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H. HAEGLER

1,757,834

FILTER

Filed Feb. 11, 1925

Fig. 1.

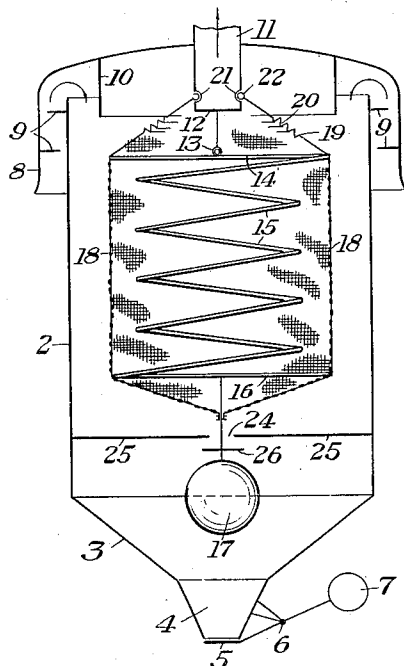


Fig. 2.

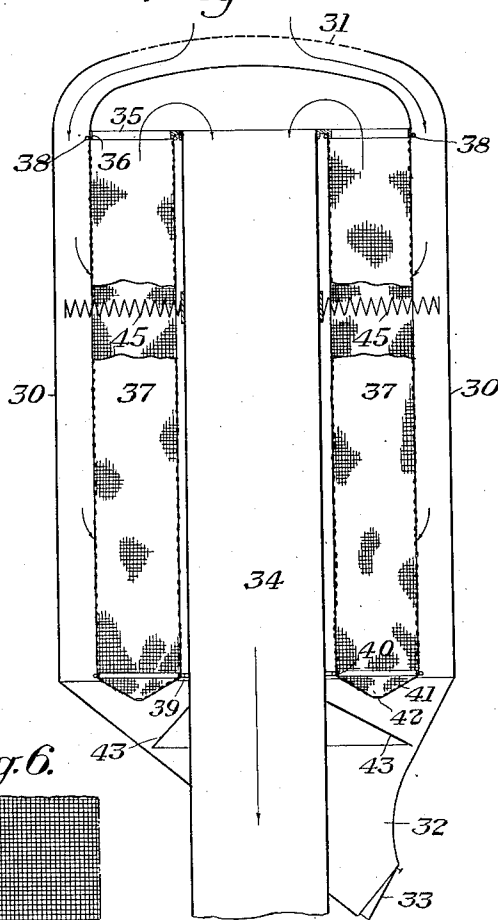


Fig. 3.

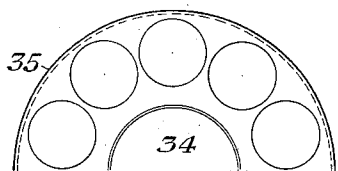


Fig. 6.

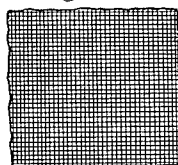


Fig. 4.

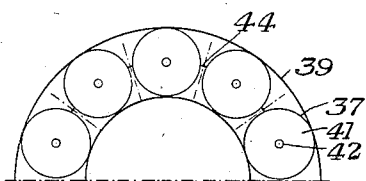
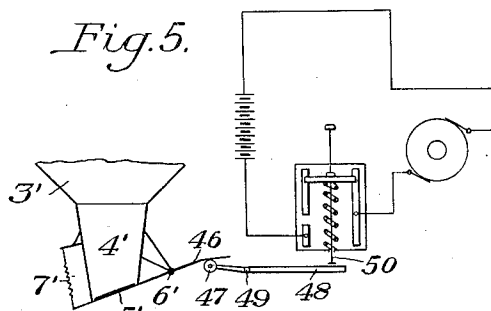


Fig. 5.



INVENTOR

Henri Haegler,
by James Sullivan & Partners,
his Attys.

UNITED STATES PATENT OFFICE

HENRI HAEGLER, OF GENEVA, SWITZERLAND

FILTER

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The present invention relates broadly to the art of cleaning air or gas and freeing it from dust and other solid particles, and more particularly to a filter for this purpose adapted for use in connection with the supply of air to internal combustion engines, although the utility of the invention is not limited in this respect.

It has heretofore been proposed in the art to which the present invention relates to provide filters for the purpose of effecting a separation of foreign material in the form of solid particles from the air supplied to the carburetor of an internal combustion engine. It has been found in practice, however, that such filters soon become clogged to such an extent that their efficiency is impaired, thereby requiring a disassembly and cleaning of the parts.

It has also been proposed generally in the art of cleaning air to provide cleaners having filtering mediums supported in a state of partial tension and adapted to be vibrated to at least some extent to effect a cleaning action thereof. Such filters, however, so far as I am aware, have not been constructed whereby they are adapted for use with automotive vehicles, both by reason of the filtering medium employed and by reason of the method of mounting the same.

It is one of the objects of the present invention to provide a self cleaning filter which is maintained at all times in a state of tension and which is so mounted as not only to permit vibration in any direction but to actually amplify the vibrations which may be transmitted to the cleaner in the form of shocks, either by undulations or inclinations in the surface of the road over which the vehicle is passing, or by contact with machinery vibrating while working.

It will be understood that any slight displacement in any direction of the body of the cleaner will be registered and amplified by the pendulum like filter, the substantially constant oscillations being transformed into substantially constant vibration by the means provided, such as abrupt interruption of oscillation and quick reversal of movement. The word "vibration" as used herein is not

used so much in the sense of shaking but in the sense of trembling such as occurs with a stretched cord or string.

Another object of the present invention is to provide a self cleaning filter of this general character which is only adapted to receive the air after there has been a preliminary separation of some of the larger particles, and in which both the larger particles separated and the finer particles may periodically be discharged from the cleaner, preferably under such conditions that the same are not for a second time brought into contact with the filtering medium itself.

In the accompanying drawings I have shown, for purposes of illustration only, certain preferred embodiments of the present invention, it being understood that the drawings do not define the limits of the invention and that changes may be made without departing either from the spirit of the invention or the scope of my broader claims.

In the drawings:

Figure 1 is a vertical sectional view through one form of filter constructed in accordance with the present invention;

Figure 2 is a view similar to Figure 1, illustrating another embodiment of the invention;

Figure 3 is a top plan view of a portion of the supporting plate shown in Figure 2;

Figure 4 is a top plan view of a portion of the weighted bottom for the individual filters.

Figure 5 is a diagrammatic view, illustrating one manner of effecting discharge of the separated particles from the filter; and

Figure 6 is a view of a portion of the filtering fabric.

In carrying out the present invention, there may be provided a container 2 preferably of substantially cylindrical form having an open upper end and formed with inwardly converging bottom walls 3 forming a collecting pocket 4. This pocket is normally closed to prevent ingress of air or discharge of particles from the container by a closure 5 having a pivotal mounting 6 and normally held in closing position by a counterweight 7.

Cooperating with the upper end of the container is a cap 8 having its side walls over-

lapping the side walls of the container throughout a portion of their length, both the cap and the container being provided with baffles 9. These baffles preferably extend in opposite directions, thereby providing a tortuous flow path between the cap and the container. The cap is also preferably formed with a downwardly projecting annular flange 10 extending to a point below the upper edge of the container 2 and serving to deflect any entering air in a downward direction. The baffles 9 tend to impede the progress of any comparatively large particles into the filter, while the flange 10 tends to project any of the larger particles which may accidentally be carried along with the air in a downward direction whereby they are collected within the pocket 4. Extending upwardly through the cap is an offtake pipe 11 leading to the carburetor or other device to which the cleaned air is to be delivered.

Adjacent the lower end of the pipe 11 there may be provided a perforated plate or bar 12 serving as a support for one member of a universal joint 13 without materially restricting the air flow through the pipe. The other member of the universal connection is carried by the upper enlarged convolution 14 of a spiral spring 15 to the lower enlarged convolution 16 from which is suspended a weight 17. Enclosing the spring 15 is a filtering medium 18 which contacts with the spring only adjacent the upper and lower end convolutions; the entire intermediate body thereof may be out of contact with any supporting body. The upper end of the filtering medium 18 is preferably shaped to provide a portion 19 of gradually decreasing diameter provided with pleats 20. The extreme upper end of the filtering medium may be clamped in position around the lower end of the pipe 11 by providing a groove 21 in the pipe to receive the filtering medium, and then clamping this medium in position by a clip or ring 22. At its lower end the filtering medium is of gradually decreasing diameter and is secured in any desired manner to the retaining rod or chain for the weight 17.

The spring 15 is preferably of the compression type whereby it maintains the intermediate body of the filtering medium 18 in a state of tension but free to vibrate without restriction within the limits allowed. The provision of the pleats 20, the universal joint 13 and the reduced area of contact between the filtering medium and its support also contribute to the free vibration of the filtering medium by enabling the same to oscillate or swing freely in any direction. As the vehicle carrying the cleaner passes over a portion of road having a lateral inclination, the weight 17 will tend to swing laterally to an extent permitted by the size of the opening 24 provided between stops 25 projecting in-

wardly from the sides of the container 2. These stops will tend to limit the oscillation of the filtering body and at the same time impart a considerable jar thereto, as will be apparent. In traveling over a rough stretch of road, the weight 17 will tend to vibrate vertically due to the character of the road, and the inertia of the parts, tending them to lag somewhat behind the movement of the vehicle and thereby imparting a considerable jar to the filtering medium. The movement of the parts vertically may be limited by a cross piece 26 adapted to engage the stops 25.

I have found that most desirable results are obtained by the use of a filtering medium constructed of such material that the spaces between adjacent strands or threads thereof provide substantially free or unobstructed interstitial areas. Such a construction is provided by a filtering medium of the general type ordinarily referred to as bolting cloth, or some similar material. Filtering cloths as ordinarily used are undesirable for most efficient results for the reason that the hairy surface provided by the free fibres tends to collect and retain dust and interfere with the passage of air therethrough. On the other hand, more rigid filtering bodies, such as screen or the like, do not provide the desired degree of elasticity, enabling free vibration such as is essential to the satisfactory operation of a filter of this character.

With the construction described it will be apparent that a preliminary separation is effected by the passage of the air through the tortuous channel provided and that thereafter the finer particles engage the filtering medium by which they are separated. The air then passes inwardly where it escapes through the pipe 11 while these particles are precipitated downwardly by the vibration of the filtering medium. At predetermined intervals, preferably at times when the engine supplied by the cleaner is not operating, the closure 5 is operated to discharge the separated particles. At such times there is no danger of the suction of the engine creating a blast tending to again bring the separated particles against the surface of the medium 18.

In Figure 2 there is illustrated a slightly modified embodiment of the invention comprising a container 30 having a perforated upper end 31 adapted to effect preliminary separation of particles from the air entering the container. At its lower end the container may be shaped in a manner similar to that before described in order to provide a collecting pocket 32 adapted to be closed by a suitable valve 33. Extending upwardly through the center of the container 30 is an offtake pipe 34 carrying at its upper end an annular support 35 formed with a series of circular supporting flanges 36. Each of these flanges may be formed with a groove

adapted to receive the upper end of a tubular filtering medium 37, such mediums being clamped in position by clips or rings 38. Surrounding the lower end of the pipe 34 there is
 5 a weighted bottom annulus 39 having a series of flanges 40 similar to the flanges 36 and adapted to cooperate with the lower ends of the filtering mediums 37 in a suitable manner. Cooperating with each of the flanges 40 is a
 10 weighted cup 41 having a discharge opening 42 adapted to permit any particles which may be carried through into the interior of the tubular filters to be discharged downwardly. Surrounding the pipe 34 there may
 15 also be provided a deflector 43 adapted to prevent any objectionable air currents within the body of the container when the closure 33 is opened.

The bottom annulus 39 which may be a
 20 composite structure formed of inner and outer rings carrying the flanges 40 with the flanges tied together by short intermediate cross bars 44, preferably loosely surrounds the pipe 34 whereby the entire structure is
 25 free to oscillate laterally as described in connection with the cleaner shown in Figure 1. It will be understood with a structure of this type that the weighted bottom annulus serves to maintain the filter cloths under the desired
 30 tension with the intermediate portions free to vibrate out of contact with any supporting members, although if desired short springs 45 may be interposed between adjacent filters so as to assist in the cleaning of the cloths
 35 by vibrating contact therewith. In both structures, the filters are free to vibrate vertically or oscillate laterally at will to effect the desired self cleaning.

In Figure 5 there is illustrated a slightly
 40 different embodiment in which the collecting pocket 4' is closed by a valve 5' carried by a pivotal mounting 6' and normally held in closed position by a spring 7'. The valve
 45 is shown as provided with an extension 46 adapted to cooperate with a roller 47 on the end of a lever 48 having a pivotal mounting 49. The opposite end of the lever lies in the path of the movable element of a switch 50
 50 which may constitute the usual means for starting the motor. As the switch is operated, the valve 5' will be opened to permit discharge of any accumulated matter from the pocket before sufficient suction is created by the motor to produce any undesirable effects.

55 The advantages of the present invention arise from the provision of a cleaner particularly adapted for use with automotive vehicles and constructed to provide filters substantially maintained in a state of tension with the intermediate portions adapted to
 60 freely vibrate out of contact with any surfaces tending to dampen such vibrations.

Further advantages arise from the provision in a cleaner of the character set forth
 65 of a filtering medium in the form of a thin

mesh providing free interstitial flow areas, such, for example, as those obtained by bolting cloth.

Still other advantages arise from the means for effecting preliminary separation of
 70 some of the heavier particles and from the means for automatically emptying the cleaner of accumulated matter.

I claim:

1. A cleaner, comprising a support, a filtering medium suspended from said support,
 75 a weight cooperating with the lower end of said medium to maintain the same in a stretched condition, an enclosing casing for said medium, and means cooperating with
 80 and carried by said casing for effecting preliminary cleaning of the air passing to the filtering medium, substantially as described.

2. A cleaner, comprising a container having a collecting pocket, a valve for said
 85 pocket, a filtering medium within said container adapted to effect precipitation of separated particles into said pocket, and means adapted for periodic operation during the operation of a motor vehicle cooperating with
 90 said valve to effect opening thereof, substantially as described.

3. In an apparatus of the class described, a container, a filtering medium therein, means
 95 for oscillating said filtering medium by inertia, and means for vibrating said filtering medium.

4. A cleaner adapted for operation by oscillation about one of its axes, comprising
 100 a container, a support therein, a filtering medium mounted for universal movement about the support, means for maintaining a constant tension and a constant cross sectional area of the filtering medium and means
 105 for limiting the movement of the filtering medium and imparting a vibratory movement thereto.

5. In a cleaner, a support, a filtering medium attached by one end to said support,
 110 a weight connected to the other end of said medium, and means for limiting lateral and vertical movements of the filtering medium.

6. In a cleaner, a base, a spring attached by one end to the base, the other end being free,
 115 a filtering medium stretched by the free end of said spring, and means for limiting the movement of the free end of said spring and imparting a vibratory movement thereto.

7. In a cleaner tiltable during operation, a container, a support therein, a filtering
 120 medium attached by one end to said support and adapted to simultaneously filter and oscillate, means for maintaining a constant tension and a constant cross-sectional area of the filtering medium, and means for limiting
 125 the movement of the filtering medium and imparting a vibratory movement thereto.

8. In a cleaner, a base, a spring-stretched filtering member mounted for universal
 130 movement about the base, and means for

limiting the movement of the filtering member and imparting a vibratory movement thereto.

9. In a cleaner, a container adapted to be bodily jerked, a support therein, a filtering member mounted for universal movement on said support, and means integral with said container for limiting the movement of the filtering member.

10. In an apparatus of the class described, a container, a filtering medium therein, a support for the same, means for oscillating said filtering medium by inertia, and means for impeding the oscillation of the filtering medium and producing vibrations therein.

15 In testimony whereof I have hereunto set my hand.

HENRI HAEGLER.

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