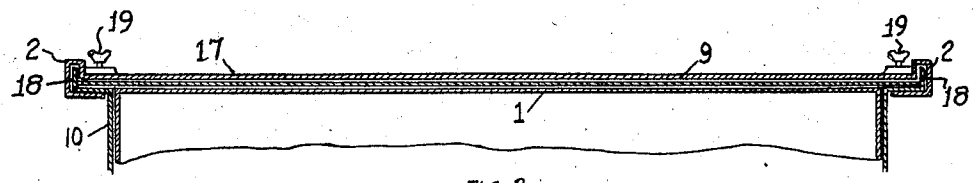


FIG. 3

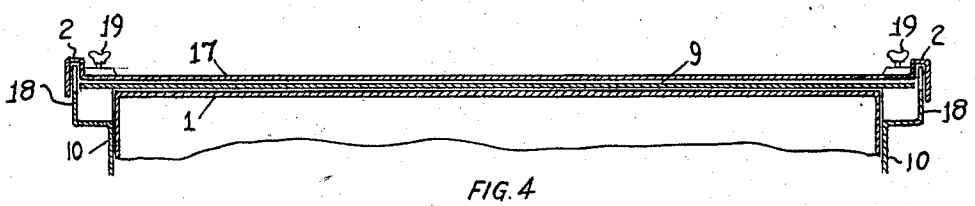


FIG. 4

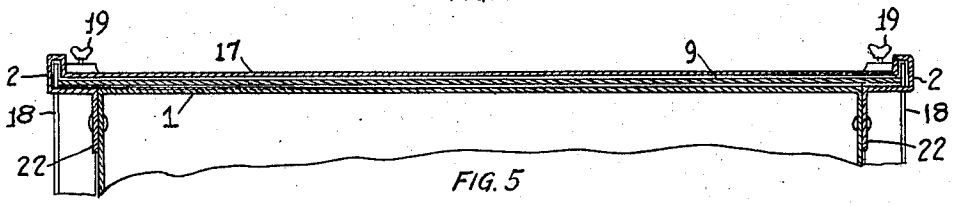


FIG. 5

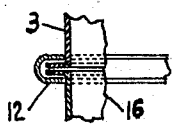


FIG. 6

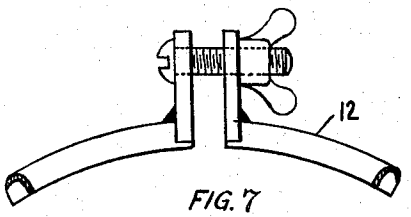


FIG. 7

INVENTOR
D. T. Theodore & W. H. Hoppmann Jr.
BY
ATTORNEY

May 28, 1946. W. H. HOPPMANN, JR., ET AL 2,400,880

ADJUSTABLE VENTILATION TERMINAL

Filed Dec. 21, 1942 3 Sheets-Sheet 3

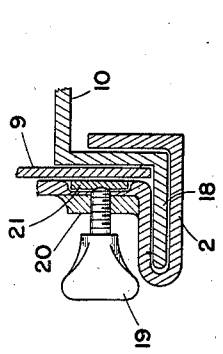


FIG. 11

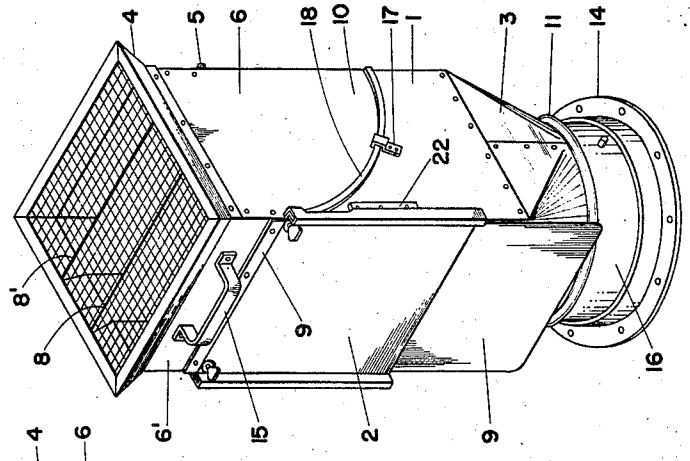


FIG. 8

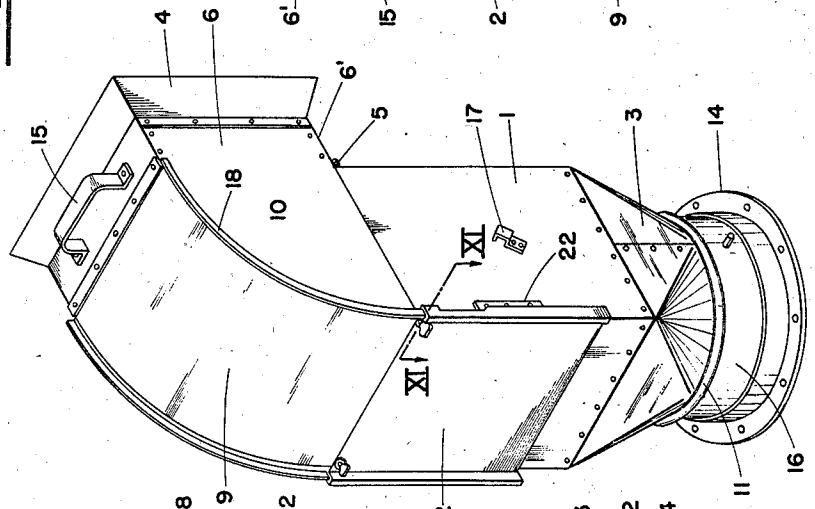


FIG. 9

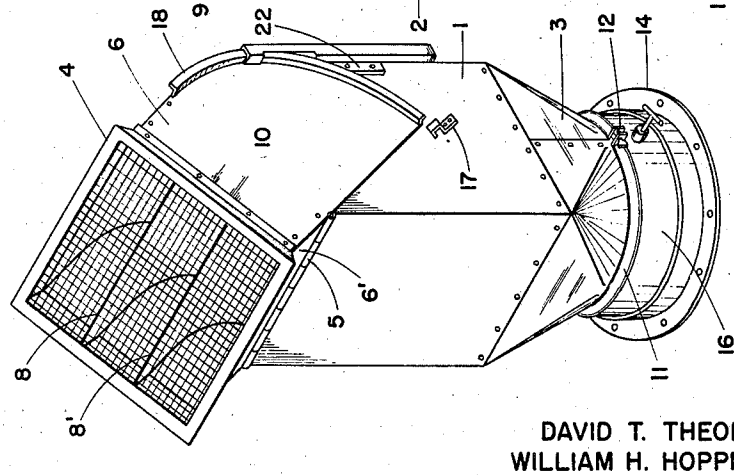


FIG. 10

Inventors

DAVID T. THEODORE

WILLIAM H. HOPPMANN JR.

By M. A. Hayes

Attorney

Patented May 28, 1946 2,400,880

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2,400,880

ADJUSTABLE VENTILATION TERMINAL

William H. Hoppmann, Jr., Valley Stream, and David T. Theodore, Elmhurst, Long Island, N. Y.

Application December 21, 1942, Serial No. 469,728

10 Claims. (Cl. 98—40)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention has to do with ventilation systems where an adjustable terminal discharge fitting is used for regulating the opening in the outlet and directing the flow therefrom in any desired direction.

The object of the present invention is to construct a terminal discharge fitting which may be adjusted to any desired angle from the outlet opening within a hemispherical space normal to the ventilation duct and having its center at the discharge end of the fitting.

A further object is to make this terminal fitting readily adjustable and to include a discharge control valve therein.

Other and more specific objects of the invention will become apparent as its detail description proceeds, having reference to the accompanying drawings, wherein:

Fig. 1 is an elevation of a preferred form of adjustable terminal discharge fitting,

Fig. 2 is an end view thereof taken from the inlet end thereof.

Fig. 3 is a section taken at III—III in Fig. 1,

Fig. 4 is a section taken at IV—IV in Fig. 1,

Fig. 5 is a section taken at V—V in Fig. 1,

Fig. 6 is an enlarged section taken at VI—VI in Fig. 1,

Fig. 7 is a detail of the clamping means for holding the relatively rotatable portions of the fitting in adjusted position,

Fig. 8 is a perspective view of the ventilator showing the cowl fully retracted so that the discharge is in alignment with the duct,

Fig. 9 is another perspective view of the ventilator as seen from the same direction, but showing the cowl fully turned through a vertical angle of 90°.

Fig. 10 is another perspective view of the portions in approximately the same relation with respect to each other as in Fig. 9 but the view is from an opposite direction and the cowl is partly retracted, and

Fig. 11 is an enlarged detail sectional view taken on the line XI—XI of Fig. 9.

This type of ventilation terminal discharge fitting may be used, in particular, on ships and boats and has for its chief object the provision of terminal fittings that can function with low pressure loss, low noise level, normal flow to outlet of terminal when fixed at any angle with respect to line of adjacent supply duct, ease of angular adjustment, and provide blasts of air in engine room and boiler spaces and in crew berthing spaces.

According to this invention the improved terminal fitting comprises a box of rectangular cross-section, 1 open at both ends a movable cowl provided with vanes 8 and 8' bendable in one direction for directing airflow at any angle from 0° to 90° with respect to the discharge duct, a transformation piece 3 from rectangular shape to circular shape, a rotation joint 11 that permits rotation of the box through angles from 0° to 360° or complete rotation, a section of circular duct 16 containing a butterfly damper, and a circular flange 14 of angle section for rigid connection to the discharge end of a ventilating duct.

In order that the invention may be clearly understood and readily carried into effect, the same will now be described more fully, by way of example, with reference to the drawings.

Similar parts in the several views are indicated by the same numerals.

Referring more particularly to the figures in the accompanying drawings, 1 designates the primary box, 6 the cowl, the cowl being rotatable about line H—H in Fig. 2, 3 the transformation piece from rectangular shape to circular shape, 4 the flared end of the cowl, 5 flat hinge, 6' flat non-flexing plate for aid in producing airflow normal to the outlet in any angular position of cowl, 7 and 7' guides for inside flexible vanes 8 and 8', and 8 and 8' inside flexible vanes, 9 outside flexible vane or heel plate, 10 side or cheek of rotatable cowl, 11 rotation joint, 12 position clamp on rotation joint, 13 butterfly damper, 14 circular flange, 15 handle on cowl, 16 circular section of terminal, 2 heel plate guide, 18 cheek flange for the heel.

The direction of flow at the outlet is maintained normal or perpendicular to the face of the discharge outlet by means of a flat plate 6' hinged along H—H in Figure 2, flexible inner vanes 8 and 8', and a flexible outer vane, heel plate or cowl top 9. Obviously, more than one inner vane such as 8 may be used if desired.

Flexibility in the vanes 8 and 8', and in the heel 9, and the hinges 5, are provided so that cowl 6 may be rotated from 0° to 90° about axis H—H in Fig. 2, permitting the direction of air to be changed through 90° while maintaining it normal to the face of the discharge outlet. A handle 15 is provided on the outside vane or cowl top for the purpose of rotating the face of the terminal through 90°. A rotation joint 11, is provided so that all of the terminal on one side of the joint (discharge side) may be rotated 360° about axis L—L in Fig. 1. The rotation joint 11 is supplied with a clamp ring 12 for the purpose of holding

the terminal rigid at the desired angle about the axis L—L.

The hinged section 6 may be locked in any adjusted angular position by means such as the clamp screw 19 threadedly mounted in lugs 20 welded to the guide 2, as shown. Flat disks 21 set in inner grooves in the guide 2, and acted on by thumb screws 19 press the flexible heel plate 9 against the curved shoulders of the flanges 18 on the edges of sides 10, thus locking section 6 in any desired angular position. Figs. 3, 4, and 5 show more clearly how the shouldered flange 18 and the flexible heel plate 9 are arranged with respect to the guide 2, which is riveted at 22 to the sides of section 1.

It is clear that the above parts provide means for directing air normal to the outlet face and to any portion of a hemispherical space with the terminal as center.

Transformation piece 3 is provided for connecting the box 1 which has a rectangular cross section to the circular tube 16. A butterfly damper 13 is provided in the round section for throttling the airflow if desired.

A circular angle flange 14 is provided for connecting the terminal to a circular ventilation duct. Obviously, if the ventilation duct is of rectangular section another transformation piece may be provided between this flange and the ventilation duct.

The flexible heel plate 9 is provided with a rigid sheetmetal guide 2 which is riveted to the top of the box 1 as shown at 22 in Figures 1 and 5.

The flexible inside vanes 8 and 8' are provided with rigid sheetmetal guide 7 and 7' as shown in Figs. 1 and 2.

The cheeks 10 of the cowl 6 are substantially quadricircular in form and have a flange 18 along their arcuate sides for receiving the flexible heel portion 9 as the cowl is turned out about the hinge 5.

It will be noted that the construction of our device is very simple and is easy to construct. There are very few curved parts to be made by reason of the rectangular section being used instead of using a cylindrical one in connection with the air flow direction changing portion in continuation of a cylindrical duct. In the rectangular form of construction, the air flow is readily maintained normal to the outlet face of the cowl by the aid of the flexible vanes and heel plate which are rectangular themselves and have rectangular guides. The only curved structures necessary are the flanged edges of the cowl cheeks. If a cylindrical section were used there would be much more difficulty in providing for the adjustment of the direction of flow.

The inner vane (or vanes), by smoothing out the air flow around the bend and maintaining it normal to the outlet, tends to reduce the noise as well as the power losses because of the reduction of eddies and uneven flow, regardless of the angles to which the terminal cowl may be adjusted.

The present structure also lends itself readily to the provision of proper sealing between the movable cowl parts, since the cheeks are flat and the heel plate can easily be made to fit snugly over the circumferential edges of the quadricircular cheeks by the aid of the angle shaped flanges thereon.

In particular, the terminal may be used in a ventilation system aboard a ship or boat for engine room, boiler room, or crew spaces, etc. In general, it may be used for any compartment or space requiring a directed blast of air or other gas.

It may therefore be seen that the terminal provides a discharge of the air in any direction with low pressure loss and relatively small generation of noise, that the angular adjustments of the terminal can be made with ease and without injuring the terminal or any of its parts, and that the purposes of the terminal are accomplished with a minimum requirement on space and weight.

Various modifications in the details of the above defined illustrative form of the adjustable discharge terminal fitting may be made without departing from the scope of the present invention as defined by the appended claims.

This invention may be made and used by or for the Government of the United States for governmental purposes without the payment to us of any royalties thereon or therefor.

What we claim is:

1. A discharge terminal fitting for a ventilation duct comprising a circular section having means for connection to the discharge end of the ventilation duct, throttle means therein, a transformation section from a circular cross-section to a rectangular cross-section having means for rotatably connecting its circular end to the circular section, a rectangular section, means for rigidly connecting the rectangular end of the transformation section to the rectangular section, a rectangular outlet hinged to one side of the other end of the rectangular section and having a cowl including a flexible heel plate extending from the opposite side over the rectangular section and a quadricircular piece extending backward in overlapping manner over each of the other two sides of the rectangular section with their centers at the hinge, circumferential channels for supporting the edges of the flexible heel plate, said outlet also having one or more inside flexible vanes for deflecting the discharge flow of air in any direction in which the outlet is turned about its hinge, guide means on said opposite side of the rectangular section for said flexible piece and guide means in said rectangular section for said inside flexible vane or vanes forming fixed guide vanes for the flow of air therethrough.

2. In a gas discharge terminal, a section for attaching to the discharge end of a duct, a rotatably adjustable rectangular section connected thereto, and an angularly adjustable outlet section rectangular in cross-section hinged to one side of the outer end of said rectangular section and having a cowl portion including a flexible overlapping heel plate opposite said hinge and rigid side overlapping portions, for directing the flow from the outlet section at any angle from 0° to 90° with respect to said terminal.

3. In a discharge terminal, a connecting section for mounting the terminal on the end of a discharge duct, a rotatably adjustable rectangular section connected thereto and having an angularly adjustable cowling section on the end thereof movable about a hinge on one side of the outer end of the rectangular section, including a flexible heel plate slidable in overlapping relation over the opposite side of said rectangular section, and having quadricircular side extensions in overlapping relation with the sides of the rectangular section for adjusting the discharge angularly to one side of the axis of the terminal through an angle of 90°, shouldered flanges on the arcuate edges of the sides of the cowl section for guiding the extended portion of the flexible

heel plate thereover as said cowl section is turned about its hinge, and guide means on said rectangular section for the overlapping portion of said flexible heel plate.

4. In a discharge terminal, a connecting section for mounting the terminal on the end of a discharge duct, a rotatably adjustable rectangular section connected thereto and having an angularly adjustable cowling section on the end thereof movable about a hinge on one side of the outer end of the rectangular section, including a flexible heel plate slidable in overlapping relation over the opposite side of said rectangular section, and having quadricircular side extensions in overlapping relation with the sides of the rectangular section, for adjusting the discharge angularly to one side of the axis of the terminal through an angle of 90°, shouldered flanges on the arcuate edges of the sides of the cowl section for guiding the extended portion of the flexible heel plate thereover as said cowl section is turned about its hinge, guide means on said rectangular section for the overlapping portion of said flexible heel plate, and one or more flexible guide vanes attached at one end to the outlet of said cowling section and slidable in guides forming fixed guide vanes in the rotatably adjustable section.

5. In a discharge terminal, a connecting section for mounting the terminal on the end of a discharge duct, a rotatably adjustable rectangular section connected thereto, and having an angularly adjustable cowling section on the end thereof moving about a hinge on one side of the outer end of the rectangular section, including a flexible heel plate in overlapping relation over the opposite side of said rectangular section, and having quadricircular side extensions in overlapping relation with the sides of the rectangular section, for adjusting the discharge angularly to one side of the axis of the terminal through an angle of 90°, shouldered flanges on the arcuate edges of the sides of the cowl section for guiding the extended portion of the flexible heel plate thereover as said cowl section is turned about its hinge, guide means on said rectangular section for the overlapping portion of said flexible heel plate, and adjustable throttling means in said connecting section.

6. In a discharge terminal, a connecting section for mounting the terminal on the end of a discharge duct, a rotatably adjustable rectangular section connected thereto and having an angularly adjustable cowling section on the end thereof moving about a hinge on one side of the outer end of the rectangular section, including a flexible heel plate in overlapping relation over the opposite side of said rectangular section, and having quadricircular side extensions in overlapping relation with the sides of the rectangular section, for adjusting the discharge angularly to one side of the axis of the terminal through an angle of 90°, shouldered flanges on the circular edges of the sides of the cowl section for guiding the extended portion of the flexible heel plate thereover as said cowl section is turned about its hinge, guide means on said rectangular section for the overlapping portion of said flexible heel plate, and one or more flexible guide vanes attached at one end to the outlet of said cowling section and adjustable throttling means in said connecting section.

7. In a discharge terminal, a connecting section for mounting the terminal on the end of a discharge duct, a rectangular section joined thereto, said rectangular section being rotatably adjustable through 360° with respect to said connecting section and having an angularly adjustable cowling section on the end thereof moving about a hinge on one side of the outer end of the rectangular section, including a flexible heel plate in overlapping relation over the opposite side of said rectangular section, and having quadricircular side extensions in overlapping relation with the sides of the rectangular section, for adjusting the discharge angularly to one side of the axis of the terminal through an angle of 90°, shouldered flanges on the circular edges of the sides of the cowl section for guiding the extended portion of the flexible heel plate thereover as said cowl section is turned about its hinge, guide means on said rectangular section for the overlapping portion of said flexible heel plate, and adjustable throttling means in said connecting section.

8. A gas duct terminal comprising a cylindrical portion, a butterfly damper therein, a rectangular portion, a transformation connecting portion from said cylindrical portion to said rectangular portion having a rotatable connection to said cylindrical portion, a hinge on one side at the outer end of said rectangular portion, a guide member on the opposite side of said rectangular portion, a cowl having a rectangular outlet and rotatably adjustable on said hinge from alignment of said outlet with said gas duct outwardly through 90°, said cowl having rigid cheeks with quadricircular angle shaped flanges around their heel-forming edges, and a flexible heel plate attached to the side of the outlet opposite the hinge and extending back over the angle shaped flanges of the cheeks and into the guide member, whereby the cheeks may be made to overlap the sides of the rectangular portion and fit snugly thereagainst, and the flexible heel plate to overlap the side of the rectangular portion opposite from the hinge, in a manner to form a good seal in any angular position of the cowl outlet.

9. A gas duct terminal comprising a cylindrical portion, a butterfly damper therein, a rectangular portion, a transformation connecting portion from said cylindrical portion to said rectangular portion having a rotatable connection to said cylindrical portion, a hinge on one side at the outer end of said rectangular portion, a guide member on the opposite side of said rectangular portion, a cowl having a rectangular outlet and rotatably adjustable on said hinge from alignment of said outlet with said gas duct outwardly through 90°, said cowl having rigid cheeks with quadricircular angle shaped flanges around their heel-forming edges, and a flexible heel plate attached to the side of the outlet opposite the hinge and extending back over the angle shaped flanges of the cheeks and into the guide member, whereby the cheeks may be made to overlap the sides of the rectangular portion and fit snugly thereagainst, and the flexible heel plate to overlap the side of the rectangular portion opposite from the hinge, in a manner to form a good seal in any angular position of the cowl outlet, one or more guide members within the rectangular portion parallel to the guide member on the side thereof, and a flexible vane plate having its end fixed within the outlet and extending into its corresponding guide member for improving the even flow of gas through the terminal and guiding it smoothly through the outlet.

10. The combination of a rectangular sectioned ventilator having a circular flange at one end

adapted for connection and rotatable adjustable axially with respect to a similar flange on a cylindrical duct, and having rectangular outlet cowl hinged for rotation about an axis perpendicular to said duct, means for providing directed flow through said cowl including flexible automatically adjustable vanes therein and a flexible heel plate for reducing noise and pressure losses, and guide means for the overlapping portions of the flexible vanes and heel plate in said ventilator, the guide means for the vanes forming fixed vanes therein.

WILLIAM H. HOPPMANN, JR.
DAVID T. THEODORE.