

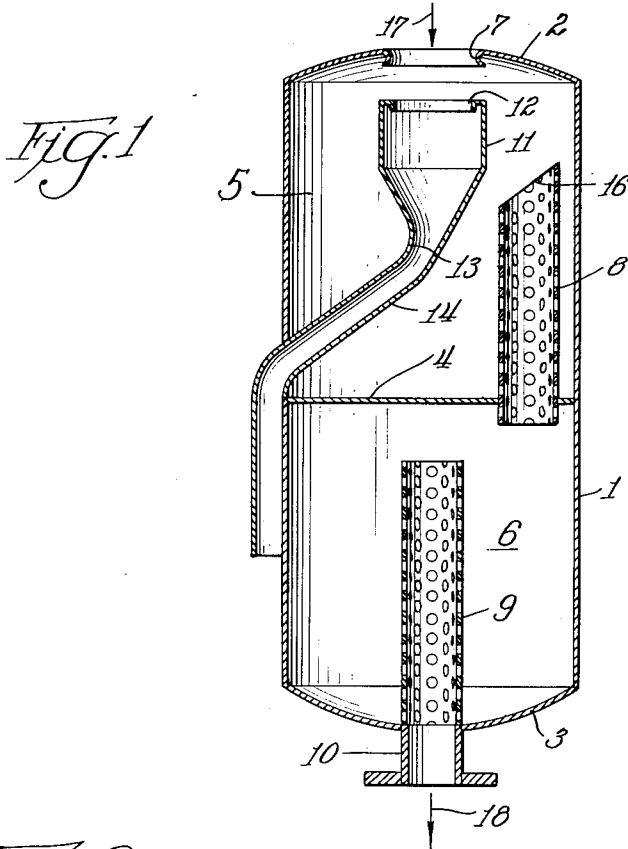
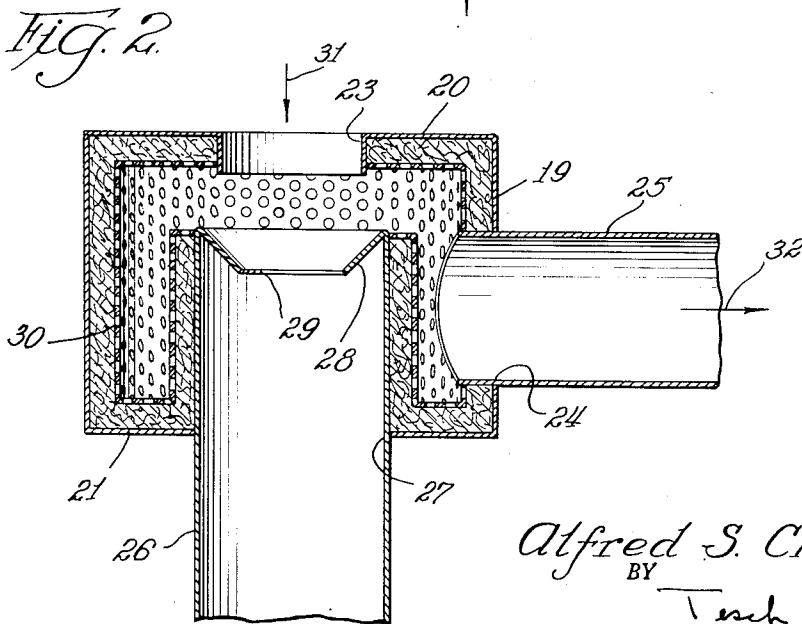
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INERTIAL AIR CLEANER AND SILENCER

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INERTIAL AIR CLEANER AND SILENCER

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This invention relates to devices for cleaning and silencing a stream of gases having liquid or solid particles entrained therein, and particularly to a combination air cleaner and silencer wherein particle removal is accomplished by reason of the inertia of the particles.

The object of the invention is to provide a combined air cleaner and silencer in a single unit which requires practically no more space than a similar silencer alone. A further object is to provide such a combined unit wherein the particle separation is accomplished without the use of filtering materials or liquid baths, whereby a reasonably efficient separator which requires minimum or no servicing is provided.

Further objects and the many advantages of the invention will become apparent as the description proceeds.

In the accompanying drawing,

Fig. 1 is a cross-sectional view of one form of the invention, and

Fig. 2 is a cross-sectional view of a different form of the invention.

A wide variety of intake silencer and air cleaner constructions has been developed and used with varying degrees of efficiency and satisfaction. Units in which these two functions are combined are also known and are in use. However, substantially all air cleaners employed in conjunction with or in combination with intake silencers have employed either filtering material to remove entrained particles or rely upon the scrubbing action of liquid bath for this purpose. Such equipment requires careful attention and frequent servicing in order to maintain it in operating condition. Centrifugal and other separators of the inertial type heretofore known are not generally adaptable to mobile applications because of the relatively large space requirements for such devices. While not so limited, the structure employed in carrying out the cleaning function of the combined unit herein described is particularly applicable where weight and space limitations require a compact unit.

In the combined air cleaner and silencer illustrated in Fig. 1, an enclosure is provided by shell 1, inlet end wall 2, and outlet end wall 3. The shell is preferably, though not necessarily, cylindrical. A partition or baffle 4 divides the enclosure into an inlet end chamber 5 and an outlet end chamber 6. An air inlet opening 7 is provided in the central area of inlet end wall 2 for the passage of a stream of air into the device. This opening need not be exactly centered in wall 2, but it should be spaced from the periphery

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of the wall. The opening may be a simple sharp-edged orifice or may be beaded or otherwise suitably finished, as shown.

A perforated open-ended air outlet tube 8 passes through partition 4 and connects chambers 5 and 6, extending toward but terminating short of inlet end wall 2. A similar perforated outlet tube 9 passes through outlet end wall 3 and extends toward but terminates short of partition 4. A suitable snout 10, which may be integral with outlet tube 9, is provided for the convenient coupling of the apparatus to a connecting conduit.

A dust trap 11 is mounted in inlet end chamber 5 near, but spaced from, inlet end wall 2. The dust trap is a receptacle of suitable shape and size having a mouth 12 in alignment with air inlet opening 7. The shape of dust trap mouth 12 is preferably similar to that of inlet opening 7. A gap is left between dust trap 11 and inlet wall 2 for the passage of air from inlet end opening 7 to an annular passageway between dust trap 11 and the side walls 1 of the shell.

The lower portion of the receptacle forming dust trap 11 converges to an outlet 13 with which a suitable chute or spout 14 connects. This spout passes through an opening in shell 1 and may be open to the atmosphere.

The cleaner-silencer unit is generally mounted at intake terminus of the intake line or conduit. Where dust outlet spout 14 is open to the atmosphere, the apparatus is necessarily installed upstream from the blower or air pumping equipment whereby the shell enclosure is continuously partially evacuated and the air is thus caused to flow into the device through inlet opening 7. For operation of the unit in this manner, the resistance to the flow of air into the inlet end chamber 5 through dust trap mouth 12 must be greater than that of air inlet opening 7 in order to avoid the inward flow of air through dust trap 11, prevent turbulence in the dust trap, and cause all air entering the apparatus to do so through air inlet opening 7. The structural characteristics required to bring about this result are well known. It is essential to proper operation of the unit that inflow of air through the dust trap be prevented by properly balancing flow resistances, as described.

Immediately upon passage through air intake opening 7, the air stream abruptly turns, spreading to flow radially in all directions through the gap between dust trap 11 and inlet end wall 2 at the periphery of the inlet opening. Entrained particles, having greater density, and

therefore greater inertia than the gases, tend to continue their movement in the direction of the incoming stream and project through mouth 12 of dust trap 11, thus separating themselves from the air stream. The gases pass laterally and then downwardly within inlet end chamber 5, leaving the chamber by means of conduit 8. The air may flow into this conduit either through the perforations provided in its walls or through the open end 16. The cleaned gases flow into outlet end chamber 6 and from the apparatus via perforated outlet conduit 9. Noise-producing pulsations are damped or substantially eliminated as the gases pass through the successive chambers and perforated tubes. It should be noted that a limited degree of silencing would be obtained by use of the first section only. The second section, outlet end chamber 6, greatly enhances the silencing efficiency of the unit.

Solid or liquid particles passing into trap 11 pass by gravity through an open end of spout 14.

In the air cleaner and silencer combination unit illustrated in Fig. 2, a shell 19, including end walls 20 and 21, forms an enclosure or chamber 22. The side walls of shell 19 are preferably, though not necessarily, cylindrical. An air inlet opening 23 is provided in the central area of end wall 20 and an air outlet opening 24 is provided in a side wall of shell 19. A suitable outlet conduit or duct 25 passes through air outlet opening 24 and opens into chamber 22. A tube 26 passes through an opening 27 in end wall 21 in alignment with air inlet opening 23. Tube 26, which forms the dust trap, projects into the shell enclosure toward end wall 20 but terminates short of this wall, leaving a gap through which air may flow after passing through inlet air opening 23. The inner end of tube 26 may be partially closed by a funnel-like section 23 converging to an opening 29 which is the mouth of the dust trap. The lower or outer end of tube 26 may be closed or may lead to a closed compartment, or it may be open to the atmosphere.

The entire inner surface of chamber 22 is lined with a suitable thickness of sound absorbing material, such as hair felt. A perforated inner shell 30 may be employed to retain the sound absorbing material in position.

Operation of the device of Fig. 2 is similar to that of Fig. 1, described above. Particles entrained in the air stream entering the apparatus as indicated by arrow 31 pass into the dust trap through mouth 29 and the cleaned gases pass from the apparatus through outlet conduit 25, as indicated by arrow 32. The sound absorbing material lining chamber 22 absorbs a substantial part of the sound energy which would otherwise be audible through inlet opening 23, the dust trap, or through the shell walls. Thus, the device operates to prevent the passage of both particles and sound.

A thorough understanding of the invention herein described will immediately suggest many possible modifications involving changes in the form or arrangement of the several elements of the unit. Those shown and described are intended merely to exemplify the invention and show its mode of operation. The full scope of the invention is intended to be limited only by the appended claims.

The invention is claimed as follows:

1. Apparatus for cleaning and silencing a stream of air comprising, in combination, a shell forming an enclosure and having an air outlet opening therein and an air inlet opening centrally located in one wall thereof, a dust trap comprising a receptacle having a mouth in spaced aligned relation to said air inlet opening within said enclosure and an outlet at a lower extremity thereof open to the atmosphere, and a perforated open-ended outlet tube passing through said shell and extending a substantial distance into said enclosure.

2. Apparatus for cleaning and silencing a stream of air comprising, in combination, an elongated shell having a transverse partition therein forming an inlet end chamber and an outlet end chamber, an air inlet opening centrally located in the end of said shell and opening into said inlet end chamber, a particle receptacle mounted within said inlet end chamber in spaced relation to said shell, said receptacle having a mouth in alignment with said air inlet opening, a spout extending downwardly from the lower extremity of said receptacle and passing through said shell and opening to the atmosphere at a point without said shell, a perforated open-ended tube passing through said partition and extending a substantial distance into said inlet end chamber, and a second perforated tube passing through said shell and extending a substantial distance into said outlet end chamber.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
485,915	Duckham	Nov. 8, 1892
919,249	Ruddiman	Apr. 20, 1909
1,872,752	Kamrath	Aug. 23, 1932
2,196,491	Chipley	Apr. 9, 1940
2,265,343	Bourne	Dec. 9, 1941

FOREIGN PATENTS

Number	Country	Date
636,564	France	Jan. 14, 1928
416,390	Germany	July 14, 1925