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[54] **VENTILATOR FOR A MOTOR VEHICLE ROOF**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **98/2.14**; 296/107

[51] **Int. Cl.** **B60h 1/24**

[58] **Field of Search** 98/2.14, 2.15; 296/107, 296/108, 123

[56] **References Cited**

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Attorney, Agent, or Firm—Toren, McGeady and Stanger

[57] **ABSTRACT**

A ventilator is positioned in the opening in a motor vehicle roof so that it can be moved between a closed position sealing the opening and a number of different open positions, the ventilator consists of a cover or plate pivotally mounted at its rear and front sides. Levers attached to the roof and connected to a shaft pivotally mounted on the cover, effect the pivotal movement of the cover at its rear side. The cover can be locked in any position by a braking device operatively associated with the shaft.

13 Claims, 6 Drawing Figures

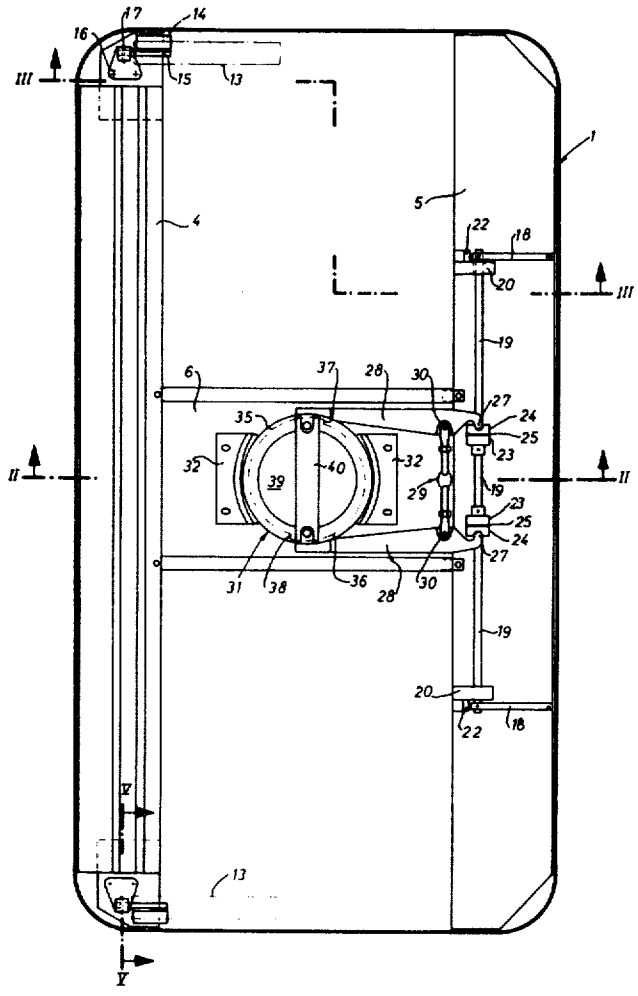

Fig. 1

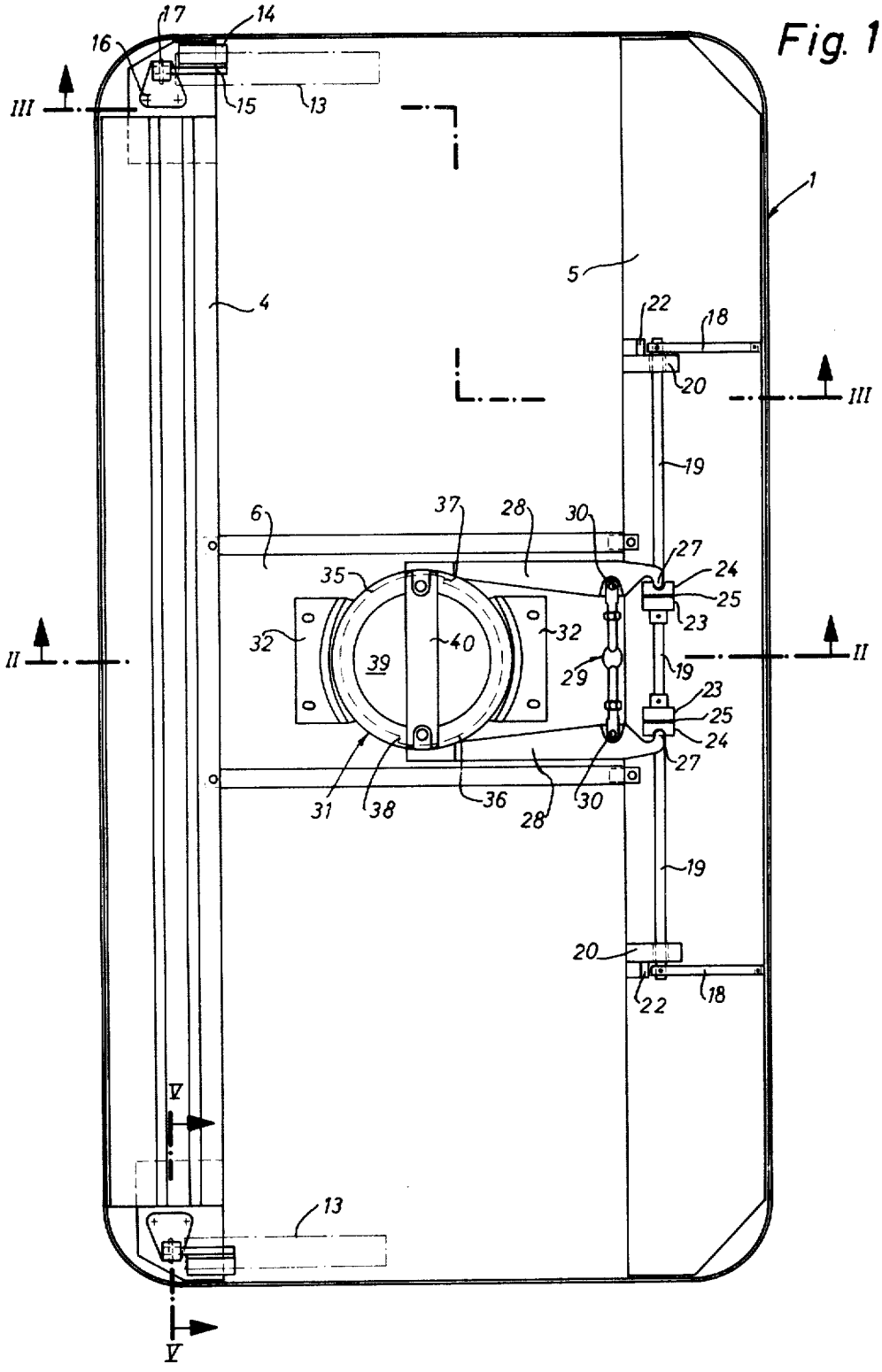
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Fig. 2

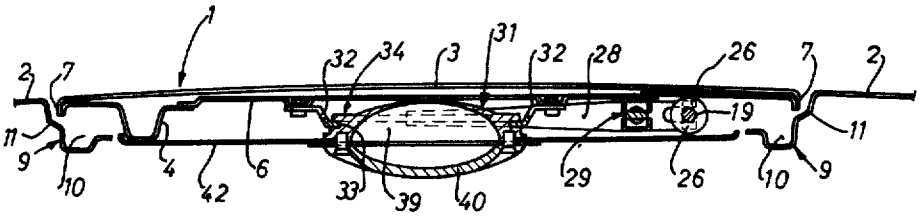


Fig. 3

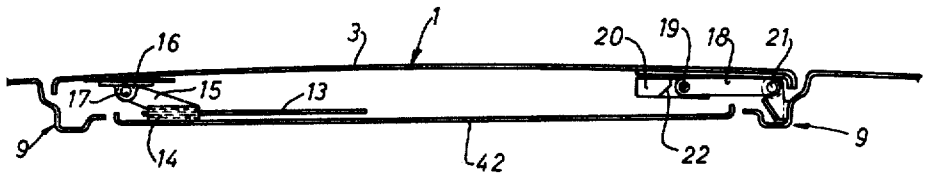


Fig. 4

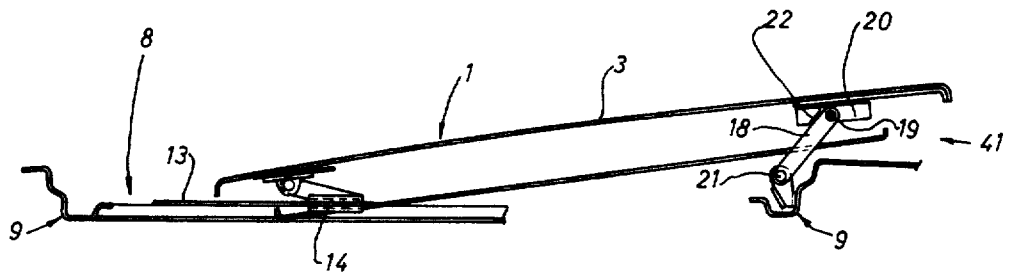


Fig. 5

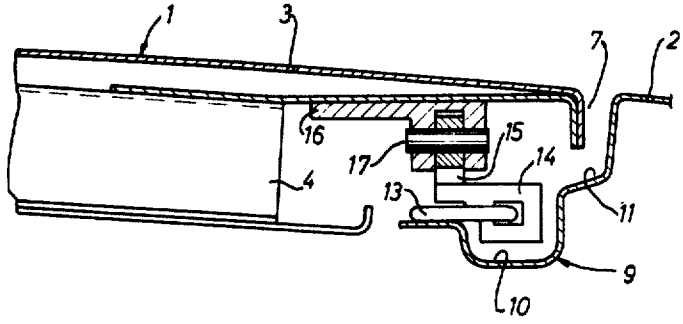
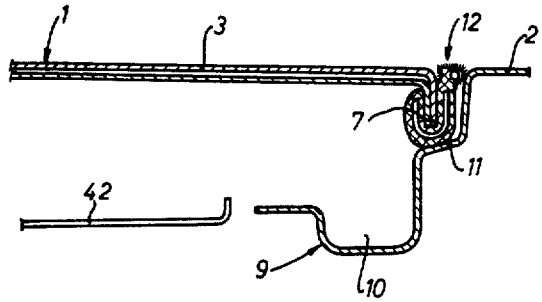


Fig. 6



VENTILATOR FOR A MOTOR VEHICLE ROOF

SUMMARY OF THE INVENTION

The present invention concerns a ventilator for a motor vehicle roof which is positioned within an opening in the roof and can be moved from its closed position to a variety of open positions by lifting the rear edge of the ventilator upwardly out of the roof opening and, more particularly, it is directed to an arrangement for locking the ventilator in any of its different positions.

Known ventilators of the type to which the present invention is directed, note German Utility Model No. 1,779,679, is guided by at least two sliding or rolling members at each lateral side at or close to the front edge of the ventilator in stationary links located laterally of the roof opening. At the initiation of the opening movement, such guides effect the inclined position of the ventilator so that it can be displaced rearwardly without striking against the rear edge of the roof opening. The purpose of this arrangement is to utilize the space between the front edge of the roof opening and the front edge of the ventilator when it is displaced in the rearward position as a vent hole, with the inclined ventilator deflecting the wind.

These known ventilators have such disadvantages that they have not achieved any practical significance in automotive engineering. The ventilators are held in position only by the front sliding or rolling members which have a small span so that the ventilator is practically cantilevered in the open position and is not securely held, especially when the vehicle is being driven. Furthermore, there are no locking means for securing these ventilators in the open position, they are merely held by the friction of their guiding or driving members and such a holding action is insufficient when the vehicle is moved. Moreover, the known ventilators have not provided any solution for the problem of providing a seal about the ventilator in the roof opening, particularly to prevent the leakage of water into the vehicle. Finally, in one of the known ventilators, German Utility Model No. 1,779,679, additional wind deflector plates pivotally mounted adjacent the front edge of the roof opening are considered necessary to provide a draft-free ventilation.

In the present invention, the difficulties experienced with the known ventilators are overcome by pivotally mounting the ventilator adjacent its front edge on a pivot pin which is guided for displacement along the lateral sides of the roof opening. Further, at least one lever is pivotally mounted in a plane disposed perpendicularly to the ventilator and connected to it adjacent its rear side so that the rear side can be pivoted upwardly out of the roof opening. A locking arrangement is associated with the lever for securing the ventilator in any position.

The present invention is based upon the concept that optimum ventilation depends on the gap between the rear side of the roof opening and the adjacent side of the ventilator than on the space between the front edge of the roof opening and the corresponding edge of the ventilator.

Accordingly, the primary object of the present invention is not to provide a maximum displacement path for the ventilator, but to provide adjustable gap widths at the rear side of the roof opening. The variability in the gap widths is achieved by the use of the levers which

pivotally attach the rear side of the ventilator to the frame about the opening in the roof so that a firm support is provided for the ventilator and the locking device and properly secure it in place. With such an arrangement additional wind deflector plates are not necessary, because the space between the front side of the roof opening and the front side of the ventilator is kept small throughout the range of open positions of the ventilator and, as a result, no noticeable draft can develop. In the present invention, the ventilator moves only slightly downwardly at its front side at the commencement of the opening operation and, since no lateral guide links are required, it is possible to provide a good all-round sealing of the ventilator in its closed position. A frame depending downwardly from the roof extends about the opening and has the same shape along each of its sides. The frame has a known gutter construction with an inwardly projecting step on which the ventilator rests, a packing or sealing material is provided along the edges of the cover which contact upwardly extending bevelled surfaces on the projecting step for affording a watertight seal when the ventilator is in its closed position within the roof opening.

Due to the relatively short ventilator displacement path, the arrangement for guiding the front side of the ventilator can be supported on guide rails extending along the lateral sides of the frame for only a short distance from its front side. A sliding shoe is mounted on each guide rail and has an extension directed forwardly and upwardly and the ventilator is pivotally attached to the upper end of the extension at a position closely adjacent to its front side. This arrangement makes it possible to keep the downward movement of the front side of the ventilator to a minimum as its rear side is displaced upwardly out of the roof opening.

To achieve an optimum support for the ventilator in any open position and under any driving conditions of the vehicle, and also to provide an adequate arrangement for locking the ventilator in position, it has been found to be particularly advantageous if a pair of levers are disposed in laterally spaced relationship and are rigidly connected to a bearing shaft which is rotatably mounted in bearing blocks attached to the ventilator and with the shaft extending approximately parallel to the front and rear sides of the ventilator. Further, the locking arrangement is associated with the shaft and is mounted on the ventilator.

For locking the ventilator in any of its positions, a disc brake is provided on the shaft supporting the levers and the brake comprises at least one fixed disc brake rigidly secured on the shaft and a loose disc brake rotatably mounted on the shaft and arranged to be pressed against the fixed disc brake. To press the brake discs together, a two-arm transmission lever is pivotally arranged so that the shorter one of its arms is connected to the loose disc brake while its longer arm is in operative engagement with a cam plate connected to a rotary handle secured to the ventilator. By rotating the cam plate, the transmission lever is pivoted and the loose disc brake can be pressed against the fixed disc brake to provide the desired locking action. Accordingly, by locking the shaft, the levers attached to the rear side of the ventilator can be locked in place in a reliable and easy-to-operate manner. While the rotary handle is used in the locking arrangement, it also serves for pivotally displacing the ventilator within the roof opening of the motor vehicle.

Preferably, the locking arrangement utilizes two fixed brake discs spaced apart on the shaft and arranged symmetrically relative to the centerline of the ventilator extending between its front and rear sides. A loose brake disc is used with each of the fixed brake discs and a transmission lever is associated with each pair of fixed and loose brake discs. The transmission levers are interconnected so that a variable spacing can be provided between them and the longer arms of the levers are disposed on opposite sides of the cam plate so that as the cam plate is rotated by the handle, the shorter arms of the transmission levers act on the loose disc brakes to secure or release the locking action. In this arrangement, a uniform distribution of force over the two braking members is provided, because the two transmission levers do not bear on fixed points on the ventilator, but against each other without any direct connection to the ventilator. Preferably, the transmission levers are joined together for variable spacing by a turnbuckle, which has a left hand and a right hand thread.

To improve the braking action and to afford a more effective locking action, it may be advisable to position a friction disc between each pair of fixed and loose brake discs.

To assure that the brake discs, though freely mounted on the shaft, do not rotate freely relative to the shaft, the ends of the transmission levers engaging the loose discs are provided with projections on a fork-like end section which engage within recesses in the loose brake disc on the side which faces outwardly away from the fixed brake disc. The projections on the lever fit into the recesses and hold the loose brake disc so that a proper braking action can be obtained.

To avoid any obstruction of the head room clearance in the vehicle, the rotary handle is mounted on the disc plate so that is spans a recess in the plate provided by its dish-shaped configuration.

Another feature of the invention is that the levers guiding the pivotal movement of the rear side of the ventilator are attached to the ventilator by bearing blocks provided with stops which limit the opening movement of the levers.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a bottom view of a ventilator for a motor vehicle roof illustrated without the roof frame or the ventilator lining;

FIG. 2 is a sectional view of the ventilator shown in FIG. 1 in its closed position and taken along line II—II and illustrating, in addition, the frame structure about the motor vehicle roof opening;

FIG. 3 is a view similar to FIG. 2 taken along the line III—III in FIG. 1;

FIG. 4 is a view similar to FIG. 2, but with the ventilator shown in its fully opened position;

FIG. 5 is an enlarged sectional view taken along line V—V in FIG. 1; and

FIG. 6 is a sectional detail view on the scale of Fig. 5 illustrating a sealing member positioned between the edge of the ventilator and the roof frame.

DETAILED DESCRIPTION OF THE INVENTION

In FIGS. 2, 3 and 4, a ventilator 1 of extremely flat design is shown and consists of an outer cover 3 shaped to conform to the curvature of the roof on a motor vehicle and the cover includes longitudinal and transverse reinforcements 4, 5 and 6. In the closed position shown in FIGS. 2 and 3, the ventilator 1 provides a closure for an opening formed in the roof 2. The reinforcements 4 and 6 support the parts of the ventilator which permit it to be displaced between its closed and open positions. As shown in FIG. 1, the cover 3 is rounded at its corners and has a vertically arranged bevel or flange surface 7 extending downwardly from the cover into the opening in the roof 2. The flange surface 7 extends fully around the edges of the cover 3, that is, along the front side, rear side, and lateral sides of the cover which extend between the rear and front sides. A shaped frame 9 is secured to extend downwardly from the edge of the opening in the roof 2 and the frame 9 has the same configuration along each side of the opening. It would also be possible to use a separate one-piece frame secured to the roof in a suitable manner in place of the frame shown in the drawing. The frame 9 is shaped to form a gutter and a step 11 projects upwardly from the gutter and is arranged to form a support for the flange surface 7 on the cover 3 when the ventilator is in its closed position. As shown in FIG. 6, a packing or sealing member 12 is positioned on the flange surface 7 of the cover and bears against the step 11 on the frame.

In FIGS. 3 and 5, the arrangement for supporting and guiding the front side of the cover is shown. Along both of the lateral sides of the frame 9, short guide rails 13 extend from adjacent the front side of the frame toward the rear side, however, as can be seen in FIG. 3, the guide rail stops at approximately the midpoint of the lateral side. A sliding shoe 14 is displaceably guided on the rail 13. As can be seen in FIG. 5, the guide rail 13 and the sliding shoe 14 do not protrude into the roof opening defined by the frame 9. Extending upwardly from and toward the forward side of the frame is a bearing extension 15 which is articulated to a bearing 16 by a bearing pin 17. The bearings 16 are secured to the front transverse reinforcement 4 on the cover 3. Note in FIG. 1 that there is a bearing 16 in each of the front corners of the ventilator. The two bearing pins 17 form the (imaginary) front swivel axis of the ventilator.

The structure for pivotally displacing the rear side of the ventilator is shown in FIGS. 1, 3, and 4. In the closed position of the cover as illustrated in FIGS. 1 and 3, a pair of laterally spaced levers 18 are rigidly connected to a bearing shaft 19 which extends in approximately parallel relationship with the rear side of the cover. The bearing shaft 19 is rotatably mounted in bearing blocks 20 secured on the rear transverse reinforcement 5 of the cover 3. The opposite ends of the levers 18 from the shaft 19 are articulated to supports 21 located on the rear side of the frame 9, note FIGS. 3 and 4. The bearing blocks 20 each have a stop 22 which limits the swivel path of the levers 18 as the cover is moved from its closed position, shown in FIG. 3, to its maximum open position, shown in FIG. 4. As

can be seen in FIG. 4, the lever is in bearing contact with the stop 22.

The structure for moving the ventilator and for locking it in position will now be described with reference to FIGS. 1 and 2. Secured to and spaced apart on the bearing shaft 19 are two brake discs 23 arranged symmetrically on opposite sides of the ventilator centerline extending between its front and rear sides. The brake discs 23 are fixed to the shaft so that they rotate with it. A loose brake disc 24 is associated with each of the fixed brake discs 23 and is located adjacent the side of the fixed brake disc which faces outwardly away from the other fixed disc. A friction disc 25 is interposed between each fixed disc brake and loose disc brake. The loose disc brakes are freely mounted on the bearing shaft, that is, they do not rotate with the shaft. Depressions or recesses 26 are formed in the surfaces of the loose disc brakes which face outwardly away from the associated fixed disc brake. Angularly disposed projections 27 on one end of a two-arm transmission lever 28 extend into the recesses 26 in the loose brake discs so that the discs are prevented or held from rotating freely on the shaft 19. As shown in FIG. 1, the transmission levers 28 extend from the position of the shaft 19 toward the front side of the cover 3 and they are interconnected, intermediate their ends and closer to the shaft 19 than to their opposite ends, by a turnbuckle 29. The ends of the turnbuckle are articulated to the transmission levers 28 by journals 30. The turnbuckle is provided in a known manner with left-hand and right-hand threads, so that rotation of the central portion of the turnbuckle in one or the other direction leads to an increase or decrease in the distance between the two journals 30.

On the lower side of the cover, spaced between its front and rear sides, a circular disc 31 is mounted on the reinforcement 6 by means of bearing pieces 32 secured to the reinforcement. As can be seen in FIG. 2, the bearing pieces 32 engage in a form fitting manner within a circumferential groove 33 in the disc. A flange 34 on the disc 31 limits the upper side of the circumferential groove and has, on its circumferential periphery, two operating cam plates or surfaces 35, 36 which meet at diametrically opposed steps 37, 38, note FIG. 1. The cam plates are designed as circular eccentrics and the forward ends of the transmission levers are disposed in contact with the cam surfaces 35, 36. As viewed in FIG. 1, it can be appreciated that each lever 28 has a longer arm extending between the turnbuckle and the corresponding cam surface and a shorter arm extending from the turnbuckle to the corresponding loose brake disc. The ends of the longer arms of the levers are grooved, not shown, and overlap the flange 34 on the disc 31. These ends are held in place by the turnbuckle and, due to the articulation of the turnbuckle to the levers, the location of contact between the ends of the lever and the cam surfaces determine the extent to which the shorter arms of the levers press the projections 27 into the recesses 26 in the loose brake discs 24. When the disc 31 is rotated by a rotary handle 40 attached to it and which bridges over a depression or recess 39 formed in the disc because it is dish-shaped, the ends of the levers 28 slide on the cam surfaces 35, 36 for displacing the levers relative to one another. In the arrangement of the ventilator parts shown in FIG. 1, the transmission levers 28 are spaced apart by the maximum distance afforded by the cam surfaces 35, 36, whereby the levers, rotating about the journals 30, press their shorter arms inwardly toward the loose brake discs 24 into contact with the fixed brake discs 23 for preventing movement of the bearing shaft 19 and thus locking the position of the levers 18. In the position of the disc 31 shown in FIG. 1, the ventilator is locked against displacement, independently of its relative position in the roof opening. To release the braking effect, the handle 40 is turned clockwise by about 90° from the position shown in FIG. 1 and the corresponding ends of the longer arms of the levers 28 move inwardly causing the opposite ends or projections 27 to move outwardly and release the braking effect between discs 23 and 24. In this released position of the disc 31, the ventilator can be moved by means of the handle 40 into different positions relative to the roof opening. The two limiting positions of the disc 31 are determined preferably by stop means, not shown.

From an inspection of FIG. 4, it can be observed that a vent hole 8 is located between the front side of the roof opening, as defined by the front side of the frame 9, and the front side of the cover 3, with the ventilator displaced for the full extent in the rearward direction. Further, another vent hole 41, characteristic of the ventilator according to the present invention, is located between the ventilator and the rear side of the roof opening as represented by the rear side of the frame 9. The height of the vent hole 41 depends on the pivoted position of the levers 18 and thus on the extent to which the ventilator 1 is displaced toward the rear. If the ventilator 1 is moved rearwardly only to the location at which the levers 18 extend approximately perpendicularly to the ventilator before they reach the stop position shown in FIG. 4, the opening provided by the vent hole 41 is at its maximum. Naturally, the ventilator can be locked in this position by operating the handle 40. When the ventilator is open, it is lifted by means of the rotary handle 40, which has been turned 90° in effecting the unlocking or releasing action, and it is displaced by the pivotal movement of the levers 18. From the stop position represented in FIG. 4, the ventilator must first be lifted, after the locking or braking action has been released, before it moves forwardly and downwardly under its own weight after overcoming the dead center position of the levers 18. In the closed position, the handle is turned into the position shown in FIG. 1, if necessary, under a slight tensile stress. The roof opening is thus closed by the ventilator in a reliable and watertight manner.

Preferably, the ventilator is provided on its underside with a suitably secured lining 42 which covers the operating parts and reinforcements. The lining 42 is recessed at its center for the passage of the visible part of the disc 31 and of the handle 40 and in the swivel range of the levers 18. To simplify the illustration of the invention, the lining 42 and the marginal sealing or packing member 12, note FIG. 6, are not represented in all of the Figures. The transverse and the longitudinal reinforcements 4, 5 and 6 can be formed of a single member.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

We claim:

1. In a ventilator for a motor vehicle roof having an opening in which the ventilator is displaceably positionable, comprising a cover arranged to be positioned within and to form a displaceable closure for the opening, said cover having a front side, a rear side, and a pair of spaced lateral sides extending between said front and rear sides, means for displaceably supporting said cover within the roof opening comprising first means connected to said cover for pivotally mounting said cover adjacent its front side, second means connected to said cover for pivotally mounting said cover adjacent its rear side, locking means associated with said second means for locking said cover in any position, said means for displaceably supporting said cover comprises a frame fixed to and arranged to extend around and depend from the opening in the motor vehicle roof, said frame having a front side, a rear side, two lateral sides extending between the front and rear sides, and corresponding to the front side, rear side, and lateral sides, respectively, of said cover, said first means and second means connected to said frame, said frame being shaped to form a gutter located below the sides of said cover when it is in the closed position, said cover comprising a plate arranged to extend across the opening and a flange extending downwardly from the edges of said plate along each side of said cover, a seal member formed along the outwardly facing side of said flange on each said side of said cover for effecting a seal with the juxtaposed surface of said frame when said cover is positioned for forming a closure for the roof opening.

2. A ventilator for a motor vehicle roof having an opening in which the ventilator is displaceably positionable, comprising a cover arranged to be positioned within and to form a displaceable closure for the opening, said cover having a front side, a rear side, and a pair of spaced lateral sides extending between said front and rear sides, means for displaceably supporting said cover within the roof opening comprising first means connected to said cover for pivotally mounting said cover adjacent its front side, second means connected to said cover for pivotally mounting said cover adjacent its rear side, locking means associated with said second means for locking said cover in any position, said means for displaceably supporting said cover comprises a frame arranged to extend around and depend from the opening in the motor vehicle roof, said frame having a front side, a rear side, two lateral sides extending between the front and rear sides, and corresponding to the front side, rear side, and lateral sides, respectively, of said cover, said first and second means connected to said frame, said first means comprises a guide rail mounted on each lateral side of said frame and extending from a location adjacent said front side of said frame to a location spaced between said front side and said rear side, a sliding shoe mounted on each said guide rail for movement therealong, a bearing extension secured to and extending upwardly from said sliding shoe, a bearing attached to said plate, and a pivot pin connecting said bearing extension to said bearing.

3. A ventilator, as set forth in claim 2, wherein said second means comprises a bearing shaft extending in approximately parallel relationship with and located adjacent to the rear side of said cover and rotatably mounted on said cover, a pair of laterally spaced levers each rigidly mounted adjacent one of its ends of said shaft and pivotally mounted adjacent the other said end on the rear side of said frame, and said locking means operatively associated with said shaft for selectively preventing its rotation.

4. A ventilator, as set forth in claim 3, wherein said locking means comprises a disc brake arrangement which includes at least one fixed brake disc secured on said shaft against rotation relative thereto, a loose brake disc rotatably mounted on said shaft, and means for displacing said loose brake disc into engagement with said fixed brake disc for securing said shaft against rotation.

5. A ventilator, as set forth in claim 4, wherein said means for displacing said loose brake disc into engagement with said fixed brake disc comprises a lever member in engagement at one end with said loose brake disc, means in engagement with the other end of said lever member for displacing it about a pivot point intermediate the ends of said lever member so that said loose disc brake can be selectively held in contact with and released from contact with said fixed brake disc.

6. A ventilator, as set forth in claim 5, wherein two said fixed brake discs are secured on said shaft, each on an opposite side of a line extending normally between the front and rear sides of said cover, one said loose brake disc is associated with each said fixed brake disc, and is located adjacent the side of said fixed brake disc facing outwardly from the line extending normally of and between the front and rear sides of said cover between said brake discs, a pair of said lever members, a member interconnecting said levers in laterally spaced relation and pivotally connected to said levers intermediate their ends so that the distance between said levers can be adjusted, cam means mounted on said plate and the ends of said levers opposite the ends thereof in contact with said loose brake discs being disposed in contact with said cam means for pivoting said lever about the point of interconnection between said member and said levers.

7. A ventilator, as set forth in claim 6, wherein said cam means comprises a cam plate having a cam surface in contact with said levers, means for rotatably supporting said cam plate from said plate at a position between the ends of said levers which contact said cam surfaces, and a handle attached to said cam plate for rotating it.

8. A ventilator, as set forth in claim 7, wherein said cam plate comprises a circular plate, said circular plate having a circumferential groove about its peripheral edge, said means for rotatably supporting said cam plate comprises bearing members attached to said plate and each having a concave surface in engagement with said circumferential groove in said plate, and said cam surfaces arranged on the circumferential periphery of said circular plate adjacent the circumferential groove therein.

9. A ventilator as set forth in claim 13, wherein said circular plate has a dished configuration forming a recess in the surface of said circular plate facing away from said plate which forms said cover, and said handle is positioned on the side of said circular plate containing said recess and said handle bridges said recess.

10. A ventilator, as set forth in claim 6, wherein said member interconnecting said levers comprises a turnbuckle having a left-hand thread and a right-hand thread.

11. A ventilator, as set forth in claim 6, wherein said brake disc arrangement comprises a friction disc dis-

posed between each said fixed brake disc and loose brake disc.

12. A ventilator, as set forth in claim 6, wherein each said loose brake disc has a pair of recesses formed on the side thereof facing outwardly from said fixed brake disc, and the ends of said lever which contact said loose brake disc has a pair of projections which engage within the recesses in said loose brake disc.

13. A ventilator, as set forth in claim 3, wherein bearing blocks are secured to said plate and said shaft is rotatably mounted in said bearing blocks, said bearing blocks each having a stop surface thereon located in the path of movement of said levers on said shaft for limiting the path of movement of said levers in the opening direction of said cover.

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