Jan. 11, 1949. J. B. SEBOK ET AL. 2,458,745

AIR CLEANER

Filed Feb. 1, 1945

Fig. 1

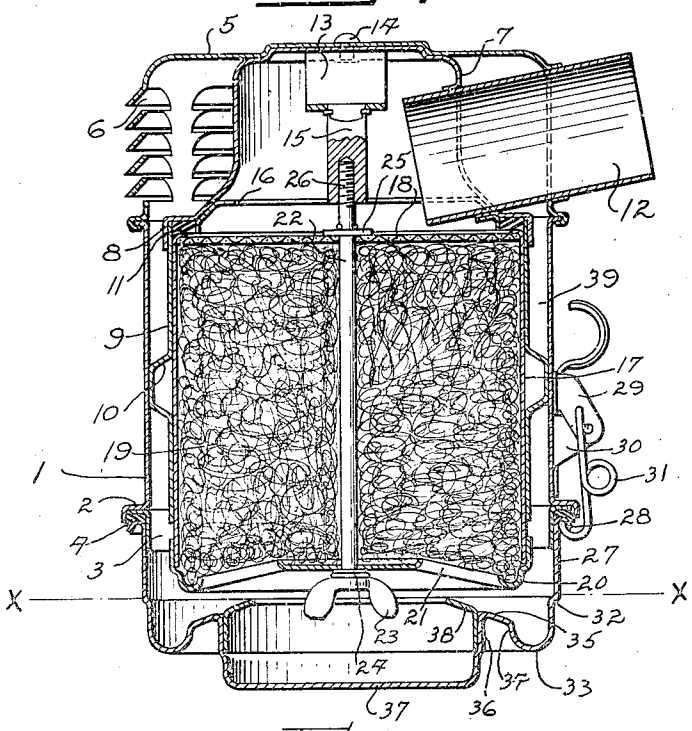
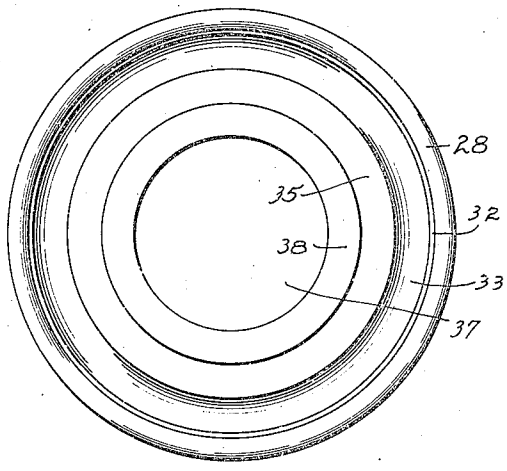


Fig. 2



INVENTORS
Joseph B. Sebok
Frank Sebok
By The Firm of Charles Wills Attys

Patented Jan. 11, 1949 2,458,745

UNITED STATES PATENT OFFICE

2,458,745

AIR CLEANER

Joseph B. Sebok and Frank Sebok, Detroit, Mich., assignors to Houdaille-Hershey Corporation, Detroit, Mich., a corporation of Michigan

Application February 1, 1945, Serial No. 575,610

4 Claims. (Cl. 183—15)

1

This invention relates to improvements in air cleaners, and more particularly to an air cleaner of the liquid bath type highly desirable for use in association with internal combustion engines, air compressors, and other apparatus requiring a supply of clean air for its efficient operation, although the invention may have other uses and purposes as will be apparent to one skilled in the art.

In the past, in the manufacture of liquid bath air cleaners, especially those used on automotive engines for automobiles, trucks, and similar vehicles, it has most frequently been the custom to provide a liquid sump at the bottom of the cleaner, a filter mass in the upper portion of the cleaner, and a baffle disposed contiguous to the liquid level in the sump to limit the amount of liquid carried into the filter mass by air traveling through the cleaner. In such cleaners, were the baffle not there, too much oil would be carried into the filter mass, causing an over-saturation of the mass, with the likely advent of pull-over of cleansing liquid into the carburetor of the engine. A goodly quantity of liquid is necessary in the sump, in order to properly handle the accumulated dirt taken from the air traveling through the cleaner, and as the level of this liquid rises due to dirt being collected in the sump, the baffle has heretofore been found essential to prevent over-saturation of the filter mass. The baffle, however, is an extra item of manufacture, objectionably expensive both to construct and install, and frequently added some difficulties to the servicing of the cleaner.

With the foregoing in mind, it is an important object of the instant invention to provide a liquid bath air cleaner having an oil cup or oil sump arrangement designed to eliminate the need of any baffle, and still meter or gauge the amount of sump liquid carried into the filter mass by air traveling through the cleaner.

Another object of the instant invention resides in the provision of an oil bath air cleaner arranged to eliminate the need of a baffle, and which for a cleaner of light air capacity, lessens the chance of sump liquid being pulled ove into the carburetor of the engine with which the cleaner is associated, establishes a definite gain in efficiency of operation, and requires the use of less liquid in the sump.

Another object of the instant invention is the provision of a liquid bath air cleaner in which the liquid sump is provided with spaced chambers separated from each other, one of those chambers being in the path of incoming air, and the other being out of the path of air traveling through the cleaner.

It is also a feature of the instant invention to provide a liquid bath air cleaner in which the liquid sump is arranged with separated chambers, one of which is nearest the inlet and one separated from the path of air traveling through the cleaner, with anti-splash means provided so that liquid from one of the chambers will not splash over into the other chamber by virtue of agitation caused by the rocking, bumping, or jarring of the vehicle carrying the cleaner.

2

Still a further feature of the instant invention resides in the provision of a liquid bath air cleaner having a liquid sump arrangement designed to eliminate the need of a baffle, the liquid sump comprising a pair of spaced chambers, that chamber nearest the inlet being arranged to provide a washing out of the accumulated dirt from that chamber into the other chamber where it may collect.

Still another object of the instant invention resides in the provision of a liquid bath air cleaner designed to eliminate the need of a baffle, and in which the liquid sump comprises a pair of spaced compartments or chambers of different depths, and separated from each other by spaced walls, the deeper chamber ultimately collecting all but a negligible quantity of the dirt removed from air traveling through the cleaner.

It is also an object of this invention to provide a liquid bath air cleaner having a liquid sump arrangement including an outer annular trough spaced directly below the annular inlet passageway of the air cleaner, and surrounding but spaced from a central and deeper well which ultimately accumulates the major part of the dirt removed from air traveling through the cleaner.

Still another object of the instant invention resides in the provision of a liquid bath air cleaner having a liquid sump arrangement comprising a pair of separated chambers, of different depths, and in which one of the chambers is provided with a curvate bottom portion to facilitate traveling air driving out accumulated dirt in that particular chamber so that this dirt may ultimately collect in the other chamber.

While some of the more salient features, characteristics and advantages of the instant invention have been above pointed out, others will become apparent from the following disclosures, taken in conjunction with the accompanying drawing, in which

Figure 1 is a substantially central vertical sectional view through an air cleaner embodying principles of the instant invention, certain parts being shown in elevation; and

Figure 2 is a top plan view of the lower casing section or liquid containing cup, separated from the rest of the cleaner.

As shown on the drawing:

In the illustrated embodiment of the instant invention, we have shown an air cleaner in which the construction of the upper part of the casing and the construction of the filter unit is quite similar to that illustrated in the Joseph B. Sebok pending application for patent entitled "Air

cleaner," filed March 13, 1942, Serial No. 434,481, which has since matured into U. S. Patent No. 2,401,322, dated June 4, 1946. The instant disclosure, however, differs from that of the aforesaid copending application by the elimination of a baffle, and by the construction of the lower part of the casing section, or more specifically, the liquid sump arrangement.

As illustrated, the air cleaner includes three readily separable parts, namely, the upper casing section, the lower casing section or liquid sump arrangement, and the filter unit which is removably associated with the upper casing section.

With reference more particularly to Figure 1, it will be seen that the upper casing section embodies a cylindrical body portion 1 having an outwardly and downwardly flanged lower margin as indicated at 2. Secured to the flanged portion 2, as by spot welding or in any other equivalent manner, is a gasket holding ring 3, and in the socket formed by the ring 3 and flange 2, a suitable gasket 4 may be disposed. The top of the cylindrical shell 1 is provided with a cover 5 preferably permanently secured to the shell in any desirable manner. This cover 5 is provided with one or more sets of louvers 6 providing inlet ports for dirty air.

Secured to the inside of the cover 5 is a hood 7 of lesser size than the cover which extends downwardly and is provided with an outwardly and downwardly flanged marginal portion 8 for telescopically receiving a filter unit holder 9 in the form of a hollow shell spot welded or equivalently secured to the flanged portion 8. The shell 9 is maintained in accurate spaced relationship from the outer shell or casing 1 by means of a plurality of projections 10 pressed outwardly from the wall of the shell. A suitable gasket 11 is seated in the gasket holding socket formed by the upper end of the shell 9 and the flanged arrangement 8 on the hood 7.

An outlet conduit 12 extends through the cover 5 of the casing 1 and also through a suitable opening in the hood 7 so that the inner end of this conduit is in open communication with the chamber defined by the hood.

A suitable support 13, which may be of U-shape, secured to the inside of the cover 5 by the same rivet or equivalent structure 14 as holds the hood in position carries on its inner portion an interiorly threaded socket member 15. This socket member is also supported at its lower end by a spider arrangement 16 spot welded or equivalently secured to the inside of the hood 7 in a manner to help hold the gasket 11 in position.

The separately removable filter unit includes an outer shell 17, the upper margin of which is turned inwardly to hold a screen in the form of a piece of hardware cloth or the equivalent indicated by numeral 18. A mass of filtering material 19 is disposed within the shell 17 and is held therein by the screen 18 at the top, and by a lower covering member 20 provided with a number of relatively large openings 21 to afford a passageway for air traveling through the filter mass. The filtering material comprising the mass 19 may be of any suitable substance such as vegetable fiber, curled cattle-tail hair, wavy wire, and similar satisfactory material. Extending preferably centrally through the filter mass is the elongated bolt 22 having an integral wing nut attachment 23 on the lower end thereof. The filter unit is maintained in its unitary compact form by means of a pair of washers or the equivalent 24 disposed outside the lower closure member 20, and another washer 25 disposed outside the screen 18 at the top end of the unit, such washers being held in position by the wing nut at the bottom and by tongues struck from the body of the bolt or in an equivalent manner at the top. The upper end of the bolt is threaded as indicated at 26 for engagement within the socket 15 which maintains the filter unit in position within the shell 9 with the turned marginal portion at the top of the unit seating snugly against the gasket 11. It is a simple expedient to remove and replace the entire filter unit, it only being necessary to actuate the wing nut 23 to disengage or engage the bolt 22. The filter unit may be quickly removed and cleansed by washing in kerosene, gasoline, or some other suitable compound, and very quickly and easily replaced in the shell 9.

The lower casing section is in the form of a liquid cup and includes a cylindrical wall portion 27 having a turned margin 28 at the top thereof to seat against the aforesaid gasket 4. This casing section is maintained in telescopic association with the ring portion 3 of the upper casing section by means of a suitable over-center spring clamp including an over-center lever 29 pivoted to a fixed bracket 30 and having connected thereto a spring element 31 which is provided with a lower upturned end for engagement in the groove formed by the turned margin 28 on the lower casing section.

Immediately below the cylindrical portion 27 there is a slight off-set 32 in the cup wall which might aid in indicating a suitable initial or static level for cleansing liquid, such as the preferred starting level shown by the dashed line X—X in Fig. 1. Below this off-set, the casing again extends downwardly and curves around in a substantial U-shape as indicated at 33 to define an outer annular trough forming one of the chambers of the liquid sump. The inner wall 34 of the trough extends upwardly to a cross connection 35 which is obliquely disposed and slopes downwardly and outwardly toward the trough 33. The cross connection terminates in another vertical wall 36 which extends downwardly to a substantially flat closed bottom portion 37 defining a centrally disposed well or second chamber of the liquid sump which is deeper than the trough 33. In order to prevent splashing of cleansing liquid from the well 37 into the trough 33 by agitation of the vehicle carrying the cleaner, a splash preventing flange 38 is secured inside the upper part of the well and extends inwardly, sloping upwardly in keeping with the slope of the cross connection 35. It will be noted that the trough 33 is disposed directly in the path of air descending through the annular inlet passage 39 formed by the outer casing wall 1 and the inner shell 9. Thus, this trough, or the depth of it, determines the amount of cleansing liquid kept circulating through the lower portion of the filter mass 19 during operation of the cleaner. Obviously, for larger sized cleaners having relatively large capacity, the trough will be of larger size than for smaller cleaners having lower capacity.

In operation, air enters through the inlet ports 6 and descends the annular inlet passage 39, striking the sump liquid, which is preferably oil, contained within the trough 33. Immediately upon starting, the liquid contained in the trough will be discharged from the trough up over the cross connection 35 and into the lower part of the filter mass. No additional liquid can be dis-

charged into the lower part of this filter mass, until some more additional liquid accumulates in the trough, the central well **37** being out of the path of travel of air passing through the cleaner. Upon stopping operation, the dirt laden liquid circulating through the lower part of the filter mass will drop out of the filter mass, and part of this liquid will fall within the central well, and part of it will fall upon the anti-splash flange **38** or the cross connection **35** and thus gravitate into the trough. However, upon resuming operation due to the curvature of the bottom of the trough, the sump liquid therein as well as most of the dirt accumulated therein will be carried upwardly by incoming air. The dirt being heavier will be pushed over the cross connection **35** and the flange **38** and thus eventually find its way into the central well.

During operation, of course some dirt laden liquid becoming too heavy to be carried by the air will gravitate out the filter mass and find its way either into the central well or the trough, but the above described operation will then be performed as a matter of continuity of performance. Whatever liquid gravitates into the trough during operation, be it dirt laden or not, will immediately be carried out of the trough by the traveling air. Any liquid that passes over the flange **38** by way of a rise in level in the central well will also be carried along by the incoming air. The upper portion of the filter mass, of course, remains dry and removes any entrained liquid from the air so that the air will exit from the cleaner clean and dry. The flange **38** merely prevents the unintentional splashing of liquid from the central well into the trough by virtue of agitation of the vehicle carrying the cleaner. Were such splashing permitted, the filter mass might become over-saturated with cleansing liquid and thus endanger a pulling over of the cleansing liquid into the carburetor along with outgoing air.

It will be especially noted that no baffle to control or meter the amount of liquid entering the filter mass is necessary with the instant construction. Further, experiments have proven that in comparison with a cleaner of similar type and capacity but having a baffle, the instant cleaner has a marked lessening of the chances of pull-over of cleansing liquid into a carburetor, denotes a noticeable increase in cleansing efficiency, and requires a less amount of sump liquid. It will also be appreciated that the cleaner is compact in form, all parts are easily accessible, the device is highly durable, and may be very economically manufactured and used. In order to clean out accumulated dirt and replenish the liquid in the sump, it is a simple expedient to actuate the one or more clamps **29** and remove the lower casing section, dump it and refill it with oil to the proper level. At the same time, the filter element as a unit may be removed and cleansed, if necessary.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

We claim as our invention:

1. In a liquid bath air cleaner, a casing having an inlet and an outlet spaced therefrom, a filter medium in the path of air traveling from said inlet to said outlet, said casing having a liquid sump below said filter medium, means in said casing defining an annular passage adjacent the casing wall for incoming air leading toward said sump, and said casing being shaped in the region of said sump to provide an outer annular open trough beneath said passage and a central well spaced from said trough, said central well being of greater depth than said trough, and inwardly extending anti-splash means at the top of said central well to prevent liquid from the well passing over into said trough by virtue of sudden movements of a vehicle carrying the cleaner.

2. In a liquid bath air cleaner, a casing having an inlet and an outlet spaced therefrom, a filter medium in the path of air traveling from said inlet to said outlet, said casing having a liquid sump below said filter medium, means in said casing defining an annular passage adjacent the casing wall for incoming air leading toward said sump, said casing being formed in the region of said sump to define an outer annular trough completely unimpeded throughout its width and disposed beneath said passage, and a central well inside of and of greater depth than said trough, said trough and well being separated by spaced walls, a cross-connection between the upper parts of said walls, and an inwardly extending marginal baffle shaped to form in effect a continuation of said cross-connection in said well.

3. A casing section for a liquid bath air cleaner, including a cup-like shell having an annular outer wall joining with a curvate formation defining an arcuately bottomed outer annular trough, said shell having a central well deeper than said trough, a pair of spaced walls separating said trough and well, an upwardly and inwardly inclined cross connection joining said pair of walls at their tops, and a marginal anti-splash baffle in the top of said well extending inwardly in line with said cross-connection.

4. In a liquid bath air cleaner, a casing having an inlet and an outlet spaced therefrom, a filter medium in the path of air traveling from said inlet to said outlet, said casing having a liquid sump below said filter medium, means in said casing defining an annular passage adjacent the casing wall for incoming air leading toward said sump, and said casing being shaped in the region of said sump to provide an outer annular trough beneath said passage and a central well spaced from said trough, and an upwardly and inwardly sloping wall connecting said trough and said well and merging with the adjacent walls of said trough and well in a manner to define an arcuate junction with each such wall, said central well being substantially twice the depth below said sloping wall as said annular trough, said trough being freely open at the top and having a smoothly curvate bottom merging with the inside trough wall to define a path along which incoming air descending said passage may drive accumulated dirt out of said trough over said sloping wall into said well.

JOSEPH B. SEBOK.
FRANK SEBOK.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,180,411	Graham	Nov. 21, 1939
2,219,176	Donaldson	Oct. 22, 1940