Nov. 15, 1927. 1,649,356

M. LOUIS

PUMP

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Fig. 1.

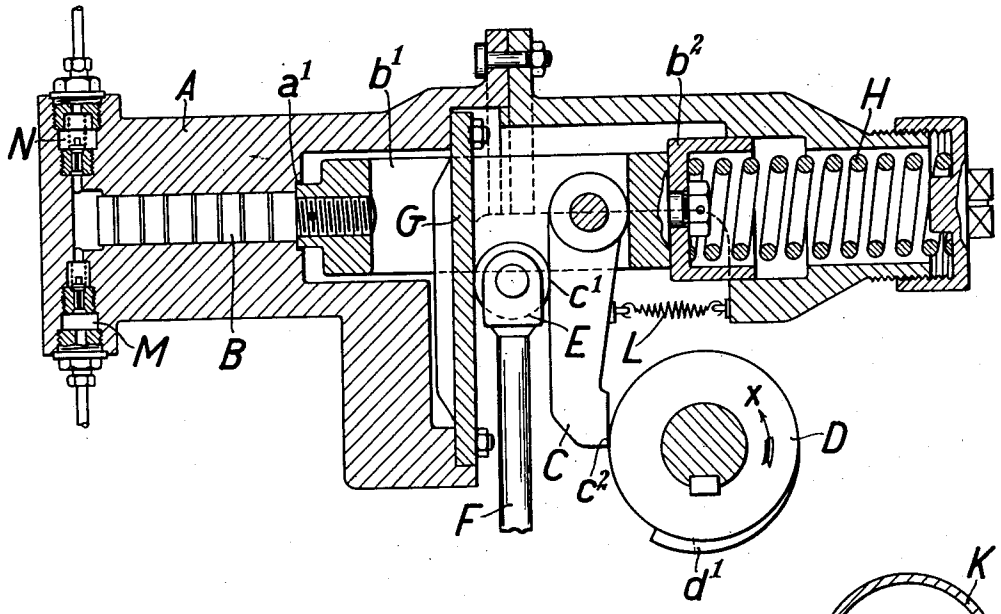
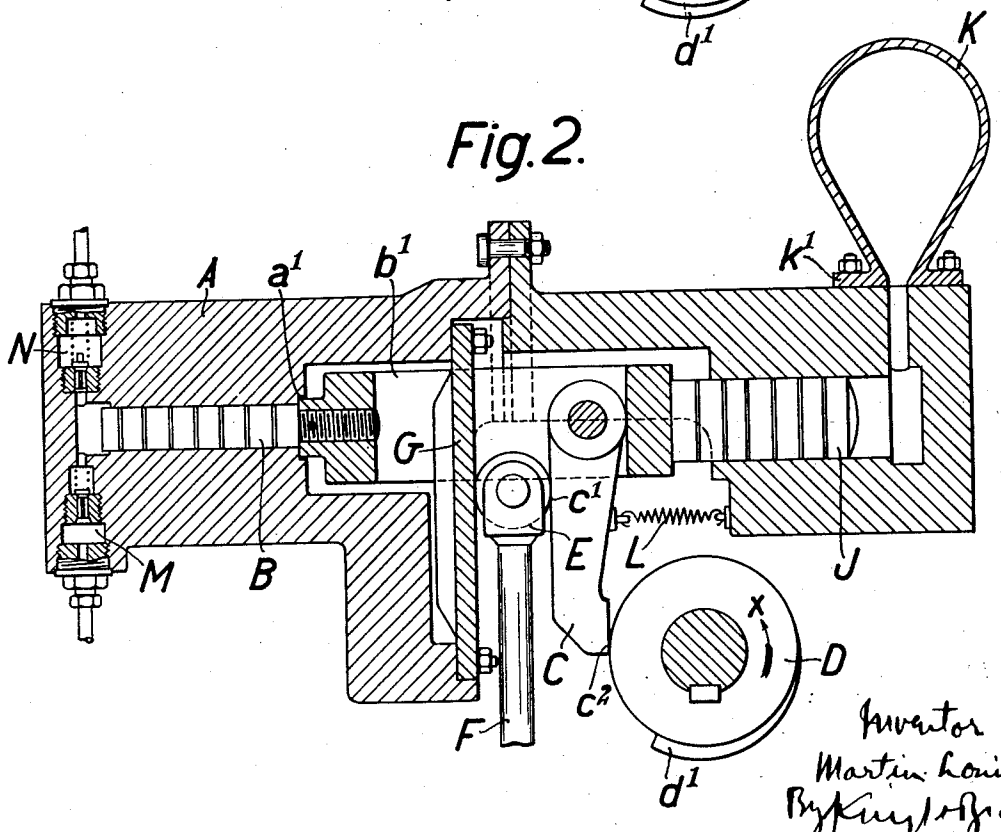


Fig. 2.



Inventor
Martin Louis
By Kingsland & Brown
Attys

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MARTIN LOUIS, OF KIEL, GERMANY, ASSIGNOR TO FRIED. KRUPP GERMANIAWERFT AKTIENGESELLSCHAFT, OF KIEL-GAARDEN, GERMANY.

PUMP.

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The invention relates to the control of the capacity of that type of fuel pumps for Diesel engines, in which the plunger is actuated during the suction stroke by means of a cam disk, whereas during the delivery stroke it is actuated by means of a spring.

Two embodiments of the subject-matter of the invention are illustrated by way of example in the accompanying drawing which forms part of this specification. In this drawing:

Fig. 1 is a longitudinal section through a pump forming the first example,

Fig. 2 is a similar section through a pump forming the second example.

The embodiment shown in Fig. 1 will be described first.

A denotes a pump casing in which a plunger B is adapted to reciprocate. The plunger has an extension b^1 which forms a frame and is acted upon by an actuating spring H abutting on a disk b^2 serving to guide said extension b^1 of the plunger. The casing A is provided with a cylindrical bore a^1 into which fits the correspondingly shaped end of the extension b^1. An arm C is linked to the extension b^1 and has its free end provided with a slide face c^2 which is pressed against a cam disk D by means of a spring L. In the casing A is provided a roller track G the slide surface of which extends in parallel with the opposite face of the arm C when the slide face c^2 abuts on the cylindrical portion of the cam disk D. Between the roller track G and the arm C is arranged a roller E which is adapted to be shifted by hand or by the governor of the engine through the intermediary of an actuating rod F. M denotes the suction valve and N the delivery valve of the pump.

Upon the cam disk D rotating in the direction of the arrow x, the face c^2 of arm C is lifted by the ascending cam d^1 of disk D and the arm C executes a rocking motion the fulcrum of which is the point c^1 where it is in contact with the roller E, and moves the plunger B to the right. During this suction stroke fuel enters through the valve M the cylinder of the pump. This movement lasts until the face c^2 suddenly glides off at the end of cam d^1. In this moment the spring H which had previously been compressed, is relaxed and shifts the plunger B to the left, this being the delivery stroke. The fuel is thereby delivered to the fuel valve (not shown) through valve N. The delivery stroke is limited by the cylindrical end of the portion b^1 striking on the bore a^1 of the casing A. As the air existing in the bore a^1 is hereby displaced, a shock damping effect is obtained. By altering the position of the roller E the ratio of transmission of arm C and thus the stroke and the volume delivered by the pump is altered.

The embodiment illustrated in Fig. 2 differs from that already described merely by an air cushion being provided for instead of spring H. To this end the portion b^1 carries a plunger J the cylinder of which is connected to an air vessel K by means of a flange k^1.

This arrangement is especially adapted to be used with multi-cylinder engines, in which the fuel pumps of all the cylinders may be lodged in a common casing. In this case the cylinders of the plungers J of all the pumps are preferably connected to a common air vessel K. It will further be preferable to fill the air vessel K with a liquid up to a level above the joint of flange k^1 as this joint is easier to be tightened for liquid than for air. Besides a small leakage of liquid will not interfere with the effect of the air vessel in a perceptible degree.

The regulation of the quantity of fuel to be delivered takes place in the same way as described in the embodiment described first.

Claims:

1. In a pump a cylinder, a piston adapted to reciprocate therein, an admission valve and a delivery valve on said cylinder, a cam disk and means for rotating it, a two-armed rocking lever, one arm of it co-operating with said cam disk and the other arm engaging said piston to move it in the direction of suction, means for displacing the fulcrum of said two-armed lever, and a power-accumulator adapted to act upon said piston in the direction of the pressure stroke.

2. In a pump a cylinder, a piston adapted to reciprocate therein, an admission valve and a delivery valve on said cylinder, a cam disk and means for rotating it, an extension on said piston, a lever linked to said extension and co-operating with said cam disk, a displaceable member in contact with said lever on a place located between its fulcrum and the face engaging said cam disk, and a power accumulator adapted to act upon said piston in the direction of the pressure stroke.

3. In a pump a cylinder, a piston adapted to reciprocate therein, an admission valve and a delivery valve on said cylinder, a cam disk and means for rotating it, an extension on said piston, a lever linked to said extension and co-operating with said cam disk, a displaceable roller in contact with said lever at a place located between its fulcrum and the face engaging said cam disk, an abutment for said roller opposite said lever, means for displacing said roller along said lever, and a power accumulator adapted to act upon said piston in the direction of the pressure stroke.

4. In a pump a cylinder, a piston adapted to reciprocate therein, an admission valve and a delivery valve on said cylinder, a cam disk and means for rotating it, an extension on said piston, a lever linked to said extension and co-operating with said cam disk, a displaceable roller in contact with said lever at a place located between its fulcrum and the face engaging said cam disk, an abutment for said roller opposite said lever, means for displacing said roller along said lever, a power accumulator adapted to act upon said piston in the direction of the pressure stroke, and means for limiting said pressure stroke to discharge said roller at the end thereof.

5. In a pump a cylinder, a piston adapted to reciprocate therein, an admission valve and a delivery valve on said cylinder, a cam disk and means for rotating it, an extension on said piston, a lever linked to said extension and co-operating with said cam disk, a displaceable roller in contact with said lever at a place located between its fulcrum and the face engaging said cam disk, an abutment for said roller opposite said lever, means for displacing said roller along said lever, a power accumulator adapted to act upon said piston in the direction of the pressure stroke, a stop face on said piston extension, and an abutment on said cylinder adapted to be struck by said stop face at the end of the pressure stroke.

6. In a pump a cylinder, a piston adapted to reciprocate therein, an admission valve and a delivery valve on said cylinder, a cam disk and means for rotating it, an extension on said piston, a lever linked to said extension and co-operating with said cam disk, a displaceable roller in contact with said lever at a place located between its fulcrum and the face engaging said cam disk, an abutment for said roller opposite said lever, means for displacing said roller along said lever, a power accumulator adapted to act upon said piston in the direction of the pressure stroke, means for limiting said pressure stroke to discharge said roller during this stroke, and means for damping the shock arising in said limiting action.

7. In a pump a cylinder, a piston adapted to reciprocate therein, an admission valve and a delivery valve on said cylinder, a cam disk and means for rotating it, an extension on said piston, a lever linked to said extension and co-operating with said cam disk, a displaceable roller in contact with said lever at a place located between its fulcrum and the face engaging said cam disk, an abutment for said roller opposite said lever, means for displacing said roller along said lever, a power accumulator adapted to act upon said piston in the direction of the pressure stroke, a hollow annular enlargement on said cylinder, and an annular stop face on said piston extension fitting into said enlargement and entering it at the end of the pressure stroke of said piston.

8. In a pump a cylinder, a piston adapted to reciprocate therein, an admission valve and a delivery valve on said cylinder, a cam disk and means for rotating it, a two-armed rocking lever, one arm of it co-operating with said cam disk and the other arm engaging said piston to move it in the direction of suction, means for displacing the fulcrum of said two-armed lever, and an air vessel adapted to act upon said piston in the direction of the pressure stroke.

9. In a pump a cylinder, a piston adapted to reciprocate therein, an admission valve and a delivery valve on said cylinder, a cam disk and means for rotating it, an extension on said piston, a lever linked to said extension and co-operating with said cam disk, a displaceable roller in contact with said lever at a place located between its fulcrum and the face engaging said cam disk, an abutment for said roller opposite said lever, means for displacing said roller along said lever, and an air vessel adapted to act upon said piston in the direction of the pressure stroke.

10. In a pump a cylinder, a piston adapted to reciprocate therein, an admission valve and a delivery valve on said cylinder, a cam disk and means for rotating it, an extension on said piston, a lever linked to said extension and co-operating with said cam disk, a displaceable roller in contact with said lever at a place located between its fulcrum and the face engaging said cam disk, an abutment for said roller opposite said lever, means for displacing said roller along said lever, an air vessel adapted to act upon said piston in the direction of the pressure stroke, a hollow annular enlargement on said cylinder, and an annular stop face on said piston extension fitting into said enlargement and entering it at the end of the pressure stroke of said piston.

11. In a pump a cylinder, a piston adapted to reciprocate therein, an admission valve and a delivery valve on said cylinder, a cam disk and means for rotating it, an extension on said piston, a lever linked to said exten-

sion and co-operating with said cam disk, a displaceable roller in contact with said lever at a place located between its fulcrum and the face engaging said cam disk, an abutment for said roller opposite said lever, means for displacing said roller along said lever, and an air vessel adapted to act upon said piston in the direction of the pressure stroke, a liquid layer being interposed between said piston and the air contained in said air vessel, in order to tighten the joint existing between the air vessel and the pump.

12. A plurality of fuel pumps for multi-cylinder internal combustion engines, comprising each a cylinder, a piston adapted to reciprocate therein, an admission valve and a delivery valve on said cylinder, a cam disk and means for rotating it, a two-armed rocking lever, one arm of it co-operating with said cam disk and the other arm engaging said piston to move it in the direction of suction, means for displacing the fulcrum of said two-armed lever, and an air vessel connected to all said cylinders and adapted to act upon said pistons in the direction of the pressure stroke.

The foregoing specification signed at Berlin, Germany, this 18th day of September, 1926.

MARTIN LOUIS.