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DEVICE FOR SAVING FUEL AND REDUCING EMISSIONS

TECHNICAL FIELD

This invention relates to a device for saving fuel in combustion
5 engines and reducing emissions, e.g. gaseous emissions to the atmosphere.

BACKGROUND ART

This invention relates particularly but not exclusively to a device
for saving fuel and reducing emissions for use on internal combustion
10 engines, e.g., normally aspirated engines and engines with fuel injectors. It
will therefore be convenient to describe the invention with reference to these
example applications.

However, it is to be clearly understood that the invention is
capable of broader application.

15 For example, the invention can be applied to any combustion
engine and not just motor vehicle engines.

Incomplete combustion of liquid fuels increases the cost of
running engines. Further unburned fuel e.g. hydrocarbons are vented to the
atmosphere through the exhaust and are generally harmful to the
20 atmosphere.

Some of the gases emitted into the atmosphere include carbon
monoxide, various nitrogen oxides, and unburned hydrocarbons.

Naturally therefore any device which acted to decrease fuel
consumption and thereby lower the running costs of a vehicle as well as
25 lowering the pollution released to the atmosphere would be a major advance
in the art and would be most advantageous to society generally.

DISCLOSURE OF INVENTION

According to one aspect of this invention there is provided a fuel
30 saving device comprising: a) a support body having: an opening therein having a
longitudinal axis and a radial dimension and defining an air/fuel flow pathway, the
longitudinal axis of the opening being co-axial with the flow pathway within an



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air/fuel environment; and b) a plurality of magnets spaced about the periphery of the opening, in opposing-pair configuration, and arranged to provide a plurality of north-south pole pairs extending substantially parallel to the flow pathway, with an even number of magnets arranged with the poles of adjacent magnets reversed relative to each other, the plurality of magnets positioned to provide multiple overlapping and interacting fields of magnetic force across the opening and in the air/fuel flow pathway.

The device is thus able to apply a magnetic force to a mixture of fuel droplets in air which is used to energise an engine prior to its introduction to the engine, the magnets being located intermediate fuel/air mixing means and a manifold leading to the engine.

The magnets apply a force to the droplets causing the droplets to be reduced in size which in turn leads to more complete combustion and less pollution.

Large droplets above a predetermined size tend to be susceptible to incomplete combustion.

Typically the engine to which this engine is applied is a normally aspirated engine, e.g. a petrol internal combustion engine, and the device is located between the carburettor and a common inlet manifold leading to the cylinders.

Alternatively, the engine may have fuel injection with the device being positioned upstream of the fuel injectors.

In one form the device may be associated with a fuel rail. In another form, the device may be positioned intermediate the fuel rail and the injectors.

The support is, for example, a spacer, and is coupled in series with the rest of the fuel line.

Typically, the magnets are permanent magnets mounted on the support.

In a preferred form, there are an even number of magnets mounted on the support with the poles of the magnets reversed relative to each other.

Preferably the device has at least four magnets with the poles of

adjacent magnets being reversed relative to each other.

In a preferred form, the N/S axis of the magnets is arranged broadly in the direction of the fuel/air passageway through the device, i.e. the axis is longitudinally arranged.

5 However, it is to be borne in mind that in some embodiments the N/S axis of the magnet may be transverse to the fuel/air passageway through the support.

Preferably, the magnets may be spaced apart from each other around the circumference of the fuel/air passageway.

10 However, it should also be borne in mind that the magnets may be axially spaced apart from each other, e.g. in the direction of the fuel/air passageway.

Advantageously, the magnets are powerful magnets, e.g. rare earth magnets.

15 Preferably the magnets are neodymium iron boron magnets and even more preferably specific grades of these magnets.

In a most preferred form an N-30 grade magnet supplied by A MAGNETIC FORCE based in Warriewood in New South Wales, Australia is used.

20 The rare earth magnets described above produce high strength magnetic fields. This enhances the magnetic force which is applied to the fuel droplets as they pass through the device. This enhances the breaking up or size reduction of the droplets as they pass through the device.

25 While neodymium iron boron magnets are particularly preferred, applicant believes that other magnets may also be used although they will not produce as effective a result, e.g. AlNiCo magnets.

30 Naturally, the size of the magnets will influence the strength of the magnetic field generated in the fuel air passageway. In one particular form, each magnet has a cross sectional surface area in the range of 20-50mm x 20-50mm. This will suffice to produce a suitable magnetic field in a fuel air passageway having a diameter of 22 mm to 40mm, preferably about 25mm or 38mm. The depth or thickness of the magnet will typically be 10-

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30mm, the actual depth being influenced by the thickness of the spacer in which the magnet is received. It will be appreciated however that the size of the magnets can vary.

5 The support body can be disc-like and provided with a plurality of apertures therein to facilitate the fixture of the body in a fuel/air line leading to a combustion chamber of an internal combustion engine line.

Suitably the support body can be provided with top and bottom cover plates which secure the magnets against displacement via top and bottom surfaces of the support body.

10 The magnets can be secured to the support body by key slots of a complimentary shape.

An even number of magnets, in total, can be provided with the poles of pairs of the magnets reversed relative to each other.

15 The device can have four magnets spaced substantially equidistantly about the circumference of a circular opening in the support body, arranged at approximately 90° apart from each other.

The device can include six magnets spaced substantially equidistantly about the circumference of a substantially oval shaped opening in the support body.

20 According to a further aspect of the present invention there is provided a fuel saving system for an internal combustion engine comprising a single or double throat carburettor and a fuel saving device as aforesaid positioned between the carburettor and an inlet to a combustion chamber of the engine.

25 According to a still further aspect of the present invention there is provided a fuel system for an internal combustion engine comprising a single or double throat carburettor and a fuel saving device as aforesaid positioned between the carburettor and a common inlet to the combustion chamber of an engine.

30 According to a still further aspect of the present invention there is provided a fuel system for a combustion engine comprising a single or multiport fuel injection system and at least one fuel saving device as aforesaid

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positioned between the fuel injection fuel rail and the injectors.

According to a still further aspect of the present invention there is provided a fuel system for a combustion engine including a fuel saving device as aforesaid mounted at an inlet to the combustion chamber(s) of the engine.

According to another aspect of the present invention there is provided an emissions reducing installation comprising a device as aforesaid associated with the exhaust system of a combustion engine.

According to again another aspect of the invention, there is provided a method of improving the fuel economy and emission outputs of a combustion engine, the method including the step of interposing a fuel saving device as aforesaid in line with the carburetor and common inlet manifold of an internal combustion engine, such that a fuel mixture passes through the opening in the fuel saving device.

According to yet another aspect of the invention, there is provided a method of saving fuel and reducing emissions including mounting a fuel saving device as aforesaid on a centre point injector system, fitted intermediate a fuel injection fuel rail and an injector, such that a fuel mixture passes through the opening in the fuel saving device.

A fuel saving and emission reducing device in accordance with this invention may manifest itself in a variety of forms. It will be convenient to hereinafter describe in detail several preferred embodiments of the invention with reference to the accompanying drawings. The purpose of providing this detailed description is to enable persons having an interest in the subject matter of the invention how to carry the invention into practical effect. It is to be clearly understood that the specific nature of this description does not supercede the generality of the preceding statements.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a three dimensional view of a device in accordance with a first embodiment of the invention;

Fig. 2 is a plan view of the device of Fig. 1;

Fig. 3 is a schematic drawing showing the North-South

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orientation of the magnets in the device of Fig. 1;

Fig. 4 shows a plan view of a device in accordance with a second embodiment of the invention;

Fig. 5 is a three dimensional view of a device in accordance with yet another embodiment of the invention;

Fig. 6 is a schematic plan view of a device in accordance with another embodiment of the invention;

Fig. 7 is a schematic plan view of a variation of the device of Fig. 10; and

Fig. 8 is a schematic plan view of a device in accordance with yet another embodiment of the invention, and

Figures 9 to 11 illustrate examples of installation sites for the device of the present invention in typical motor vehicle engine fuel systems.

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DESCRIPTION

In Figs. 1 to 3 reference numeral 1 refers generally to a fuel saving and emission control device in accordance with the invention.

Broadly, the device 1 comprises a support 2 in the form of a flattened rectangular block defining a fuel/air passageway 3 therethrough.

A plurality of permanent magnets 4 are arranged around the circumference of the passageway 3

Fig. 1 shows recesses or apertures without magnets fitted or inserted for clarity.

Each magnet is a neodymium iron boron magnet. These are recently developed high power permanent magnets.

The specifications of these magnets are available from the Australian based supplier mentioned earlier.

The arrangement of the North-South Poles of the magnets 4 are shown in Fig. 3.

The polar axes are arranged generally in the direction of the air/fuel passageway.

Adjacent magnets have opposed N-S orientations as shown in

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the drawings.

In use the support 2 is coupled in line with the carburettor and common inlet manifold of an internal combustion engine such that the fuel air mixture passes through the passageway 3 therein.

5 This exposes fuel droplets passing from the carburettor to the manifold to the magnetic field of the magnets causing the droplets to reduce in size.

This leads to more complete combustion when the fuel enters the cylinder causing lower fuel consumption and less exhaust gas pollution.

10 Without being bound by theory, applicant believes that the magnetic forces applied to the fuel droplets by the magnetic fields of the various magnets acts to substantially reduce the size of the droplets.

The applicant believes that the strong magnetic fields break down the size of the droplets and that the droplets may be reduced in size to
15 as low as 3 micron diameter.

As a result, the fuel droplets have a substantially greater surface area in contact with the air and the subsequent combustion reaction in the cylinder is more complete and more efficient.

It is closer to a complete burn where all the hydrocarbons react
20 with oxygen.

Experiments conducted by the applicant show that the device does reduce substantially the number of large droplets of fuel passing into the cylinder.

Experiments have also shown that the use of the device leads to
25 reduced fuel consumption.

Experiments also show that some forms of the device substantially reduce CO, CO₂ and NO_x emission levels.

While the fuel consumption savings have been emphasised the reduction in emissions are also significant and important.

30 The applicant has achieved fuel savings of up to 63% with a preferred device according to the invention on a four cylinder petrol engine.

Fig. 4 illustrates a device in accordance with a second possible

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embodiment of the present invention.

The device is structurally and functionally very similar to that in Fig. 3 and unless otherwise indicated the same reference numerals are used to refer to the same components.

5 The device is used on a vehicle with a twin throat carburettor. This explains why it has an elongate oval passage of substantially greater cross sectional surface area than the Fig. 1 embodiment.

 Another structural difference between this device and the Fig. 1 device is the six magnets arranged around the circumference of the
10 passageway.

 This provides a magnetic field across the larger cross sectional surface area of the passageway comparable to that of the four magnets of the Fig. 1 device.

 In the case of the devices illustrated by figures 1 to 4 fixture
15 apertures 2a of various shapes and in various positions can be provided in the supports 2.

 Top and bottom cover plates (not shown) can be provided to secure the magnets against displacement via the top and bottom surfaces of the body 2.

20 Fig. 5 illustrates yet another embodiment.

 The Fig. 5 embodiment has a plurality of layers of magnets 4 which are longitudinally spaced from each other. In a layer, the magnets 4 are arranged with their North-South axes transverse to the fuel/air passageway 3. In the previous embodiments the North-South axes were parallel to the fuel air
25 passageway. In essence a plurality of magnets 4 are arranged head to toe around the circumference of the passageway with small spacings between adjacent magnets. The poles of adjacent magnets in a layer are opposed, i. e. the North Pole of one magnet is adjacent the South Pole of the adjacent magnet.

 Each layer comprises a plurality of magnets, e.g. two magnets 4,
30 arranged relative to each other as with the previous embodiment.

 The magnets are received within a sleeve 5, e.g. of copper, aluminium, steel or other material having slots 6 defined therein. The sleeve 5 is then passed into a housing (not shown) which is mounted inline with a fuel

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line.

The housing typically has flanged ends (not shown) for attaching it to the adjacent components. The sleeves 5 and magnet 4 are sized to be received within the housing with a small clearance.

5 Figs. 6 to 8 illustrate a fuel saving device for use on a fuel injection system as distinct from a carburettor system.

Fig. 6 illustrates a device mounted on a centre point injector system. More specifically, the device is fitted intermediate the fuel injection fuel rail and the injector.

10 A device will typically be installed for each injector.

The fuel saving device is only illustrated schematically in the drawings.

The structure and function thereof however is similar to that described above with reference to anyone of Figs. 1 to 4.

15 Fig. 7 illustrates a device which is incorporated into the injector fuel rail.

The device comprises a plurality of magnets 4 spaced apart around the periphery of the fuel rail as shown in the drawings.

20 With this embodiment, a single device serves all injectors. By contrast with the Fig. 6 embodiment, there is a separate device for each injector.

Fig. 8 illustrates a fuel saving device which is mounted in the head, e.g. of the cylinder, adjacent the inlet.

25 The fuel saving device will be mounted in each of the cylinders to achieve the fuel saving and emission reduction effect therein.

While the illustrated device has six magnets, this number is not essential. It might equally have two or four magnets.

30 Where the device is fitted to a head the device may be fitted to a round or square support which receives square or round magnets, and the support may provide an internally threaded mounting for receiving and securing a fuel injector valve. Alternatively similar arrangements may be built into head cylinders when engines are manufactured.

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Figures 9 to 11 of the drawings indicate specific installation sites for the device of the present invention.

In figure 9 in an electronic fuel system the device can be inserted in either of the positions "X" being at the opening to a combustion chamber adjacent an injector 7 and/or in the air line 8 preceding the injector 7.

In figure 10 a typical mechanical injection system the device can be positioned at sites "X" to either side of the injector 7.

In figure 11 being that of a typical inlet manifold 9 of a four-cylinder engine the device can be interposed at site "X" between the carburetor 10 and common inlet of the manifold 11.

Applicant has found its fuel saving and emission device to be highly effective.

A particular advantage of the device is that it is of relatively simple structure, can easily be manufactured, and can be retrofitted to existing motor vehicles.

The device is most effective on carburettor and centrepont injection systems, however it does have application to other systems such as fuel injection systems.

The device can be used on the exhaust of a diesel engine where it has been found to reduce exhaust emissions, e.g. including black smoke.

The following is a typical example of comparative emission levels from recent tests on combustion engines showing levels of emissions with and without a device of the present invention installed in a fuel system.

LEVEL		RPM	%
CO	COLD ENGINE WITHOUT DEVICE FITTED	840	1.2
CO2		840	3.2
O2		840	13.8
HC		840	200PPM
CO	HOT ENGINE WITHOUT DEVICE FITTED	860	2.3
CO2		860	3
O2		860	13.8

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HC		860	200PPM
CO		780	0.1
CO2	WARM ENGINE	780	3.4
O2	WITH DEVICE FITTED	780	15
HC		780	80PPM
CO		1440	0.1
CO2		1440	3.9
O2		1440	14
HC		1440	40PPM
CO		1430	0.1
CO2		1430	4.1
O2		1430	14
HC		1430	20PPM
CO		1410	0.1
CO2		1410	4
O2		1410	14
HC		1410	20PPM
CO		890	0
CO2		890	0.4
O2		890	20.1
HC		890	60PPM
CO		890	0
CO2		890	0.3
O2		890	20.2
HC		890	60PPM
CO		890	0
CO2		890	0.8
O2		890	20.3
HC		890	40PPM
CO		890	0
CO2	HOT ENGINE	890	0
O2	WITH DEVICE FITTED	890	20.5
HC		890	20PPM
CO	ENGINE STOPPED	810	0
CO2	AND	810	4.7
O2	RESTARTED	810	12.3
HC		810	140PPM

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It will of course be realised that the above has been given by way of illustrative examples of the invention and that all such modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the invention as defined in

5 the appended claims.

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CLAIMS:

1. A fuel saving device comprising:
 - 5 a) a support body having: an opening therein having a longitudinal axis and a radial dimension and defining an air/fuel flow pathway, the longitudinal axis of the opening being co-axial with the flow pathway within an air/fuel environment; and
 - 10 b) a plurality of magnets spaced about the periphery of the opening, in opposing-pair configuration, and arranged to provide a plurality of north-south pole pairs extending substantially parallel to the flow pathway, with an even number of magnets arranged with the poles of adjacent magnets reversed relative to each other, the plurality of magnets positioned to provide multiple overlapping and interacting fields of magnetic force across the opening and in the air/fuel flow pathway.
- 15 2. A device according to claim 1, wherein the fuel saving device includes at least 4 magnets.
- 20 3. A device according to claim 1 or 2, wherein the opening is substantially circular.
4. A device according to claim 1 or 2, wherein the opening is substantially oval.
- 25 5. A device according to claim 3 or 4, wherein the opening extends as a passageway in the body, the passageway being the same shape as the opening.
6. A device according to any one of the preceding claims, wherein the plurality of north-south pole pairs are provided by magnets arranged with their
30 polar axes orientated substantially parallel to the flow pathway.
7. A device according to any one of the preceding claims, wherein the magnets are arranged in layers spaced from each other in a direction substantially parallel to the flow pathway, with the plurality of north-south pole

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pairs provided by the poles of the magnets in one layer and opposing poles of opposing magnets in an adjacent layer.

8. A device according to claim 2, wherein the opening has a periphery and the magnets are keyed into the periphery, each magnet having a magnetic face which extends to and is directly communicable with the opening.

9. A device as claimed in claim 2, wherein the body is provided with a plurality of apertures therein to facilitate the fixture of the body in a fuel/air line leading to a combustion chamber of an internal combustion engine.

10. A device as claimed in claim 2, wherein the body is provided with top and bottom cover plates which secure the magnets against displacement via top and bottom surfaces of the body.

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11. A device as claimed in claim 2, wherein there are an even number of magnets, in total, with the polar axes of all adjacent magnets reversed relative to each other.

12. A device as claimed in claim 2, wherein the device has four magnets spaced substantially equidistantly about the circumference of the opening in the body, arranged at approximately 90° apart from each other.

13. A device as claimed in claim 4, wherein the device includes six magnets spaced substantially equidistantly about the circumference of the opening in the body.

14. A fuel saving system for an internal combustion engine comprising a single or double throat carburettor and a fuel saving device as claimed in any one of the preceding claims positioned between the carburettor and an inlet to a combustion chamber of the engine.

15. A fuel system for an internal combustion engine comprising a single or double throat carburettor and a fuel saving device as claimed in any one of

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claims 1 to 13 positioned between the carburettor and a common inlet to the combustion chamber of an engine.

16. A fuel system for a combustion engine comprising a single or multiport fuel
5 injection system and at least one fuel saving device as claimed in any one of claims 1 to 13 positioned between the fuel injection fuel rail and the injectors.

17. A fuel system for a combustion engine including a fuel saving device
10 according to any one of claims 1 to 13 mounted at the inlet of the combustion chamber(s) of the engine.

18. An emissions reducing installation comprising a device according to any
one of claims 1 to 13 associated with the exhaust system of a combustion
15 engine.

19. A method of improving the fuel economy and emission outputs of a
combustion engine, the method including the step of interposing a fuel saving
device, which device is as defined according to any one of claims 1 to 13, in line
with the carburetor and common inlet manifold of an internal combustion engine,
20 such that a fuel mixture passes through the opening in the fuel saving device.

20. A method of saving fuel and reducing emissions including mounting a fuel
saving device, which device is as defined according to any one of claims 1 to 13,
on a centre point injector system, fitted intermediate a fuel injection fuel rail and
25 an injector, such that a fuel mixture passes through the opening in the fuel saving device.