United States Patent [19]

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[54] **NOISE ATTENUATOR**

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[52] **U.S. Cl.** ..... **181/36 R**, 98/115 K, 181/33 G

[51] **Int. Cl.** **F01n 3/06**

[58] **Field of Search** ..... 98/115 R, 115 K, 115 LH; 23/277 C; 181/35 R, 35 C, 36 R, 36 B, 36 C, 36 D, 42, 50, 71, 35 C, 33 G; 126/299 R

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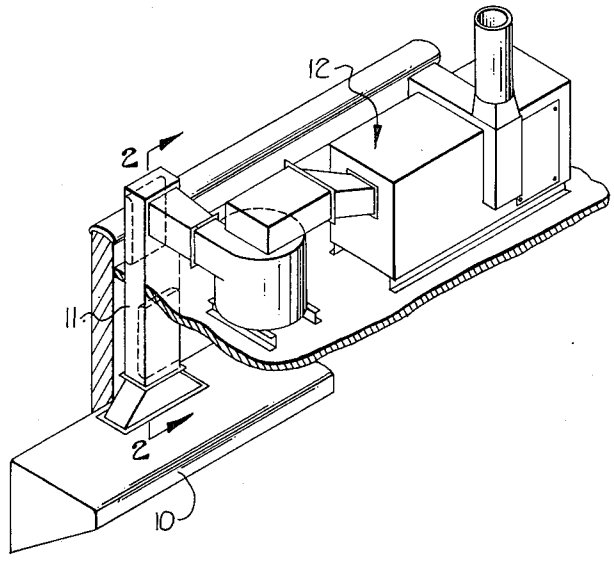
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[57] **ABSTRACT**

Noise otherwise emanating from a duct system through which airborne particulate matter is conveyed is attentuated by a device in which an energy absorbing material is sealed within an impervious film bag, so that decay in the noise attenuation efficiency of the device otherwise occurring due to accretion of particulate matter to the energy absorbing material is avoided.

1 Claim, 3 Drawing Figures



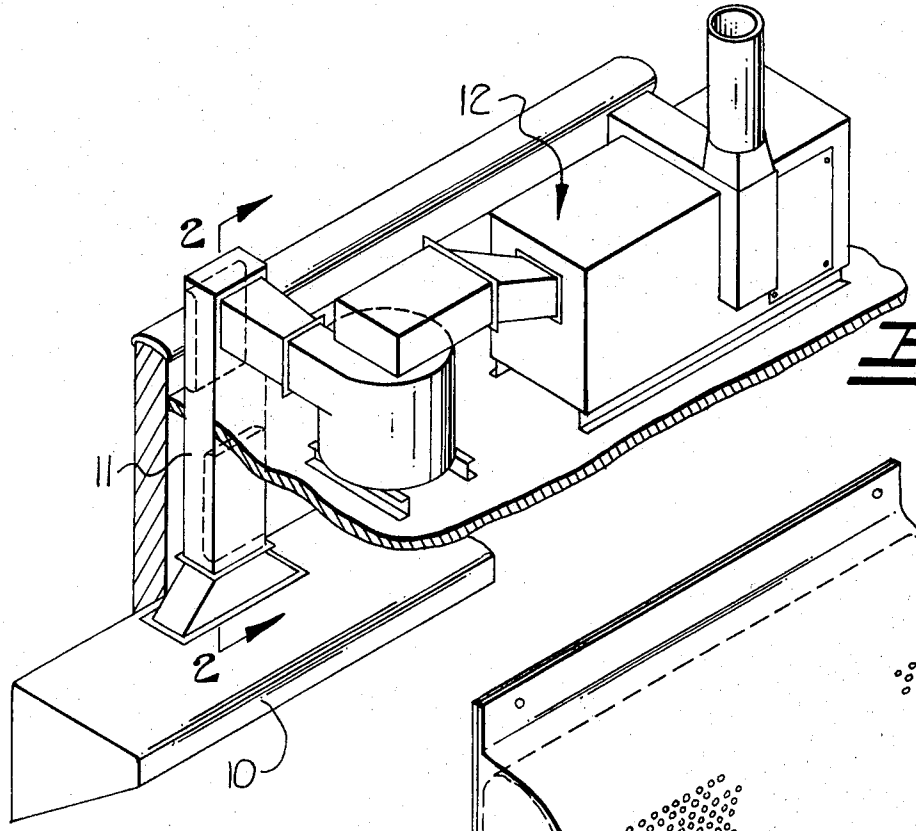


Fig-1

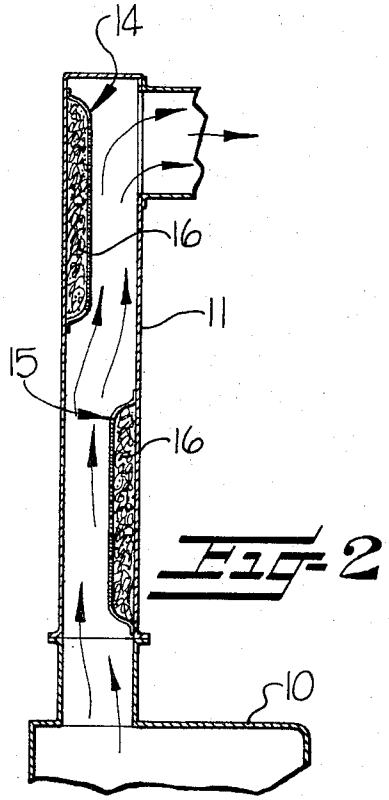


Fig-2

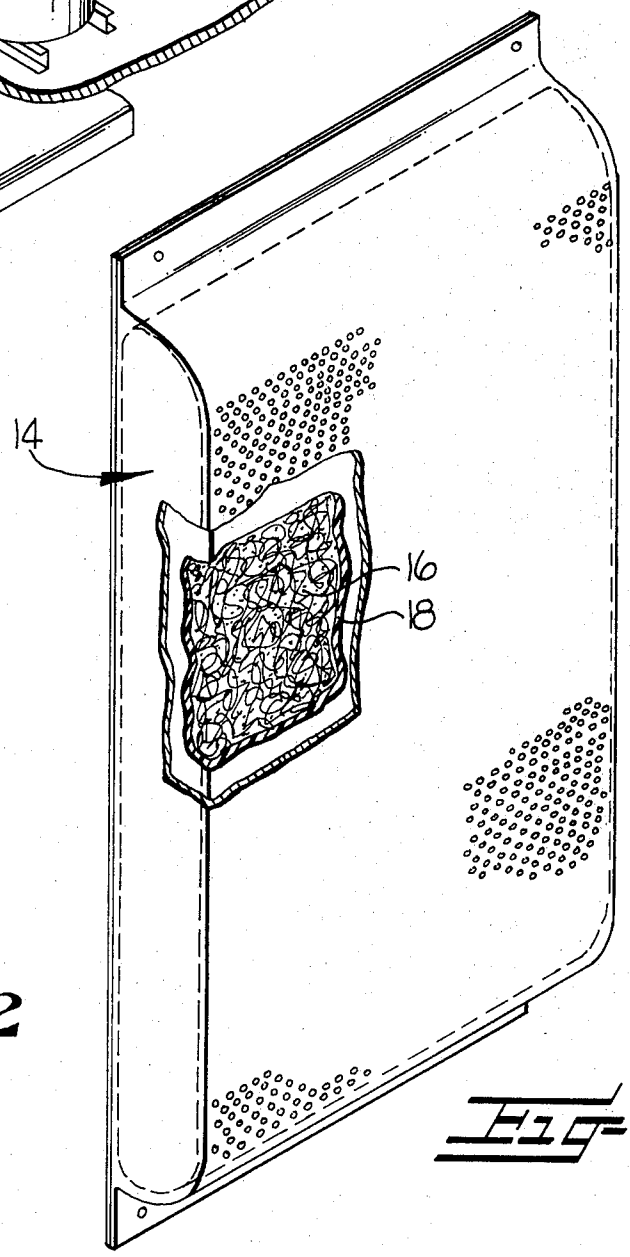


Fig-3

NOISE ATTENUATOR

Duct systems are frequently employed for the entrainment and conveyance of airborne particulate matter. Particularly in instances where such systems are employed in connection with public spaces, such as in a fast service restuarant having a ventilation system for removing airborne liquid grease, difficulties have been encountered in circumstances where noise generators are included in the duct systems. Most notably, certain forms of disposal devices and particularly afterburners have been known to have operating conditions which give rise to objectionable noise levels. Where such a noise generator is included in a duct system, the resulting emanation of noise endangers the success of the restaurant and the mental and physical well-being of employees working in the restaurant.

Heretofore, attempts at suppressing or attenuating such noise have included use of conventional silencers or suppressors. However, such devices have had only limited success due to more or less prompt failure of the devices. In particular, it has been discovered that the particulate matter being conveyed through the duct system "loads" or gathers on the silencer or suppression device, causing decay in the noise attenuation efficiency thereof.

Accordingly, it is an object of this invention to overcome the deficiencies of prior arrangements by avoiding decay in the noise attenuation efficiency of an arrangement which attenuates noise otherwise emanating from a duct system. In realizing this object of the present invention, noise is attenuated by mechanically compressive absorption and dissipation of sonic energy while "loading" or accretion of particulate matter on the energy absorbing material is precluded by sealing the material in an impervious film bag.

Some of the objects and advantages of the invention having been stated, others will appear as the description proceeds, when taken in connection with the accompanying drawings, in which

FIG. 1 is a perspective view, partially in section, of an arrangement in accordance with this invention;

FIG. 2 is an enlarged elevation view, partially in section, through a portion of the arrangement of FIG. 1 taken generally along the line 2—2 in that figure; and

FIG. 3 is an enlarged perspective view of an attenuation device in accordance with this invention.

While the description which follows will set forth the best mode presently contemplated for the practice of this invention, it is anticipated that there may be variations in specific details in following the present invention. For that reason, the description is to be taken as a broad teaching, and not as a restriction or limitation on the scope of this invention.

FIG. 1 illustrates, somewhat schematically, a duct system in which the present invention has been found to be of particular utility. The duct system, as illustrated, includes a hood **10** disposed within a building structure and generally overlying a cooking area (not shown). Typically, such a hood **10** is installed in a fast service restaurant adjacent a cooking apparatus which generates airborne particulate matter, such as a charbroiler or frier from which liquid grease is discharged into the ambient atmosphere.

The arrangement of FIG. 1 further includes a duct **11** operatively communicating with the hood and passing

from within the building structure to a location outside the building structure. Operatively associated with the duct **11** is a suitable means for inducing the flow of air from the area within the building, into the hood **10** and through the duct **11.** Further, the arrangement includes means, such as an after-burner generally indicated at **12,** which functions as a noise generator within the ventilation system, and which operatively communicates with the airflow inducing means, the duct **11** and the hood **10.**

In accordance with this invention, noise attenuation or suppression devices generally indicated at **14** and **15** are positioned within the duct **11** for attenuating noise otherwise emanating from the duct system (FIGS. **1** and **2**). Inasmuch as the devices **14, 15** are of identical construction and assembly, the discussion which follows will be limited to particular reference to device **14,** with it being understood that the construction of the device **15** is the same.

The noise attenuating device **14** comprises energy absorbing means for dissipating by mechanically compressive absorption of sonic energy which impinges on the device. Preferably, the energy absorbing means is in the form of a body **16** of agglomerated fibers. More specifically, the body **16** preferably is a glass fiber batt of suitable dimensions for the overall dimensions of the device **14.** The fiber body **16** is sealed within an impervious film bag **18,** in order to preclude access of the airborne particulate matter to the body **16** of fibers. While the impervious bag **18** thus protects the device **14** against the decay of noise attenuating efficiency which would occur with such accretion of particulate matter, it is to be understood that the bag in no way significantly impedes impingement of sonic energy or dissipation of such energy by mechanically compressive absorption in the body **16** of fibers. Particularly in applications intended for fast service restaurants where the particulate matter conveyed through the duct **11** is liquid grease, it is desirable for the material of the film bag **18** to be Tedlar brand of polyvinylflouride, inasmuch as that material has a particularly notable resistance to grease, oil and the like. Other membrane materials may, however, be found to be satisfactory in various specific applications and may include, by way of example, neoprene, butyl rubber, Hypalon brand of chlorosulfonated polyethylene, polyisobutylene rubber, vinylidene chloride or polyvinylchloride.

The impervious film bag **18** and the body **16** of fibers sealed therewithin are received within a mounting means **20** suitably fabricated out of sheet metal. As so fabricated, one face **21** of the sheet metal mounting means **20** is perforated, to assure exposure of the bag to sonic energy present in the system including the duct **11.**

As illustrated, it is preferred that a system incorporate first and second devices **14, 15.** Preferably, the devices are secured to oppositely facing walls of a duct such as the duct **11,** in predetermined spaced apart relation correlated to the dimensions of the devices taken longitudinally of the duct and the frequency of the noise to be attenuated. By so mounting the devices **14, 15,** otherwise unacceptable restrictions of the flow path for the air and conveyed particulate matter are avoided (FIG. **2**) while the desired efficiency of noise attenuation is maintained.

In the drawings and specification, there has been set forth a preferred embodiment of the invention, and al-

though specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation.

That which is claimed is:

1. The combination, with a hood positioned adjacent a food preparation area within a building and an air pollution control system including an afterburner disposed outside the building and in which particulate grease is burned and noise is generated and a duct extending between the hood and the afterburner and through which airborne particulate grease is conveyed from the food preparation area, the duct including a vertically rising portion and a horizontally directed portion forming an ell with the vertically rising portion, of an arrangement for attenuating noise otherwise transmitted from the afterburner to the hood and comprising first and second noise attenuating devices each comprising a grease impervious film bag, energy absorbing means sealed within said bag for dissipating by mechanically compressive absorption sonic energy impinging on said bag, said bag precluding accretion of grease on said energy absorbing means and thereby avoiding decay in the noise attenuation efficiency thereof, and means for mounting said bag within said duct in exposure to sonic energy being transmitted from the afterburner to the hood, said mounting means disposing said first noise attenuation device adjacent said ell for substantially direct, perpendicular impingement of sonic energy thereon and mounting said second noise attenuator device in predetermined spaced relation within the duct from said first noise attenuator device.

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