July 9, 1940. G. A. GILBERTSON 2,207,147

RADIATOR SHUTTER UNIT

Filed Jan. 15, 1937

Fig. 1

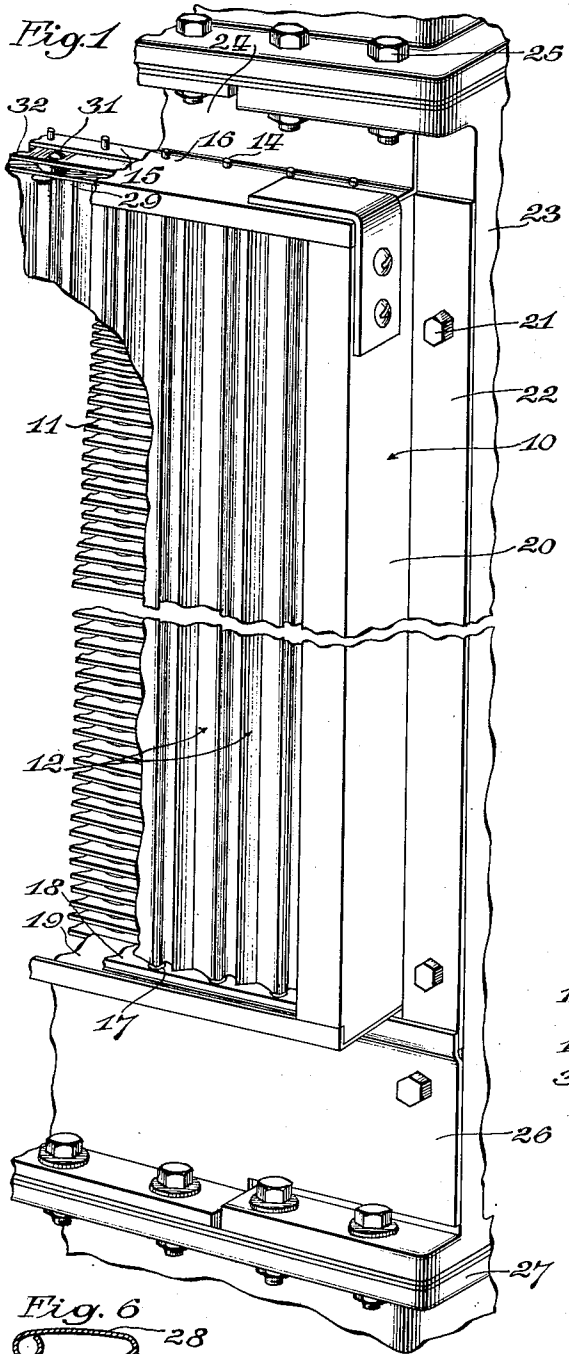
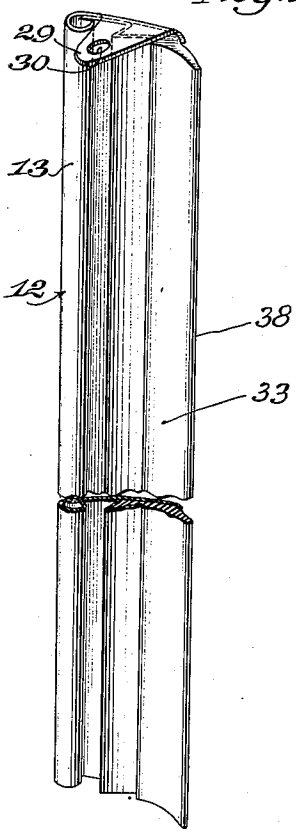


Fig. 2



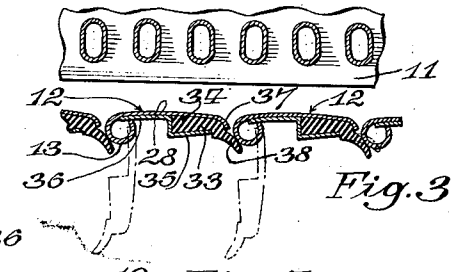


Fig. 3

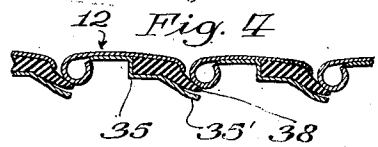


Fig. 4

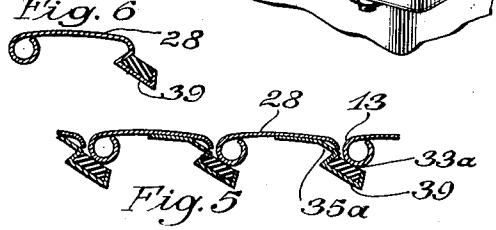


Fig. 5

Fig. 6

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RADIATOR SHUTTER UNIT

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Application January 15, 1937, Serial No. 120,702

2 Claims. (Cl. 188—62)

My invention relates to radiator shutter units and especially radiator shutter units for controlling the flow of cooling air through the radiators of internal combustion engines.

The principal object of my invention is to secure a better and more air tight closure of the shutters. Although the application of my invention is by no means limited to radiators for tractors or heavy duty stationary engines, it is particularly desirable for them for a number of reasons. One reason is that, as there is no great speed of the radiator through the air as there is in an automobile, which can be relied upon when the cooling requirements are greatest, it is necessary to provide a more powerful fan. When the shutters are closed, the power of the fan tends to aggravate any leakage of air through the shutter unit. Also, such engines are generally operated on kerosene or other low grade fuel and are started on gasoline, only a limited supply of which is available for the starting period. For this reason it is desirable to insure as effective and short a warming of the motor as can be procured, and this in turn requires a minimizing of the leakage of air through the shutter unit when the shutters are closed for the starting in cold weather. More specifically, in carrying out the primary object of my invention, I provide the free or swinging edges of the shutter blades, where they close against the opposite edges of the adjacent shutter, with a flexible and resilient sealing strip, preferably of rubber, so arranged that when the bodies of the shutters are turned simultaneously to the closed position the sealing strip on each shutter is resiliently urged against the adjacent shutter to provide an air tight seal despite any irregularities in the shutters within the limits which may ordinarily be encountered in shutter units even after they have been in operation for some time and subjected to considerable abuse.

Another object of my invention is an air tight seal between the shutters when they are in their closed position which will satisfactorily cope with the situation presented by the formation of ice on one or both of the cooperating sealing edges of the shutters.

A more detailed object is the provision of protection for the rubber sealing strip and means for preventing the flexing of the strip beyond predetermined limits.

The foregoing together with further objects, features and advantages of my invention are set forth in the following description of specific embodiments thereof, which are illustrated in the accompanying drawing wherein:

Fig. 1 is a fragmentary perspective view of a shutter unit applied to the radiator of a tractor looking from the front of the tractor and showing the forward right hand corner of the radiator;

Fig. 2 is a perspective view of one of the shutters with the bearing trunnions thereof removed;

Fig. 3 is a fragmentary plan section through some of the shutters showing their position when closed;

Fig. 4 is a view similar to Fig. 3 but showing a modified form;

Fig. 5 is another view similar to Fig. 3 but showing another modification; and

Fig. 6 is a cross section of a single shutter similar to the modification of Fig. 5, but showing a variation thereof.

In the drawing I have shown my invention as incorporated in a shutter unit applied to the radiator of a tractor. Except for the incorporation of my invention in the shutters, the construction of the shutter and radiator is to be understood as the same as that shown in the contemporaneous patent application in the name of William C. Agerell and John D. Durant on radiator shutter units, and reference is made thereto for more detailed description and disclosure of the shutter unit structure and the radiator here only partially disclosed.

The shutter unit indicated generally at 10 is mounted to cover the forward face of the radiator core 11, and the shutters are preferably, as shown, so mounted that when closed they lie close to the face of the core and when open the free edges of the shutters swing away from the core. In this manner the fan, which pulls air rearwardly through the core, tends to close the shutters. Each shutter 12 is vertically disposed and has a rolled bead 13 at its pivoted edge. The upper end of each rolled bead 13 carries a trunnion 14 whereby the shutter is mounted at its upper end in a bearing strip 15 carried on the underside of the horizontal web of a Z-shaped upper frame member 16 of the shutter unit frame. The lower end of each rolled bead 13 carries a similar trunnion 17 whereby it is journaled in a lower bearing strip 18 carried on the upper face of the horizontal web of the lower frame member 19 of the shutter unit. The frame of the shutter unit is completed at each end by an upright frame member 20 to which the upper and lower frame members 16 and 19 are secured.

The shutter unit is secured to the radiator frame by cap screws 21 which extend through the rear and outwardly directed flange 22 of the upright frame members 20 and into the upright 23

of the radiator frame. The rear and upwardly directed vertical flange 24 of the upper frame member 16 closes off the face of the core 11 between the upper edges of the shutters and upper header 25 of the radiator. A panel 26 closes off the face of the radiator core between the lower frame member 19 of the shutter unit and the lower header 27 of the radiator.

The main body of each shutter 12, which is formed of sheet metal, includes, in addition to the rolled bead 13 at the pivoted edge, a panel 28. At its upper end the body of the panel 28 is bent forwardly into a horizontal plane to form an arm 29 having a pivot pin opening 30 for a pivot pin 31 (Fig. 1) by which the arm is connected to an operating bar 32 which is similarly connected to the arms of the other shutters for simultaneously swinging them between their open and closed positions. The operating bar 32 is connected by operating mechanism for convenient movement by the driver, whereby the shutters can be locked in open position, in closed position, or in any desired intermediate position, and spring means may be provided for urging the shutters one way or another as desired. The operating mechanism, beyond the operating bar 32, is not here shown, but is disclosed in said application of William C. Agerell and John D. Durant.

The panel 28 of each shutter does not itself extend into contact with the bead 13 of the adjacent shutter, instead each shutter carries a flexible resilient strip 33 preferably of rubber, which contacts the bead 13 of the adjacent shutter. The sealing strip 33 includes an anchoring portion 34, preferably of dovetail cross section, which is received in the similarly shaped slot defined by the forward face of the panel 28 and the offset or outer flange of a Z-shaped mounting strip 35, whose inner flange 36 lies directly against the forward face of the panel 28 and is secured thereto as by spotwelding. As shown, the margin of the flange 36 nearest the pivotal edge of the shutter may be inserted to fill a gap between the margin of the bead 13 and the panel 28.

The free edge of the panel 28 is preferably curved forwardly, as indicated at 37, for the dual purpose of reinforcing that edge of the panel and providing a forwardly opening slot between the free margin of the panel and the adjacent edge of the outer flange of the Z-shaped mounting strip 35. Through this slot an integral portion of the strip 33 protrudes as a curved lip 38 having curved forward and rearward surfaces arranged somewhat crescent-wise.

The strip 33 is so molded initially that the lip 38 normally extends somewhat more in the general plane of the shutter than as is shown in full lines in Fig. 3. In this way, when the shutters are swung to their closed positions, the lip 38 in contacting the beaded edge of the adjacent shutter, is flexed somewhat against its own resilience. The normal position of the lip 38 in reference to the remainder of the shutter is shown in Fig. 3 by the dotted line position of the shutters when they are swung to open position.

When the operating bar 32 is moved to swing the several shutters simultaneously to their definite closed positions, the lips 38 are flexed by engagement with the beads 13 of the adjacent shutters. Due to manufacturing inaccuracies or subsequent abuse or wear in the moving parts, the several shutters may not occupy exactly similar positions, but the resilient flexibility of the lips 38 will permit each lip to be flexed to the extent necessary to make sealing contact with its adjacent bead 13 without interfering with the similar sealing of any of the other lips 38 on other shutters. Furthermore, each lip 38 is free to flex resiliently to a different position at different points along its own length affording local flexure from a straight line position for each lip 38. If, as is preferably the arrangement especially for application to tractors and heavy duty engines, the shutters are so mounted that the fan tends to close them, the support afforded by the panel 28 and the mounting strip 35 for all of the strip save its relatively narrow protruding lip 38, prevents the lip 38 under extreme suction from being pulled through the space between the metal parts of the adjacent shutters to a position where the lip would be on the rear side instead of the forward side of the adjacent bead 13. If that should happen, the lip 38 would lose much of its function in self-closing under suction of the fan, and the reversing of the position of the lip might interfere with the subsequent opening of the shutters. The support afforded by the panel 28 at the edge 37, together with its rather closely spaced distance from the adjacent bead 13, precludes such a reversing action of the lip.

The panel 28 and the mounting strip 35 leave but a relatively narrow edge of the strip 33 protruding and thereby they protect most of the strip against injury, as well as against the action of any influence, such as wind pressure, which might tend to excessive flapping of a wide protruding flexible edge.

When a tractor has been exposed, especially with its shutters set in open position, to sleet or to rain or heavy fog followed by freezing temperature, ice will often form on the shutters, including the cooperating sealing surfaces of the shutters. When the shutters are then moved to closed position in again starting the engine, the unequal deposits of ice will prevent the closing of the shutters with the normal degree of tightness. This materially interferes with the warming up period and may interfere sufficiently to permit the freezing of the water in the radiator while the engine is running, if the outside temperature is low enough. The inclusion of the rubber sealing strips according to my invention, while not preventing the formation of ice on the shutter edges under such conditions, is peculiarly well adapted to surmount the difficulties presented by the ice coating. This it does in two ways. The first way is in the action of the flexing of the lip 38 as it comes in contact with the adjacent bead 13, in scaling off the ice which has been formed on the sealing face of the lip 38. The fact that the protruding lip is tapered in cross section toward its free edge, better insures that the flexure is not localized at the mouth of the slot in the panel, but that instead the flexure occurs in increment throughout the width of the tapered lip. In this way the ice film is scaled from the protruding lip throughout the width thereof. If the protruding lip were of uniform thickness, the flexure would be localized at the mouth of the slot and the scaling would likewise be localized there, leaving a film of ice adhering to the lip therebeyond.

This scaling off of the ice from the lip by the flexing of the lip, may readily be amplified by the driver in repeatedly opening and then closing the shutters to the fullest extent until the ice deposits have been entirely removed from at least the sealing faces of the lips 38 themselves. After that has been accomplishd by the flexing

of the lips, the lips have only to adjust themselves to unequal thicknesses of the ice deposits on the sealing faces of the beads 13. The other way in which the rubber lips 38 act to overcome the effect of such ice deposits is that whether or not the ice is freed from the sealing faces of the lips 38 by their flexure, the resilient flexibility of the lips will permit them to flex sufficiently to make a seal which will compensate for the unequal thicknesses of ice deposits in various places along the line of seal, even though the ice still adheres to the sealing faces of the lips.

In Fig. 4 I have shown a modified form of sealing strip and mounting therefor which differs from that shown in Fig. 3 chiefly in the extension of the outer edge 35' of the mounting strip 35 to embrace the side of the lip 38 opposite the adjacent bead 13. The extended margin 35', however, does not closely embrace the lip 38 all of the way to its edge in the normal position of the lip. In this way the strip of Fig. 4 also protrudes from the slot proper. The sealing strip is so molded that its lip 38 normally diverges from the margin 35' of the mounting strip, and even when the lip 38 is flexed to the normal or usual extent in making sealing contact with the adjacent bead 13, there is still some divergence between the lip 38 and the margin 35' of the mounting strip. The margin 35' of the mounting strip does, however, constitute a maximum limit for the flexing of the lip 38. Beyond that extreme limitation of flexure the sealing face of the lip 38 can yield only by virtue of the resilient compressibility of the rubber of the lip at the line of contact.

The extended margin 35' thus, by limiting extreme flexure of the lip 38, precludes such working or fatiguing of the material of the lip as might prematurely cause it to tear loose. Also the extended margin 35' shields the lip 38 when the shutters are in the closed position and thereby protects it from injury. When the shutters are swung to open or partially open position, the extended margin 35', since it extends as far from the pivot as does the lip 38, will continue to protect the lip against injury.

In Fig. 5 I have illustrated still another modification where the mounting strip 35—*a* is extended to form a dovetail channel 39 in which is received a rubber sealing strip 33—*a* of cross section to fit the channel 39 which, when the shutters are closed, faces the rolled bead 13 of the adjacent shutter. In this form the sealing strip 33—*a* does not flex, and compensation for irregularities is afforded by the resilient compressibility of the material of the sealing strip 33—*a*, and by such flexibility as may be provided in the mounting strip 35—*a* outwardly of its anchorage to the shutter panel 28. The channel 39 embraces all sides of the sealing strip 33—*a*, save its exposed sealing face and, therefore, better protects the strip against injury or internal fatigue. The channel 39 may be formed from an integral extension of the sheet material of the panel 28, as shown in Fig. 6.

While I have described these specific embodiments of my invention, I contemplate that many changes and substitutions can be made thereover without departing from the scope or spirit of my invention.

I claim:

1. A shutter for a radiator shutter unit comprising a sheet metal panel portion, bearing means for pivotally mounting the shutter along one edge of the panel portion, means adjacent the opposite edge of the panel forming a channel therealong, a sealing strip of rubber received in the channel and protruding therefrom, the protruding portion of the sealing strip being adapted resiliently to contact under flexure and seal against the pivotal edge of an adjacent shutter, and a sheet metal flange carried by the shutter and extending along the side of the protruding edge of the strip opposite from its sealing face and extending as far as the free edge thereof for providing a protective backing for the sealing strip, the free edge of the sealing strip, in its normal open position, being disposed away from the backing strip but being resiliently flexible theretoward in sealing against the pivotal edge of an adjacent shutter, and in its normal closed position being closely embraced by, but still spaced slightly from, the backing strip.

2. A shutter which, with a plurality of like shutters and a mounting frame, forms a gang-operated shutter unit for an automobile radiator, the shutter comprising a sheet metal panel portion, bearing means for pivotally mounting the shutter along one edge of the panel portion, means adjacent the opposite edge of the panel forming a channel therealong, a sealing strip of flexible and resilient rubber received in the channel and protruding therefrom away from the pivoted edge, the protruding portion of the sealing strip being constructed and arranged to contact, by resilient flexure from its normal position in relation to the panel portion, and seal against the pivoted edge of an adjacent like shutter in overlapping relation to the proximate side thereof, and means for protecting the back side of the protruding portion of the sealing strip, for limiting sealing flexure thereof and for preventing swinging of the shutter far enough to carry the protruding end of the sealing strip past its seat on the pivoted edge of the adjacent shutter, comprising a sheet metal backing flange carried by the shutter embracing the back side of the protruding portion of the sealing strip and extending transversely substantially as far as the free edge thereof but spaced back from the normal unflexed position of the protruding portion while being spaced back only slightly from the normal sealing position thereof.

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