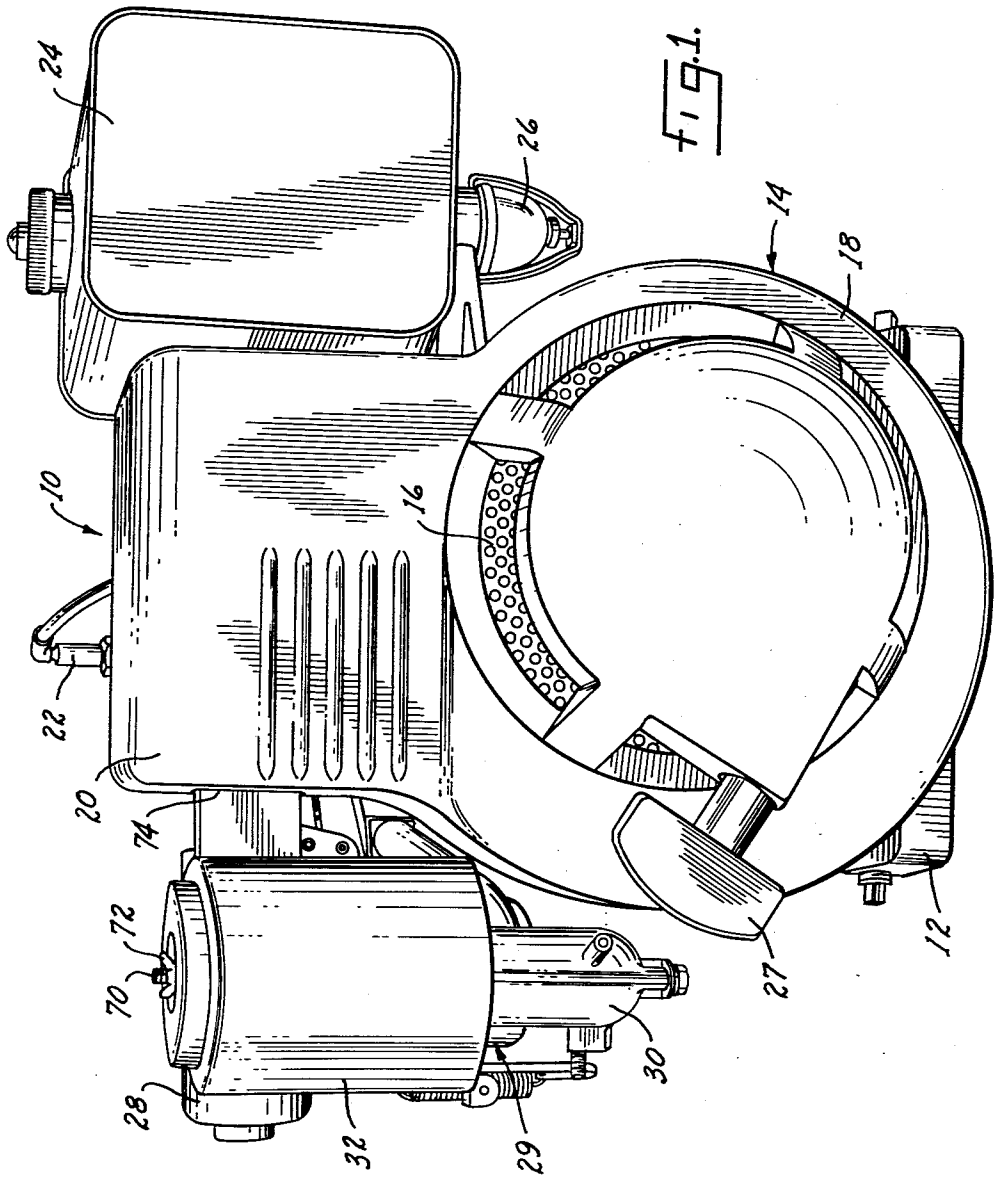
Oct. 31, 1961 W. W. LOWTHER 3,006,437

AIR CLEANER AND METHOD

Filed Sept. 11, 1959 2 Sheets-Sheet 1

Fig. 1.



INVENTOR.
Wilfred W. Lowther,
BY Parker & Carter
Attorneys.

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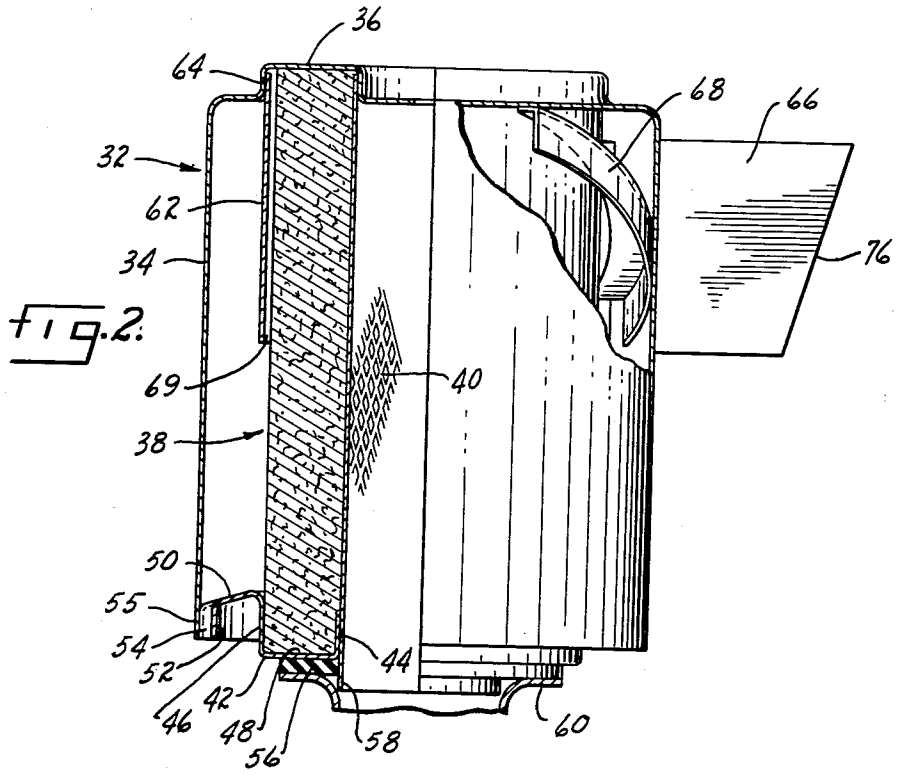


Fig. 2.

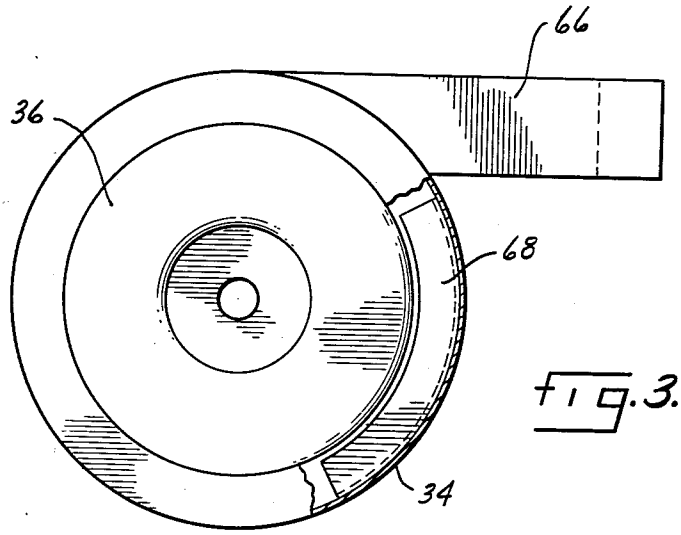


Fig. 3.

INVENTOR.
Wilfred W. Lowther,
BY Parker & Carter
Attorneys.

United States Patent Office

3,006,437
Patented Oct. 31, 1961

3,006,437

AIR CLEANER AND METHOD

Wilfred W. Lowther, Chicago, Ill., assignor to Novo Industrial Corporation, a corporation of New York

Filed Sept. 11, 1959, Ser. No. 839,486
4 Claims. (Cl. 183—36)

This invention is in the field of methods and devices for cleaning air before it is used for combustion purposes in internal combustion engines. The invention is more specifically concerned with an air cleaning arrangement and method on air cooled engines, preferably small horsepower units.

A primary object of my invention is a new method of cleaning air for use with air cooled engines.

Another object is an air cleaning method which does not require the use of cleaning liquids or fluids.

Another object is an air cleaning method for use on air cooled engines having a dry precleaning step.

Another object is a combination air cooled engine and an air cleaner which is simple but efficient.

Another object is an air cleaner for an air cooled engine which is inexpensive to manufacture.

Another object is a self-servicing cleaner.

Another object is a cleaner in which the dirt is automatically discharged so that the unit will not require periodic servicing.

Other objects will appear from time to time in the ensuing specification and drawings in which:

FIGURE 1 is a perspective of an air cleaner and an air cooled engine illustrating the invention;

FIGURE 2 is a front view of the air cleaner in FIGURE 1, but on an enlarged scale, in half section, and with parts broken away; and

FIGURE 3 is a top view of FIGURE 2, with parts broken away.

In FIGURE 1, I have shown a small air cooled engine, designated generally at **10**, which may be considered a 10 or 15 horsepower unit. The engine is shown with a suitable base **12** and a shroud **14** surrounding a conventional fan, not shown, driven by the crankshaft of the engine with air being drawn through a suitable grilled opening **16** in the shroud. The lower portion **18** of the shroud is somewhat circular and enlarges in a clockwise direction forming a scroll configuration so that air from the fan, which is located behind the grilled opening **16**, will flow up to the square upper portion **20** of the shroud which directs the air across the fins on the sides and head of the cylinder or cylinders. Such an engine is normally a spark-fired gasoline engine and a conventional spark plug is indicated generally at **22**. The engine may have a suitable gasoline tank **24**, a sediment bulb **26**, hand starter **27**, and an exhaust outlet **28**, which is only partially shown in FIGURE 1 and may be considered as connected to the back or rear of the engine. The engine may have a suitable carburetor, partially shown at **29**, which meters fuel into the inlet air stream and conveys the mixture to the cylinder or cylinders. The inlet to the carburetor may have an elbow or horn **30** which opens upwardly and supports an air cleaner, indicated generally at **32**.

The air cleaner, shown in detail in FIGURES 2 and 3, has an outer housing or cap or cover **34** which is generally cylindrical with an annular upstanding rim or projection **36** on top which receives the upper end of a filter element, designated generally **38**, disposed under the cap or cover. The filter element is annular and generally cylindrical and includes an expanded wire or center core **40** which projects slightly below a bottom plate **42** which may be welded or otherwise suitably connected to the center tube, as at **44**. The bottom plate is offset upwardly at **46** to define a trough **48** for receiving the

lower end of the filter element. The bottom plate is then deformed outwardly and downwardly somewhat at **50** and then down at **52** and dimpled or offset at three or four points, as at **54**, thereby providing spacing lugs which space the lower edge or skirt **55** of the housing from the edge **52** of the bottom or lower plate to provide a plurality of arcuate slots or openings. A seal ring **56** is disposed under the trough **48** formed in the bottom plate about the extension **58** of the center core or sleeve to bear against the outwardly flared end **60** of the carburetor elbow **30**.

The housing or cap is provided with a depending inner sleeve **62** which is suitably welded or otherwise connected at **64** in the top groove **36** to mask an inlet **66** which, as shown in FIGURE 3, is tangentially disposed to the housing adjacent the upper end. An air ramp **68** may be used if desired to prevent dirt from orbiting adjacent the upper end or top of the housing, thereby causing the dirt and dust to move or be deflected down to the discharge at the bottom. It will be noted that the sleeve **62** is spaced out somewhat, as at **69** in FIGURE 2, from the outer surface of the filter element **38** so that air may circulate back up in under the sleeve and the entire length of the filter element is usable for filtering.

The entire assembly may be held together by a rod **70** which is mounted in the opening of the elbow **30** and projects up through the center of the air cleaner and the housing is pulled down and held together by a wing nut **72** in FIGURE 1.

The cleaner housing is mounted or oriented on the elbow so that the tangential inlet **66** projects toward the upper part **20** of the shroud **14** and extends through an opening **74** in the side thereof, as shown in FIGURE 1, with the end of the inlet **66** preferably cut on a bias, as shown at **76** in FIGURE 2. Thus, the air from the crankshaft driven fan inside of the shroud will be forced under slight pressure through the inlet **66**. Once it is tangentially admitted to the housing **34**, it will swirl or rotate and the dirt held therein will move down against the inside of the housing and out through the openings defined in the lower end thereof. The suction created by the pistons will draw air through the elbow **30** and this in turn will draw air from the inside of the swirl through the filter element **38**.

The use, operation and function of my invention are as follows:

Both the positive pressure from the shroud fan and the negative pressure or vacuum from the cylinders will cause the air to swirl in the housing and the result will be that 90% or 95% of all dirt carried in the air will be centrifugally discharged in the precleaner part or phase.

The invention has the advantage that small horsepower air cooled engines of this type are normally supplied with a fan for directing air across the finned exterior of the cylinders to cool them. This air, under slight pressure, is readily available and I use it as an inlet air source.

I might provide a seal around the inlet **66** where it enters the shroud **14**, but this is optional. The point is that air that already exists under pressure is used as the inlet air and the positive pressure is used to swirl the air inside of the housing to centrifuge the dirt out.

The cleaner itself, as shown in detail in FIGURES 2 and 3, is simple. The filter element **38** is generally annular and cylindrical and may be made in any suitable manner. At present I prefer a multi-stage element which has one wrap of felt on the inside for the finest or as a fail safe filter surrounded by one layer of Dacron, which is somewhat more porous but, nevertheless, a fine filter, and this in turn surrounded by one or more wraps of a suitable foam plastic, such as foamed polyurethane, which is a coarser filter. Or any suitable number of wraps of each could be used. I prefer that the length of the filter

material be somewhat greater than the distance between the lower seat 48 and the upper seat **36** when the cover is fully seated so that the filter will be under slight axial compression and will effect a seal at the top and bottom.

The suction from the engine on the carburetor elbow, by itself, would set up a swirl of air in the cleaner housing. Add to this the positive pressure on the inlet gained by projecting the inlet into the air shroud on the engine and the result is a combination of forces that will set up a fast swirl in the cleaner housing that positively and effectively centrifuges the dirt which in turn is discharged through the peripheral slots at the bottom.

A balance must be struck between the positive pressure on the inlet and the negative pressure from the engine suction on the outlet. The balance should be in favor of the positive pressure on the inlet so that there is positive pressure in the cleaner housing. Thus, some air will flow out of the housing through the openings or arcuate slots or dirt discharge in the bottom, past dimples **54**. In a sense, this is a proportioning situation, but the arrangement must be controlled so that a positive pressure exists in the cleaner housing to cause air to flow out from the dirt discharge openings. The flow of air through these openings greatly increases the percentage of dirt that will be discharged in the precleaning step ahead of the filter element **38**. At the same time, the positive pressure in the housing must not be excessive. This is to say that if the connection **66** to the air shroud is too large, more than enough air will swirl in the cleaner housing. The engine will only take as much as it needs for combustion. The excess will be discharged through the dirt openings in the bottom of the housing and far more air will be cleaned than is necessary. Therefore, the total area of the dirt discharge openings, at **54**, is proportioned to the area of inlet **66**. And these two areas are proportioned relative to the demands of the engine so that, on the one hand, there will be a positive pressure in the cleaner housing and not a vacuum, and, on the other hand, excess air over and above that required for efficient cleaning will not be robbed from the air shroud.

While I have shown and described the preferred form of my invention, it should be understood that suitable additional modifications, changes, substitutions and alterations may be made without departing from the invention's fundamental theme. I, therefore, wish that the invention be unrestricted, except as by the appended claims.

I claim:

1. A method of cleaning the inlet air for an air cooled engine which has a shrouded fan driven by its crankshaft for blowing air under pressure over the engine cylinders, including the steps of tapping some of the air from inside the shroud and conveying it to a separate housing, tangentially introducing the tapped air into one end of the separate housing to set up a swirl of air to thereby centrifuge the dirt in the air to the outside, discharging the dirt from the other end of the separate housing, and separately discharging the air from the center of the separate housing to the engine.

2. A method of cleaning the inlet air for use in the combustion process in an air cooled engine which has a shrouded fan driven by the engine crankshaft for blowing air under pressure over the cylinders for cooling them, including the steps of tapping some of the pressure air from inside of the shroud by providing a hole in it, conveying the air through the hole and directing it into a swirl so that the dirt in the air will be centrifuged to the outside, withdrawing the cleaner air on the inside of the swirl and conveying it to the engine for use therein in the combustion process, and separately discharging the dirty air from the outside of the swirl.

3. For use with an air cooled engine having a crankshaft driving a fan enclosed in a shroud so that air from the fan will be directed over the cylinders to cool them with an inlet for supplying air to the fan and an inlet for supplying air to the engine for combustion purposes, the improvement comprising an air cleaner housing mounted on the engine inlet and having an inlet connection to the shroud so as to receive air under pressure from the shroud, the connection being disposed tangentially at one end of the air cleaner housing so that air from the shroud will flow through the connection and will swirl inside of the air cleaner housing, a dirt discharge at the other end of the housing, an annular filter element in the housing to filter the air before it goes to the engine inlet, and a connection between the inside of the filter element and the engine inlet for supplying clean air to the engine for combustion purposes.

4. In an air cooled engine, an engine frame having a crankshaft, a fan driven by the crankshaft for cooling the engine cylinders, a shroud around the fan with an inlet for supplying air to the fan, an engine inlet for supplying air to the cylinders for combustion purposes, an air cleaner housing mounted on the engine inlet, a connection between the air cleaner housing and the shroud so that air from the fan will be supplied to the air cleaner housing, the connection being tangentially disposed to the air cleaner housing and at one end so that air from the fan will flow through the connection and will swirl in the air cleaner housing, an annular dirt discharge at the other end of the housing for discharging dirt centrifuged from the swirling air, an annular filter element in the housing to filter the air from the inside of the air swirl set up in the housing, and an outlet connection in communication with the inside of the filter element and connected to the engine inlet for supplying clean air to the engine inlet for combustion purposes.

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