Sept. 30, 1969 J. W. WILKINSON ET AL 3,469,566

CENTRIFUGAL AIR PRECLEANER WITH BLOWER

Filed Jan. 19, 1967 2 Sheets-Sheet 1

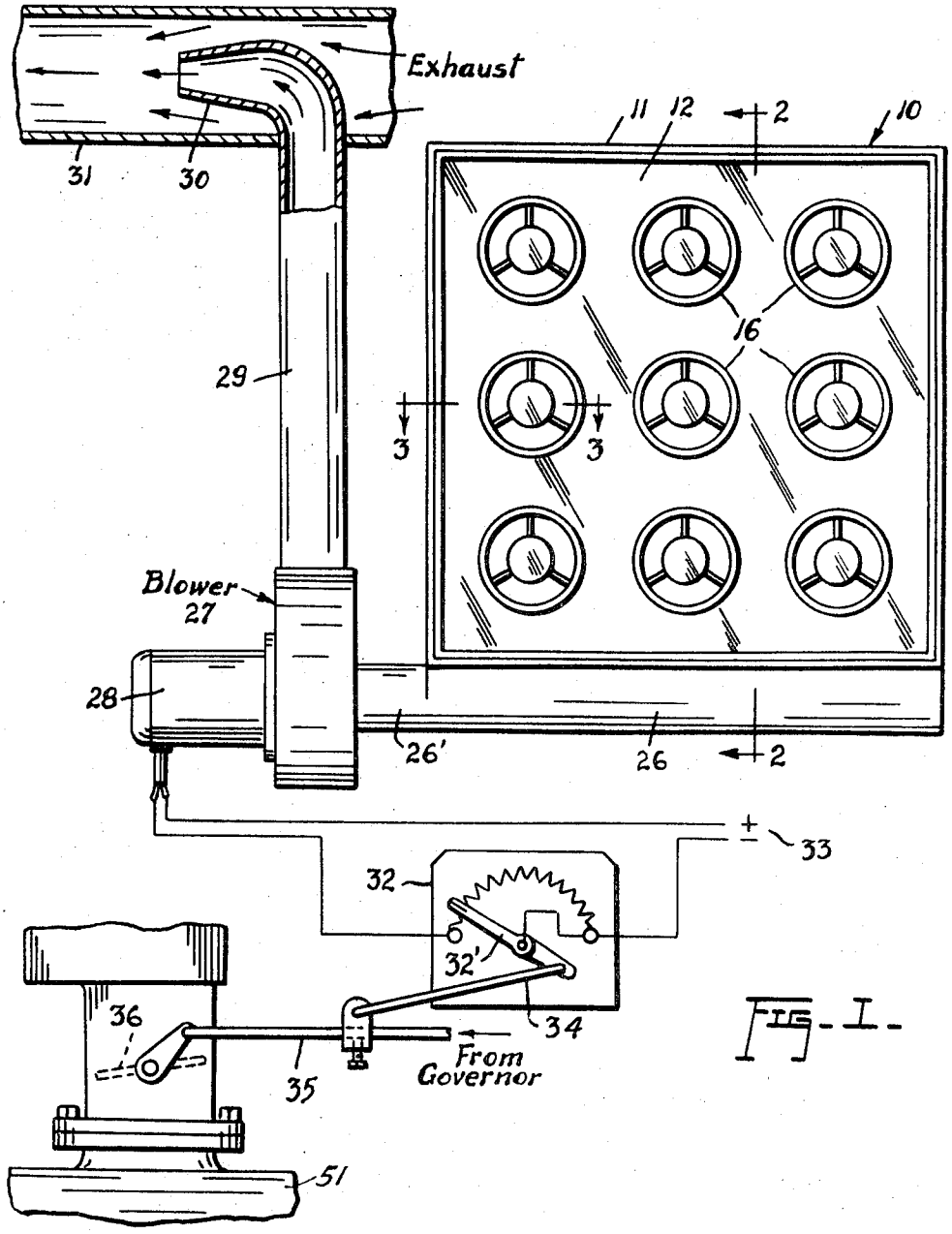

FIG. 1

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CENTRIFUGAL AIR PRECLEANER WITH BLOWER

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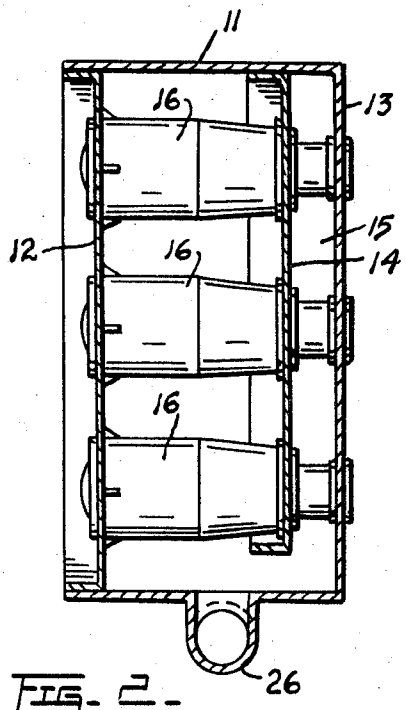

FIG. 2.

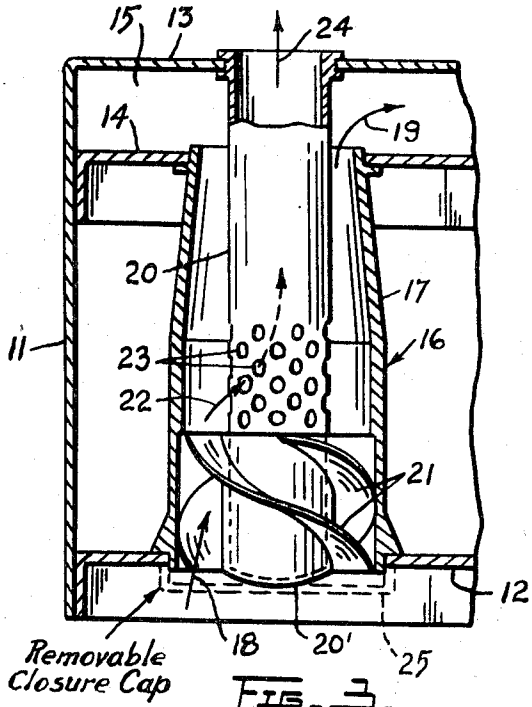

FIG. 3.

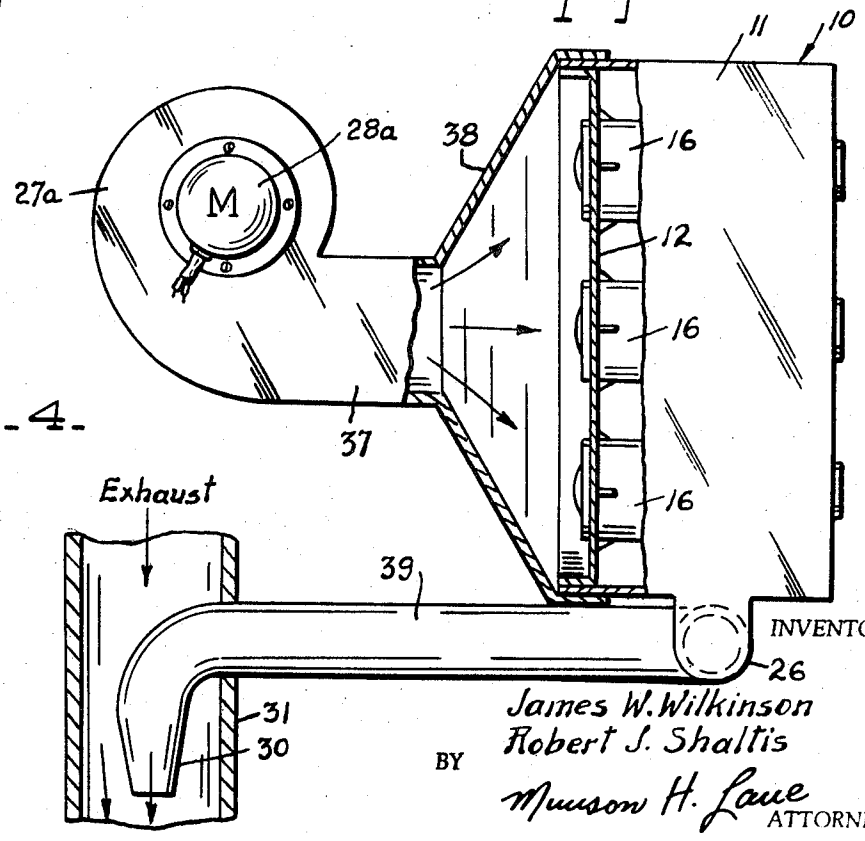

FIG. 4.

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CENTRIFUGAL AIR PRECLEANER WITH BLOWER

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ABSTRACT OF THE DISCLOSURE

A centrifugal type air precleaner for an internal combustion engine, the precleaner having an air inlet, a clean air outlet and a dirty air discharge. A blower driven by an electric motor delivers dirty air through the discharge at optimum velocity which may be either constant or variable by a rheostat in circuit with the blower driving motor. If a rheostat is provided, it is actuated automatically by the throttle linkage of the engine, so that the optimum velocity of the dirty air discharge is maintained even at engine idling speeds. The blower may be provided either at the air inlet or at the dirty air discharge of the precleaner, and the dirty air discharge may be either into the atmosphere or into an exhaust pipe of the engine.

This invention relates to new and useful improvements in air precleaners of internal combustion engines, more particularly precleaners of the centrifugal type which are often employed in advance of the usual air filter for removing from the incoming air relatively large particles of dust and other foreign matter so that the work of the air filter is not unduly over-burdened by such large dirt particles and, as a result, the useful life of the air filter is substantially lengthened.

In accordance with conventional practice, the incoming air is drawn through the precleaner by the suction of the engine, and since this suction decreases in proportion to engine speed, the centrifugal air precleaning operation becomes progressively less efficient as the engine speed drops and is virtually non-effective when the engine is idling. Thus, particularly at idling speeds, the precleaner does not properly serve its intended purpose and unduly frequent replacements of the air filter are necessary notwithstanding the fact that a precleaner is provided.

It is, therefore, the principal object of this invention to eliminate the disadvantages above outlined by assuring operation of the precleaner at optimum efficiency regardless of the speed of the engine and, more particularly so, at slow or idling speeds when the engine suction cannot be relied upon to promote effective centrifugal extraction of dirt in the precleaner.

As such, the invention attains the aforementioned object by providing a motor-driven blower for delivering dirty air from the precleaner quite independently of the engine suction, so that the centrifugal extraction of dirt takes place by the action of the blower propelling air through the precleaner at optimum velocity.

While the motor-driven blower may have a constant speed, the invention provides as another of its features a rheostat for varying the speed of the blower, and means responsive to the usual throttle linkage of the engine for automatically actuating the rheostat, so that the speed of the blower is increased when the engine speed decreases, and vice versa, to assure efficient operation of the precleaner especially at slow or idling speeds when, as already indicated, the engine suction cannot be relied upon to promote effective centrifugal extraction of dirt.

With the foregoing more important object and features in view and such other objects and features as may become apparent as this specification proceeds, the invention will be understood from the following description taken in conjunction with the accompanying drawings, wherein like characters of reference are used to designate like parts, and wherein:

FIGURE 1 is an elevational view, partly in section and partly broken away, showing one embodiment of the invention;

FIGURE 2 is a vertical sectional view, taken substantially in the plane of the line 2—2 in FIG. 1;

FIGURE 3 is an enlarged, fragmentary sectional view, taken substantially in the plane of the line 3—3 in FIG. 1;

FIGURE 4 is an elevational view, partly in section and partly broken away, showing a modified embodiment of the invention.

Referring now to the accompanying drawings in detail, more particularly to FIGS. 1–3, the reference numeral **10** generally designates a centrifugal type air precleaner such as may be used in advance of and in series with a conventional air filter (not shown) of an internal combustion engine **51**, for the purpose of removing relatively large or heavy particles of dust, dirt and other foreign matter from the incoming air so that such dirt particles do not unduly over-burden the work of the air filter.

The precleaner **10** comprises a housing **11** which may or may not be rectangular as shown, the housing **11** including a front wall **12**, a back wall **13** and a partition **14** adjacent the back wall, forming a chamber **15** between the back wall and the partition. A plurality of centrifugal type air cleaning units **16** are mounted in the housing **11**, these units being more-or-less conventional in construction as will be apparent from FIG. 3 wherein one of the units appears in detail. The unit **16** comprises an open-ended outer tube **17** which extends between and has its end portions suitably mounted in openings formed in the front wall **12** and in the partition **14**. The open front end of the tube **17** provides an inlet for incoming air as indicated at **18**, while the open rear end of the tube provides a discharge for dirty air into the chamber **15**, as indicated at **19**.

A smaller, central tube **20** is disposed axially in the outer tube **17**, the tube **20** having a closed front end **20'** and being provided exteriorly on its front end portion with a set of spiral baffles or vanes **21**. These vanes not only serve to mount the front end portion of the central tube **20** in the outer tube **17**, but also to impart a swirling action to the air incoming as at **18**, so that relatively large or heavy particles of dust, dirt, et cetera, are centrifugally extracted from the incoming air and, as a dirty air current, are discharged into the chamber **15** as at **19**. The relatively clean air flows inwardly into the central tube **20** as at **22** through a series of apertures **23** with which the tube **20** is provided rearwardly of the vanes **21**, and the clean air then passes through an outlet afforded by an open rear end of the tube **20**, as at **24**, to the conventional air filter (not shown). As will be noted, the rear end portion of the central tube **20** extends beyond the partition **14** and is suitably mounted in the rear wall **13**.

As already indicated, several of the precleaning units **16** may be provided in the same housing **11**, and if under some circumstances the use of all such units at the same time is not required, one or more of the units may be closed off and rendered inoperative by installation of a removable closure cap **25** at the front end of the outer tube **17** as shown in FIG. 3, so as to prevent the flow of incoming air into that particular unit or units.

As will be apparent from FIG. 2, the lower edge of the partition **14** is spaced above the bottom of the housing **11**, so that the centrifugally extracted dirt discharged from the units **16** into the chamber **15** may flow to the bottom of the housing into a dirt collecting trough **26** communicating, as by a duct **26'**, with the intake of a blower or fan

27. The latter is driven by a suitable motor, as for example, an electric motor 28, and the outlet 29 of the blower 27 may discharge into the atmosphere, if appropriate precautions are taken to prevent the discharged dirty air from re-entering the precleaner. Alternatively, as shown in the drawings, the dirty air outlet 29 of the blower 27 may be extended as an aspirating nozzle 30 into the exhaust pipe 31 of the associated engine 51, so that the dirty air is aspirated into the exhaust fumes.

In operation, incoming air will be drawn into the outer tubes 17 of the precleaner units 16 as at 18, and under the swirling action imparted thereto by the vanes 21, large or heavy particles of dirt will be centrifugally extracted therefrom, while clean air will flow through the central tubes 20 as at 22 and 24, solely by engine suction and in accordance with the requirements of the engine at any given speed. However, under the action of the blower 27, the dirty air in the outer tubes 17 will be positively delivered through the chamber 15, trough 26, duct 26' and the outlet 29 to its point of disposition, that is, either into the atmosphere or into the exhaust pipe 31. The blower driving motor 28 may operate at constant speed, in which event the centrifugal dirt extracting operation inside the units 16 will take place constantly at optimum air speed or velocity produced by the blower, and quite independently of the engine speed. Thus, the system will function at optimum efficiency regardless of the engine speed and effective air precleaning will be provided even when the engine speed is not high enough to promote a sufficient air flow in the units 16 for efficient dirt extraction to take place.

While as already stated the speed of the blower 27 may be constant, it is preferred that an automatic speed control be provided for the motor 28. Such a speed control may comprise a rheostat 32, connected in series with the motor 28 to a source of current 33. The rheostat 32 has a movable actuating arm 32' which is operatively connected by a link 34 to the usual linkage 35 of the engine throttle 36 and the throttle linkage may be actuated by a conventional speed governor (not shown) in the usual manner. The arrangement is such that when the throttle is closed and the engine is running at idling speed, the resistance through the rheostat 32 is low and the motor 28 drives the blower 27 at a fast speed to produce a high velocity of air through the precleaner for a highly effective dirt removing operation when the engine suction, due to the low engine speed, is very small.

On the other hand, as the engine speed is increased, the resistance in the rheostat is increased proportionately and the speed of the blower 27 is proportionately decreased, so that in the presence of higher engine suction, a reduction in the speed of the blower still permits an optimum velocity of air for an efficient precleaning operation to be effected.

In the embodiment of FIGS. 1–3 the blower 27 is disposed at the dirty air discharge side of the precleaner, that is to say, on the dirt collecting trough 26 and duct 26'. However, in the modified embodiment shown in FIG. 4 the blower 27*a* has its air intake communicating with the atmosphere, while its outlet 37 communicates with a hood 38 covering the front of the precleaner housing 11, so that the incoming air delivered by the blower 27*a* flows into the precleaner units 16. In this modified embodiment the dirt collecting trough 26 empties through a duct 39

either into the atmosphere or into the exhaust pipe 31 as already described, and the motor 28*a* driving the blower 27*a* may have either constant or variable speed, also as already mentioned. The operation of the embodiment of FIG. 4 is the same as that of FIGS. 1–3, with exception that in the embodiment of FIG. 4 the air is forced into the precleaner, rather than being drawn through it, as in the embodiment of FIGS. 1–3.

While in the foregoing there have been described and shown the preferred embodiments of the invention, various modifications may become apparent to those skilled in the art to which the invention relates.

What is claimed as new is:

1. The combination of an internal combustion engine including an air intake and an exhaust for products of combustion and also including a throttle valve whereby the engine speed may be controlled in the conventional manner, an air cleaner comprising a housing having an air inlet communicating with the atmosphere, a clean air outlet connected to said air intake of the engine, a plurality of centrifugal type air cleaning members provided in said housing between the air inlet and the clean air outlet thereof, said housing also including a dirty air chamber into which dirty air is discharged by said air cleaning members, a dirty air discharge line extending from said dirty air chamber in said housing into said exhaust of the engine, an air blower delivering dirty air through said dirty air discharge line at an optimum rate of flow which is sufficient to facilitate effective separation of dirty air from clean air by said air cleaning members even when the engine speed is low, an electric motor driving said blower, and a speed controlling rheostat connected in series with said electric motor to a source of current, and linkage operatively connecting said rheostat to said throttle valve so that the speed of the electric motor and blower driven thereby may be increased when the engine speed is low.

2. The combination as defined in claim 1 wherein said blower is provided in said dirty air discharge line between said cleaner housing said engine exhaust.

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55—210, 347, 348, 457, 467; 60—30