May 5, 1953 C. H. HARMON 2,637,264

CLOSURE FOR EXHAUST PIPE FOR GAS ENGINES

Filed Jan. 14, 1950

FIG. 1

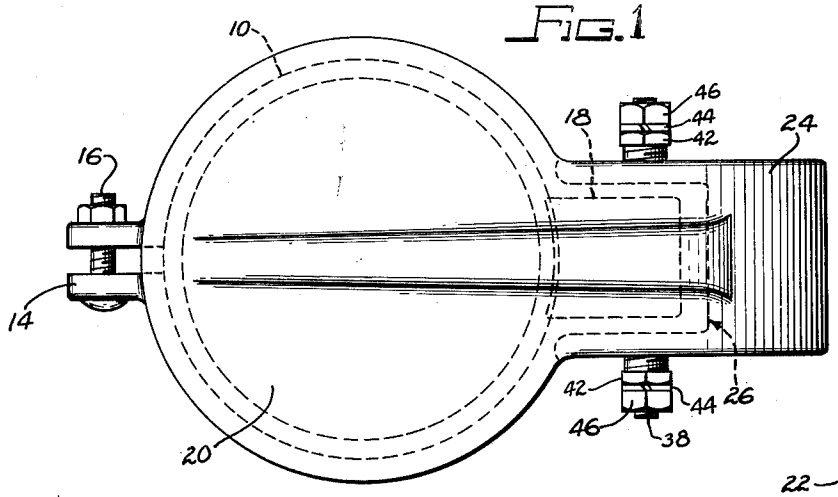


FIG. 2

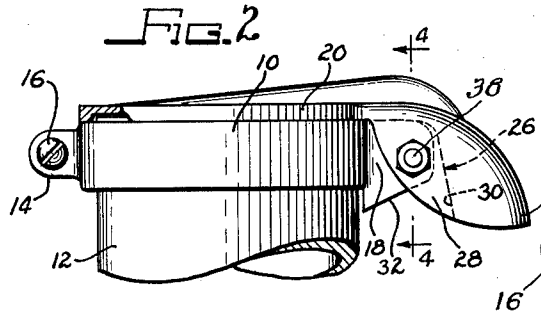


FIG. 3

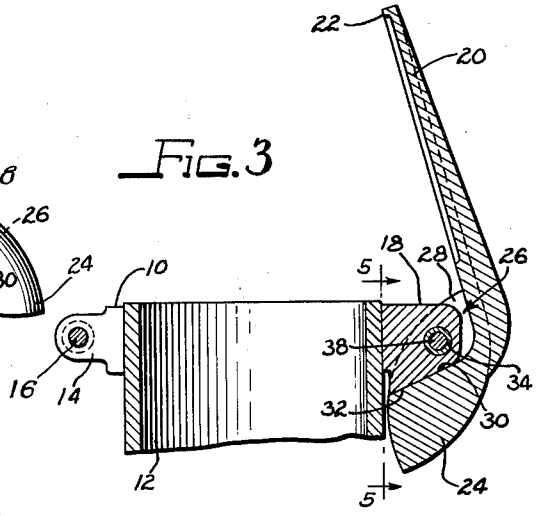


FIG. 4

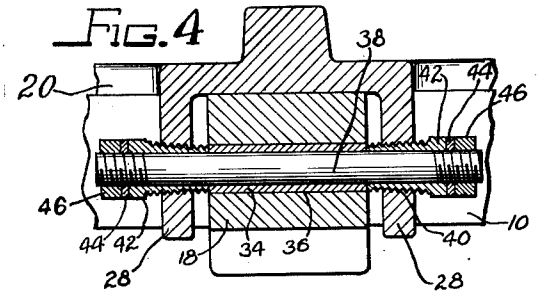


FIG. 5

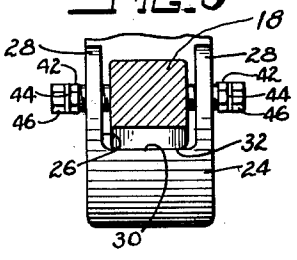
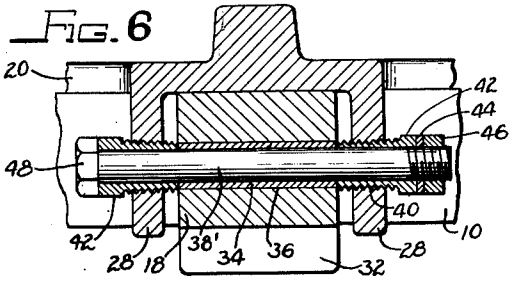


FIG. 6



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CLOSURE FOR EXHAUST PIPE FOR GAS ENGINES

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Application January 14, 1950, Serial No. 138,650

7 Claims. (Cl. 98—59)

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The present invention relates to a closure device for protecting the open end of an upright terminal portion of an exhaust pipe of gasoline and diesel engines and the like. Devices of this general type serve to exclude rain, snow, dust, dirt and foreign matter from entering the exhaust pipe when the engine is not operating, and automatically exposes the end of said pipe when exhaust gases are discharged therethrough.

More specifically the present invention is directed to improvements in closure devices in which such device includes a frame member in the form of a ring provided with a laterally extending lug to which a counter-weighted closure flap is pivotally connected.

Preferably, such devices should be constructed and arranged so that the closure flap is free to move about its pivotal connection in response to the presence or absence of pressure of the exhaust gases in the exhaust pipe. It is recognized that devices of this general type, by reason of their position of use, are subject to relatively high temperatures by reason of the exhaust gases passing through the exhaust pipe, and hence the metal parts of the closure device are subject to substantial expansion and contraction over a period of time. By reason of such a condition, it sometimes happens that the pivotal connection of the closure flap becomes impaired to the extent that the closure flap does not readily move in response to the presence or absence of pressure of exhaust gases and thus fails to perform its intended function.

The main object of the present invention is to provide a novel form of pivotal connection or mounting for the closure flap which will insure satisfactory operation of the closure flap for long periods of time.

Another object is the provision of an improved pivotal mounting for a closure device of the character indicated having means for adjustment to compensate for wear of the moving parts.

Still another object is the provision of an improved pivotal mounting for a closure device of the character indicated which includes a hardened steel pin rockably mounted in a brass bushing and in which the closure flap is mounted on said hardened steel pin and includes take-up bushings for engagement with the brass bushing to compensate for wear.

A further object is the provision of an improved pivotal mounting for a closure device of the character indicated in which a closure flap is pivoted on a laterally extending lug on the frame member and the closure flap has a counter-weight in which is provided a cavity for receiving the lug and the side walls of the cavity are provided with means for engaging the lug for spacing the side walls from the lug and thereby positioning the closure flap with respect to the frame.

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A still further object is the provision of an improved closure device of the character indicated having a frame for mounting on an exhaust pipe and a closure flap pivotally mounted on the frame in which the frame and the closure flap are provided with large area, interengageable contact surfaces which serve to limit the movement of the closure flap to open position, and because of the large area of the contact surfaces the danger of damage to either of the two elements making up the device is reduced to a minimum.

With these and other objects in view, my invention consists in the construction, arrangement, and combination of the various parts of my device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, wherein:

Figure 1 is a plan view of a closure device embodying the present invention;

Figure 2 is a reduced scale side elevational view of the device mounted on an exhaust pipe showing a portion of the closure flap in section;

Figure 3 is a reduced scale vertical sectional view of the closure device and the exhaust pipe;

Figure 4 is a large scale sectional view taken on line 4—4 of Figure 2;

Figure 5 is a view taken on line 5—5 of Figure 3; and

Figure 6 is a view similar to Figure 4, illustrating a modified form of pivot pin.

The closure device comprises a frame 10, in the form of a split ring, adapted to surround the upper end of an exhaust pipe as indicated at 12, as clearly seen in Figures 2 and 3 of the drawing. The split ring includes a pair of laterally projecting, transversely spaced apart ears 14 adapted to be connected together by a bolt 16, the bolt serving to draw the ears together for firmly clamping the ring around the exhaust pipe.

Extending laterally from the frame or ring 10, at substantially diametrically opposite relation to the ears 14, is a lug 18, to which a closure flap 20 is pivotally connected. The closure flap is generally of circular contour, and provided with a marginal depending flange 22, adapted to surround the upper portion of the exhaust pipe 12, and seats upon the upper end of the split ring 10. As may be seen in the drawing, the split ring is mounted on the exhaust pipe so that the upper end of the pipe projects slightly above the upper surface of the ring and in such relation that the closure flap will at no time engage the upper end of said pipe.

Formed integrally with the closure flap is a rearwardly extending tail portion 24, constituting a counter-weight, the undersurface of which is recessed, as indicated at 26, for accommodating

therein the mounting lug 18 of the split ring, as clearly seen in Figures 2 and 3 of the drawing. The side walls 28 of said tail portion, constituting the side walls of said cavity 26, are spaced apart a proper distance so as to provide adequate clearance for the lug 18, as may be seen in Figures 1, 4 and 5 of the drawing.

The cavity 26 is defined at its rear extremity by a sloping wall surface 30 which is adapted to engage a surface 32 on the lower side of the lug 18. The surface 32 extends the full width of the lug, and extends in the opposite direction a substantially equal distance; the surface 30 of the cavity 26 has at least as great, and slightly greater, dimensions as the corresponding dimensions of the surface 32. When the closure flap is opened to the position illustrated in Figure 3 the surfaces 30 and 32 contact each other, establishing a stop for limiting the opening movement of the closure flap. When the two surfaces are in engagement, the contact therebetween is distributed substantially throughout the area of their surfaces. The respective dimensions of the surfaces are clearly illustrated in Figures 3 and 5.

The pivotal connection forming a part of the present invention includes a bushing 34 preferably formed of brass, which is press-fitted in a transverse aperture 36 in the lug 18. The bushing 34 may also be formed of other non-ferrous material. The bushing 36 is fitted in the aperture so as to be secured against rotation therein.

Rockably mounted in the bushing 34 is a hardened steel pin 38, the ends of which extend through threaded apertures 40 in the side walls 28 of the tail portion of the closure flap. The pin 38 is snugly fitted in the bushing 34 but is permitted to rock therein.

Surrounding the outer ends of the hardened steel pin 38 are take-up bushings 42 which are slid over the ends of the pin, the bushings being exteriorly threaded for screwing into the apertures 40. The bushings 42 are screwed into position where they engage the ends of bushing 34 to such a tightness as to provide a relatively snug fit but permitting rocking of the pin and the take-up bushings 42 with respect to the bushing 34. Outwardly of the take-up bushings 42 (in one form of the invention, as illustrated in Figure 4) lock washers 44 and lock nuts 46 are threaded on the outer threaded extremities of the pin 38. The lock nuts 46 and lock washers 44 are turned up tight, locking the take-up bushings 42 in the adjusted positions. The take-up bushings 42 space the side walls 28 with respect to the lug 18 and center said lug between said side walls so as to position the closure flap substantially centrally with respect to the frame 10.

In Figure 6, a pin 38' is employed, but instead of having both ends threaded, as described in connection with Figure 4, one end is provided with a bolt head 48, and the other end with a lock washer 44 and lock nut 46. The bolt head 48 directly engages the adjacent take-up bushing 42. As the closure flap swings open and closed, there is a tendency to considerable wear on the pivot connection. As above explained, the closure flap is forced open by the exhaust gases and because of the repeated impulses of the exhaust gases due to individual explosions of the engine, the closure flap actually flutters, that is, it swings or vibrates at a rapid speed and the tendency to wear on the pivotal connection due to friction is great. The fact that the pin 38 is of hardened steel and the bushing 34 is of brass, or other non-ferrous material, minimizes the wear due to friction. The construction of the present invention provides unusual strength and durability.

It is desirable to compensate for what wear that does occur, and this may be done by adjusting the take-up bushings 42 by turning them into new positions with respect to the ends of the bushing 34, and thereafter turning up the lock nuts 46 (Figure 4) to lock the take-up bushings in their new adjusted positions.

In the case of the construction of Figure 6, take-up for wear is accomplished by adjusting the take-up bushings 42 to the desired new position, and thereafter tightening the single nut 46. The construction of Figure 6 constitutes a simple and expedient means for compensating for wear that is self-adjusting in response to tightening of the single nut 46.

Another advantageous feature of the invention has to do with the fact that because of the intense heat of the exhaust gases, it is difficult to properly lubricate the pivotal connection, and because of the lack of lubrication the wear due to friction is greater than would be the case if it were lubricated. By the present construction I have greatly reduced the wear due to friction and lack of lubrication, and provided a novel construction for compensating for the minimum of wear that does occur.

The bushings 42 also are effective for spacing the side walls 28 with respect to the mounting lug 18, and thereby properly positioning the closure flap 20 with respect to the ring 10 and the exhaust pipe.

The wide area contact surfaces 30 and 32 also provide an effective stop means for limiting the opening movement of the closure flap, and because of such wide area surfaces there is no impairment of any of the elements such as would be the case if certain elements contacted together in areas having sharp edges or limited areas of contact. It is pointed out that the stop means provided by the surfaces 30 and 32 is, in contrast, an improvement over previous kinds in which the side walls 28 engage the ring 10 in which case the areas of engagement would be substantially not greater than point contact, and consequent damage would result to the ring, with possible breakage thereof.

It is also contemplated in the present invention that instead of providing a brass bushing 34 the entire ring 10 and lug 18 can be made of brass, or similar material, so that the hardened steel pin 38 fitted in the aperture would engage the brass surface thereof with the same effect as with the provision of the brass bushing in the present construction.

The construction embodied in the present invention results in unusual strength and durability and enables longer wear of the device than would be the case in connection with other constructions used under similarly deleterious conditions.

While I have herein shown and described a preferred embodiment of our invention, manifestly it is capable of modification and rearrangement of parts without departing from the spirit and scope thereof. I do not, therefore, wish to be understood as limiting this invention to the precise form herein disclosed, except as I may be so limited by the appended claims.

I claim as my invention:

1. In combination, a supporting member having a mounting lug, a closure flap pivotally mounted on said supporting member, said closure member having an extension with spaced wall portions on opposite sides of said lug, said lug

and wall portions having aligned apertures therethrough, the apertures in said wall portions being threaded, a pin in the aperture in said lug and extending through the apertures in said wall portions, and bushings surrounding the ends of said pin and threaded in the apertures in said wall portions with their inner ends adjustably disposed in close relation to the adjacent surfaces of said lug for spacing said lug with respect to said wall portions.

2. In combination, a supporting member having a mounting lug, said lug having an aperture therethrough, a bushing of non-ferrous material mounted in said aperture, a closure flap pivotally mounted on said supporting member, said closure flap having spaced wall portions on opposite sides of said lug, said wall portions having threaded apertures therethrough in alignment with the aperture in said lug, a hardened steel pin in the aperture in said lug and adapted to rock therein, the ends of said pin extending through the apertures in said wall portions, and bushings surrounding the ends of said pin and threaded in the apertures in said wall portions, with their inner ends adjustably disposed in close relation to the adjacent surfaces of said lug for spacing said lug with respect to said wall portions.

3. In combination, a supporting member having a mounting lug, said lug having an aperture therethrough, a bushing of non-ferrous material, press-fitted in said aperture, a closure flap pivotally mounted on said supporting member, said closure flap having spaced wall portions on opposite sides of said lug, said wall portions having threaded apertures therethrough in alignment with the aperture in said lug, a hardened steel pin rockably mounted in said bushing, the ends of said steel pin extending through the apertures in said wall portions, bushings surrounding the ends of said pin and threaded in the apertures in said wall portions, with their inner ends adjustably disposed with respect to the adjacent ends of said bushing in the lug for spacing said lug with respect to said wall portions, and means fixedly securing said pin with respect to said wall portions so that said pin rocks in said first bushing in response to pivotal swinging of said closure flap.

4. In a device of the character disclosed, a supporting member adapted for mounting on the end of an exhaust pipe, said supporting member having a laterally disposed lug, said lug having an aperture therethrough, a closure flap adapted to close the end of the exhaust pipe, said closure flap having a laterally extending counterweight with a cavity therein, said cavity having spaced side walls, said lug being disposed in said cavity, said side walls having threaded apertures in alignment with the aperture in said lug, a pin in the aperture in said lug, the ends of said pin extending through the apertures in said side walls, exteriorly threaded bushings surrounding the ends of said pin and threaded in the apertures in said side walls, said bushings being adjustable into close relation to the adjacent surfaces of said lug, and means for locking said bushings in adjusted positions.

5. In a closure device of the character described, comprising a frame element adapted to surround the terminal portion of an exhaust pipe, a lug carried by and extending laterally from said frame element, and a closure flap pivotally connected to said lug and adapted to normally cover the open end of exhaust pipe and movable to an open position by the pressure of the exhaust gases discharging through said pipe, said flap having a laterally extending counter-weight for counter-balancing a portion of the overhanging weight of said flap, said counter-weight having a cavity formed in its underside between a pair of laterally spaced apart walls, said flap being mounted on the frame with said lug projecting into said cavity, between said walls; the improvement wherein said pivotal connection comprises a non-ferrous bushing press-fitted in an aperture in said lug, a hardened steel pin rockably mounted in said bushing, one end of said pin having a bolt head and the other end being threaded, said pin extending through apertures in said walls, the apertures in said spaced apart walls being threaded, second bushings surrounding the ends of said pin and threaded in the apertures in said walls, said second bushings being adjustable into engagement with said non-ferrous bushing, said bolt head being engageable with the end of one of said second bushings, and a lock nut threaded on the threaded end of said pin and engageable with the end of the other of said second bushings.

6. In a closure device of the character described, comprising a frame element adapted to surround the terminal portion of an exhaust pipe, a lug carried by and extending laterally from said frame element, and a closure flap having an extension pivotally connected to said lug and adapted to normally cover the open end of the exhaust pipe and movable to an open position by the pressure of the exhaust gases discharging through said pipe, said lug and extension having interengageable contact areas forming stop means for limiting the movement of said flap to open position, said contact areas extending in one direction substantially the full transverse dimension of said lug and extending a substantially equal extent in a direction transverse thereto.

7. In a closure device of the character described, comprising a frame element adapted to surround the terminal portion of an exhaust pipe, a lug carried by and extending laterally from said frame element, and a closure flap pivotally connected to said lug and adapted to normally cover the open end of the exhaust pipe and movable to an open position by the pressure of the exhaust gases discharging through said pipe, said flap having a laterally extending counter-weight for counter-balancing a portion of the overhanging weight of said flap, said counter-weight having a cavity formed in its underside, said flap being mounted on the frame with said lug projecting into said cavity, said lug and one wall of said cavity having interengageable contact areas forming stop means for limiting the movement of said flap to open position, said contact areas extending in one direction substantially the full transverse dimension of said lug and extending a substantially equal extent in a direction transverse thereto.

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