Oct. 29, 1935. C. E. SHERMAN ET AL 2,019,024

OIL TESTING DEVICE

Filed Nov. 16, 1934

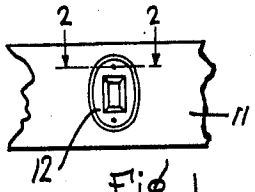


Fig. 1

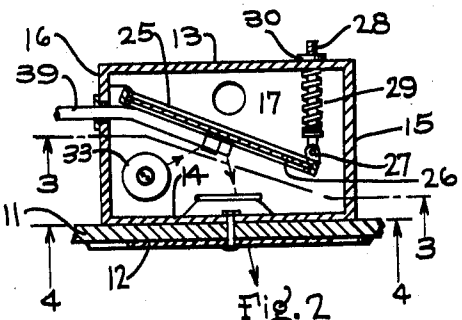


Fig. 2

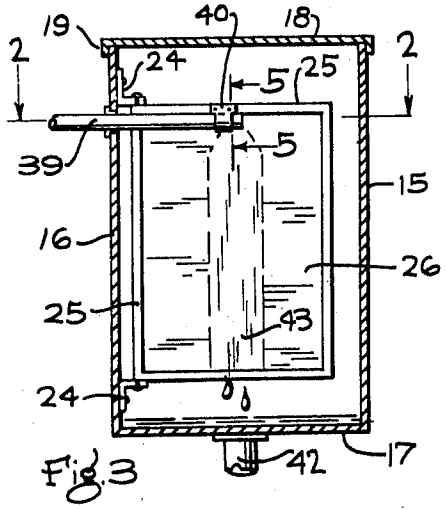


Fig. 3

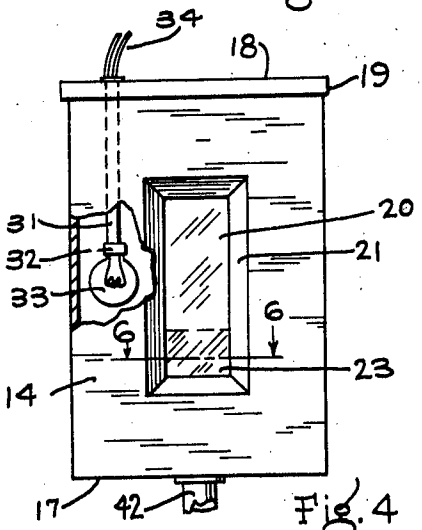


Fig. 4

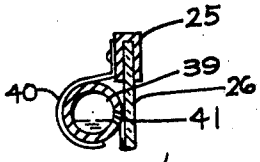


Fig. 5

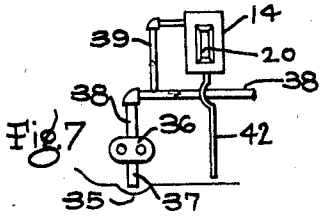


Fig. 7

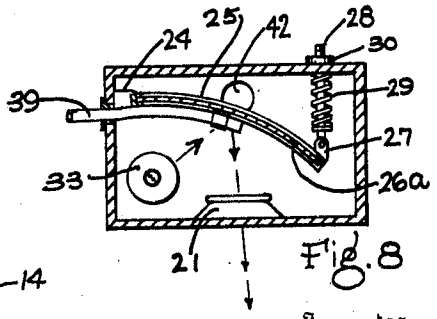


Fig. 8

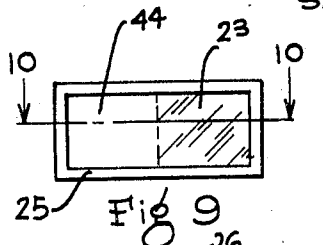


Fig 9

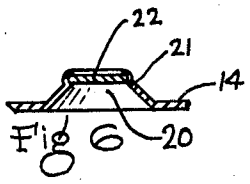


Fig 6

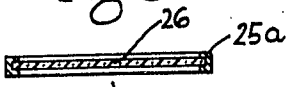


Fig. 10

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OIL TESTING DEVICE

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Application November 16, 1934, Serial No. 753,407

6 Claims. (Cl. 88—14)

This invention relates to improvements in devices for determining the condition of lubricating oils.

Since the automobile has been popularized, the public has been educted to the importance of lubricating oil in connection with machinery and especially in connection with automobile engines, with the result that they understand that a poor or worn out lubricating oil can be the cause of a large amount of damage when employed in connection with a delicate mechanism such as an internal combustion engine.

The ordinary automobile is not provided with any means for quickly determining the condition of the oil in the crank case and the usual method employed by automobile owners is to change the oil at the end of a certain number of miles, or only whenever the quantity of oil has been depleted beyond a permissible limit. The result of this is that if the first method is followed, a very extravagant use of oil usually results and if the oil consumed is merely replaced from time to time, the oil becomes worn, filled with carbon particles and grit, and becomes diluted with gasoline from the combustion chambers to such an extent that it is almost worthless for lubricating purposes.

It is the object of this invention to produce a simple device that can be easily applied to any automobile of ordinary construction and by means of which the operator can inspect a sample of the oil at any time for the purpose of determining its condition as to cleanliness and lubricating properties. One property of lubricating oil that is of utmost importance, is its viscosity, because this property determines the quality of the lubricating film that is formed on the metal parts that are being lubricated. When the viscosity is destroyed or becomes very low, the lubricating value is correspondingly destroyed. Another property of lubricating oil that determines its effectiveness is the amount of foreign matter contained therein, and also the character of the foreign matter.

It is evident that the quantity of oil could be removed from the crank case from time to time and subjected to the ordinary tests now employed in the laboratory and in this manner its lubricating qualities quite correctly determined, but such a procedure is, of course, out of question and the result is that the operator of an automobile is usually quite ignorant of the condition of his lubricating oil.

This device, briefly described, consists of a light proof box that has one side provided with an elongated opening through which the interior of the box can be viewed. Located on the inside of the box is a member having a reflecting surface on the side towards the opening. This member can be made from glass, preferably cobalt glass, or porcelain, or even metal, but must have one surface polished so that it will reflect light quite readily. If a piece of glass is employed, this is mounted in a frame that is pivoted near the rear corner of the box and provided with means for adjusting the position angularly about the pivots. A lamp is located inside the box to one side of the opening and to the front of the reflecting surface. The reflecting surface is so positioned that light from the lamp will be reflected by the surface so as to pass out through the opening. Means is provided for depositing a small quantity of oil on the reflecting surface near its top so that this may flow downwardly in front of the opening where it will be penetrated by the light from the lamp which light will pass through the film in one direction, strike the reflecting surface and be reflected out through the opening after having twice passed through the film of oil.

Having thus briefly described the invention, the same will now be described in detail, and for this purpose reference will be had to the accompanying drawing in which the preferred embodiment thereof has been illustrated, and in which:

Fig. 1 is a front elevation of a portion of an instrument board of an automobile;

Fig. 2 is a section taken on line 2—2, Figs. 1 and 3;

Fig. 3 is a section taken on line 3—3, Fig. 2;

Fig. 4 is a view taken along plane 4—4, Fig. 2, a portion of the front side of the box being broken away to show the position of a lamp;

Fig. 5 is a section, to an enlarged scale, taken on line 5—5, Fig. 3, and shows how oil is applied to the reflecting member;

Fig. 6 is a section taken on line 6—6, Fig. 4, and shows the construction of the front sides of the box and the manner in which a glass is held in place in an opening in the box;

Fig. 7 is a diagrammatic view showing the manner in which the testing device is connected with the oiling system of an automobile;

Fig. 8 is a section similar to that shown in Fig. 2, and shows how the reflecting surface can be made concave;

Fig. 9 is a plan view of a simplified form of the invention; and

Fig. 10 is a section taken on line 10—10, Fig. 9.

In the drawing reference numeral 11 indicates

the instrument board of an automobile and numeral 12 designates a plate that serves to cooperate with the instrument board to hold the oil testing device in place. The oil testing device that forms the subject of this invention consists of a metal box which has been shown as of rectangular cross section, both in a transverse and longitudinal direction. This box has a back 13, a front side 14, side members 15 and 16, a bottom 17 and a removable top 18. The top forms a cover and has downwardly extending sides 19 that serve to hold it in place by friction or it may be secured in place by some additional means, if desired. The front 14 of the box is provided with an elongated rectangular opening 20 which is surrounded by inclined sides 21. The bottom of the opening is preferably closed by means of a glass plate 22. The upper part of the glass plate is transparent, while the lower part has been painted a color with which the color of the light that emerges from the chamber can be compared, and this painted area has been designated by reference numeral 23 in Fig. 4. Secured to the inside of the wall 16 are two brackets 24 between which is pivotally connected a frame 25. The frame may be of metal and secured in this frame is a reflector 26. The surface of the reflector that faces the opening 20 must be a reflecting surface and the member 26 is preferably made from cobalt glass, although this particular color is not an essential. The member 26 may be made from porcelain or even from polished metal, but very satisfactory results have been obtained by the use of cobalt glass. The frame is provided at its free end with two spaced lugs 27 to which a bolt 28 is pivotally connected. A helical spring 29 surrounds the bolt and is normally under compression. By turning the nut 30 on the bolt, the position of the reflector 26 can be angularly adjusted with respect to the box within which it is located. Extending downwardly from the cover is a conduit 31 to the lower end of which a socket 32 is connected. A small incandescent lamp 34 is attached to the socket and positioned to one side of the opening 20 and in front of the reflecting surface 26. Conductors 34 serve to convey electricity to the lamp when it is in operation. The pipe 31 is connected with the cover and therefore by merely removing the cover, the socket and the lamp can be removed for the purpose of replacing the lamp, if it burns out.

Oil is conveyed from the crank case to the oil testing device by an arrangement which has been shown diagrammatically in Fig. 7, in which reference numeral 35 designates a sump in the crank case of an automobile engine. Reference numeral 36 indicates a gear pump that is driven from the engine and which always operates when the engine is running. The intake port of the pump is connected with the bottom of the sump 35 by means of a pipe 37 and the oil is discharged through the pipe 38. The pipe 38 extends to the bearings of the engine in the usual manner. A pipe 39 is connected with the pipe 38 and extends to the testing device where it terminates in a flexible end portion which extends through the wall 16 and into the box. The end of pipe 39 is secured to the frame 25 by means of a clamp 40 as shown in Fig. 5. The end of pipe 39 within the box is provided with an elongated narrow opening 41 through which the oil is discharged onto the reflecting surface of plate 26. Since the pipe 39 can be made of copper or brass, it will permit slight bending and therefore it will follow the frame when the latter is adjusted and will always remain in proper position to deposit oil on the reflecting surface. A pipe 42 extends from the testing device into the crank case in the manner shown in Fig. 7 so that any oil that has been diverted and passed through the testing device will return to the crank case.

It will be apparent that when the pump 36 is functioning a portion of the oil will be diverted and will pass through the pipe 39 and flow downwardly over the reflecting surface so as to form a film, which has been designated by reference numeral 43 in Fig. 3. This film is so positioned that light from the lamp will pass through the film before it strikes the reflecting surface and after it has been reflected, it will again pass through the film and thence outwardly through the opening in the manner indicated by arrows in Figs. 2 and 8.

Attention is called at this point to the fact that with the construction shown, the light from the lamp will pass through the film two times and each time at an angle so that there will be some dispersion of the light due to the refractive power of the oil. Experience has shown that the characteristic of the light that emerges through the opening 20 is a fair indicator of the qualities of the lubricating oil and will vary in color in such a way that when the oil has lost its lubricating qualities to such an extent that it is no longer fit to serve as a lubricant, the color will compare quite closely with the color 23 painted on the glass 22. The color to which the light is compared is selected after experimentation so as to correspond to the character of the reflected light that indicates that the oil has not sufficient lubricating properties to be useful and safe.

In Fig. 8 a slightly modified form has been shown. In this modification the plate 26*a* that corresponds to plate 26 in the other figures has been curved so as to present a cylindrical surface with the concave side towards the lamp and towards the opening. The object of thus curving the plate 26*a* is to get a construction in which the angle between the surface and the line connecting the surface with an observer's eye will remain substantially constant when viewed from different positions to the right and left, and therefore this construction tends to eliminate any variations due to the position of the observer. Aside from the cylindrical shape of the reflecting surface 26*a*, the device shown in Fig. 8 is the same as that shown in Fig. 2.

For testing oils generally, a very simple embodiment of the invention can be employed and this has been illustrated in Figs. 9 and 10. The device shown in Figs. 9 and 10 consists of a flat plate 26 which may be of cobalt glass or porcelain or even metal, but which has a reflecting surface. This plate is enclosed in a frame 25*a* and has a portion of its surface painted so as to present a color that can be used for comparing the color of the oil during tests. When this device is to be used for testing oil, a drop of oil is placed on the surface 44 and spread over the latter so as to form a film. The device is then held in such a position that either the light from the sun, or from a strong lamp will fall on the oil film and this light will pass through the film, be reflected and again pass through the film in the manner explained in connection with the preferred embodiment and this reflected light is then compared with the color on area 23. This simplified device is a great convenience for any one operating machines of any kind, as it permits the oil

to be quickly inspected and its lubricating properties determined.

The exact scientific theory underlying this inventon is not absolutely clear at this time, but it is believed that what takes place while we look at the film of oil which flows over the opaque or translucent glass plate is that the rays of light penetrate the film of oil and certain rays are absorbed or refracted by the oil and others are absorbed by the reflecting surface with the result that the rays that are reflected back through the oil film have changed their color in such a way that their color forms a good indicator of the condition of the oil.

Although this device is primarily intended for use in connection with automobiles, it is evident that it can be placed on a bench or testing table at any place and oil applied to the surface and it is thus suitable for use in factories or in places where oil is sold or manufactured.

Having described the invention what is claimed as new is:

1. An apparatus for determining the condition of a lubricating oil which comprises, in combination, a box, a plate having a reflecting surface located in the box, the side of the box opposite the reflecting surface having an opening through which the surface of the plate can be seen, a lamp located in the box to one side of the opening and positioned in front of the plate to direct light onto the reflecting surface thereof, and means for applying a film of oil to the reflecting surface whereby the light that emerges through the opening will have passed through the film of oil twice.

2. An apparatus for determining the condition of a lubricating oil which comprises, in combination, a box, a plate having a reflecting surface located in the box, the side of the box opposite from the reflecting surface having an opening through which the reflecting surface of the plate can be seen, a lamp located in the box to one side of the opening and positioned to direct light onto the reflecting surface, means for changing the plane of the reflecting surface angularly with respect to the lamp and means for applying a film of oil onto the reflecting surface in position to intercept the light from the lamp in its passage towards the reflecting surface and from the reflected surface to the opening.

3. A device for determining the condition of a lubricating oil comprising, in combination, a box having one side provided with an opening, a concave mirror located in the box in position to be seen through the opening, a lamp located in the box to one side of the opening and in front of the mirror, the mirror being so inclined with respect to the lamp and the opening that light from the lamp will be reflected so as to pass through the opening and means for depositing a film of oil on the glass plate in position to intercept the light from the lamp.

4. An apparatus for determining the condition of a lubricant comprising in combination, a closed box, a mirror located in the box, the wall of the box having an opening positioned in front of the mirror, a lamp located within the box, to one side of the opening, and in front of the mirror, means located in the box for intercepting direct rays of light from the lamp to the opening, the angular adjustment of the mirror relative to the lamp and the opening being such that light from the lamp will be reflected so as to pass out through the opening, means for depositing a film of oil on the surface of the mirror, near its upper end, and an oil drain in the bottom of the box.

5. An apparatus for determining the condition of a lubricant comprising in combination, a closed box, a mirror located within the box, one edge of the mirror being pivotally connected with a wall of the box, a spring having one end abutting the mirror and the other end abutting the inside of the box for urging the mirror to rotate about its pivot, means comprising a screw for resisting the action of the spring, the bottom of the box having a drain, means for depositing a film of oil on the mirror near its top, the wall of the box having an opening located in front of the mirror, a lamp located within the box, to one side of the opening, and means for intercepting direct rays of light from the lamp to the opening.

6. An apparatus for determining the condition of a lubricating oil which comprises, in combination, a box, a mirror located in the box, the wall of the box having an opening located opposite the reflecting surface of the mirror and through which the latter can be seen, a lamp located in the box, to one side of the opening, and positioned to direct light onto the mirror, means for changing the plane of the mirror angularly with respect to a line joining the lamp and the opening, and means for applying a film of oil onto the mirror in position to intercept the light from the lamp in its passage toward the mirror and from the mirror to the opening.

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