April 17, 1956 R. PRYNE 2,741,972

ROOF JACK FOR VENTILATING DUCT

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FIG. 1.

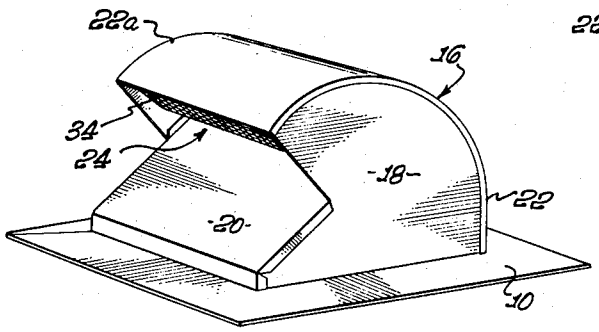


FIG. 5.

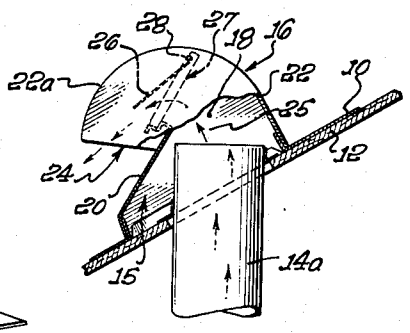


FIG. 2.

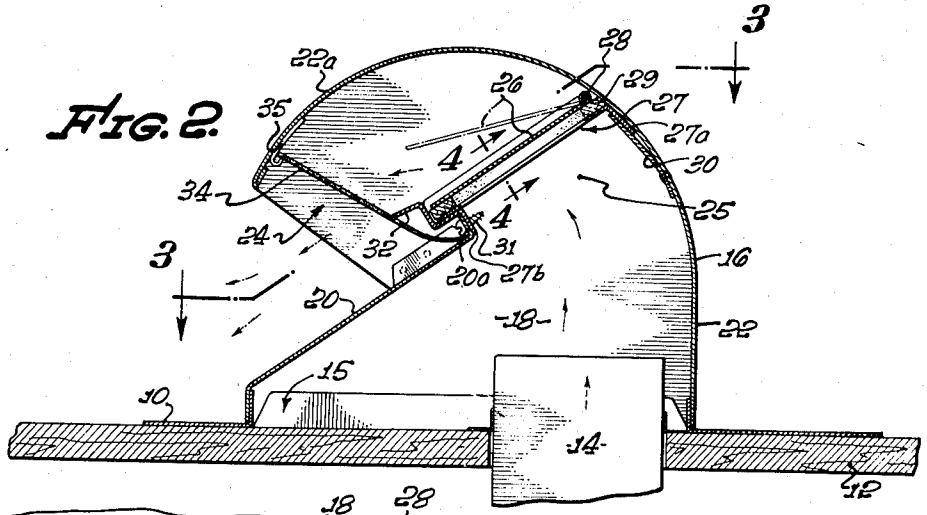


FIG. 3.

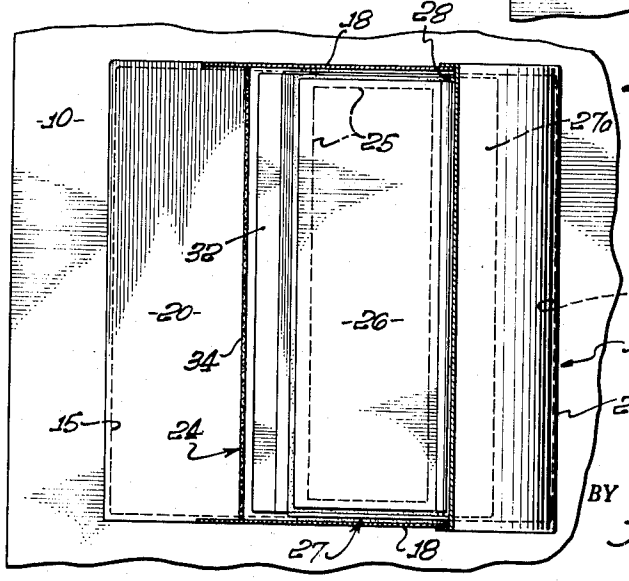
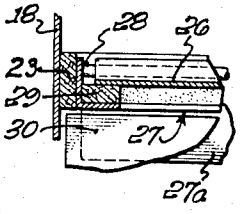


FIG. 4.



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ROOF JACK FOR VENTILATING DUCT

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4 Claims. (Cl. 98—119)

The present invention relates generally to ventilating apparatus and equipment and relates more particularly to protective closure means for the open upper end of a ventilating duct passing through a roof or the like. Protective closures of this type are commonly referred to in the trade as "roof jacks" and will be so referred to herein, but it will be understood that the term is used without intending to limit the invention in any way.

Ventilating fans or blowers may discharge air from residences and buildings through an exhaust duct which opens to the atmosphere. The open end of this duct needs to be protected, not only against the entry of winds and rain but also convection air currents which would create a back-draft or reverse flow into the duct when the fan is not operating. For this purpose, a suitably designed closure means is provided on the roof to receive and cover the open end of the exhaust duct, this closure means including a pivotally mounted shutter which can swing by gravity to a position closing the end of the duct and which can be opened by the pressure of air being discharged to the atmosphere.

Because roofs may be flat or pitched at any angle over a considerable range of angles, and exhaust ducts of different sizes and shapes are found in actual practice, roof jacks have been of different sizes and shapes to fit different sets of conditions. Ability to standardize on a single design or size which, even if not fully universal, will fit a number of different conditions, will result in a cheaper, more satisfactory article.

It is a general object of my invention to improve the effectiveness of the operation of closure means of this type at the end of an exhaust duct.

It is also a general object of my invention to provide a new and improved design for a roof jack which adapts a jack of a single standardized size to all roofs within the range of slopes usually encountered, as well as a flat roof, and a considerable variety of sizes of exhaust ducts.

It is also an object of my invention to provide an improved design for a roof jack in which wind blowing into the outlet opening is deflected to exert a force on the shutter tending to close the shutter and thereby keep out the wind.

It is a further object of my invention to provide an improved design for a roof jack in which the outgoing stream of air is deflected smoothly and continuously towards the outlet of the jack so that the air stream flows through the roof jack with a minimum of resistance.

The above objects are obtained in a closure means embodying my invention having a planar base flange and wall means rising upwardly from the flange around the sides of an inlet opening defined by the flange. The wall means includes a pair of parallel side walls, a front wall that slopes upwardly and rearwardly, and a rear wall that slopes upwardly and forwardly. Inside the jack the walls define a throat of materially lesser area than the inlet opening; and a shutter is mounted at the throat to swing by gravity towards a normal closed

position. A portion of the rear wall extends forwardly over the sloping front wall and, together with portions of the side walls, forms a hood over the shutter and also defines a downwardly facing air outlet opening.

In a preferred embodiment, the shutter is mounted on a removable frame which is held in place at the throat by engagement with the various walls of the closure means. This frame carries a baffle along its forward side to shield the forward edge of the shutter from air currents which might tend to open it and blow past the shutter.

How the above objects and advantages of my invention, as well as others not specifically referred to herein, are attained will be more readily understood by reference to the following description and to the annexed drawings, in which:

Fig. 1 is a perspective view of a roof jack embodying my invention;

Fig. 2 is an enlarged vertical section through my improved roof jack showing it mounted on a flat roof;

Fig. 3 is a fragmentary horizontal section on line 3—3 of Fig. 2;

Fig. 4 is a fragmentary section on line 4—4 of Fig. 2; and

Fig. 5 is a side elevation at reduced scale showing the roof jack installed on a sloping roof.

Referring now to the drawings, there is shown in Fig. 1 a roof jack as it appears by itself; and it is shown installed on a flat roof in Fig. 2 or on a sloping roof in Fig. 5. The roof jack has a flat or planar flange **10** at its base by which the jack is fastened to roof **12** in an air-tight and water-tight manner. Details of this connection to the roof are conventional and not part of this invention, so are not shown. The jack is mounted on top of the roof over the open upper end of exhaust duct **14** which normally is running vertically where it passes through the roof. Air forced through duct **14** by a fan, not shown, is exhausted to the atmosphere after passing through the roof jack. At the level of base flange **10** is inlet opening **15** which is preferably rectangular, typically being square. The flange extends outwardly from and entirely around the inlet opening in order to define the opening. The end of duct **14** projects into the interior of the roof jack through inlet opening **15**, as may be seen in Figs. 2 and 5.

The main body **16** of the roof jack is formed by wall means extending upwardly from flange **10** around the edges of inlet opening **15**. The wall means comprises two side walls **18**, a front wall **20**, and a rear wall **22**. The two side walls are flat members that are preferably parallel to each other and perpendicular to the base flange. Front wall **20** is also flat over most of its extent and slopes rearwardly and upwardly. The front wall makes an angle of about 35° with the plane of flange **10** is a preferred form of my invention, but this angle may be varied by at least 10° either way and still obtain the advantages of my invention. At the upper end of the front wall is an upstanding flange **20***a* extending entirely across the front wall between the two side walls.

Rear wall **22** rises perpendicularly from flange **10** for a short distance and then curves smoothly forward so that portion **22***a* of it overhangs the front wall like a hood. The side walls rise above front wall **20** and join the overhanging portion of the rear wall; and there is formed by the four walls an air outlet opening of rectangular shape at **24** above the sloping front wall. Exhausted air leaves the roof jack through this opening.

That side of the roof jack towards which the exhaust or outlet opening **24** is directed has been arbitrarily designated as the front side of the roof jack; and accordingly the opposite side is termed the rear side.

The space inside housing **16** tapers upwardly to a

comparatively restricted opening at throat **25** at the upper end of the front wall. Throat **25** is rectangular in outline and may be considered to be bounded at each side by one of the four walls of housing **16**. At this throat is located shutter **26** which shuts by gravity to close the throat to backdrafts. Closing the throat keeps rain, cold air or wind, from flowing down exhaust duct **14**. At the same time, the shutter is made so light in weight that the normal pressure of the exhaust air stream against the inner or under side of the shutter opens it easily, as indicated in the dot-dash position of Figs. 2 and 5.

As a means for supporting the shutter in place, it is preferred to provide at throat **25** an open rectangular frame **27** which fits snugly within the throat and engages all the housing walls. It is preferred to surround the frame with a strip **23** of felt or the like to make the frame fit tightly enough to prevent air from passing between the frame and the housing. Frame **27** consists of narrow angular members which extend around the four sides of a central opening. The frame members can be seen in Figs. 2 and 4, and may be padded on the outside with a layer of felt **29** that engages the margins of shutter **26** to effect an air-tight seal with the shutter.

Shutter **26** is pivoted at **28** on frame **27** to swing about a horizontal axis. This axis is located closely adjacent to rear wall **22** and is always above and rearward of the bottom edge of the shutter and also of the lower side of the frame, for all ordinary inclinations of base flange **10**. As a consequence, the shutter is always urged by gravity toward the closed position. This is true when a roof jack is mounted on a flat roof as in Fig. 2, or on a pitched roof as in Fig. 5 because the shutter is normally disposed at about the same slope as the front walls. Roofs seldom exceed a slope of 30°; and the proportions shown permit the shutter to close normally for any pitch up to and beyond 30°. Shutter **26** closes in a normal manner even when the roof is pitched as deeply as 45° because, assuming the shutter to be at 35° to the flange, as is the front wall, the shutter then makes an angle of 80° with the horizontal. The further the shutter is opened, the greater the force tending to close it.

Frame **27** may be held in place in any suitable manner. Here the frame has on its rearward side a flange **27***a* which is held between the rear wall and a resilient clip **30** fastened to the inside face of wall **22**. Clip **30** is an elongated strip of metal which is attached to the rear wall of the housing along its lower edge, as by spot welding, to form an air-tight joint. The strip extends across substantially the full width of wall **22**, as may be seen in Fig. 4. Flange **27***a* on the frame is inclined at the proper angle to lie against this spring clip when it is inserted between the clip and the housing wall, as shown in Fig. 2. Light pressure of the two members against each other forms an air-tight joint at this point. The resilient nature of strip **30** allows it to maintain this sealing contact with the frame while at the same time moving toward or away from the rear wall to accommodate minor variations in the front-to-rear dimension of frame **27**.

Extending entirely across the side of this frame is another depending flange **27***b* which is parallel to and in engagement with flange **20***a* of the front wall. Contact between these two flanges maintains an air-tight connection at this point; and the two flanges may be held together by any suitable means, as for example by metal screw **31**.

Also mounted on the lower edge of frame **27** is baffle **32** which extends entirely across the frame. This angular baffle member shields the edge of the shutter from air currents which enter the roof jack through outlet opening **24** and might otherwise blow under the edge of shutter **26** and between shutter and frame **27**. Such entering air currents are directed upwardly away from the edge of the shutter by the baffle. In general, gusts of wind and the like blowing into opening **24** strike against the underside of curved wall **22***a* of the housing and are then directed

downwardly against the outside face of shutter **26** in a direction to more firmly close the shutter.

It is preferable to close opening **24** against the entry of birds by providing screen **34** at the opening, which screen may be of relatively large mesh. Cut to the same size as the outlet opening in the housing, the screen may be pushed into place, and is then held frictionally. A narrow metal clip **35** attached to the housing at one end may be then bent into a U-shape to engage the under side of the screen and hold it against dropping downwardly.

Rectangular inlet **15** is considerably larger than throat **25**. Although both openings have one dimension in common, since they both extend the full distance between side walls **18**, in the other dimension inlet **15** is two or more times the size of the throat. This is done in order to accommodate the roof jack to exhaust ducts of various sizes and shapes, irrespective of whether or not the base of the jack is sloped with respect to the duct because it is mounted on a pitched roof. A large variety of sizes and shapes of exhaust ducts are commonly encountered. An oblong duct approximately ten inches by three inches is used frequently in interior partition walls. A six inch square duct is also frequently encountered while in round ducts diameters are as large as six to eight inches. Since the largest of these dimensions is ten inches, the inlet opening **15** is preferably made slightly larger than ten inches in each dimension. This has the further advantage that a square or round duct up to eight inches can also be easily accommodated, even on a steeply pitched roof. This situation is shown in Fig. 5 where duct **14***a* represents a typical round duct.

On a flat roof, the opening required to receive the end of the exhaust duct has the same dimensions as the exhaust duct itself. However, on a sloping roof, the inclination of the plane of the inlet opening requires that it have a dimension from front to rear considerably greater than the corresponding dimension of the exhaust duct. At the same time, the net area at the throat need only be of approximately the same magnitude as the cross sectional area of the duct so that the throat can be considerably smaller than the area of the inlet opening. This being the case, the forward wall of the roof jack is sloped upwardly and rearwardly to give an upwardly tapered shape to the space within the housing. It will be noted that at its point of closest approach to the rear wall, there is still sufficient space between the rear wall and the front wall to allow the duct to project into the interior of the housing for at least a short distance.

The air exhausted from the end of the duct encounters the curved underside of wall **22***a* and is directed over a smoothly curved path to the outlet from the roof jack which faces downwardly in order to protect it from wind and rain. Actually, the direction of the exhaust stream may be changed as much as 180° from the direction it is flowing at the time it leaves the exhaust duct. At the same time, this change in direction is made without creating any pockets within the housing in which the air collects or which would offer resistance to streamline flow.

The roof jack is normally mounted with the exhaust duct as close to the rear wall as is practical in order that the air is directed as much as possible directly toward and against the under side of shutter **26**. In this position the full energy of the outwardly moving air stream is available to open the shutter.

From the above description, it will be seen that various changes in the proportion or shaping of parts may be made without departing from the spirit and scope of my invention; and accordingly it is to be understood that the above description is considered as being illustrative of, rather than limitative upon, the appended claims.

I claim:

1. A closure means for an exhaust duct or the like venting through a roof, comprising; a planar flange for attachment to the roof with an air-tight seal and extending around a rectangular air inlet opening to the closure

means adapted to receive an end of the exhaust duct; wall means rising upwardly from said flange around the inlet opening therein, said wall means including a pair of parallel side walls, a rearwardly and upwardly sloping front wall, and a rear wall extending upwardly and forwardly, said wall means defining at the upper end of the front wall a rectangular throat that is above and has not more than one-half the front-to-rear dimension of the inlet opening; a resilient clip fastened at its lower edge to the inside face of the rear wall; an open frame at the throat and having at its upper edge a flange received between the back wall and said resilient clip; cooperating means on the frame and on the upper end of the front wall engaging each other to position the frame; and a shutter pivotally mounted at its top edge to the upper side of the frame and gravity biased to normally close the opening in the frame to prevent back-draft into the duct.

2. A closure means for an exhaust duct or the like projecting through a roof, comprising: a planar flange for attachment to the roof and extending around and defining a rectangular inlet opening comprising substantially the entire underside of the closure means and adapted to receive the upper end of the exhaust duct; wall means connected to and rising from the flange at the sides of the inlet opening, said wall means including a pair of parallel side walls, a rear wall having an upwardly and a forwardly extending portion, and an upwardly and rearwardly sloping front wall that is disposed at an acute angle relative to the planar flange and terminates beneath the forwardly extending portion of the rear wall at a position spaced rearwardly from the front end of the rear wall to form with said rear wall a rectangular throat which is coextensive with the inlet opening between the parallel side walls, but has about one-half the front-to-rear dimension of the inlet opening, and said front wall and the front end of the rear wall defining with the side walls an outlet opening disposed above the sloping front wall; and shutter means at the throat.

3. A closure means as in claim 2 in which the front wall slopes at an angle of about 35° with respect to the plane of said planar flange.

4. A closure means for an exhaust duct or the like venting through a roof, comprising; a planar flange for attachment to the roof with an airtight seal and extending around a rectangular air inlet opening to the closure means adapted to receive an end of the exhaust duct; wall means rising upwardly from said flange around the inlet opening therein, said wall means including a pair of parallel, upwardly extending side walls, a sloping front wall that extends upwardly and rearwardly making an acute angle with the planar flange, and a rear wall having an upwardly extending lower portion and a forwardly extending upper portion that extends over and is spaced above the sloping front wall, said wall means defining at the upper end of the front wall a rectangular throat that is above and has substantially one half the front to rear dimension of the inlet opening, said forwardly extending portion of the rear wall joining the side walls at their upper ends to form a hood over the throat and, in cooperation with the sloping front wall, a downwardly facing outlet opening above the front wall.

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