

June 10, 1958

A. HESSE ET AL
MUFFLER ASSEMBLY

2,838,129

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2 Sheets-Sheet 1

Fig. 1

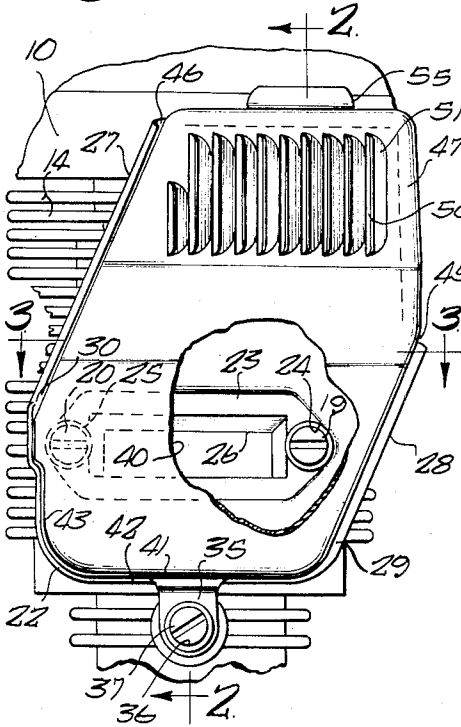


Fig. 2

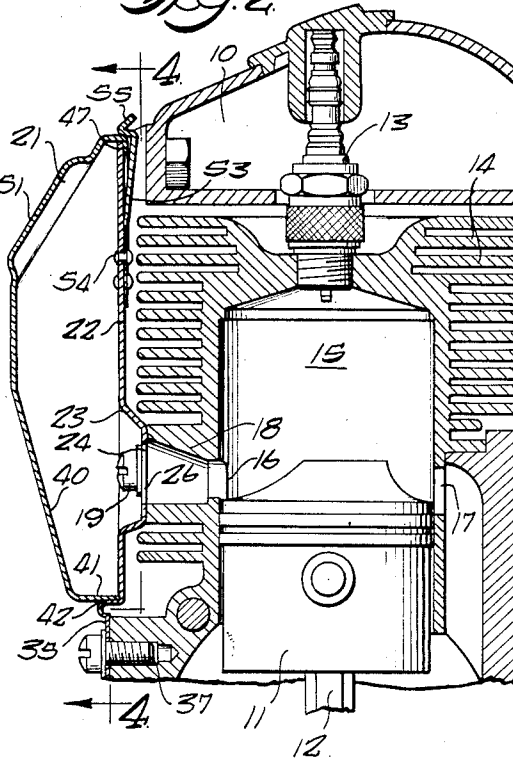
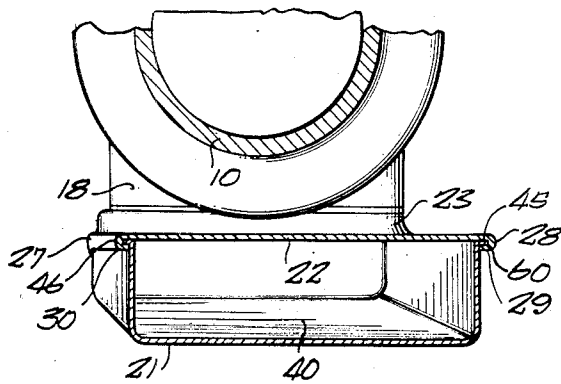


Fig. 3



Inventors
Arno Hesse
Peter Walzak
by John Bundock &
Attorney

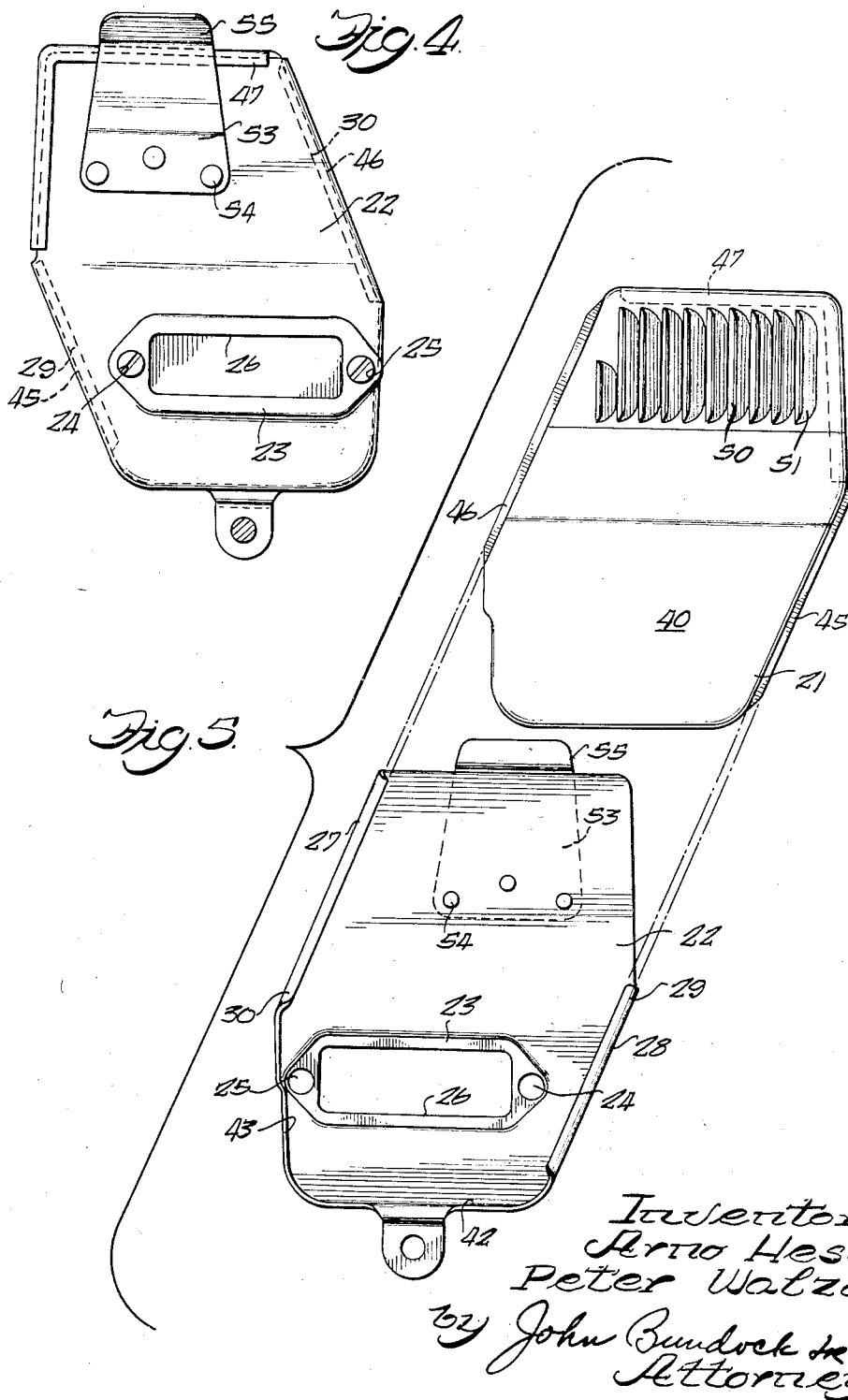
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MUFFLER ASSEMBLY

Arno Hesse and Peter Walzak, Chicago, Ill., assignors to
Mail Tool Company, Chicago, Ill., a corporation of
Illinois

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3 Claims. (Cl. 181—61)

This invention relates to a manifold system for internal combustion engines and more particularly to a muffler assembly on a two cycle gasoline engine.

Two cycle gasoline engines of the spark ignition type with crankcase scavenging, one of the simplest prime movers known, require no separate inlet or exhaust valve systems as ports opened and closed by the piston in its reciprocation in the cylinder are provided to admit the fuel mixture and exhaust the burned gases. Vaporized fuel is passed from the carburetor directly into a sealed crankcase and the downstroke of the piston is utilized to compress the mixture of fuel and air. A by-pass or transfer port allows the fuel mixture into the combustion chamber. This engine scavenges by virtue of a pressure difference between the transfer and exhaust ports. During each cycle the exhaust port is opened a few degrees before the transfer port in order to reduce the pressure in the cylinder to a low value before scavenging starts so that the burned gases may be swept out the exhaust port in front of the incoming wave of vaporized fuel mixture from the crankcase. Improved scavenging results when the dynamics of the system is such that the exhaust gases flow out the restricted orifice of the exhaust port in an efficient manner in front of the denser fuel air mixture entering the combustion chamber from the transfer port.

It is apparent that scavenging will be considerably affected by back pressure built up in the exhaust passage. Accordingly, mufflers and long exhaust passages which have an undesirable effect on scavenging by reason of the build up of back pressure are to be avoided.

Another factor affecting engine performance relates to mechanical losses, a very large portion of which arises from the friction of the piston and rings. This is attributable to the large area of the surfaces in contact, the high velocities between the surfaces, and from the fact that lubrication conditions are relatively poor.

In order to keep engine friction within reasonable limits it is desirable to use oils with the lowest viscosity possible without encountering excessive ring and cylinder wear or excessive oil consumption. In two cycle engines where piston loads and temperatures are not high, satisfactory lubrication of the piston and rings may be had with a low viscosity lubricant. Therefore, in two cycle engines with crankcase scavenging it has been common practice to mix a small proportion of low viscosity oil with the fuel to lubricate the pistons and rings.

With this method of lubrication oil vapor is passed with the vaporized fuel into the crankcase to secure an oil film deposit on the cylinder walls for lubrication purposes, and the oil vapor which passes into the combustion chamber with the vaporized fuel is either burned completely and blown as a gas out the exhaust passage or burned incompletely and deposited as carbon on the walls of the cylinder or in the exhaust passage or port.

During the firing of any engine the oil on the cylinder walls is exposed to extremely high temperatures and a certain part of this oil ignites, is burned and passes out the exhaust. This incomplete burning leaves parti-

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cles of carbon and gum deposits on the cylinder walls and is encountered in the operation of both conventional four cycle engines and two cycle engines. Engines running at high temperatures may burn away some of the carbon which tends to deposit on the cylinder walls, but the building up of carbonaceous deposits in the exhaust passage, blocking the exhaust port, and in the ring grooves (piston ring gumming) cannot be entirely prevented. In addition to this condition, however, an excessive build up of carbon deposits in the cylinder resulting in choking the exhaust port is a major problem with two cycle engines which have piston and piston ring lubrication by oil mixed with the fuel.

Another effect of mixing oil with the fuel is that the higher viscosity oil holds in suspension larger particles of grit or foreign matter than would be held in suspension in the lower viscosity gasoline. Such material in suspension in the fuel and passing into the combustion chamber may cause additional deposits on the cylinder walls, spark plugs and head of the piston and also may, incidentally, promote corrosion of these parts.

This invention is used in connection with the exhaust system of a two cycle engine which utilizes crankcase scavenging and which is adapted to permit piston cylinder lubrication by oil mixed with the fuel.

A large exhaust port is required for proper scavenging and improved engine performance by reducing the time of the "blow-down" process. This exhaust port is usually located in the wall of the cylinder adjacent the base and in the flow of air passing over the engine so that exhaust gases may be carried away from the end of the exhaust pipe and to permit proper cooling.

It is an object of this invention to provide such an exhaust system with an extremely short exhaust pipe and also to provide a muffler arranged on the end of the exhaust pipe so constructed as to minimize the effect of back pressure build up.

Since the accumulation of carbon and also the deposit of solid particles or of gumming carbonaceous deposits in the exhaust passage decreases the area of the passage, there results a tendency to choke the passage thereby affecting back pressure of the exhaust and decreasing scavenging efficiency. In addition any choking of the exhaust port affects detrimentally the dynamics of the system with a corresponding reduction in scavenging efficiency. This is very noticeable in the operation of two cycle engines which are particularly sensitive to this condition by reason of the burning in the combustion chamber of oil vapor during each cycle of engine operation.

It is desirable in the maintenance of such engines that this carbon deposit, as well as the deposit of gum and solid particles, be removed periodically and conventional practice is to disassemble the engine, remove the piston, and scrape the exhaust passages with a blunt tool. Periodic overhauling for proper maintenance also includes the scraping of the cylinder walls and the head of the piston to remove accumulations of foreign material.

It is very noticeable when the exhaust port of a two cycle engine begins to choke with carbon because the engine loses much of its normal power. On most engines it is possible but only with considerable difficulty, to loosen the bolts connecting the exhaust system to the cylinder head and remove the exhaust pipe so as to permit cleaning of the exhaust port walls and of the exhaust pipe itself.

Therefore, this invention has as a further object the provision of a manifold assembly which enables the operator to conveniently and quickly gain access to the exhaust ports for cleaning purposes. More particularly it is an object of this invention to provide in combination with the exhaust port flange of a two cycle engine, an

adapter plate arranged on the flange and provided with an exhaust passage, and a muffler attached to said plate and fastened thereto by a clip.

In accordance with our invention we provide an adapter plate which is bolted to the exhaust port flange and which is provided with an exhaust passage communicating with the exhaust port. The outer rim of the plate is provided with a seat to receive the muffler and arranged co-operatively on the muffler and on the plate there is a clip for securely fastening the muffler to the plate.

Further in accordance with this invention the muffler is constructed of a chamber with outlet openings in one wall and with another wall arranged as a baffle positioned transversely to the axis of the exhaust passage at an angle to deflect the gases into the chamber around which the gases swirl prior to exit through the openings.

Further objects will become apparent from the following description taken in connection with the accompanying drawings wherein:

Fig. 1 is a view in elevation of the muffler of this invention mounted on a two cycle engine cylinder;

Fig. 2 is a view in section of the muffler and cylinder taken on lines 2—2 of Fig. 1;

Fig. 3 is a detail sectional view taken on lines 3—3 of Fig. 1;

Fig. 4 is a section taken on lines 4—4 of Fig. 2, showing the muffler assembly from the rear;

Fig. 5 is an exploded view of the muffler and mounting plate.

The muffler shown in Figs. 1 through 5 is supported on a cylinder casting 10 of a two cycle engine which has all functional parts including a piston 11, connecting rod 12, and spark plug 13. The cylinder casting 10 is provided with fins 14 for cooling, and has a combustion chamber 15 which communicates to atmosphere through exhaust port 16 and to the crank case through by-pass port 17. To provide a support for a muffler assembly, the cylinder casting 10 has an exhaust flange 18 substantially rectangular in form and with threaded openings to receive bolts for mounting the muffler assembly in place.

The muffler of this invention comprises a plate 22 adapted to be mounted on the exhaust port flange 18 by means of bolts 19, 20. The plate 22 is constructed of a substantially flat stamped piece with an offset portion 23 forming a bracket and provided with openings 24, 25 through which the bolts pass to secure the plate on the cylinder casting. In the offset portion 23 there is an opening 26 which registers or communicates with the exhaust port 16 to receive the exhaust gases from the combustion chamber of the cylinder.

Opposite sides 27, 28 of the plate 22 are arranged substantially parallel and are bent back over the top of the plate to make a narrow lip 29, 30. To securely fasten the plate 22 to the cylinder casting a lug 35 is riveted on the lower end of the plate which lug has an opening 36 receiving a bolt 37 which is threaded into the cylinder casting.

Mounted on the plate 22 is the dished muffler cover 21 which forms with the plate 22 the muffler cavity. The muffler cover 21 is shaped to correspond generally in outward dimensions with the plate 22 and has an outer wall 40 opposite opening 26 in the plate arranged obliquely to said opening so as to deflect gases entering the muffler cavity. The lower side 41 of the muffler cover lies against a rim 42 standing at right angles to the plate 22 sealing the muffler cavity against leakage. The rim 42 extends partially along one side 43 of the plate and the corresponding side wall of the muffler cover 21 extends substantially at right angles to the plate to fit against the rim.

To enable the cover 21 to be mounted on plate 22, along opposite sides there are formed flanges 45, 46 which slip beneath the lips 29, 30 on the plate. On the upper side of the muffler cover 21 and extending partially around one side is a bead 47 lying under the edge of the plate 22. The bead abuts against the underside of the plate and

forms a seal preventing the escape of exhaust gases from the muffler cavity.

In the upper sloping portion of the outer wall of the muffler cover 21 there are provided a plurality of parallel slots 50 with louvers 51 angularly arranged to deflect the exhaust gases emitted from the slots.

Also fastened on the underside of the plate 22 is a spring clip 53 which serves to retain the muffler cover in place seated on the plate. The spring clip 53 is fastened by means of rivets 54 and may be bent away from the plate by applying pressure against the arm 55.

In the exploded view of Fig. 5 muffler cover 21 is shown slid away from plate 22. It may readily be observed that the lips 29, 30 on the plate are arranged to fit over the flanges 45, 46 on the muffler cover and securely lock the muffler cover in place to form the muffler cavity. The rim 42 at the lower end of the plate 22 which extends partially around one side 43 of the plate serves the function of sealing the muffler cavity by snugly fitting against the companion side walls of the cover and also seats the cover as it is slid into place on the plate.

An important feature of the present invention resides in the fact that the muffler cover 21 may be quickly removed from the plate 22, providing easy access to the exhaust port 16. In the maintenance of two cycle engines it is frequently necessary to clean this exhaust port and also to scrape carbon from the top of piston 11 and around the lower end of spark plug 13. After removing the cover 21 a tool may be inserted for scraping the exhaust port 16 which may also be manipulated to scrape the top of the piston 11 and portions of the combustion chamber which have accumulated carbon deposits. The muffler cover can then be slid back into place on the plate and is permanently mounted without danger of becoming loosened from engine vibration or as a result of being accidentally jarred.

The exhaust gases from the exhaust port 16 are deflected by the obliquely arranged outer wall 40 and whirl across the muffler cavity to be forced through the slots and past the louvers in the muffler cover. The louvers may be arranged to deflect the gases in any desired direction without materially affecting the performance characteristics of the muffler.

Particular attention is directed to the fact the muffler cavity is of substantial size, as is the exhaust port 16, to reduce back pressure so as not to unduly affect the dynamics of the exhaust system.

The invention has been described with reference to particular preferred embodiments and it is understood the details are merely illustrative and that the invention may be carried out in other ways without departing from the true spirit and scope of the appended claims.

We claim:

1. A muffler for the exhaust port of a cylinder of an internal combustion engine, said cylinder being provided with an exhaust port flange, comprising a plate carried on the engine cylinder, said plate having an offset portion forming a bracket for mounting the plate on the exhaust port flange, with an opening in said portion communicating with the exhaust port, said plate having substantially parallel sides bent over to provide parallel lips, and a dished muffler cover adapted to be supported on the plate to form a muffler cavity, having substantially parallel sides formed with narrow flanges to slip under the lips of the plate and slidably fasten the cover thereto, whereby the cover may be removed providing easy access to the exhaust port.

2. A muffler for the exhaust port of the cylinder of an internal combustion engine, comprising a plate mounted on the engine cylinder and formed with an opening communicating with the exhaust port, said plate having substantially parallel sides each having a lip bent over to make a narrow track, and a dished muffler cover formed with an outer wall spaced from the opening in the plate and obliquely arranged to deflect gases entering the

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muffler cover, and slots in said outer wall to permit the gases to exhaust from the muffler cover, said cover having substantially parallel sides formed with narrow flanges to slip under the lips on each side of the plate and fasten the cover thereto, whereby the cover may be removed providing easy access to the exhaust port.

3. A muffler for the exhaust port of an internal combustion engine comprising a plate adapted to be mounted upon an internal combustion engine and having an exhaust inlet for communicating with said exhaust port, a dish cover being detachably mounted upon said plate and having an outer wall equipped with an exhaust outlet, said outer wall being inclined away from said plate to define a tapered muffler chamber of increasing cross-sectional area from said inlet to said outlet, said plate

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having substantially parallel sides turned inwardly to provide lips, said cover having substantially parallel sides formed with narrow flanges adapted to slip under the lips of the plate for slidably and detachably securing the cover thereto, whereby, the cover may be easily removed to provide access to the exhaust port of the internal combustion engine.

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