Nov. 22, 1955 R. H. WELLMAN 2,724,378

SAFETY COVER MEANS FOR INTERNAL COMBUSTION ENGINES

Filed Sept. 4, 1951 2 Sheets-Sheet 1

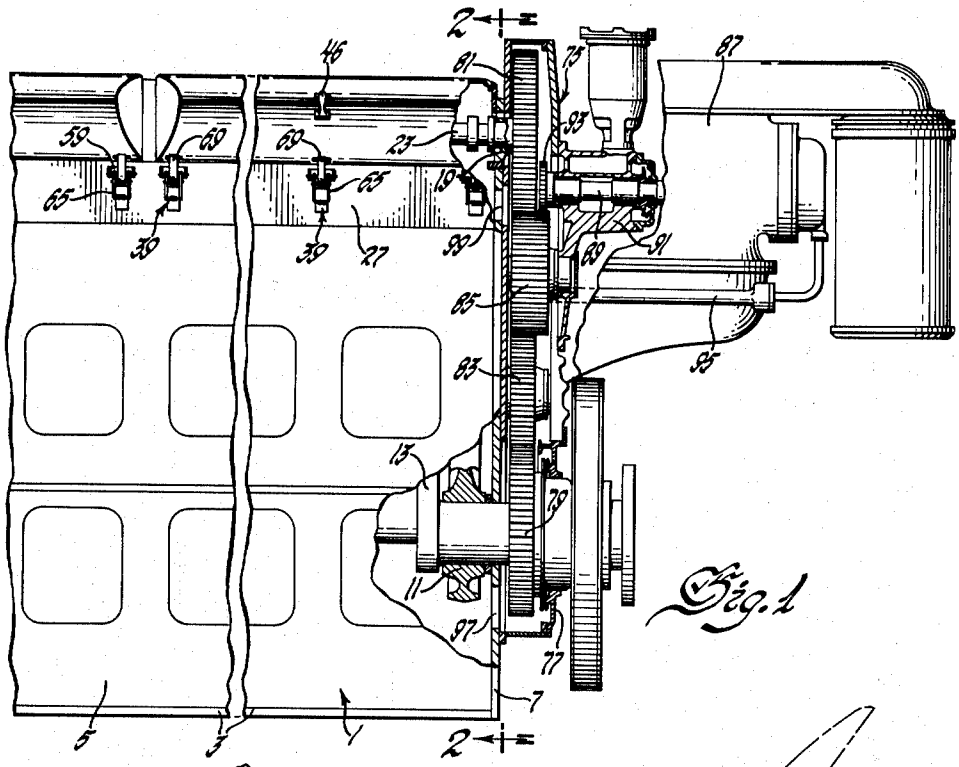


Fig. 1

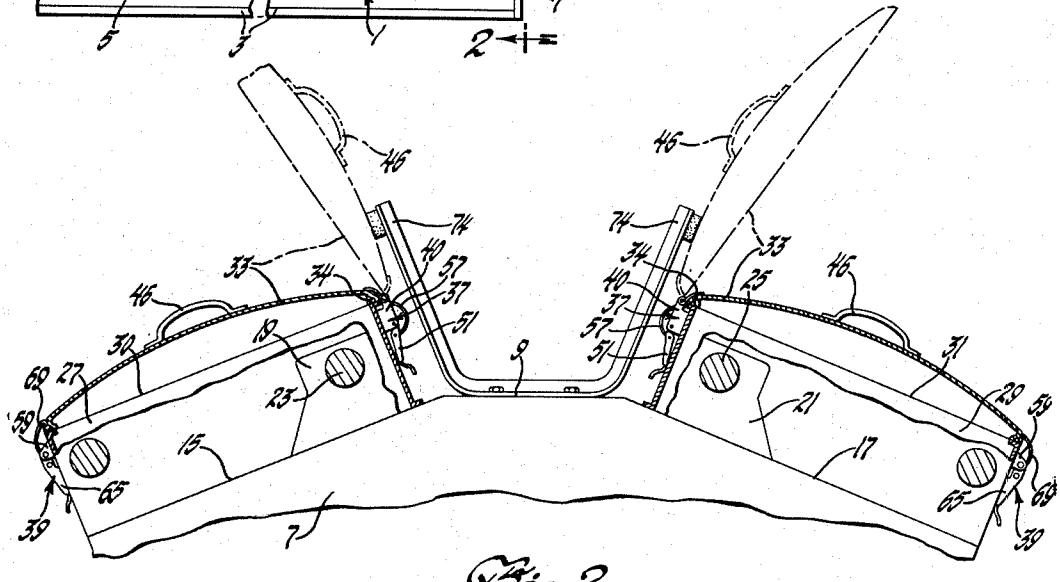


Fig. 2

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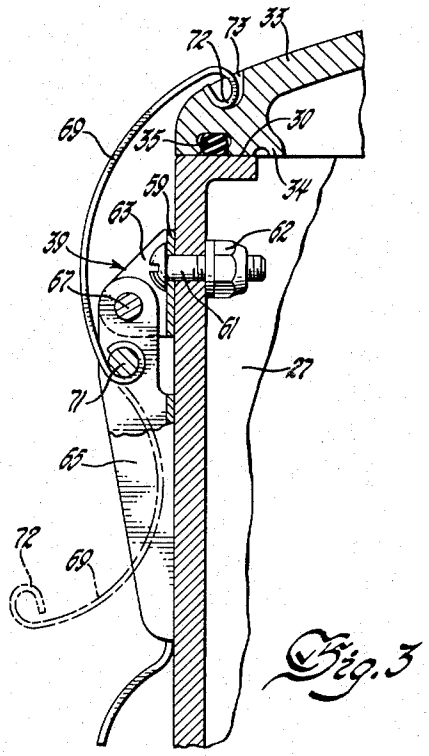


Fig. 3

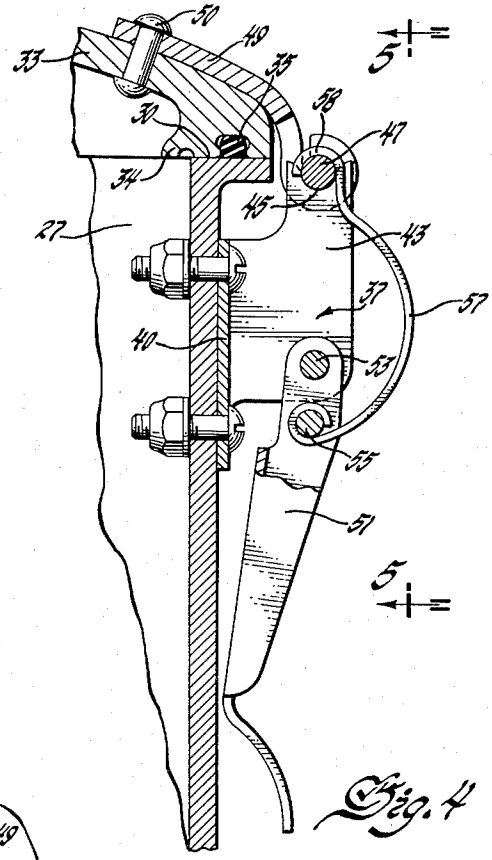


Fig. 4

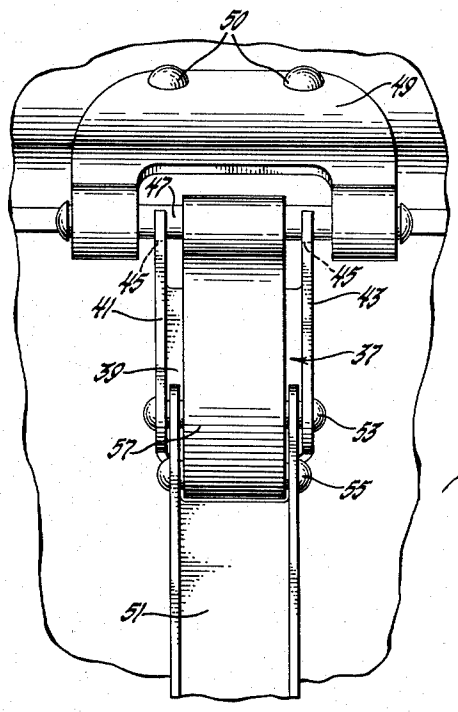


Fig. 5

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SAFETY COVER MEANS FOR INTERNAL COMBUSTION ENGINES

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3 Claims. (Cl. 123—198)

The invention generally relates to internal combustion engines and more particularly to means for protecting engines from internal explosions within the engine crank housing, and to extinguish fires resulting from such explosions.

The principal object of the invention is to provide an engine housing cover releasably mounted on the engine housing for limited angular movement from a normally closed position against gravity by explosion pressure within the engine housing to quickly relieve this pressure and extinguish fire.

The means by which this object is accomplished will become apparent by reference to the following detailed description and drawings illustrating one form of the invention which is particularly adapted for use on various types of internal combustion engines.

Figure 1 of the drawings is a side elevation view of the engine with parts shown broken away and in section.

Figure 2 is an enlarged view taken on line 2—2 of Figure 1 with parts broken away and in section.

Figures 3 and 4 are enlarged views of portions of Figure 2 with parts shown broken away and in section.

Figure 5 is a view taken on line 5—5 of Figure 4.

An internal combustion engine is shown in Figures 1 and 2 having a hollow welded frame 1 comprising bottom mounting plate 3, side plates 5, and plates 7 and an upper deck plate 9. Transversely extending bearing members 11 are welded between the side plates 5 and the main journals of engine crankshaft 13 are rotatably supported in these bearing members.

The upper deck plate 9 is shown in Figure 2 provided with a horizontal, longitudinally extending central portion and transversely outwardly and downwardly inclined side portions 15 and 17 for supporting engine cylinders and cylinder heads, not shown, radially with respect to the longitudinal axis of the crankshaft 13, suitable longitudinally spaced openings being provided in the side portions 15 and 17 through which the engine cylinders project.

Longitudinally aligned cam shaft bearing members 19 are secured on the upper face of the inclined side portion 15 of the upper deck plate 9, and similar longitudinally aligned cam shaft bearings 21 are secured to the upper inclined face of the side portion 17 of the upper deck plate 9. A cam shaft 23 is rotatably supported in the cam shaft bearings 19 and another cam shaft 25 is rotatably supported in the cam shaft bearings 21. Each of these cam shafts 23 and 25 operate the valve and fuel injector mechanisms mounted in the cylinder heads, not shown, adjacent these cam shafts.

A hollow rectangular cylinder head housing 27 is secured to the side portion 15 of the upper deck plate for enclosing the cylinder heads and cam shaft 23 and another hollow rectangular cylinder head housing 29 is secured to the side portion 17 of the upper deck plate 9 for enclosing cylinder heads and cam shaft 25. The cylinder head housing 27 is shown in Figure 2 provided

with an upper seating surface 30 and the other cylinder head housing 29 is provided with an upper seating surface 31. It will be noted that the seating surface 30 is parallel to the upper face of the side portion 15 of the upper deck deck plate 9 and the seating surface 31 of the housing 29 is parallel to the other side portion 17 of the upper deck plate 9. A pair of identical cylinder head housing covers 33 of rectangular form are provided for the housings 27 and 29. The housing covers 33 are provided with a flanged edge portion 34 of rectangular form having a groove therein in which a resilient sealing gasket 35 is placed as best shown in Figures 3 and 4. It will be noted in these figures that the sealing gasket 35 is seated on the seating surface 30 of the cylinder head housing 27. The other housing cover 33 is provided with a similar sealing gasket which is seated on the seating surface 31 of the housing 29 as best shown in Figure 2. A plurality of holddown means generally indicated by the reference character 37 are secured along the adjacent side faces of the housings 27 and 29, and other holddown means generally indicated by the reference character 39 are secured along the remote side faces of these housings.

Each of the holddown means 37 comprising a bracket 40 as shown in Figure 4 is bolted to the housing 27. The bracket 40 is provided with longitudinally spaced ear portions 41 and 43 shown extending transversely outwardly of the housing 27. These ear portions 41 and 43 are provided with upstanding portions having longitudinally aligned notches 45 in the upper ends thereof. A pivot pin 47 is shown in Figures 4 and 5 seated in the notches 45 and the ends of this pin are supported in the bifurcated outer end of a bracket 49 secured by rivets 50 to the adjacent upper face portion of the housing cover 33. As best seen in Figures 4 and 5 a depending lever 51 having an upper bifurcated end portion is located between the ears 41 and 43 of the bracket 40 and a pivot pin 53 extends longitudinally through suitable openings in these ears and the upper bifurcated end portion of the lever 51 for transverse swinging movement thereon about an axis parallel to and in the same vertical plane as the pivot pin 47. Another pivot pin 55 extends between the upper bifurcated end portions of the lever 51 below the pivot pin 53 and parallel thereto. A C-shaped leaf spring 57 is pivoted on the pin 55 and is provided with a hooked portion 58 shown hooked over the pivot pin 47 between its points of support in the grooves 45 of the bracket ears 41 and 43. With the lever 51 in the position shown in Figure 4, the pin 55 on the lever 51 is swung transversely inwardly in over center relation to the pivot pin 47 to bend the spring 57 and cause the upper hooked end portion 58 to draw the pivot pin 47 of the bracket 49 secured to the housing cover 33 downwardly into the notches 45 of the bracket 40. This causes compression of the resilient cover gasket 35.

Each of the other holddown means 39, as best shown in Figure 3, includes a bracket 59 secured by a frangible bolt 61 and a nut 62 to the remote, outer sides of each of the housings 27 and 29. Each of the brackets 59 is provided with longitudinally spaced, transversely outwardly extending ears, one of which is indicated at 63. The upper, bifurcated end of another depending lever 65 is pivoted between the ears of the bracket by a pivot pin 67 extending longitudinally through suitable openings in these ears and the bifurcated upper end of the lever 65. Another C-shaped leaf spring 69 is shown in Figure 3 pivoted at the lower end on a pivot pin 71 extending between the bifurcated end of the lever 65 below and parallel to the pin 67 and the upper end of the spring 69 is provided with a loop forming a hook 72 shown engaged in a notch 73 in the upper face of the cover 33 adjacent the other side. The pivot pin 71 on the lever 65 is also shown in Figure 3 swung transversely inwardly

of the pivot pin 67 and in over center relation with the pivot pin 67 to bend the spring 69 and urge the upper hooked end 72 thereof into firm engagement with the lower portion of the notch 73 in the cover 33 to also compress the cover gasket 35.

As best seen in Figure 2 by swinging the levers 65 transversely outwardly into over center relationship with the pivot pins 67, the hooked ends 72 of the springs 69 may be disengaged from the notches 73 and the covers may be swung by means of the handles 46 thereon upwardly and transversely inwardly from the outer lower sides of the cylinder head housings 27 and 29 about the axes of the pivot pins 47 of the holddown means 37 located higher up on the adjacent inner sides of the housings 27 and 29. Stop means 74 are shown in Figure 2 secured to the upper deck plate 9 of the engine frame. This stop means 74 is engageable by the cover plates 33 to prevent over center pivoting movement thereof relative to the axes of the pivot pin 47 beyond the dotted line open position of these covers so that the cover plates will fall by gravity to the closed full line position as shown in Figure 2.

With the spring 69 of the holddown means 39 released from the notches 73 of the cover plates 33, the covers 33 may be removed by swinging the levers 51 of the holddown means 37 transversely outwardly into over center relation with the pivot pins 47 of the holddown means 37 on the adjacent inner sides of the housings 27 and 29. This causes the upper hooked ends 47 of the springs 57 to be unhooked from the pivot pins 47 so that the covers 33 may be lifted off the housings 27 and 29 by the handles 46 on these covers.

As best shown in Figure 1 an accessory driving gear housing, generally indicated by the reference character 75 is removably attached to one end plate 7 of the engine frame 1. One end of the crankshaft 13 extends outwardly through aligned openings in the end plate 7 and a cover 77 removably secured to the accessory gear housing 75. An accessory driving gear 79 is secured to the crankshaft within the accessory gear housing 75. Each of the cam shafts 23 and 25 in the cylinder head housings 27 and 29 extend outwardly through suitable openings in the ends thereof and through aligned openings in the gear housing 75, and a cam shaft driving gear 81 is secured on the end of each of the cam shafts 23 and 25 within the housing 75, a gear 83 is shown in the gear housing 75 meshing with the driving gear 79 on the crankshaft and two other gears 85 in the housing 75 mesh with the gear 83 and each of the cam shaft driving gears 81 to rotate the cam shafts 23 and 25 in timed relation with th crankshaft 13. The gears 83 and 85 are supported for rotation within the accessory gear housing 75 by suitable bearings provided therein.

Separate engine driven blowers 87 are removably secured to the outer ends of the accessory drive gear housing 75 and separate blower driving shafts 89 are rotatably supported in bearings provided in separate cover plates 91 secured to the gear housing 75. A blower driving gear 93 is secured to the inner end of each of the blower driving shafts 89 within the housing 75 and each of the gears 93 mesh with one of the gears 85 therein for driving the blowers 87. A suction pipe line 95 is shown in Figure 1 connected at one end to the suction side of one of the blowers 87 and the opposite end opens into the interior of the accessory driving gear housing 75. The interior of the gear housing 75 is placed in communication with the space in the hollow engine frame around the crankshaft 13 by an opening 97 in the end plate 7 of the engine frame. The interiors of the accessory drive gear housing 75 and the two cylinder head housings 27 and 29 are placed in communication by means of registering openings 99 provided in the end plate 7 of the engine and the inner wall of the gear housing 75. The suction from the blower 87 draws oil vapor out of the engine frame 1 and the cylinder head and from the accessory gear housings 27, 29 and 75 and outside air enters the frame and these housings through suitable bleed openings, not shown, to ventilate the interiors thereof and lessen the chances of an explosion therein by removal of oil vapor and also the by-products of combustion leaking through the clearance space between the cylinders and pistons into the space in the engine frame around the crankshaft 13.

With the cylinder head covers 33 held on the seating surfaces 30 and 31 of the cylinder head housings 27 and 29 by the holddown means 37 and 39, as best shown in Figures 2, 3, 4 and 5, should an explosion occur in the space around the crankshaft 13 in the engine frame 1 by a hot bearing, seized piston, etc., the resulting pressure rise due to this explosion will be communicated through the interior of the gear housing 75 through the opening 95 and also will reach the interiors of the cylinder head gear housings 27 and 29 through the registering openings 97 therein. The explosion pressure applied to the underside of the covers 33 of the cylinder head housings 27 and 29 causes an upward force thereon which will shear the frangible bolts 61 of the holddown means 65 on the remote outer faces of the cylinder head housings 27 and 29, and the cylinder head at one or both of the cylinder head covers 33 will be blown upwardly and pivot about the axes of the pivot pins 47 of the holddown means 37 bolted to the inner adjacent faces of the housings 27 and 29. The stop means 74 secured to the upper deck plate 9 of the engine frame, as previously described, limits upward pivoting movement of both of the cylinder head covers so that they will not be blown into overcenter relation with the pivot pins 47 and after the pressure of the explosion has been reduced by the opening of one or both of the covers, the covers will fall by gravity back into seating relation with the seating surfaces 30 and 31 of the housings 27 and 29 and smother out any fire due to the explosion within the engine frame and housings 27, 29 and 75.

The combined means described above act in combination to continuously ventilate the interior of the engine and housings and relieve explosion pressures therein and smother the fire due to this explosion.

I claim:

1. A compartmented internal combustion engine housing including a separately enclosed crankcase chamber and a separately enclosed cylinder head containing chamber in either of which an explosion may occur due to the presence of unburned explosive mixtures, said cylinder head containing chamber having an opening therein, a closure member for said opening releasable to uncover said opening when predetermined explosive pressures are exerted thereagainst, an accessory drive housing mounted on one end of said engine housing providing a passageway connecting said chambers together for communication with each other, said chambers having openings communicating with said passageway of such size that said closure member is operable to relieve predetermined explosive pressures occurring in said crankcase chamber.

2. A compartmented internal combustion engine housing including a separately enclosed crankcase chamber and a separately enclosed cylinder head containing chamber in either of which an explosion may occur due to the presence of unburned explosive mixtures, said cylinder head containing chamber having an opening therein, a closure member for said opening, pivotal means connecting said closure member to said engine housing, said closure member pivoting to uncover said opening when predetermined explosive pressures are exerted thereagainst, an accessory drive housing mounted on one end of said engine housing providing a passageway connecting said chambers together for communication with each other, said chambers having openings communicatinug with said passageway of such size that said closure member is

operable to relieve predetermined explosive pressures occurring in said crankcase chamber.

3. A compartmented internal combustion engine housing including a separately enclosed crankcase chamber and a separately enclosed cylinder head containing chamber in either of which an explosion may occur due to the pressure of unburned explosive mixtures, said cylinder head containing chamber having an opening therein, a closure member for said opening, pivotal means connecting said closure member to said engine housing, said closure member pivoting to uncover said opening when predetermined explosive pressures are exerted thereagainst, an accessory drive housing mounted on one end of said engine housing providing a passageway connecting said chambers together for communication with each other, said chambers having openings communicating with said passageway of such size that said closure member pivots to uncover said opening and relieves predetermined explosive pressures occurring in said crankcase chamber, and stop means on said engine housing to limit pivotal movement of said closure member away from said member and return said closure member to cover said opening after an explosion thereby tending to smother any combustion occurring in said chamber.

References Cited in the file of this patent

UNITED STATES PATENTS

815,236	Trump	Mar. 13, 1906
884,853	Radcliffe	Apr. 14, 1908
1,483,855	Stephenson	Feb. 12, 1924
1,671,547	Rothera	May 29, 1928
1,729,085	Pofeldt	Sept. 24, 1929
1,737,148	Chupp	Nov. 26, 1929
1,741,111	Hines	Dec. 24, 1929
2,169,123	Galusha	Aug. 8, 1939
2,291,374	Canfield	July 28, 1942

FOREIGN PATENTS

321,759	Italy	Oct. 16, 1934