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CRANKCASE ACCESS AND EXPLOSION RELIEF COVER

Filed Dec. 7, 1959

2 Sheets-Sheet 1

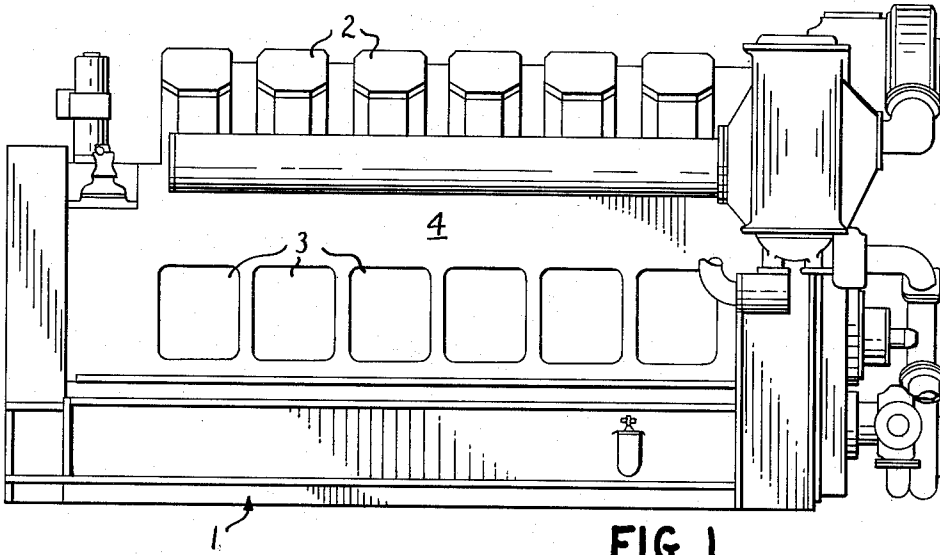


FIG. 1

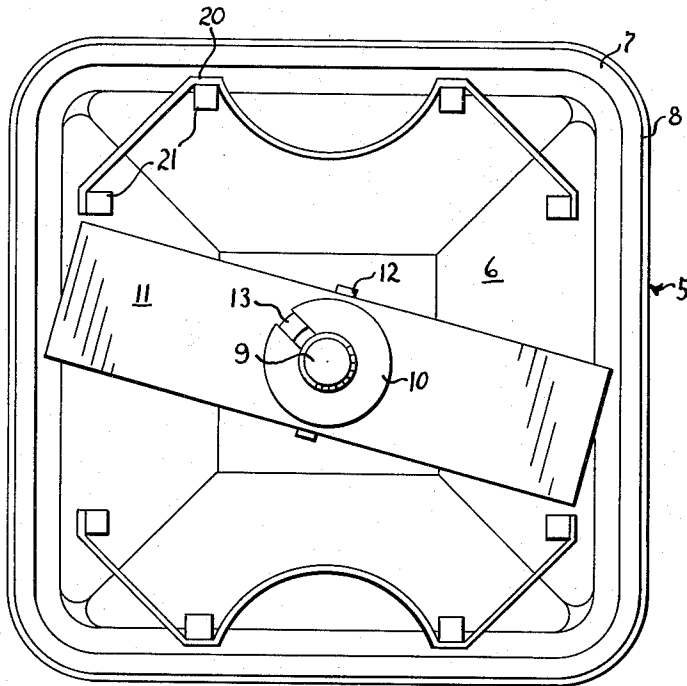


FIG. 4

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FIG. 2

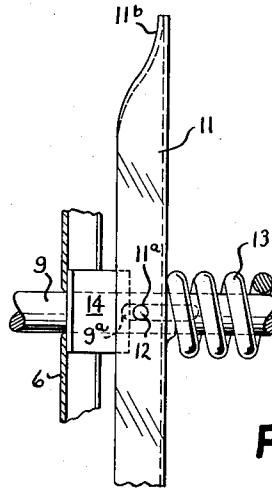
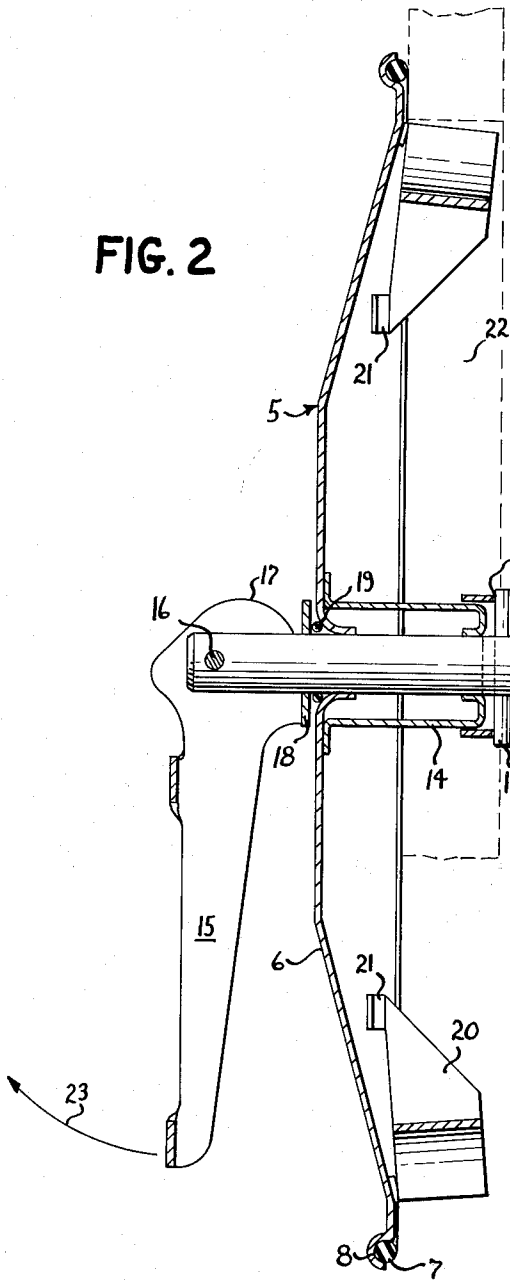


FIG. 2a

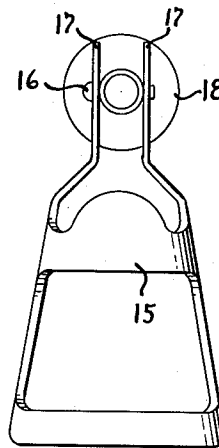


FIG. 3

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2,997,038 CRANKCASE ACCESS AND EXPLOSION RELIEF COVER

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8 Claims. (Cl. 123-198)

This invention relates to a crankcase access port cover for an internal combustion engine, and more particularly relates to such a cover which also serves as a crankcase pressure relief and check valve.

Large internal combustion engines, such as diesel engines used as prime movers on diesel electric locomotives, have crankcase access ports in the engine body, usually an access port for each cylinder and piston assembly. The purpose of providing a plurality of access ports in the engine body is to facilitate access to cylinder and piston assemblies to enable repair and maintenance of internal assemblies of the internal combustion engine without having to tear down the engine in order to gain access therein for a possible minor item of repair or maintenance. Of course, some sort of access port cover is provided to enclose the crankcase when the engine is being operated. Heretofore, these access port covers have been bolted to the engine frame or clamped thereto in some manner which required many turns of rotational securing element(s) before the access port cover could be removed, thus adding to repair or maintenance time.

It is also necessary to provide a pressure relief valve-check valve arrangement in the engine frame to release a rapid build-up of pressure in the crankcase and, upon release of the internal pressure, prevent introduction of air into the crankcase. During operation, a combustible mixture of fuel oil vapor may be enclosed within the crankcase chamber. This mixture will be rather rich, and if a malfunction should develop such as an overheated bearing, the mixture may be ignited and a weak explosion will occur. Occurrence of such an explosion will open the aforementioned low pressure relief valve, relieving pressure due to the explosion. The relief valve must close immediately when the pressure is relieved or there will be an in-rush of air into the crankcase, producing a lean combustible mixture which, if ignited, will produce a very violent secondary explosion which will undoubtedly result in severe damage to the engine. Thus, a frequent practice is to provide a combination crankcase pressure relief valve and check valve which will vent a build-up of pressure within the crankcase, but which checks any in-rush of air into the crankcase.

The present invention provides a quick access port cover which also acts as a pressure relief and check valve and has as its primary object the provision of a rapidly removable crankcase access port cover which also provides crankcase explosion relief.

The features of the invention which are believed to be novel are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, can best be understood by referring to the following description when taken in connection with the following drawings wherein:

FIGURE 1 is a side elevation of a diesel engine;

FIGURE 2 is a sectional side elevation of a crankcase access port cover embodying the invention;

FIGURE 2a is a partial plan view of the crankcase access port cover of FIGURE 2;

FIGURE 3 illustrates a quick release handle incorporated in the present invention;

FIGURE 4 is a view of the access port cover seen from the crankcase side.

Reference is now made to FIG. 1 wherein I show a

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diesel engine 1 for purposes of illustration and orientation. The diesel engine 1 is of the V-type, having cylinders 2 and rectangular access ports 3 in the side of the engine frame 4.

Referring now to FIGS. 2, 2a, 3 and 4, I show a crankcase access port cover 5 in a sectional side elevation, constructed in accordance with my invention. The cover assembly comprises a cover plate 6 having a sealing gasket 7 in a groove 8 about its periphery. A rotatable shaft 9 extends through the cover plate 6 and has a spring seat which may comprise a washer 10 secured thereon. A compression closure member such as a clamping bar 11 is mounted on the shaft 9. The shaft 9 is axially movable. A pin 12 extends through apertures 11a of clamping bar 11 and engages the sides of a slot 9a (see FIG. 2a), in shaft 9 to cause the bar 11 to rotate upon rotation of the shaft. A spring 13 is provided between the clamping bar 11 and washer 10, tending to force the clamping bar 11 away from the washer 10. The force exerted by the spring 13 on clamping bar 11 axially moves pin 12 in slot 9a until restrained by the portions of 11b of clamping bar 11 contacting the engine frame 22. A clamping bar bearing 14 is provided to prevent undesired rotation of the clamping bar 11 when the bar is in a locked position. Attached to the opposite end of the shaft is a quick release handle 15 which is pivotably secured to shaft 9 by means of pin 16. The handle 15 (see FIG. 3) includes cam portions 17 which bear on a cam bearing washer 18. An O-ring 19 may be provided about the shaft between the cover plate 6 and cam bearing washer 18. The shaft 9 moves axially with respect to cam bearing washer 18 when the cam surface 17 is rotated about pin 16. Guide members 20 are secured, as by welding tabs 21, to the interior of the cover plate (see FIG. 4).

The cover assembly is shown in FIG. 2 in locked position. In such a position, the portions 11b of clamping bar 11 are forced against the interior of the portion of the engine frame defining an access port by the force exerted by spring 13 thereon. The engine frame is indicated by the phantom outline 22. The spring 13 additionally exerts a force on washer 10, tending to urge shaft 9 inwardly towards the crankcase, thus producing a force in that direction on cam bearing washer 18, which in turn urges cover plate 6 against the exterior of the engine frame covering the access port. This compresses sealing gasket 7, thus positively sealing the crankcase access port.

When it is desired to gain access to the crankcase, the handle is lifted in the direction indicated by the arrow 23. This moves cam surface 17 across cam bearing washer 18, moving the shaft inwardly towards the crankcase. This movement of the shaft carries pin 12 and clamping bar 11 in that direction a sufficient distance to allow disengagement of the clamping bar 11 from bearing 14. The handle 15 may now be rotated which rotates clamping bar 11 (see FIG. 4). Sufficient rotation of clamping bar 11 will provide clearance between the clamping bar 11 and the edges of the means defining the access port and therefore removal of the cover assembly. The length of clamping bar 11 is greater than the smaller dimension across the crankcase access port 3 by a predetermined length, but not as great as the larger dimension across the rectangular port.

It may be readily seen that the entire cover assembly may be removed by first rotating the handle 15 in one plane about the pin 16 and then rotating the handle in a transverse plane to rotate the clamping bar 11, thus providing extremely rapid access to the crankcase and/or a piston and cylinder assembly. Neither rotation of the handle 15 substantially exceeds 90°. The cover assembly 5 may be replaced to close an access port very rapidly by inserting the shaft in the access port, properly locating

the cover assembly by means of guide members 20, rotating the handle to horizontally position clamping bar 11, and releasing the cam to lock the assembly in place. With this arrangement the cover assembly is positively seated and the gasket provides a positive oil seal on the crankcase.

Considering now the cover assembly to be mounted on the crankcase frame and sealing an access port, if there should be a rapid pressure built up within the crankcase due to an explosion or any other cause, the increase in pressure will exert a force on the interior of cover plate 6, and if the pressure increases sufficiently to provide a force to overcome the tension of spring 13 on washer 10, cover plate 6 will move outwardly, releasing pressure on the gasket 7 which allows venting of the crankcase. When the excess pressure in the crankcase has been relieved, the tensional force of spring 13 exerted on washer 10 will pull cover plate 6 inwardly, reseating gasket 7 to reseal the access port and prevent the in-rush of air. The spring 13 is so selected that when the pressure within the crankcase builds up to a predetermined value, the tensional force exerted by the spring will be overcome by the pressure on the inside of cover 6 and cover 6 will be forced open to relieve pressure in the crankcase. The guide members 20 will coact with the edges of the access ports 3 to insure proper reseating of the cover member 6 when the spring 13 pulls cover plate 16 inwardly subsequent to venting of the crankcase.

While I have illustrated and described a preferred and specific embodiment of my invention, changes in this disclosed embodiment may occur to those skilled in the art without departing from the spirit and scope of this invention. Accordingly, it is my intention to cover all changes and modifications of the example of the invention herein chosen for purposes of disclosure which do not constitute departure from the spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination, an internal combustion engine having means defining a crankcase access port therein, an access port cover assembly comprising, a cover plate member, a clamping member, said cover plate member being of sufficient size to cover the port, said clamping member having a length sufficient to allow the ends thereof to engage the port defining means across one dimension thereof and insufficient to engage the port defining means across another dimension thereof, a shaft extending through said members and having seating means on one end, a handle having a cam surface portion pivotably mounted on the other end of said shaft, said cam surface portion bearing on said cover member, resilient biasing means interposed between said seating means and said clamping member urging said cover member and said clamping member together, said shaft being arranged to move axially upon rotation of said cam surface to cause said resilient biasing means to urge said clamping member toward said cover member to cause compressive engagement of opposite surfaces of the port defining means by said cover member and said clamping member when said cam surface is rotated in one direction and to release said biasing means when rotated in the opposite direction.

2. In combination, an internal combustion engine having means defining a crankcase access port therein, an access port cover assembly comprising, a cover plate member, a clamping member, said cover plate member being of sufficient size to cover the port, said clamping member having a length sufficient to allow the ends thereof to engage the port defining means across one dimension thereof and insufficient to engage the port defining means across another dimension thereof, a shaft extending through said members and having seating means on one end, a handle having a cam surface portion pivotably mounted on the other end of said shaft, said cam surface

portion bearing on said cover member, resilient biasing means interposed between said seating means and said clamping member urging said cover member and said clamping member together, said shaft being arranged to move axially upon rotation of said cam surface to urge said cover member and said clamping member to compressively engage opposite surfaces of the port defining means when said cam surface is rotated in one direction and to release said clamping member from compressive engagement with the port defining means when rotated in the opposite direction, said resilient biasing means being so selected that when the pressure within the crankcase builds up to a predetermined value the pressure on said cover member is sufficient to overcome the tensional force of said resilient biasing means to unseat said cover member to relieve pressure in the crankcase.

3. In combination with an internal combustion engine having means defining a crankcase access port therein, an access port cover assembly comprising, a cover plate member, a clamping member, said cover plate member being of sufficient size to cover the port, said clamping member having a length sufficient to allow the ends thereof to engage the port defining means across one dimension thereof but insufficient to engage the port defining means across another dimension thereof, a shaft extending through said members and having seating means on one end, a handle having a cam surface portion pivotably mounted on the other end of said shaft, said cam surface portion bearing on said cover member, resilient biasing means interposed between said seating means and said clamping member urging said cover member and said clamping member together, said shaft being arranged to move axially upon rotation of said cam surface to urge said cover member and said clamping member to compressively engage opposite surfaces of the port defining means when said cam surface is rotated in one direction and to move said clamping member out of engagement with the port defining means when rotated in the opposite direction, said handle being rotatable in a transverse plane to rotate said shaft and clamping member when said clamping member is out of engagement with the port defining means.

4. A crankcase access port cover assembly for an internal combustion engine having means defining a crankcase access port therein, said assembly comprising a cover plate member of sufficient size to cover the port, a clamping member having a length sufficient to allow the ends thereof to engage opposite sides of the port defining means across one dimension thereof but insufficient to engage the port defining means across another dimension thereof, a shaft extending through said members and having seating means on one end, means preventing rotational movement of said clamping member with respect to said shaft and limiting movement of said clamping member towards said cover member, resilient biasing means interposed between said seating means and said clamping member urging said clamping member towards said cover plate member, a handle having a cam surface portion pivotably mounted on the other end of said shaft and bearing on said cover plate member, said handle being arranged for rotational movement in transverse planes whereby rotation of said handle about the pivot axially moves said shaft and rotation of said handle in a transverse plane causes rotation of said shaft and said clamping means.

5. A crankcase access port cover assembly for use with an internal combustion engine having means defining a crankcase access port therein, said assembly comprising a cover plate member of sufficient size to cover the port, a clamping member having a length sufficient to allow the ends thereof to engage the port defining means across one dimension thereof and insufficient to engage the port defining means across another dimension thereof, a shaft extending through said members and having spring seating means on one end, a pin extending through said

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clamping member and slidable in a slot in said shaft to prevent relative rotation of said shaft and said clamping member and to limit movement of said clamping on said shaft, said pin being held at a relatively fixed position on said shaft with respect to said seating means whereby axial movement of said seating means away from said cover member causes a movement of said clamping member away from said cover member, resilient biasing means interposed between said seating means and said clamping member urging said clamping member and said cover plate member towards each other, a handle having a cam surface portion pivotably mounted on the other end of said shaft and bearing on said cover plate member, said handle being arranged for rotational movement in transverse planes whereby rotation of said handle about the pivot axially moves said shaft and rotation of said handle in a transverse plane causes rotation of said shaft and said clamping member.

6. For use with an internal combustion engine having a crankcase and means defining a crankcase access port therein, a combination access port cover and explosion relief and check valve assembly comprising, a cover plate member, a clamping member, said cover plate member being of sufficient size to cover the port, said clamping member having a length sufficient to allow the ends thereof to engage the port defining means across one dimension thereof and insufficient to engage the port defining means across another dimension thereof, a shaft extending through said members and having seating means on one end, a handle having a cam surface portion pivotably mounted on the other end of said shaft, said cam surface portion bearing on said cover member, resilient biasing means interposed between said seating means and said clamping member urging said cover member and said clamping member together, said shaft being arranged to move axially upon rotation of said cam surface to urge said cover member and said clamping member to compressively engage opposite surfaces of the port defining

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means when said cam surface is rotated in one direction and to release said clamping member from compressive engagement with the port defining means when rotated in the opposite direction, said resilient biasing means being so selected that when the pressure within the crankcase builds up to a predetermined value the pressure on said cover member is sufficient to overcome the tensional force of said resilient biasing means to unseat said cover member to vent the crankcase to relieve pressure therein, said resilient biasing means being effective to reseat said cover member upon venting of the crankcase.

7. The assembly of claim 6 wherein said cover has guide means on the crankcase side thereof arranged to coact with said port defining means to insure proper reseating of said cover means subsequent to unseating of said cover member to vent the crankcase.

8. The assembly of claim 6 wherein the crankcase side of said cover defines a seal receiving groove near the periphery thereof arranged to partially receive a sealing gasket therein and dimensioned to include within its perimeter the defined access port, sealing means in said groove adapted to be compressed between said cover and the crankcase by said resilient biasing means to provide a positive seal therebetween.

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