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COMPLETE SPECIFICATION.

Improvements in or relating to a Fuel Supply Unit for Internal-Combustion Engines.

I, FRANK METCALF ASPIN, a British Subject, of "Westray", Horseshoe Lane, Alderley Edge, Cheshire, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to improvements in internal combustion engines and in particular to small compact engine units.

For certain purposes, such as, for example, driving chain saws and outboard units for boats, it is desirable to provide a small size internal combustion engine which may be adjusted with the driven unit to varying angles relative to a normal position. In this way the necessity of providing intermediate gearing between the engine and the driven unit, other than speed reduction gearing, is dispensed with.

When utilising such a construction, it is necessary to provide a means for keeping the carburettor in a vertical position to provide proper metering of the fuel and also to provide a fuel tank from which there is no fear of the fuel escaping whatever the angular position may be at which the engine is disposed and this is most conveniently effected by keeping the tank in a substantially level position for all engine positions and having a carburettor attached integrally thereto, so that there need be no intermediate piping between the tank and the said carburettor.

It has already been proposed to mount a combined tank and carburettor unit so that it is angularly adjustable relative to an engine to provide a means for keeping the tank and carburettor unit upright for different engine positions by simple rotation of the combined unit about its support. In the previous known constructions using an angularly adjustable tank and carburettor unit difficulty has arisen from the leakage of air into the induction system of the engine between the carburettor and the induction pipe or manifold and it is the principle object of the present invention to overcome this disadvantage.

According to the present invention a fuel supply unit for an internal combustion engine requiring carburetted liquid fuel comprises an induction tube adapted to be rigidly attached to the engine, a carrier member rotatably mounted on said induction tube, the said carrier member and tube having complementary bearing and gas-sealing surfaces, and means for restraining rotation when not required, and the carrier member having mounting formations for the rigid attachment thereto of a fuel tank and a carburettor.

Preferably the induction tube is provided with a thick end flange having spring-loaded members, such as steel balls disposed in apertures in its rear face and the combined carburettor and fuel tank unit is mounted on a carrier member having a complementary housing riding concentrically on said flange and provided with a retaining plate for the spring-loaded balls. The sealing is effected between the front face of the end flange and the corresponding surface inside the housing, the two sealing faces being urged towards each other by the spring-loaded balls.

The retaining plate is formed with a number of circularly disposed evenly spaced apertures which are adapted to register in turn with said spring loaded members, but are of such a size that a sufficient rotational force applied to the tank will cause the locking balls to be disengaged from their apertures and the tank rotated as far as may be desirable into another position of ball and aperture engagement.

In order that the invention may be more clearly understood one form of the invention

will be described hereinafter with particular reference to an engine intended for the propulsion of a portable chain saw.

For the chain saw to have the full versatility that is desirable, it must be possible to cut upwards, downwards, horizontally and at any inclined angle as when notching a tree to start the main cut in felling. In the early efforts made to achieve this end, complex gearing was provided to allow the chain blade to be rotated relative to the engine. It has since been realised that the use of a dry sump petroil two-stroke engine will obviate such gearing, so that the saw blade drive is connected to the engine and no allowance is made for any angular adjustment of the saw relative to the engine with consequent great saving in cost of manufacture.

As already explained however, it is necessary to provide means for keeping the petrol tank and carburettor in a substantially fixed position relative to the vertical to obtain satisfactory running of the engine.

In the accompanying drawings:

Figure 1 is a part-sectional end view showing one example of a fuel supply unit;

Figure 2 is a part-sectional side elevation of the unit shown in Figure 1;

Figure 3 is a part-sectional side elevation showing a modified construction of the unit shown in Figure 1.

As shown in the drawings there is provided an induction tube *a* fixed to the rear end of the engine and has a thick flange *b* at its outer end, in which are formed a number of parallel recesses facing towards the engine serving to locate compression springs *c* pressing against steel balls *d*. The outer end face of the flange forms one sealing surface which is adapted to form a seal with a co-operating surface of a socket in a carrier member *e* mounted rotatably on the flange *b*. The carrier member *e* has a tubular extension *f* coaxial with the induction tube, adapted to receive the carburettor *g* while the back face of the carrier is adapted to have the mounting lug *h* of the tank h^1 bolted to it. Bolted to the opposite face of the carrier socket is a retaining plate *i* formed with a row of circularly disposed evenly spaced apertures i^1 adapted to register with the spring loaded steel balls and so define a number of angular positions that the tank and carburettor unit can take up relative to the engine. The cylindrical surface of the socket forms a bearing surface complementary to the cylindrical periphery of the flange.

The carrier member is so formed that the width of the bearing between it and the periphery of the flange is sufficiently long to ensure an easy rotation of the tank and carburettor unit. The wide bearing surface ensures that the two end sealing surfaces remain substantially parallel despite the fact that the centre of gravity of the tank and carburettor is not over the bearing surface, so that the bearing surface takes up the swivelling load of the carburettor and tank unit.

It will be appreciated that this method of mounting the carburettor and the fuel tank as one unit allows a very compact structure.

The float chamber *j* of the carburettor has a top inlet having a socket *k* at its upper end, complementary to an outlet nozzle *m* secured in the bottom of the tank. The socket is provided in known manner with a sealing gland. In the tank is a valve needle *n* carrying a spring n^1 and co-acting with a seating formed in the upper end of the nozzle passage. The upper end of the needle valve is bent over and is caused by the spring n^1 to bear on the tank surface which is so shaped that the valve in one position is open but when turned into another position is closed. The needle valve therefore acts as an "on-off" fuel valve. A throttle operating member *o* also extends up the side of the tank and is similarly placed in a convenient position for the operator.

In a modified construction as shown in Figure 3 the sealing and bearing surfaces are combined by having a tapered peripheral surface on the flange and a corresponding conical surface *p* in the interior of the carrier socket, the two surface being pressed into contact by means of the spring-loaded, steel balls as in the foregoing example.

What I claim is:—

1. A fuel supply unit for an internal combustion engine requiring carburetted liquid fuel comprising an induction tube adapted to be rigidly attached to the engine, a carrier member rotatably mounted on said induction tube, the said carrier member and tube having complementary bearing and gas-sealing surfaces, and means for restraining rotation when not required, and the carrier member having mounting formations for the rigid attachment thereto of a fuel tank and a carburettor.

2. A fuel supply unit according to Claim 1 further characterised in that the fuel supply connection between the tank and the carburettor comprises an outlet nozzle attached to the underside of the tank and a complementary axially-engageable socket attached to the fuel-inlet of the carburettor float chamber, gland sealing means being provided to seal said nozzle in the socket when engaged therewith.

3. A fuel supply unit according to Claim 2 further characterised in that the outlet nozzle is constructed to provide a seating for a valve member mounted in the tank.

4. A fuel supply unit according to any of the preceding claims characterised in that

the complementary bearing and gas-sealing surfaces comprise cylindrical bearing surfaces, separate axially-engageable gas-sealing surfaces and resilient means urging said gas-sealing surfaces into engagement.

5. A fuel supply unit according to any of the preceding Claims 1—3 characterised in that the induction tube and carrier member are formed with conical complementary surfaces of such angle as to form combined bearing and gas-sealing surfaces, in combination with resilient means urging said surfaces into engagement.

6. A fuel supply unit according to Claim 4 or 5 further characterised in that the resilient means for urging the complementary gas-sealing surfaces into engagement also load detent means for retaining the carrier in any of several alternative predetermined positions relative to the induction tube.

7. A fuel supply unit according to any of the preceding claims further characterised in that the induction tube is formed with a flange having a cylindrical periphery and an end-sealing surface, and axially directed recesses in its shoulder, and in that the carrier has a socket complementary to said flange, a retaining plate for the flange being attachable to the carrier, a spring and detent ball being located in each recess in such a manner, that the balls may engage complementary detent apertures in the retaining plate.

8. A fuel supply unit constructed substantially as herein described with reference to and as illustrated in Figures 1 and 2 or as modified according to Figure 3 of the accompanying drawings.

For the Applicant,
WILSON, GUNN & ELLIS,
Chartered Patent Agents,
54/56 Market Street,
Manchester 1.

PROVISIONAL SPECIFICATION.

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For certain purposes, such as, for example, driving chain saws and outboard units for boats, it is desirable to provide a small size internal combustion engine which may be adjusted with the driven unit to varying angles relative to a normal position. In this way the necessity of providing intermediate gearing between the engine and the driven unit, other than speed reduction gearing, is dispensed with.

When utilising such a construction, it is necessary to provide a means for keeping the carburettor in a vertical position to provide proper metering of the fuel and also to provide a fuel tank from which there is no fear of the fuel escaping whatever the angular position at which the engine is disposed and this is most conveniently effected by keeping the tank in a substantially vertical position in all engine positions and having a carburettor attached integrally thereto, so that there need be no intermediate piping between the tank and the said carburettor.

It has already been proposed to mount a combined tank and carburettor unit so that it is angularly adjustable relative to an engine to provide a means for keeping the tank and carburettor unit upright for different engine positions by simple rotation of the combined unit about its support. In the previous known constructions using an angularly adjustable tank and carburettor unit difficulty has arisen from the leakage of air into the induction system of the engine between the carburettor and the manifold and it is the principle object of the present invention to overcome this disadvantage.

According to the present invention a combined tank and carburettor unit is pivotally mounted on the induction manifold of the engine, said unit and said manifold being provided with co-operating sealing surfaces which are urged towards each other by resilient means to provide an effective seal between the two parts.

Preferably the induction manifold is provided with a thick end flange having spring-loaded members, such as steel balls disposed in apertures in its rear face and the combined carburettor and fuel tank unit is mounted on a second flange riding concentrically on said first flange and attached to a retaining plate for the spring loaded balls. The sealing is effected between the front face of the manifold end flange and the corresponding surface inside the tank unit flange, the two sealing faces being urged towards each other by the spring-loaded balls.

The retaining plate is formed with a

number of circularly disposed evenly spaced apertures which are adapted to register in turn with said spring-loaded members, but are of such a size that a sufficient rotational force applied to the tank will cause the locking balls to be disengaged from their apertures and the tank rotated as far as may be desirable into another position of ball and aperture engagement.

In order that the invention may be more clearly understood one form of the invention will be described hereinafter with particular reference to an engine intended for the propulsion of a portable chain saw.

For the chain saw to have the full versatility that is desirable, it must be possible to cut upwards, downwards, horizontally and at any inclined angle as when notching a tree to start the main cut in felling. In the early efforts made to achieve this end, complex gearing was provided to allow the chain blade to be rotated relative to the engine. It has since been realised that the use of a dry sump petroil 2-stroke engine will obviate such gearing, so that the saw blade drive is connected to the engine and no allowance is made for any angular adjustment of the saw relative to the engine with consequent great saving in cost of manufacture.

As already explained however, it is necessary to provide means for keeping the petrol tank and carburettor in a substantially fixed position relative to the vertical to obtain satisfactory running of the engine.

The induction manifold of the engine is provided as a tube fixed to the rear end of the engine and has a thick flange at its end, in which are formed a number of parallel recesses facing towards the engine serving to locate compression springs pressing against steel balls. The outer annular face of the flange forms one sealing surface which is adapted to form a seal with a co-operating surface on a second hollow flange mounted rotatably on the manifold flange. The second flange is connected to the carburettor and carries the carburettor and tank unit. Bolted to the second flange are retaining plates formed with a row of circularly disposed evenly spaced apertures adapted to register with the spring loaded steel balls and so define a number of angular positions that the tank and carburettor unit can take up relative to the engine.

The second flange is so formed that the width of the bearing between it and the periphery of the manifold flange is sufficiently long to ensure an easy rotation of the tank and carburettor unit. The wide bearing surface ensures that the two sealing surfaces remain substantially parallel despite the fact that the centre of gravity of the tank and carburettor is not over the bearing surface, so that the bearing surface takes up the swivelling load of the carburettor and tank unit.

It will be appreciated that this method of mounting the carburettor and the fuel tank as one unit allows a very compact structure. In the present construction the fuel may be switched off by means of a needle valve an extension of which extends upwardly through the tank structure and is conveniently placed for the operator. A spring-loaded throttle operating member also extends up the side of the tank and is similarly placed in a convenient position for the operator.

In a modified construction the sealing and bearing surfaces may be combined by making a tapered sealing surface on the periphery of the manifold flange and a corresponding conical surface on the interior of the tank and carburettor unit supporting flange, the two surfaces being pressed into contact by means of spring-loaded steel balls as in the foregoing example.

For the Applicant,
WILSON, GUNN & ELLIS,
Chartered Patent Agents,
54/56 Market Street,
Manchester 1.

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691,181 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

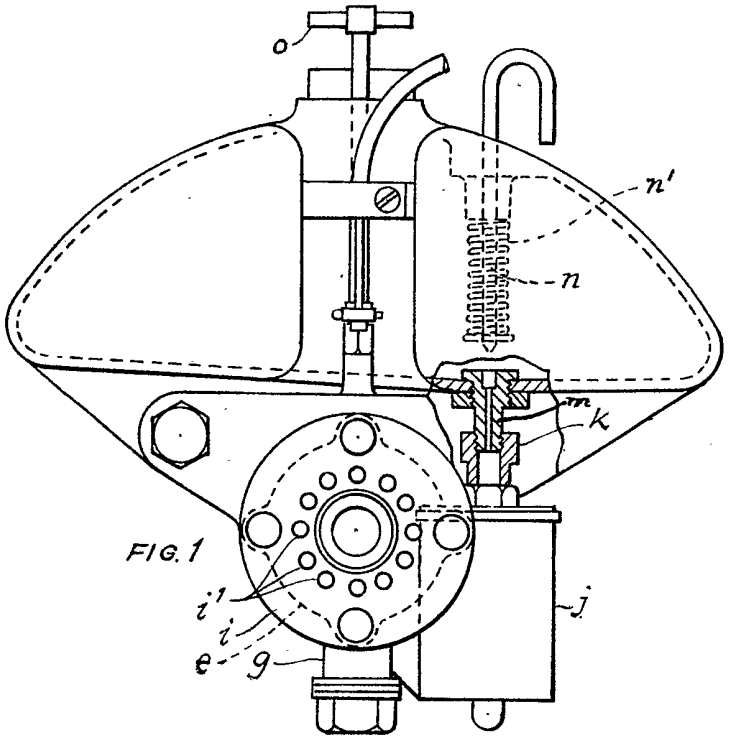

FIG. 1

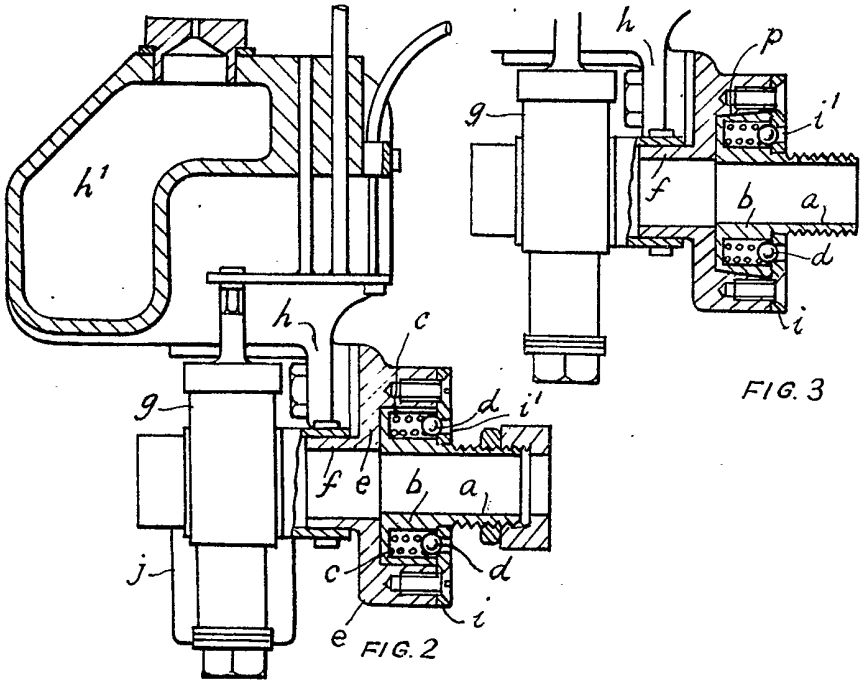

FIG. 2

FIG. 3