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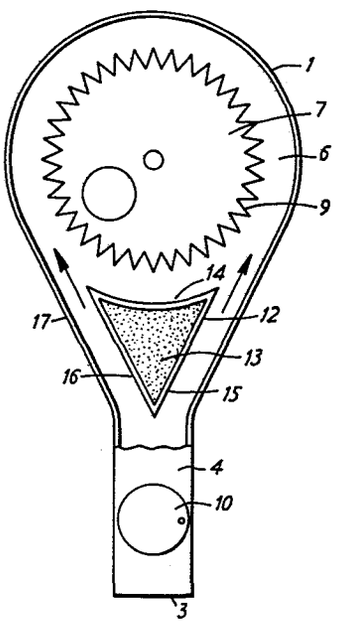
(54) Air filter assemblies for reciprocating machines.

(57) An air filter assembly primarily for Air I.C. engine is provided with an air streamlining and sound energy absorbing baffle (12) arranged to substantially obstruct the direct noise transmission path from the air outlet port (5) through the filter element (9) to the input air duct (4).



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Air Filter Assemblies for Reciprocating Machines.

This invention relates to air filter assemblies for reciprocating machines and relates especially to noise reduction in air filter assemblies for internal combustion engines.

Air filter assemblies for internal combustion engines are known in which an air filter housing is provided for mounting immediately above an engine air intake (typically the choke of a carburettor), whereby in operation air is drawn radially inwards through a generally cylindrical pleated paper filter element for cleaning air from a surrounding chamber connected to an inlet tube or duct. It is found that such apparatus is prone to transmit appreciable engine induction noise.

The principle object of the present invention is to provide inexpensive and efficient means for reducing such noise.

According to the present invention there is provided an air filter assembly for a reciprocating machine including a housing having a chamber for a filter element providing a filtering barrier surrounding an air outlet port and an inlet duct communicating with a region of said chamber outside the filter element, characterised by noise attenuating means located in the air stream from said duct for streamlining and generally directing the air flow in two directions around the filter element but substantially obstructing the direct noise transmission path between the outlet port and said duct.

The attenuating means may have thin walls to form a sound absorbing enclosure which may preferably be filled with a sound absorbing material such as expanded polystyrene.

In order that the invention may be more clearly understood and readily carried into effect the same will be further described by way of example with reference to the accompanying drawing in wich:

Fig. 1 illustrates in diagramatic form a perspective view of a typical air filter assembly for a motor vehicle petrol engine and,

Fig. 2 illustrates a part-cut-away view of such an assembly incorporating a noise absorbing baffle in accordance with the present invention.

Referring to Fig. 1, a generally flat cylindrical filter housing 1 is provided with a removeable upper end-cover 2 for providing access to the interior in known manner for replacement of a generally cylindrical impregnated pleated paper air filter 9 as seen in Fig. 2. The main air inlet to the filter housing is at 3 via a tube or duct 4 providing access via a tapered portion 17 of the housing to a generally annular region 6 around the outside of the filter element and the outlet to the carburettor is via a port 5 which communicates with a region 7 on the inside of the filter element. It will be understood that in the complete assembly the respective ends of the pleats of the paper filter 9 are effectively sealed between the cover 2 and the floor of the housing against the passage of airborne material from 6 to 7.

In order to provide some control over the temperature of air reaching the carburettor and especially to prevent excessively colder air reaching it a temperature controlled vacuum operated motor 10 is incorporated in the tube or duct 4 to control the opening and closing of a flap valve (not shown) to permit the entry of warm air at a further port 11, derived from an enclosure (not shown) around the exhaust manifold of the engine. If required the apparatus may also incorporate means as described in the Specification of copending E.P.O. Patent Application No.82300731.5 for preventing problems arising from loss of vacuum at full throttle settings.

The apparatus as thus described is prone to transmit noise levels from the housing and the port 3 whereas the current desire of vehicle builders is to reduce noise levels even lower than hitherto. Accordingly, by virtue of one example of the invention it is proposed to introduce into the tapered portion 17 of the housing which opens into the chamber 6, a noise attenuating means in the form of a generally triangular baffle 12. This is of hollow form filled with a noise absorbent material 13 such as expanded polystyrene. The dimensions of the baffle are so chosen that it streamlines and generally directs the air flow in two directions around the filter element as indicated by the arrows. The baffle 12 introduces negligible reduction of cross-sectional flow area for access of air to the chamber 6 and port 5 but at the same time it substantially obstructs the direct noise transmission path between the outlet port 5 and the duct 4.

In the example shown in Fig. 2 the face 14 of the baffle

12 which faces the filter element is curved to conform generally with the curvature of the housing 1 whereas the walls 15 and 16 are substantially flat to conform with the adjacent walls of the tube or duct. With such an arrangement it is found that appreciable noise level reduction is achieved and it is believed that such reduction results in part from internal reflection and surface absorbtion especially at surface 14 of the baffle.

It will be appreciated that dependent upon the shape of the filter housing and duct or tube, the precise shape of the baffle may be varied. For example in some applications, the sides such as 15 and 16 may require to be curved to correspond with curved adjacent walls of the tube or duct. Moreover, the face 14 and even the walls 15 and 16 may be acoustically formed to improve the sound attenuating quality of the assembly. For example these faces may be perforated, or given a small sawtooth or corrugated form which does not appreciably detract from the streamline flow of air.

In an alternative embodiment the tube or duct 4 may be of generally circular or oval cross-section.

In such an example the baffle may preferably be designed to be of generally conical shape. Whilst still streamlining and generally directing air flow in two directions around the filter element 9. In this case the baffle shape although not having vertical sides extending between upper and lower faces of the duct would be provided with means for supporting it in the desired position in the flow path and again such as to

substantially obstruct the direct noise transmission path between the outlet port 5 and the duct 4.

In yet a further alternative the baffle may be of generally 'V' section. That is it may be provided with walls such as 15 and 16 or a circular conical or elliptical conical surface but having no base surface such as 14. In such a case noise attenuation will occur as a result of internal absorption and reflection within the baffle.

By virtue of the way in which such a baffle can be positioned to influence noise transmission and the air flow around the filter element in addition to an attenuated level of noise improved filter efficiency and dust capacity may usefully and advantageously be achieved with consequent longer filter element life.

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CLAIMS

1. An air filter assembly for a reciprocating machine including a housing (1) having a chamber for a filter element (9) providing a filtering barrier surrounding an air outlet port (5) and an inlet duct (4) communicating with a region (6) of said chamber outside the filter element, characterised by noise attentuating means (12) located in the air stream from said duct (4) for streamlining and generally directing the air flow in two directions around the filter element (9') but substantially obstructing the direct noise transmission path between the outlet port (5) and said duct (4).

2. An air filter assembly as claimed in claim 1 characterised by said noise attenuating means (12) comprising a generally tapered baffle located in a similarly tapered portion (17) of the housing.

3. An air filter assembly as claimed in claim 2 characterised by said baffle having a base surface facing the filter element.

4. An air filter assembly as claimed in claim 1, 2 or 3 the surfaces of the baffle which are impinged by an incoming air stream being generally flat surfaces (15, 16).

5. An air filter assembly as claimed in claim 1, 2 or 3, said baffle having a generally conical surface presented to the incoming air stream.

6. An air filter assembly as claimed in claims 1, 2, 3,4 or 5 said baffle comprising an outer shell filled with sound absorbent material (13).

7. An air filter assembly as claimed in claim 6, said sound absorbent material (13) being expanded polystyrene.

8. An air filter assembly as claimed in claim 1, 2, 3, 4, 5, 6 or 7 the surface of the baffle being provided with acoustically designed perforations corrugations or sawtooth shape to enhance the resultant noise attenuation.

9. An air filter assembly substantially as described herein with reference to Fig. 1 and Fig. 2 of the accompanying drawing.

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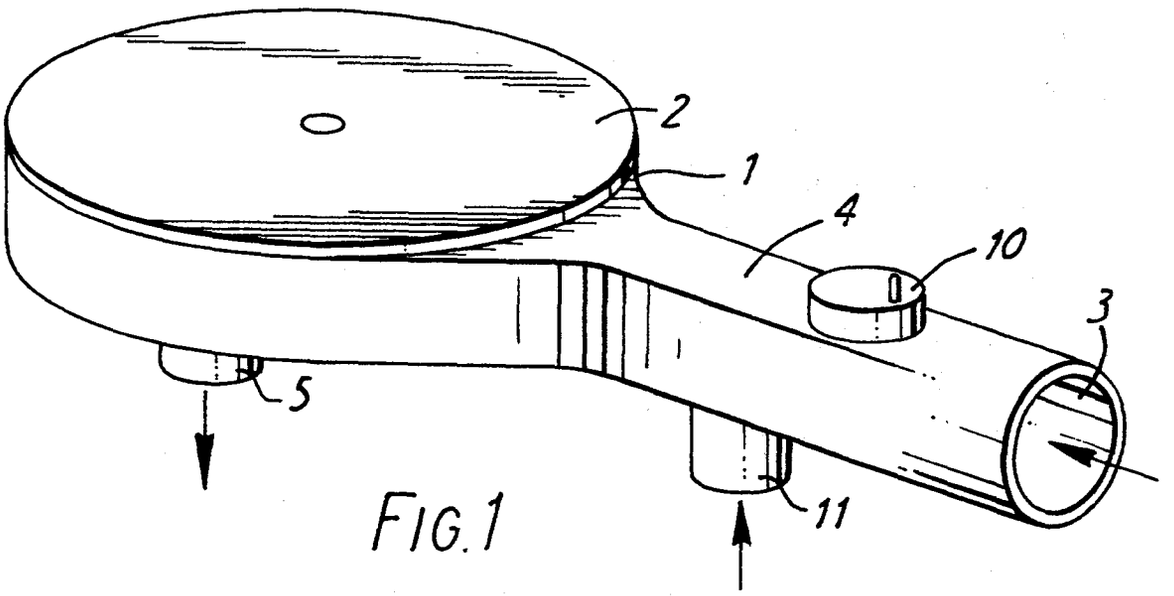

FIG.1

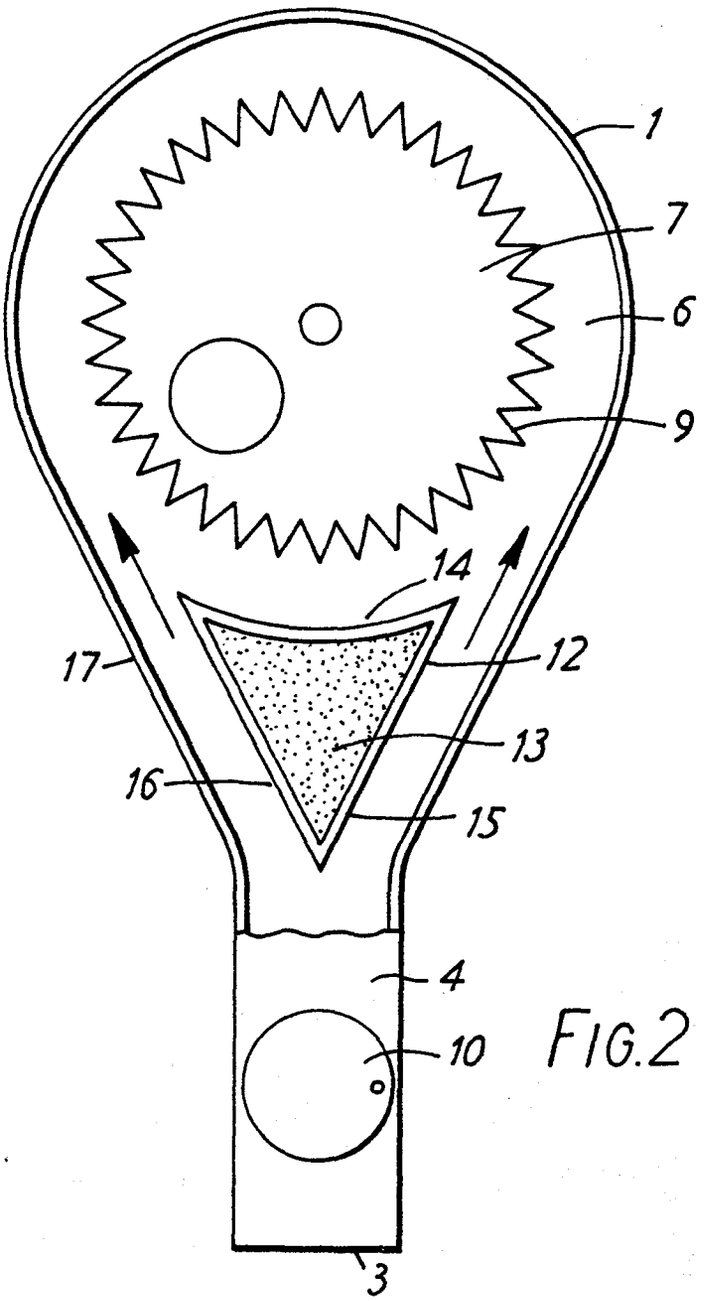

FIG.2

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EUROPEAN SEARCH REPORT

Application number

EP 83 30 3036

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
X	FR-A-1 017 065 (DE LA FOURNIERE) * Page 1, column 2, line 28 - page 2, column 1, line 5; page 2, column 2, lines 12-26; figures 1-3; abstract; points 1, 12-18 *	1-4,6-8	F 02 M 35/14
X	AT-B- 184 406 (KNECHT) * Page 1, column 1, lines 35-41; claim 5; figures 1, 2 *	1	
A	DE-C-1 085 713 (FORD-WERKE)		
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			F 02 M 35/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	19-08-1983	NORDSTROEM U.L.N.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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& : member of the same patent family, corresponding document