Feb. 4, 1930. H. G. KAMRATH 1,746,218

AIR CLEANER

Filed April 8, 1927

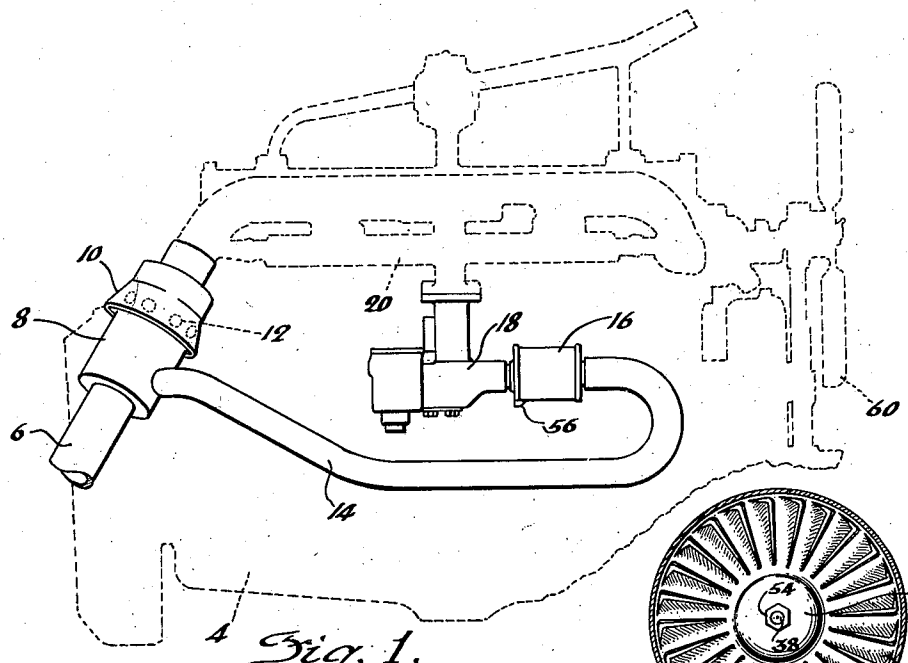


Fig. 1.

Fig. 3.

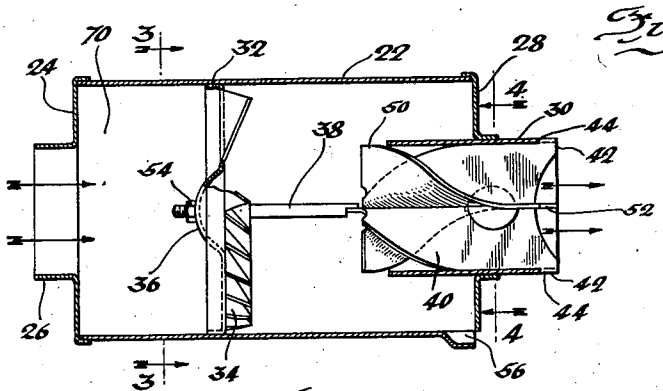


Fig. 2.

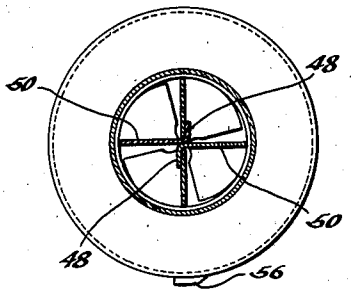


Fig. 4.

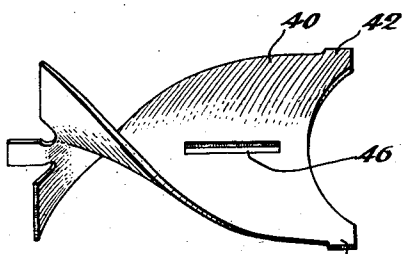


Fig. 5.

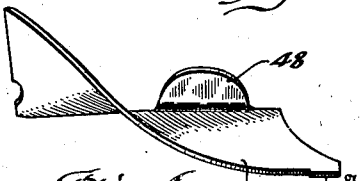


Fig. 6.

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Patented Feb. 4, 1930 1,746,218

UNITED STATES PATENT OFFICE

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AIR CLEANER

Application filed April 8, 1927. Serial No. 182,078.

This invention relates to air cleaners of the type used on internal combustion engines to clean the air supplied to the carburetor.

It is an improvement upon cleaners of the type described and claimed in the prior applications of Caleb E. Summers, Serial No. 754,007 filed December 5th, 1924, and in my applications, Serial No. 53,341 filed August 29th, 1925, and Serial No. 80,004 filed January 8th, 1926.

One of the objects of the invention is to adapt a cleaner of this general type for use with engines provided with air heating stoves. To accomplish this result, I have provided the cleaner with a chamber in advance of the spiral blades which direct the air currents in a whirling path to effect separation of dust particles. This chamber is provided with a restricted passage which may be connected by means of a suitable conduit to the hot air stove.

Another object of my invention consists in the provision of an improved air straightener of the type described and claimed in the Summers' application referred to. In designing air cleaners for certain engines, it has been found necessary to reduce interference with air flow to a very low figure in order that the engine may be assured of a sufficient supply of air when operating at extremes of speed or load. I have found that by employing a straightener composed of two or more suitably warped blades, I can very materially reduce the resistance to air flow as compared with constructions in which but a single straightener blade is employed. I have preferably designed these blades so that one may be interlocked with the other in a very simple manner and yet be firmly maintained in place.

In the drawings, Figure 1 is a view showing the application of my improved cleaner to a conventional automobile engine. Figure 2 is a longitudinal sectional view through the cleaner, but with the parts reversed with respect to the showing of Figure 1. Figure 3 is a section on line 3—3 of Figure 2. Figure 4 is a section on line 4—4 of Figure 2. Figures 5 and 6 show details of the air straightener blades.

In Figure 1, I have shown a conventional automobile engine, 4, provided with an exhaust conduit 6, upon which is arranged a hot air stove, 8. This stove may be of any suitable design and for purpose of illustration, I have preferred to show the stove as used upon the Chevrolet automobile. The stove is provided with a baffle, 10, shielding the air admission openings, 12, from the direct entrance of outside air as described and claimed in the application of Charles F. Kettering, Serial No. 71,367 filed November 25th, 1925. By this means, preliminary selection of clean air is effected. From the lower part of the stove, 8, a conduit, 14, leads air to the cleaner, 16, whence it passes into the carburetor, 18, and intake manifold, 20, for consumption in the engine.

The air cleaner, 16, comprises a cylindrical casing, 22, one end of which is closed by cap, 24, provided with an axially arranged opening, 26, for conection with the conduit, 14. The opposite end of the casing is closed by means of annulus, 28, supporting a centrally arranged stand-pipe, 30, extending into the casing, 22, and adapted at its other end for connection to the air inlet of the carburetor, 18.

Adjacent to inlet, 26, the casing is spanned by a plate-like member, 32, in which is formed an annular series of spiral blades, 34, radiating from a central raised portion, 36. The portion, 36, is apertured to receive bolt, 38, secured at its other end to plate 40 of the air straightener. This plate is provided with outwardly projecting lugs, 42, for engagement in notches, 44, formed in the outer end of the conduit, 30. As best shown in Figure 5, member 40 is provided with a central slot, 46, thru which pass lugs 48 formed on oppositely arranged plates, 50. As shown in Figure 4, the lugs 48 are bent to lie along the surface of plate 40 and may be secured to the plate by riveting or welding, if desired. Each of the members, 50, is provided with a lug, 52, corresponding to lugs 42 of plate 40 and engaging in slots corresponding to slots 44 shown in Figure 2. With the straightener plates anchored by engagement of lugs 42 and 52 in their respective slots, it is appar-

ent that tightening up the nut, 54, on the end of the member, 38, the straightener is securely locked in place.

The operation of the cleaner will be briefly described:

The blast produced by the fan, 60, causes the heavier particles of dust to be carried past the baffle, 10, so that only relatively clean air enters the stove, 8, thru the apertures, 12. After being heated the air passes thru conduit 14 into chamber 70 at the left-hand end of the casing, as shown in Figure 2. Upon striking the blades, 34, the air is given a whirling motion causing the particles of dust to hug the walls of the casing and upon reaching the end, 28, of the casing, the dust particles are ejected thru the tangentially arranged slot, 56, and are carried off by the passing air currents. The remainder of the whirling air stream reverses its direction upon striking the rear wall, 28, of the casing and after undergoing a second reversal of movement, passes outwardly thru the conduit, 30. The portions of the air straightener blades which first encounter the whirling air, herein called the leading portions of the blades, have a relatively steep pitch while the portions of the blades which are last encountered by the advancing air column lie in a single plane. The intermediate portions of the plates are of pitch gradually diminishing from the leading edges to the trailing edges. The spiral twist thus given the blades is in the same direction as the twist produced in the air column by the blades 34. As shown in the drawings the air, upon striking blades 34, is set whirling in a clockwise direction. Plates 40 and 50 are correspondingly twisted in a clockwise direction so that the spiralling column of air, upon striking the blades, is changed but slightly, if any, in direction but as it advances along the path defined by the blades is gradually straightened out until upon passing the trailing edges there is practically linear flow. In effect, the energy of the twisting air column is, by reaction against the stationary blades, converted into energy acting in the desired direction of flow; thus the passage of air thru the cleaner is facilitated and the resistance due to undesired currents in the air stream is reduced to a minimum.

I have illustrated my improved air straightener as applied to a cleaner modified for use where a hot air stove is employed. Obviously, the use of the stove, the chamber 70 and the connecting piping constitutes an appreciable restriction to the air flow. In cases where it is important that resistance to flow be reduced to a minimum the stove, 8, chamber, 70, and the piping 14 will be omitted and air will enter the cleaner directly thru the annular opening in which the blades, 34, are arranged.

I have found the multiple spiral, such as herein shown, to be very effective in reducing resistance to flow. In some cases, it has been a determining factor in making cleaners of this type applicable to engines such as those used upon trucks and busses, in which the air consumption is very high.

Various modifications will occur to those skilled in the art and it is to be understood that my invention is not limited otherwise than as defined by the appended claims.

I claim:

1. In an air cleaner the combination of a casing having an air inlet, a dust discharge passage in the peripheral portion of the casing, an axial clean air outlet communicating with the casing, means in said inlet for imparting a whirling motion to the entering air stream and a multiple spiral air straightener in said outlet for directing the air in a gradually straightened path to the carburetor.

2. In an air cleaner for use in cleaning the air supply to the carburetor of an internal combustion engine the combination of a cylindrical casing having an air inlet, an axial air outlet, and a dust discharge passage arranged in the peripheral portion of the casing between the inlet and outlet, means for imparting a whirling motion to the air passing from the inlet to the outlet, and a multiple spiral air straightener arranged adjacent said outlet for gradually straightening the course of air flow to the carburetor.

3. In the combination as defined in claim 2, said whirling means comprising annularly arranged stationary blades.

4. In the combination as defined in claim 2, said air straightener comprising intersecting spirally warped blades.

5. An air straightener comprising a plate of a width to extend diametrically across the clean air outlet of an air cleaner, said plate having its leading portion of warped spiral form and its trailing portion substantially uniplanar, the intermediate portions gradually decreasing in curvature from the leading end to the trailing end, and a second plate of similar formation extending at an angle to the first named plate.

6. In the combination as defined in claim 5, said first named plate being provided with a slot and said second named plate with a tongue having interlocked engagement with said slot.

7. An air straightener comprising a warped plate having a centrally arranged slot, a second similarly warped plate provided with a tongue extended thru the slot and lying along the surface of said first named plate; and a third plate arranged diametrically opposite said second named plate and having a tongue passing thru said slot and lying along the surface of said first named plate, whereby said parts are locked against separation.

In testimony whereof I affix my signature.

HERBERT G. KAMRATH.