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AIR CLEANER AND SILENCER
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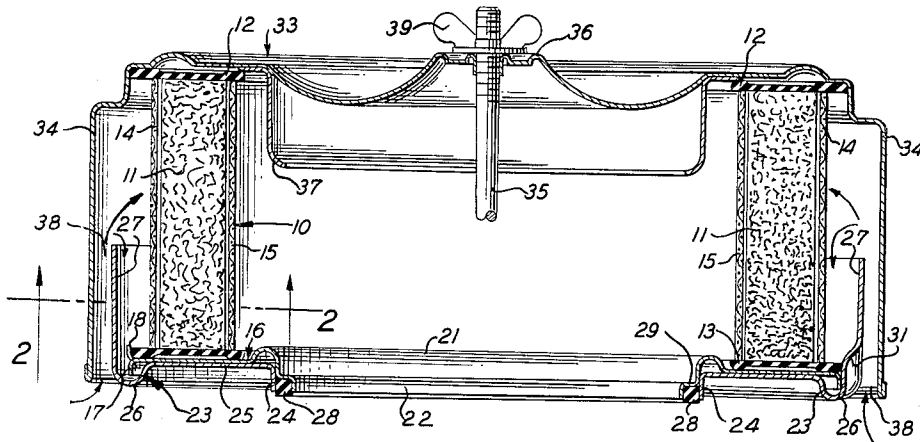


FIG. 1

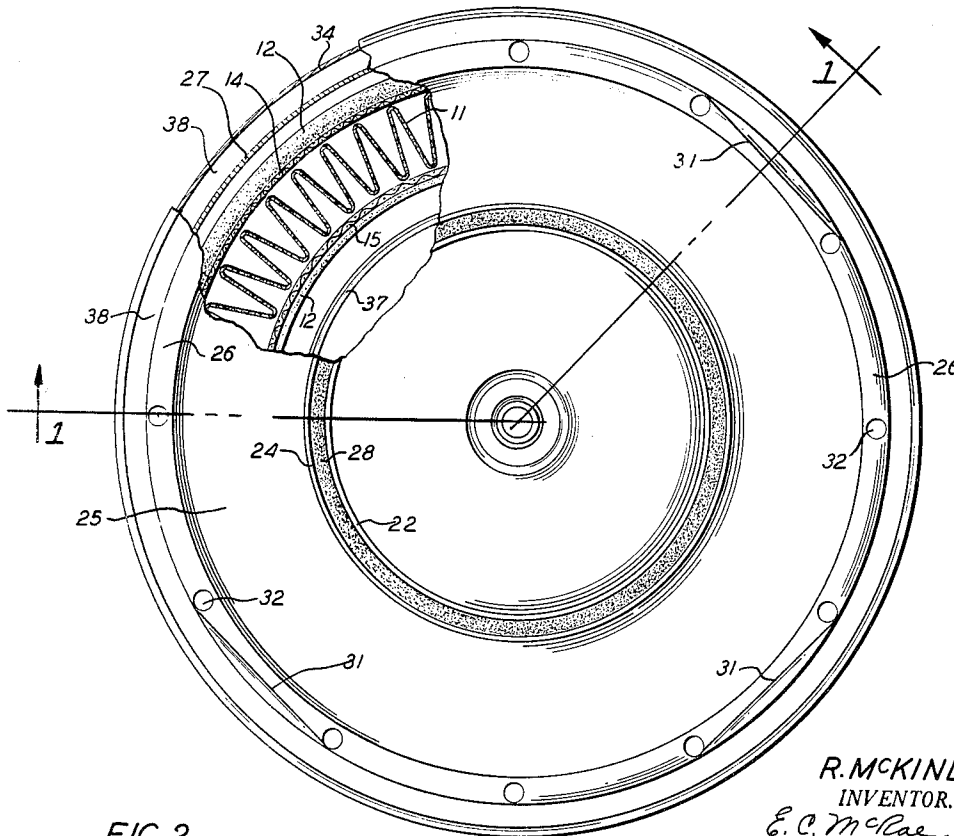


FIG. 2

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AIR CLEANER AND SILENCER

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This application is a continuation-in-part of my co-pending application entitled Air Cleaner and Silencer, Serial Number 677,073, filed August 8, 1957, and now abandoned.

This invention relates to an air cleaner and silencer for an internal combustion engine and more particularly to such an air cleaner and silencer in which a baffle is placed between the air cleaner element and the protective cover for said element.

In commercial internal combustion engines, particularly those designed for use in trucks, sound waves of many frequencies, varying from low frequency sound waves below the range of audibility up through high frequency sound waves above the range of audibility, are set up in the air column extending from the throat of the carburetor to cylinders of the engine. These sound waves are caused by many factors, such as the opening and closing of valves and the moving of the pistons in the cylinders. They travel to the throat of the carburetor and are propagated as noise to the operator and passengers of the vehicle through the atmosphere. Many of these sounds, particularly the high pitched tone caused by higher frequencies, are objectionable to the operator and may even be so severe as to cause driver fatigue.

Air cleaner assemblies have been constructed to silence the aforementioned sound waves generated by the engine. These prior art constructions rely upon separate resonating chambers and sound deadening material for their silencing qualities. Such constructions are costly to produce and, accordingly, their use is limited.

This invention eliminates or substantially dampens the engine sounds in a simplified manner by placing a baffle between the air cleaner element and the air cleaner protective cover in spaced relationship to the protective cover to form a channel or resonance chamber having a rather long length in comparison to its width. Thus, as sound waves are emitted from the throat of the carburetor they are reflected several times between the baffle and the protective cover of the air cleaner before reaching the atmosphere, thereby substantially attenuating the amplitude thereof so that the sound is less objectionable to the driver and occupants of the motor vehicle in which the engine is mounted.

It is evident that any silencing mechanism placed in the air cleaner of an internal combustion engine will cause some reduction in the amount of air inducted into the engine with an attendant reduction of horsepower. The present invention by providing for induction of air around the complete periphery of the air cleaner between the air cleaner skirt and the baffle causes a very minimum of reduction in the amount of air inducted into the engine, and hence a very minimum in the reduction in horsepower.

Accordingly, an object of the present invention is the provision of a low cost air cleaner and silencer capable of substantially silencing sounds emitted from the throat of a carburetor of an internal combustion engine.

A further object of the invention is to provide an air cleaner and silencer capable of substantially silencing sounds emitted from the throat of a carburetor of an internal combustion engine while causing a very minimum of reduction in the amount of air inducted into the engine.

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Another object of the invention is the provision of an air cleaner and silencer capable of substantially silencing sounds emitted from the throat of a carburetor of an internal combustion engine by causing the sound waves to be reflected a number of times before reaching the atmosphere thereby substantially attenuating the amplitude of the sound waves.

A further object of the invention is the provision of a silencing means for a conventional air cleaner which is simple, effective and inexpensive.

Further objects and other advantages will become more apparent as the specification is considered in connection with the following drawings in which:

FIGURE 1 is a cross sectional view through an air cleaner employing the silencer of the present invention, taken along the lines 1—1 of FIGURE 2; and,

FIGURE 2 is a bottom plan view partially in section of the air cleaner employing the silencer with the sectional portion being taken along lines 2—2 in FIGURE 1.

Referring now to the drawings in which like reference numerals designate like parts in both figures thereof, there is shown in FIGURE 1 an air cleaner element generally designated by the numeral 10. Although the air cleaner element may take any known form, an annular shaped accordion pleated paper element is shown with the paper element 11 secured in place by a top plastic retaining ring 12 and a bottom plastic retaining ring 13. This element employs inner and outer circumferential retaining means, for example, an outer wire mesh screen 14 and an inner wire mesh screen 15, which also protects the paper element from damage due to handling and gives it added rigidity.

The air cleaner element is mounted on an annular tray 16, having depending lips 17 which serve to strengthen the tray and upstanding lips 18 which serve as locators for the bottom retaining ring 13 of the air cleaner element. The tray is provided with an upstanding bead 21, a depending flange 22 and a shoulder 29, around the inner circumference thereof. The depending flange has a diameter equal to that of the throat of the carburetor which it is designed to receive and the upstanding bead serves to strengthen the tray through a plane parallel to the surface of the tray which receives the retaining ring 13.

An annular baffle assembly generally designated by the numeral 23 having a depending flange 24, a flat portion 25 which fits against the bottom of the tray 16, a depending bead 26 and an upstanding flange or baffle plate 27 preferably cylindrical in shape is spot welded or otherwise suitably fastened to the tray along its flat portion 25.

The baffle plate 27 may be positioned in spaced coaxial relation with respect to the air cleaner element 11 and extends for a substantial portion of the distance between the flat surface 25 of the tray 16 and the top of the cover 33, or stated differently, the baffle plate extends for a substantial portion of the length of the air cleaner element 11. Thus, the baffle plate 27 is capable of performing its function as a silencing mechanism while simultaneously permitting the air cleaner element 11 to perform its function of removing foreign matter from the air inducted into the carburetor.

A gasket 28 is provided between the depending flange 24 of the baffle assembly 23 and fits against the shoulder 29 for securing a tight seal between the air cleaner and the carburetor. The baffle 27 has a plurality of struck in surfaces 31 around the periphery at the lower edge thereof which facilitates locating the air cleaner element properly on the tray. As the air cleaner is dropped inside the baffle and onto the tray, these surfaces guide the lower retaining ring 13 of the element into proper position on the tray so that the locators 18 are all positioned outside the outer circumference of the ring 13. The depending bead 26 is provided with a series of holes 32 at the bot-

tom thereof which serve as escape holes for dust and dirt which may accumulate in the bead as a result of such dust and dirt shaking out of the filter.

A cover 33 having a depending skirt 34 which serves as a protective means against stones and the like for the air cleaner element 11 is positioned over the air cleaner element so that the skirt is spaced from the baffle 27 and extends to the bottom of the bead 26. Preferably, the skirt 34 is cylindrical in shape and is positioned in spaced coaxial relation with respect to the baffle plate 27. The cover is secured down against the top retaining ring 12 of the air cleaner element by means of a wing nut 39 which threadingly engages a stud 35 mounted on the carburetor (not shown) and also engages a boss 36 of the cover 33. The cover may also be provided with a flame shield 37 which confines any backfire of the engine and prevents the air cleaner element from being burned.

As can be appreciated by an examination of the drawings, the skirt 34 of the cover and the baffle 27 may be mounted in spaced coaxial relation to one another around the entire circumference of the air cleaner element 10, thus providing a cylindrical channel or resonance chamber 38 of substantial length around the periphery of the air cleaner element. When sound waves are emitted from the throat of the carburetor due to the various causes, such as opening and closing of the valves, the only path to the atmosphere is through the channel or resonance chamber 38. Since the source of these sound waves lies at a point nearly perpendicular to the surfaces of the baffle plate 27 and the skirt 34 of the cover 33, these sound waves must be reflected from the baffle and the skirt several times as they travel the length of the channel or resonance chamber 38 to the atmosphere. This results in substantially attenuating the amplitude of these sound waves and hence substantially reducing the intensity of the high frequency sound reaching the operator.

It is well known that different types of engines may have different noise characteristics. By adjusting the height of the baffle plate 27 and the distance between the baffle plate 27 and the depending skirt 34, the invention can provide optimum silencing for any engine. It has been found that the length and width of the channel 38 are very critical in the tuning of the system. For a given engine differences of less than $\frac{1}{8}$ of an inch in length and width produce marked changes in the silencing. In all events, however, the length of the channel or resonance chamber 38 is substantially greater than its width.

Another important feature of the invention is the provision of the silencing system with provision for the induction of air around the entire periphery of the air cleaner through the channel or resonance chamber 38 formed between the baffle plate 27 and the skirt 34 of the cover. This is known in the parlance of those skilled in the art as "360° induction" and provides a very minimum in the reduction of air flow due to the placing of the baffle between the skirt and the air cleaner.

Thus, the present invention provides a simple, effective silencing system for an internal combustion engine with a very minimum of reduction in the flow of air to the engine.

Although a dry type air cleaner and silencer has been illustrated and described, it should be obvious that this invention could be practiced with any type of filtering medium by those skilled in the art. For example, this invention may be practiced with an oil bath filtering system. In an oil bath system, the tray 16 will be formed to provide a reservoir for the oil below the filtering medium. In other respects the air cleaner and silencer would be substantially the same as that shown and described. Various other changes and modifications may be made without departing from the spirit and scope of the invention as defined by the appended claims.

I claim:

1. An air cleaner and silencer apparatus adapted to be mounted on the carburetor of an internal combustion engine comprising; a tray having a flat portion, a central aperture and a depending flange positioned about the central aperture; an air cleaner element having one edge positioned upon the flat portion of said tray, a cover positioned against the other edge of said element and having a depending skirt; said skirt extending for substantially the full length of said air cleaner element; means for securing said cover against said air cleaner element and the air cleaner element against said tray; a baffle assembly having a central aperture and a flat portion, a flange depending from the flat portion at the aperture, said baffle assembly having a depending bead and an upstanding baffle plate about the periphery thereof, the flat portion of said baffle assembly being fastened to the flat surface of said tray on the side opposite to that upon which said air cleaner element is positioned, said baffle plate extending between the skirt of said cover and the air cleaner element in spaced relation to said skirt for a portion of the length of said air cleaner element to form an air induction and silencing channel between the depending skirt of the cover and the baffle plate, the depending bead of said baffle assembly having a plurality of apertures positioned therein to permit dust and dirt particles to pass through said baffle assembly, and a gasket positioned between the depending flange of said tray and the depending flange of said baffle assembly for providing a seal between the air cleaner silencer and the carburetor.

2. An air cleaner silencing apparatus for use in an internal combustion engine comprising; an annular tray having a flat surface adapted to support an air cleaner element and a depending flange around the inner periphery adapted to engage the carburetor of the engine; a cover adapted to engage the air cleaner element and hold the element against the flat surface of the tray, said cover having a cylindrical depending skirt adapted to extend for substantially the entire length of the air cleaner element and being positioned in spaced coaxial relation to the outer periphery of said tray; an annular baffle element including, a flat portion affixed to the side of the flat surface of said tray opposite to the side adapted to support the air cleaner element, a depending bead having a plurality of apertures therein positioned at the outer periphery of the baffle element, and an upstanding cylindrical baffle plate positioned in spaced coaxial relation with respect to the depending skirt of said cover and extending for a portion of the length of said skirt thereby forming a cylindrical channel between the baffle plate and the depending skirt whereby air may be inducted into the engine through said cylindrical channel and said cylindrical channel acts as a silencing means for attenuating the amplitude of sound waves which may be emitted from the carburetor.

3. An air cleaner silencing apparatus for use in an internal combustion engine comprising an annular tray having a flat surface adapted to support an air cleaner element and a depending flange around the inner periphery adapted to engage the carburetor of the engine, a cover adapted to engage the air cleaner element and hold the element against the flat surface of the tray, said cover having a cylindrical depending skirt adapted to extend for substantially the entire length of the air cleaner element and being positioned in spaced coaxial relation to the outer periphery of said tray, an annular baffle element including, a flat portion affixed to the side of the flat surface of said tray opposite to the side adapted to support the air cleaner element, a depending bead having a plurality of apertures therein positioned at the outer periphery thereof, a depending flange positioned at the inner periphery thereof, and an upstanding cylindrical baffle plate positioned in spaced coaxial relation with respect to the depending skirt of said cover and ex-

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tending for a portion of the length of said skirt thereby forming a cylindrical channel between the baffle plate and the depending skirt whereby air may be inducted into the engine through said cylindrical channel and said cylindrical channel acts as a silencing means for attenuating the amplitude of sound waves which may be emitted from the carburetor; and a gasket positioned between the depending flange of said tray and the depending flange of said baffle element.

4. An air cleaner and silencing apparatus for use in a reciprocating internal combustion engine and adapted to be mounted on the carburetor thereof comprising, a tray, an air cleaner element supported upon said tray, a cover adapted to hold said air cleaner element against said tray, said cover having an extending skirt portion, a baffle plate affixed in closely spaced relation to said skirt portion and having a part thereof extending along a portion of the length of said skirt portion, said part of said baffle plate and the adjacent portion of said skirt portion defining a channel through which air flowing into said carburetor passes, said channel having a substantially greater length than width, the width and length of said channel being proportioned to induce reflection of the pulsations in air flow from adjacent surfaces of said skirt portion and said baffle plate for substantially reducing the amplitude thereof.

5. An air cleaner and silencing apparatus for use in a reciprocating internal combustion engine and adapted to be mounted on the carburetor thereof comprising, a tray, an air cleaner element supported upon said tray, a cover adapted to hold said air cleaner element against said tray, said cover having a cylindrical skirt portion extending for a substantial length, a cylindrical baffle plate affixed to said tray in closely spaced coaxial relation to said skirt portion, said baffle plate and said skirt portion having parts thereof that overlap, said overlapping parts being of substantially greater length than the distance therebetween and forming a channel through which air flowing into said carburetor passes, the width and length of said channel being proportioned to induce reflection of the pulsations in air flow from adjacent surfaces of said skirt portion and said baffle plate for substantially reducing the amplitude thereof.

6. An air cleaning and silencing apparatus for the induction system of an internal combustion engine comprising a tray adapted to be supported about the inlet of the induction system, an air outlet in said tray adapted to register with the induction system air inlet, a cover plate affixed relative to said tray, an air filtration element supported between said cover and said tray around said air outlet, said air filtration element being in communica-

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tion at its outlet side with said air outlet, a baffle extending from said tray, and a skirt extending from said cover toward said baffle, said skirt and said baffle extending adjacent to each other for at least a portion of their length and forming a resonance chamber therebetween, said resonance chamber being open at one end to the atmosphere around the periphery of the air cleaning and silencing apparatus, said resonance chamber further being open at the other end to the inlet side of said air filtration element for air flow from the atmosphere through said resonance chamber and said filtration element into the induction system, said resonance chamber being defined in width by the distance between said baffle and said skirt and being defined in length by the distance said baffle extends adjacent to said skirt, the length and width of said resonance chamber being proportioned to induce reflection of the pulsations in air flow from adjacent surfaces of said skirt and said baffle for substantially reducing the amplitude of the pulsations.

7. An air cleaning and silencing apparatus as defined by claim 6 wherein the resonance chamber has substantially greater length than width.

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