Jan. 24, 1933. R. MÜLLER 1,895,259

CAM OPERATING MEANS

Filed July 2, 1929 2 Sheets-Sheet 1

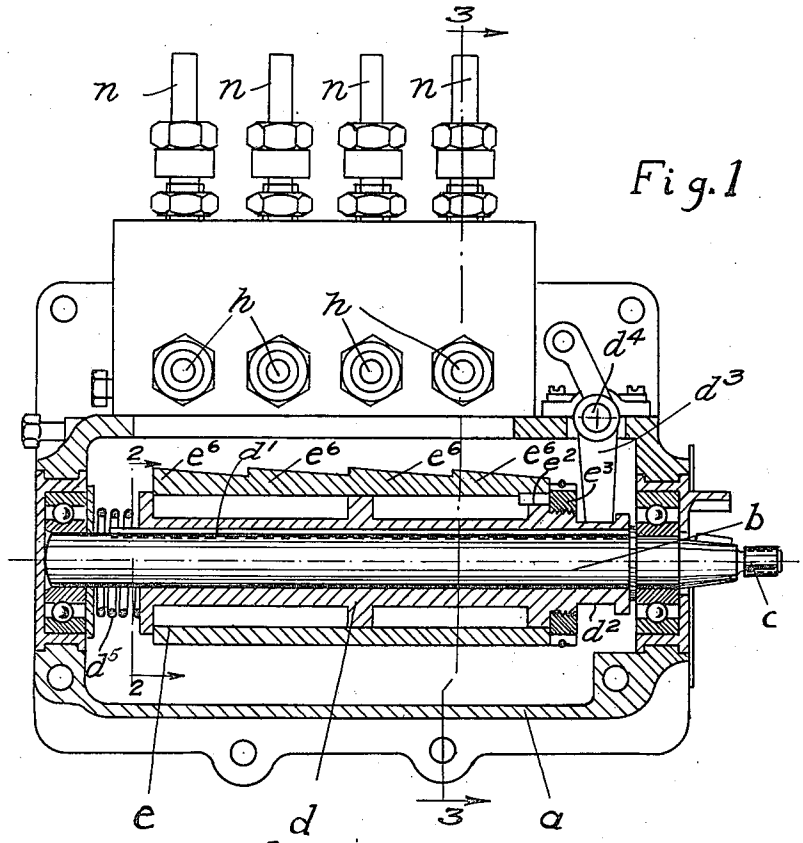


Fig. 1

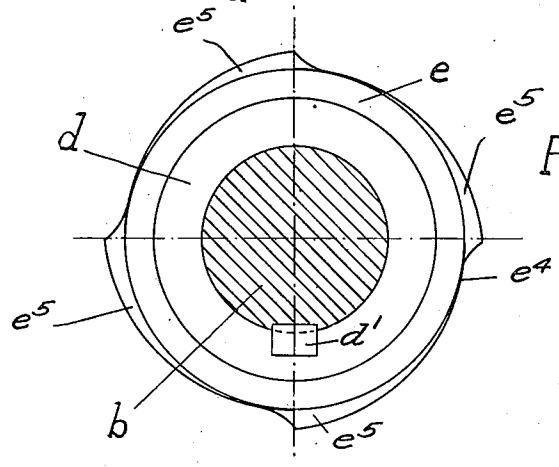


Fig. 2

Inventor:
Rudolf Müller,
by Cameron Kerr & Dawson
Attys.

Jan. 24, 1933. R. MÜLLER 1,895,259

CAM OPERATING MEANS

Filed July 2, 1929 2 Sheets-Sheet 2

Fig.3.

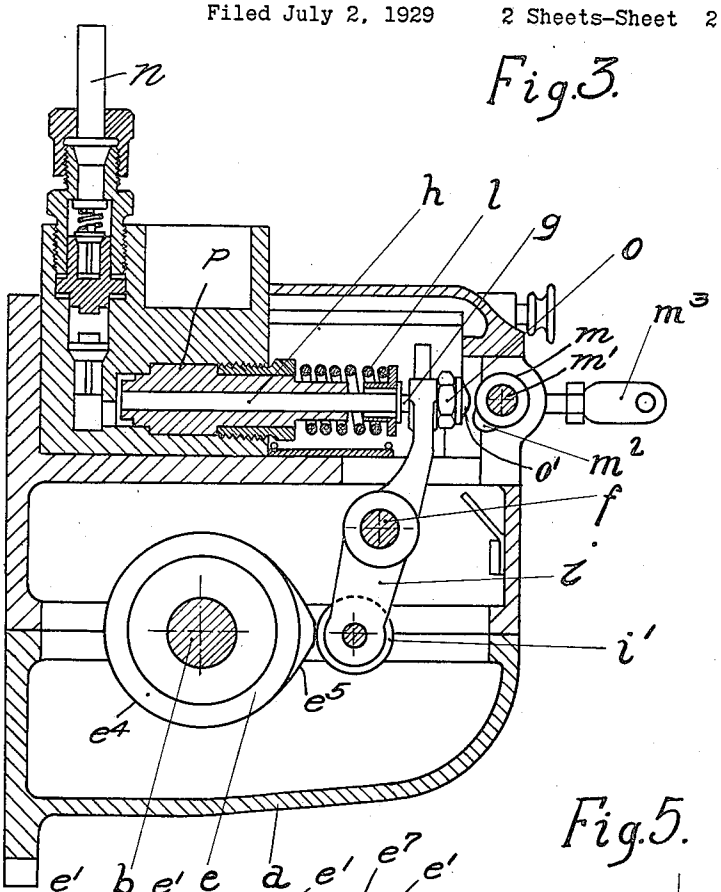
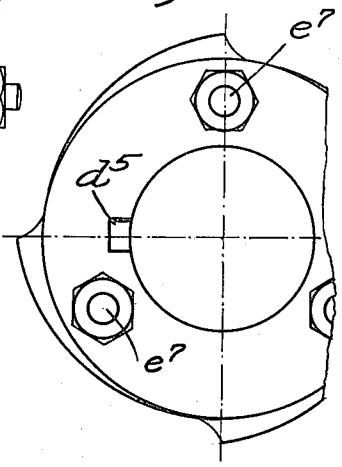


Fig.5.



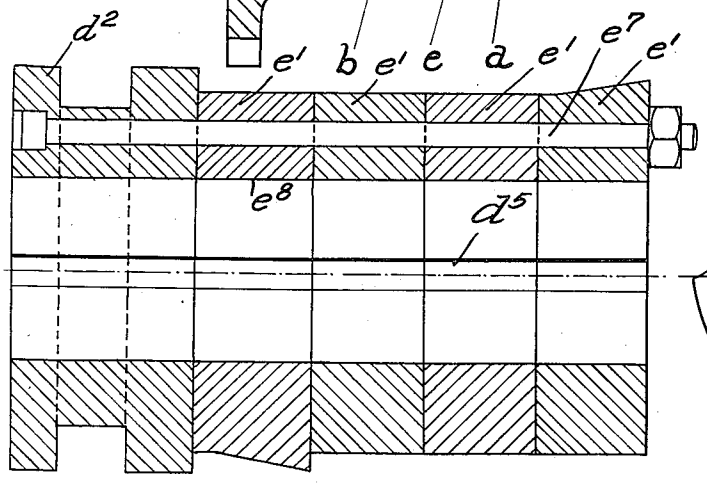


Fig.4.

Inventor:
Rudolf Müller,
by Fairweather Brock Farnum & Townsend
Attys.

Patented Jan. 24, 1933 1,895,259

UNITED STATES PATENT OFFICE

RUDOLF MÜLLER, OF OBERURSEL NEAR FRANKFORT-ON-THE-MAIN, GERMANY, ASSIGNOR TO MOTORENFABRIK DEUTZ, AKTIENGESELLSCHAFT, OF KOLN-DEUTZ, GERMANY

CAM OPERATING MEANS

Application filed July 2, 1929, Serial No. 375,543, and in Germany July 11, 1928.

My invention relates to improved means for operating the fuel injection pumps of a motor cylinder Diesel type engine.

The invention, which has among its objects the provision of fuel pump operating means of simple and durable construction in which the injurious effects of wear and possibilities of improper adjustment are reduced to a minimum, will be best understood from the following description when read in the light of the accompanying drawings of several embodiments of the invention selected for illustrative purposes, the scope of which invention will be more particularly pointed out in the appended claims.

In the drawings:—

Fig. 1 is an elevation, with parts in section and parts omitted, of the fuel pump casing and associated parts according to the invention;

Fig. 2 is a section on the line 2—2 of Fig. 1, with parts omitted;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 shows a modification of the cam assembly; and

Fig. 5 is an end elevation of the cam constructed according to Fig. 4.

In the embodiments of the invention illustrated by the drawings, the fuel pump casing a is provided with four fuel pumps p, that is to say, one for each cylinder of a four cylinder Diesel engine, it being understood that in any particular application of the invention the number of fuel pumps preferably will correspond to the number of cylinders. As shown, each fuel pump is provided with a connection n for conducting fuel to the corresponding cylinder. The details of the fuel pump form no part of the present invention, and accordingly will not be described.

As shown, the pump casing has mounted thereon a rotary cam shaft b, which shaft is secured against longitudinal movement and is driven by the engine in any convenient manner through the driving connection c. On the shaft b is mounted a sleeve d which is splined to the shaft by means of the key d' permitting the sleeve to be shifted longitudinally of the shaft, but restraining it against rotation relative to the shaft. For shifting the sleeve d, one end thereof is formed with a slip collar d^2 with which coacts the end of a manually or automatically operated control lever d^3 pivoted to the casing at d^4. As shown, a helical spring d^5 surrounding the shaft b urges the sleeve d to the right, as viewed in Fig. 1, against the abutment formed by the lever d^3, this construction being effective to take up all lost motion in the parts and therefore being effective to secure a certain and uniform operation of said parts.

Herein, the longitudinal shiftable sleeve d carries a cam assembly e having the four cams e', each for operating one of the several plungers h of the fuel injection pump. As shown, the cam assembly is keyed to the sleeve d by a key e^2 and is secured in assembled relation with the sleeve by a collar e^3 screw threaded on said sleeve. As shown in Figs. 2 and 3, each cam comprises the concentric portion e^4 and raised or eccentric portion e^5, the latter being inclined longitudinally of the shaft b as indicated at e^6 in Fig. 1, whereby shifting of the sleeve d is effective to vary the lifts of the pump plunger operating levers i, the latter of which are pivoted to the casing at f, and at their lower ends, as viewed in Fig. 3, are provided with cam rollers i'.

Conveniently the cam sleeve e is of relatively hard material to resist wear. Manufacture of the device is facilitated by having this sleeve separate from the sleeve d formed to provide the slip collar d^2 and in which the groove for the key e^2 is formed and on which are formed the screw threads for the collar or nut e^3.

Herein, the upper end of each pump plunger operating lever i carries a tappet portion g secured thereto, preferably in non-adjustable relation, by a bolt o, the tappet g acting upon the end of the associated pump plunger h. As illustrated, a spring l associated with each plunger urges the latter toward the right, as viewed in Fig. 3, so as to retract the plunger after it has been forced to make its power stroke by action of the ec-

centric portion e^5 of the cam, this construction being effective to take up lost motion in the parts. As shown, the outward limits of travel of the pump plungers are determined by collars m on a shaft m' rotatably mounted on the casing a, the collars coacting with stops o' carried by the head of the bolt o. In this way the end of the suction stroke of each pump plunger is determined by the stop surface afforded by the collar m, and is not influenced by wear on the concentric portions of the cam. The tendency of the construction therefore is to keep constant the amount of oil injected for a given adjustment of the sleeve d, and to prevent any effect in non-uniformity in the amounts of fuel injected into the several cylinders, which lack of uniformity might be caused by differences in wear of the several cams.

As shown, the rotary shaft m' is provided with cams m^2, whereby rotation of said shaft, which may be caused by manipulation of the arm m^3 fixed to said shaft, is effective to bring the cams m^2 into the paths of the stops o' for preventing stroking of the pump plungers.

In the modification of the invention shown by Figs. 4 and 5 the slip collar d^2 and four cams e' are made as separate members held in rigid assembled relation by means of the bolts e^7, the slip collar and cams having aligned openings e^8 for fitting the cam shaft b, the single bore thus formed being provided with a slot d^5 for fitting the key d' carried by said shaft.

It will be understood that wide deviations may be made from the embodiments of the invention herein described without departing from the spirit of said invention.

I claim:

1. A cam assembly for operating the fuel pumps of a multi-cylinder Diesel engine comprising, in combination, a cam shaft, an inner sleeve splined to said shaft for movement longitudinally thereof, an outer sleeve having a plurality of cams integrally formed therewith, said outer sleeve fitting over said inner sleeve, means on said inner sleeve at one end portion thereof forming a shoulder against which one end of said outer sleeve abuts, the opposite end of said inner sleeve being screw threaded, and a nut on the screw threaded portion of said inner sleeve for engaging with the corresponding end of said outer sleeve for forcing the latter against said shoulder.

2. A cam assembly for operating the fuel pumps of a multi-cylinder Diesel engine comprising, in combination, a cam shaft, an inner sleeve splined to said shaft for movement longitudinally thereof, an outer sleeve of relatively hard material having a plurality of cams integrally formed therewith, said outer sleeve fitting over said inner sleeve, means on said inner sleeve at one end portion thereof forming a shoulder against which one end of said outer sleeve abuts, the opposite end of said inner sleeve being screw threaded, and a nut on the screw threaded portion of said inner sleeve for engaging with the corresponding end of said outer sleeve for forcing the latter against said shoulder.

In testimony whereof, I have signed my name to this specification.

RUDOLF MÜLLER.