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2,354,722

CRANK CASE OIL SEPARATOR

Filed June 12, 1940

2 Sheets-Sheet 1

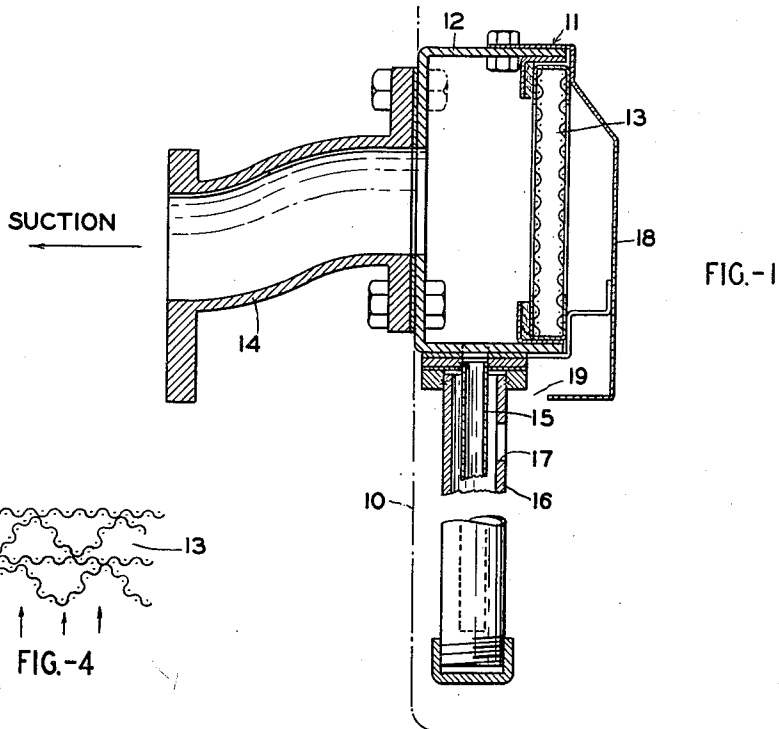
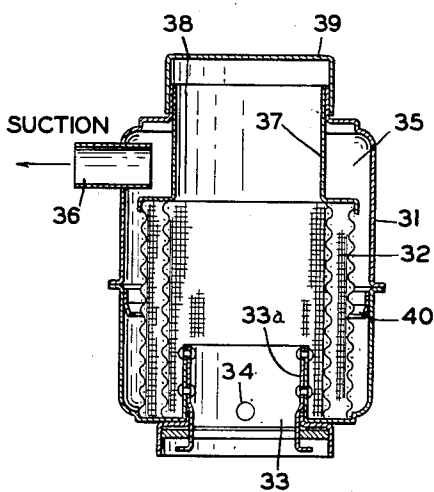


FIG-3

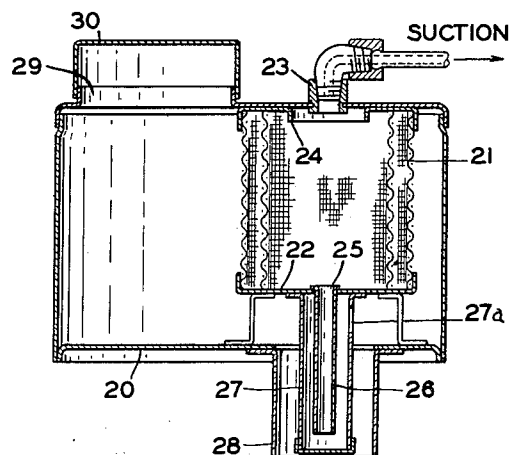


FIG.-2

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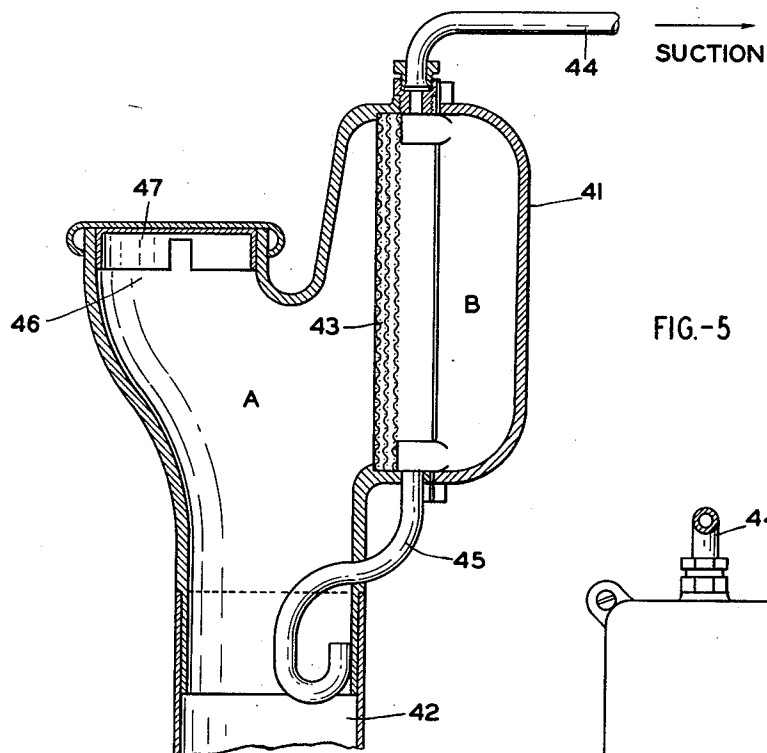
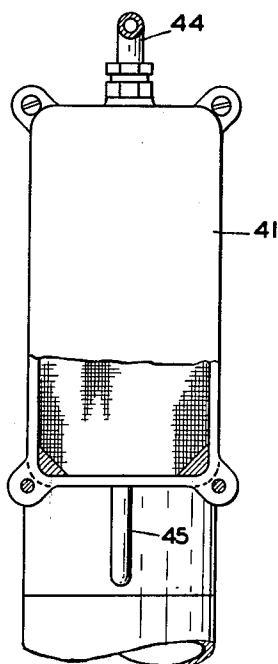
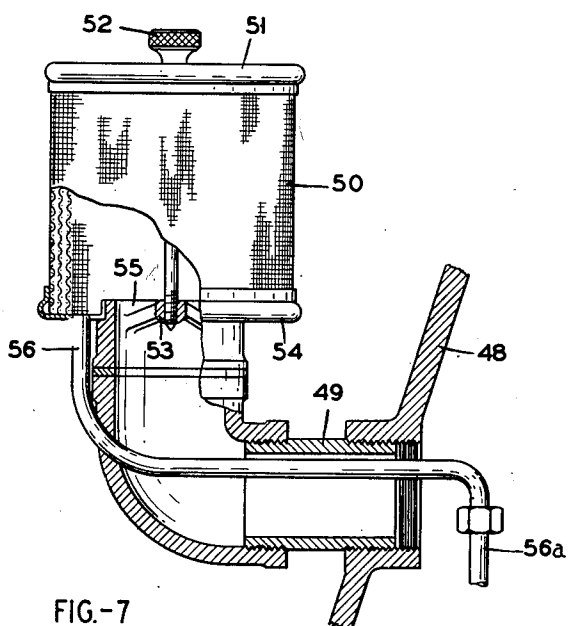
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CRANKCASE OIL SEPARATOR

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Application June 12, 1940, Serial No. 340,014

8 Claims. (Cl. 121-194)

This invention relates to improvements in crank case oil separators.

This application is a continuation in part of my copending application Serial No. 90,177 filed July 11, 1936, now Patent No. 2,230,278.

One of the objects of the present invention is to provide apparatus whereby the crank case of an internal combustion engine may be placed under a slight vacuum while collecting and returning to the crank case practically all of the oil which otherwise would pass out as vapor through the suction outlet. Great advantages are being realized today in improving the atmospheric conditions in engine rooms, particularly where Diesel engines are used. Such atmospheric control is imperative on submarines and very desirable in other locations.

The invention also has advantages in the case of Diesel engines where the crank case is maintained under suction from the engine inlet manifold. Under these conditions Diesel engines have been known to run away with their normal fuel supply entirely cut off because blow-by conditions and vaporization in the crank case supplied sufficient fuel to the engine manifold to permit this to happen.

An object of the present invention is to provide efficient means for supplying a slight suction in the crank case, separating oil vapors which are sucked out of the case and returning the oil to the crank case.

Another object of the invention is to provide a structure such as has been pointed out above together with means for conveniently introducing fresh oil to the crank case when desired.

Other objects and advantages of the invention will be apparent from the accompanying description and drawings and the essential features thereof will be summarized in the claims.

In the drawings, Fig. 1 is a sectional view of structure suitable for Diesel engines or the like where the entire apparatus must be placed in as narrow a space as possible; Fig. 2 is a modified form suitable for attachment to the crank case of an internal combustion engine; Fig. 3 is another modification suitable for application to a crank case; Fig. 4 is an enlarged sectional view through a portion of the separator screen of Fig. 1; Figs. 5 and 6 are two views of still another modification showing the installation in a slightly different form; while Fig. 7 is a view of still another modification of the crank case "breather" type.

In the form shown in Fig. 1, I have indicated the outline of a crank case generally at 10 with

a separator unit indicated generally at 11 designed to fit closely in a very narrow space against the wall of the crank case. In this form of device a casing 12 supports an elongated oil separator unit 13 which, for instance, is of the order of fifteen inches long and three inches wide as to its exposed surface. The casing is so arranged that it embraces the entire peripheral edge of the unit 13 so as to seal it against passage of fluid around the separator, thus compelling all of the vapors and gases moving out of the crank case to pass through the separator unit 13. A connection 14 leads from the casing 12 to the inlet manifold of the engine so as to create a slight suction in the crank case. The separator unit 13 is preferably of the type illustrated in greatly enlarged fashion in Fig. 4. This is the type disclosed and claimed in my above mentioned copending application. Here screens of greater fineness are placed on the upstream side of the separator and coarser screens are placed on the downstream side. The corrugated screens between adjacent layers permit the passage of oil globules from one screen to the other until the outermost screen on the downstream side is reached. The theory of this type of separator is that the very fine mist of oil engaging the first screen is coalesced into larger globules which pass from screen to screen and finally fall to the bottom of the separator unit on the downstream side thereof.

As shown in Fig. 1, means is provided for returning this coalesced or separated oil to the crank case. In the form shown a tube 15 extends downwardly in a well 16 which is provided with an outlet opening at 17. The tube 15 is thus sealed preventing the suction in the casing 12 being communicated directly to the crank case while permitting overflow of oil from casing 12 to the crank case.

Preferably a shield 18 is placed parallel to and along the entire length of the separator unit 13 to prevent the direct splashing of oil on the separator unit. Thus all gases and vapors must enter at the point 19 and pass inside of the guard 18 to reach the separator unit.

In the modification of Fig. 2, casing means 20 houses a separator unit 21 which may be of similar construction to that already described except that here the screens are rolled to provide a hollow generally cylindrical unit. The casing means together with the partition 22 serves to substantially close the top and bottom of the cylinder. The top of the cylinder is provided with an outlet conduit 23 which is con-

nected to a source of suction, such as the engine manifold. An annular flange 24 may be provided just inside the upper end of the cylinder to prevent particles of oil travelling to the suction outlet. The bottom of the cylinder is provided with an outlet opening 25 for separated oil. This is connected with a tube 26 which extends downwardly in the well 27 which in turn is provided with an outlet 27a for return of oil to the crank case. This structure provides an oil seal similar to that previously described. The connection 28 is for attachment to the engine crank case.

The left side of casing 20 provides an open chamber having at its upper end an oil inlet 29 provided with a substantially fluid-tight cover 30. This permits the pouring of fresh oil into the casing 20 so that the oil may flow down to the crank case without passing through the separator unit 21.

In the modification of Fig. 3, the casing means 31 houses a cylindrical separator unit 32 similar to 21. Here the separator unit rests against the bottom of the casing 31 so that the central portion of the cylindrical separator unit is sealed at the bottom except for the outlet opening 33 leading to the crank case which is connected directly below the unit. An opening 34 in the collar 33a permits the flow of separated oil into the crank case. The casing 31 extends above the separator unit 32 to provide a suction chamber 35 which is connected by line 36 to the inlet manifold of the engine. Partition means 37 seals the upper end of separator unit 32 and also provides a passageway to the upper oil inlet opening 38. It will be understood that 37 is an impermeate cylindrical piece connected in a substantially fluid-tight manner to the casing outlet opening 38 which is provided with a closure means 39. Preferably an intumed flange 40 is provided in the inner wall of the casing to prevent travel of oil upwardly along the inside casing wall. In this form of the device suction through line 36 cannot be communicated directly to the crank case because of the partition means 37 and everything passing out of the crank case must pass through the separator unit 32.

In the modification shown in Figs. 5 and 6, casing means 41 is connected to the crank case at 42. Within the casing means is a separator unit 43 similar to 13. It will be understood that the edges of this separator unit are in substantially sealed relationship with the casing 41. A suction line 44 is connected with the engine manifold. A U-tube 45 communicates from chamber B on the downstream side of separator unit 43 to chamber A and the crank case connection so that separated oil may pass through the tube 45 to the crank case while protecting the crank case against direct application of suction. Chamber A is provided with an oil inlet opening 46 with a closure cap 47.

In the modification of Fig. 7, the crank case is indicated at 48 having a breather connection at 49 to which is secured a cylindrical separator unit 50 similar to those already described at 21 and 32. The separator cylinder is closed at the top by the removable cap 51 which is secured in place by the screw 52 which is threaded into a spider as shown at 53. The partition means 54 closes the bottom of the separator unit except for the opening 55. A return line 56 permits oil collected in the bottom of the separator to return to the crank case. The pulsations in

the crank case permit and aid the flow of oil globules from the separator screen to the return line 56. The end of the line at 56a is sealed in the oil of the crank case, thus providing the same function as the seals previously described. By the removal of cap 51 fresh oil may be poured through the hollow center of the separator unit and connection 49 to the crank case.

In this last modification no suction connection is needed but the usual breather action in the crank case causes pulsations of pressure which would carry oil vapors out of the crank case if it were not for the separator unit 50. Globules of oil collect on the screens of the separator unit and drain back to the crank case through the connection 56. If the return line 56 were not sealed at 56a, the separated oil would not return properly to the crank case.

What I claim is:

1. Crank case oil separating structure comprising a crank case, a source of suction, an oil separating unit between said case and source, casing means constraining all fluid passing from said case to said source to move through said unit, and an oil seal connected between the suction side of said unit and said crank case, said seal having a longer effective leg for collecting oil from said unit and having a shorter effective leg opening to said case.

2. Crank case oil separating structure comprising a crank case, a source of suction, an oil separating unit between said case and source, casing means constraining all fluid passing from said case to said source to move through said unit, said separating unit comprising a plurality of contiguous screens of different mesh superimposed in the direction of stream flow therethrough with the finer of said screens upstream whereby globules of oil coalesce and travel downstream, and means for returning oil from the downstream side of said unit to said case and including an oil seal protecting said case from direct suction from said source.

3. In combination, casing means providing a combined oil outlet and vapor inlet for connection with an internal combustion engine crank case, said casing means providing an upper suction outlet for connection with the intake manifold of said engine, said casing means also providing an upper oil inlet opening, closure means for said last named opening, a hollow cylindrical foraminous oil separator unit in said casing means spaced above said combined oil outlet and vapor inlet, a sealed oil drain communicating with said combined outlet and inlet, partition means coacting with said casing means to substantially close the open ends of said cylindrical unit, the upper end of said hollow cylindrical unit communicating with said suction outlet and the lower end of said cylindrical unit communicating with said oil drain.

4. A device for the purpose described, comprising a housing, and a foraminous separator unit disposed within said housing to divide its interior into a pair of laterally adjacent compartments, said housing having, on one side of said separator, a bottom opening for connection to the oil inlet of an engine crank case, and a top inlet opening for oil, with a closure therefor, said housing having, on the other side of said separator, an opening for connection to the engine inlet manifold.

5. A device for the purpose described, com-

prising a housing, a foraminous separator unit disposed within said housing to divide its interior into a pair of laterally adjacent compartments, said housing having, in the compartment on one side of said separator, a bottom opening for connection to the oil inlet of an engine crank case, and a top inlet opening for oil, with a closure therefor, said housing having, in the compartment on the other side of said separator, an opening for connection to the engine inlet manifold, and a drain for separated oil leading from the last named compartment, past said separator to said bottom opening compartment, and including means providing a seal against return flow.

6. Crank case oil separating structure comprising a crank case, an elongated oil separating unit close to but spaced from a wall of said case, casing means housing said unit, a source of suction communicating with said casing means on one side of said unit, said casing means constraining all fluid passing from said case to said source to move through said unit, means communicating with said casing means on the suction side of said unit for returning oil to said case, and said last named means having a seal preventing suction through said last named means.

7. Apparatus for use in combination with an internal combustion engine having an intake suction manifold and a crank case, comprising con-

duit means for establishing communication between said manifold and crank case, a unit in said conduit means for separating oil from an air stream passing through the unit, casing means compelling all of said stream of oil-bearing air in said conduit means to pass through said unit, said unit comprising a plurality of contiguous screens of different mesh superimposed in the direction of stream flow therethrough with the finer of said screens upstream whereby globules of oil coalesce and travel downstream, and means for continuously returning to said crank case the oil separated by said unit independently of the effect of said suction.

8. Apparatus of the class described, comprising a source of suction, a liquid reservoir case, conduit means establishing communication between said source and said case, a unit in said conduit means for separating liquid vapor from a fluid stream passing through the unit, said unit having filling material interposed in the path of fluid flow providing a plurality of fine interstices for coalescing fine globules of liquid and providing a plurality of paths for travel of the globules to the downstream side of said unit, and means for continuously returning to said case the liquid from the downstream side of said unit independently of the effect of said suction.

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