Jan. 25, 1944. G. C. MILLER 2,340,010

VARIABLE STROKE COMBUSTION ENGINE

Filed Aug. 19, 1942

Fig. 1.

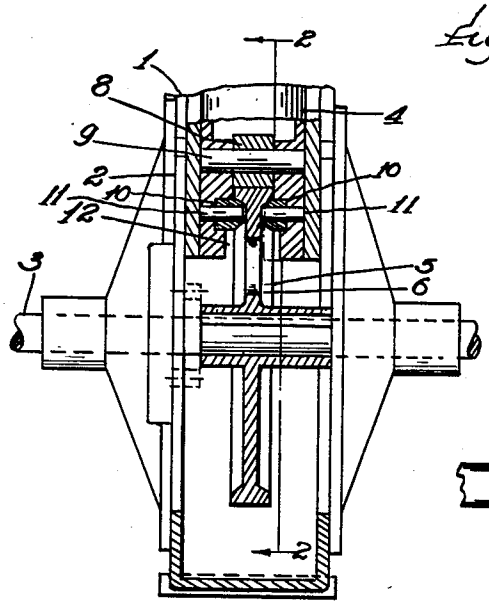


Fig. 2.

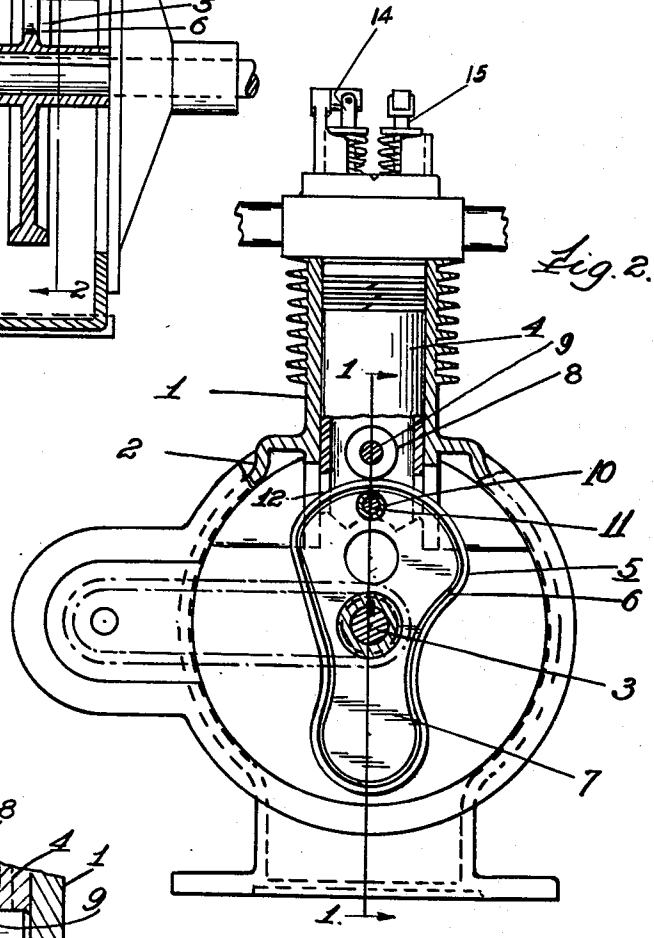
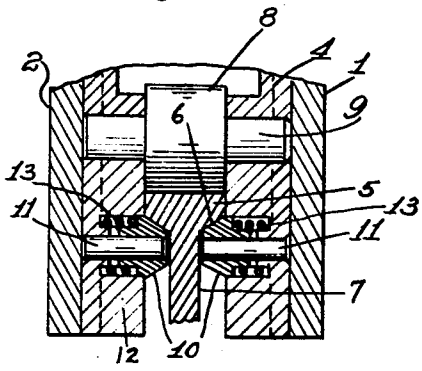


Fig. 3.



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VARIABLE STROKE COMBUSTION ENGINE

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3 Claims. (Cl. 74—55)

This invention appertains to variable stroke combustion engines of the general class disclosed in Rightenour Patents No. 1,583,937, issued May 11, 1926, and No. 1,728,363, issued September 17, 1929.

The present invention involves primarily improvements in the construction of the engine disclosed in the latter or second mentioned Rightenour patent above referred to. In this particular construction of engine there was utilized a variable stroke actuating cam for the drive shaft means, said cam working in cooperation with roller means carried by the adjacent or lower end of the piston of the combustion engine. In said earlier construction, for maintaining the cooperation between the roller means and actuating cam, a tension spring unit was utilized, the same involving springs attached to the piston at its roller equipped end, and also attached to a fixed point whereby the tension of the springs could be availed of to hold the roller means of the piston in operative contact with the actuating cam.

A primary object of this present invention, in improving upon the variable stroke engine of the later patent referred to above has been to do away with the just described spring tension unit since the latter involves complications of construction and relatively expensive parts that are not needed in view of the changed construction of the present improvements.

Whereas, in the engine of Patent 1,728,363 aforesaid operative contact between the roller means and the piston of the actuating cam, only, was availed of to keep their parts in their proper working relation, the present improvements of this invention involve an interlocking of the piston means with the actuating cam means, by which the necessary operative contact between said parts is secured and by which the necessary general operating relation of the said parts is maintained throughout the operating cycle of the engine. My improved means for maintaining the working relation of the roller means of the piston and the actuating cam involves special interlocking rollers carried by the lower end of the piston and interengaging a flange on the cam periphery, which flange operates in contact with the piston actuating roller means. While the interlocking roller means may be mounted in unyielding bearings of the piston skirt, it is contemplated under some conditions to employ rollers mounted to yield slightly in a plane transverse to the plane of the piston actuating roller and the actuating cam therefor, with certain resultant advantages as regards the manufacturing cost of the engine.

The improvements of this invention are illustrated in the accompanying drawing, in which—

Figure 1 is a fragmentary vertical sectional view taken about on the line 1—1 of Figure 2, the upper portion of the engine being broken away and opposite heads of the casing being illustrated in elevation along with certain adjacent parts.

Figure 2 is a vertical sectional view through the entire engine generally speaking, taken in a plane transverse to that of Figure 1 and about on the line 2—2 of the structure illustrated in Figure 1, so far as it is disclosed.

Figure 3 is a fragmentary vertical sectional view through that portion of the engine comprising the lower end of the cylinder, the lower end of the piston and the upper portion of the actuating cam with the associated actuating roller, and disclosing a modified form of the interlocking roller parts wherein they are resiliently mounted for yielding in a direction rectilinear to the plane of the actuating cam.

Describing in detail the improvements of the present invention, reference is particularly made to the construction of the engine thereof, which is generally presented in the Rightenour Patent 1,728,363 in regard to all of the main and essential features of construction. The drawing of the present improvement are intended to illustrate only those changes made in the engine of Patent 1,728,363 that constitute the inventive additions to said patented construction.

Generally speaking, the present improved engine comprises the cylinder 1 with which is integrally formed the crank case 2, the latter being of approximately round form and preferably cast with the cylinder thereof though not necessarily so.

Mounted in suitable bearings in the sides of the cylinder is the driving shaft 3 which is operated by the piston 4 in the cylinder 1 through the provision intermediate said shaft 3 and the piston 4 of actuating cam 7 keyed thereto. The cam 7 comprises a body portion having a cam periphery or track 5 and said periphery or track is somewhat T-shaped in cross section, as seen in Figures 1 and 3, so as to provide at opposite sides thereof the bevel raceways or auxiliary track portions 6.

It is contemplated that the actuating cam 7 shall be of substantially the general type as disclosed by Rightenour Patent 1,728,363, being therefore a variable stroke cam and intended to

operate in conjunction with the piston 4 in substantially the same manner as set forth in said last mentioned patent, in so far as the cooperation between the piston and cam is concerned, for carrying out the cycles involving the exhausting and intake actions of the cylinder and the compression and firing cycles as fully disclosed in said prior patent.

Now upon the piston 4 is carried at the lower end thereof the cam actuating roller 8 supported by a suitable shaft or any approved type of bearing means 9 and having its periphery in contact with the periphery or track 5 of the cam 7.

It is contemplated that the cooperating contact between the cam 7 and roller 8 shall be maintained by the improved means of this invention involving the use of spaced horizontally and alignedly disposed rollers 10 supported on stub shafts 11 and having their adjacent ends beveled to correspond with the bevels or chamfers 6 at the opposite inner sides or surfaces of the cam track 5. In the construction of Figure 1, the rollers 10 are freely rotatable upon the bearing shafts 11 and at their outer ends have a bearing against the inner end walls of recesses in the lower skirt portion of the piston 4.

If desired, needle or ball bearings might be provided between the outer ends of rollers 10 and the inner portions or walls of the recesses by which they are mounted in the piston skirt.

It will be evident from the foregoing, therefore, that according to the construction of Figure 1 the rollers 10 create an interlocking means connecting positively the lower end of the piston at the skirt portion 12 with the actuating cam 7 so that in the upward and downward strokes of the piston the cam 7 will be actuated while always maintained in direct connection with the lower end of the said piston 4.

Passing to Figure 3 of the drawing, it is notable that I may employ, according to this construction, a modification in the form of the rollers 10. In this instance the rollers coact with the bevel or inner surface portions 6 of the cam 7 at opposite sides of the cam in substantially the same way as in the Figure 1 construction, so far as effecting the interlocking cooperation between the parts 7 and 8 is concerned. However, in this modification of Figure 3, the rollers 10 are yieldably mounted by the provision of springs 13 intermediate outer side portions of the rollers and the inner ends of the recesses in the piston skirt 12 in which the rollers are mounted.

With the above in view, the rollers at their outer ends may be of slightly reduced form to provide hub portions encircled by the inner or adjacent ends of the springs 13. The modified form of the spring actuated rollers 10 enables the same to maintain the desired interlocking connection between the cam 7 and piston 4 for correspondingly maintaining the operating contact between the roller 8 and the cam track 5 even though the beveled portions 6 and opposite sides of the cam body may not be as accurately machined as would be required according to the construction of Figure 1. It is apparent that if sufficient clearance be provided between the inner ends of the rollers 10 and the opposite sides of the cam body, no machining of said sides will be necessary.

The variable stroke engine as hereinbefore described embodying the present improvements will be equipped with other general features the same as in Patent 1,728,363, including the intake valve 14 and the exhaust valve 15, as well as other features of construction in the prior patent which are not herein further referred to because fully disclosed in said patent. The operation of the engine is the same, generally speaking, as presented in Patent 1,728,363, and the improvements hereof are comprised primarily, as stated before, of the roller means 10 and a change in the form of the roller 8, which latter is provided with a flat peripheral portion instead of equipped with edge flanges as in the prior patent last mentioned. The end thrust on the roller in the prior construction corresponding with the roller 8 as produced by the cam engagement therewith is thus eliminated in the present construction.

The guiding of the piston in correct alignment with the cam is attained by guide portions in the skirt of the piston cooperating with the edge surfaces of the cam track, the bearing surfaces provided thereby being of substantially greater area.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a variable stroke engine of the class described, a cylinder and piston therein, a casing, an actuating cam mounted in the casing, said cam comprising opposite cam heads of different cam areas for effecting variable stroke operation, a driving shaft upon which the cam is mounted for rotation with said shaft, an actuating roller carried by the piston and engaging with the outer surface of the actuating cam, and interlocking means between the piston and the cam for maintaining the operative contact between the said piston actuated roller and cam, comprising interlocking rollers mounted in spaced relation on the piston and interengaging the actuating cam at opposite sides thereof, the operating cam being formed with a roller track at its periphery or outer surface for said actuating roller and said track portion of the cam having outwardly beveled portions at the opposite inner sides thereof, said spaced interengaging rollers having adjacent beveled ends engaging the beveled inner surface portions at opposite sides of the cam track.

2. A variable stroke combustion engine as claimed in claim 1, wherein the spaced interlocking rollers are yieldable in a direction rectilinear to the plane of movement of the actuating cam.

3. A variable stroke combustion engine as claimed in claim 1, wherein the said interlocking rollers are yieldable in a direction rectilinear to the plane of movement of the actuating cam, the piston having springs cooperating with said spaced interengaging rollers for maintaining the same in engagement with the beveled inner surface portions of the cam track at opposite sides thereof and permitting the yielding action of the last mentioned rollers during the rotation of the cam with the driving shaft.

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