Oct. 15, 1946. E. M. GADOUX ET AL 2,409,555

PISTON ENGINE

Filed June 15, 1945 4 Sheets-Sheet 1

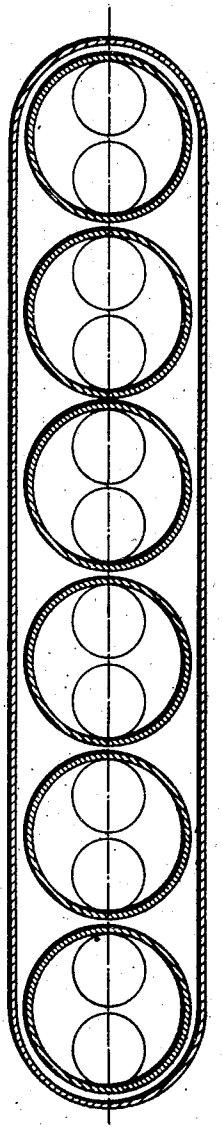


FIG. 1

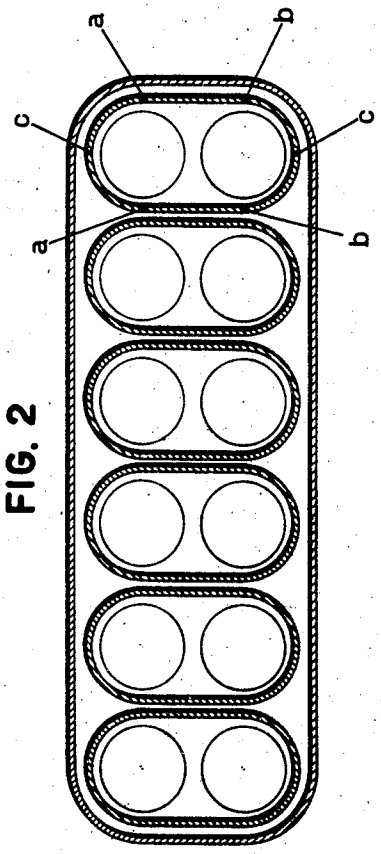


FIG. 2

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FIG. 3

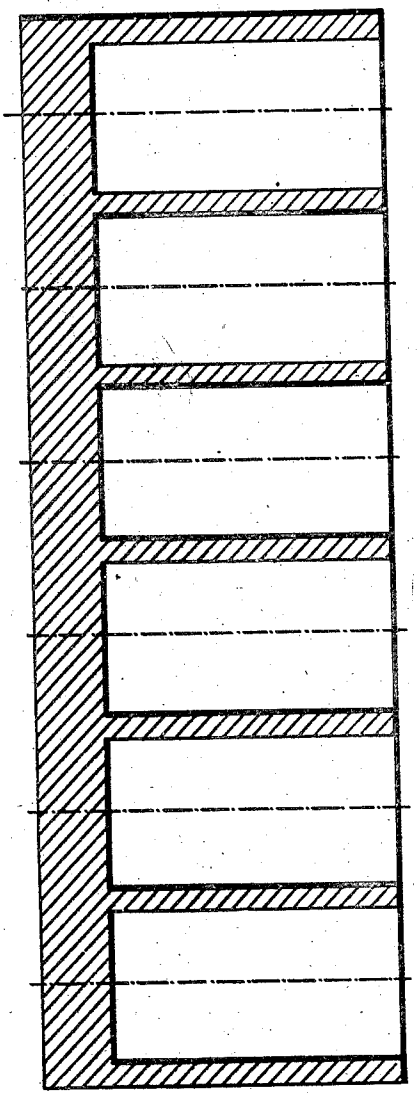
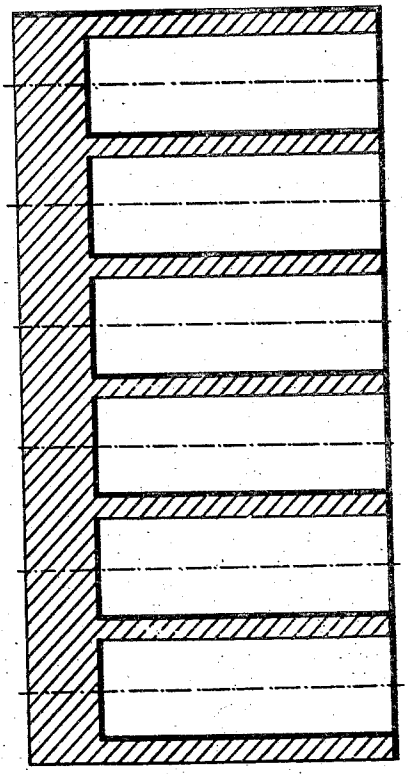


FIG. 4



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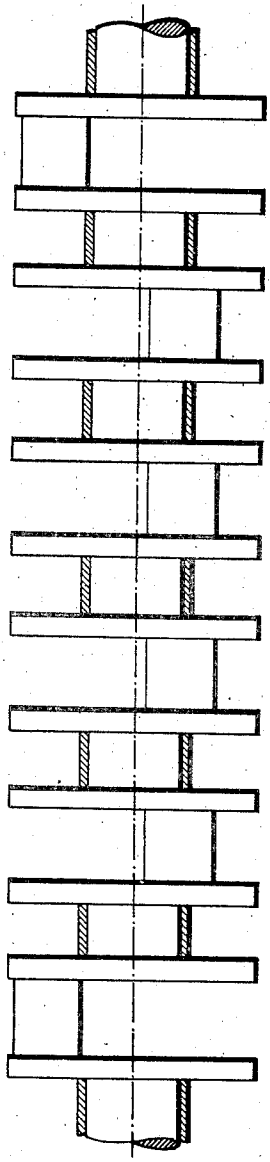


FIG. 5

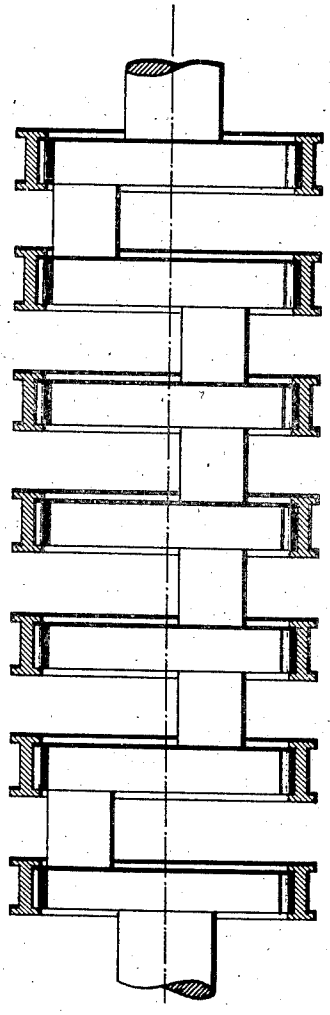


FIG. 6

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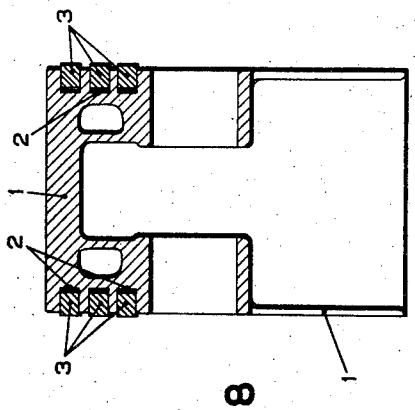


FIG. 8

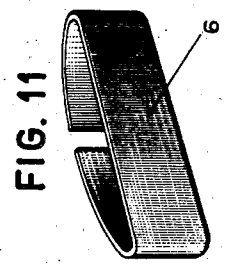


FIG. 11

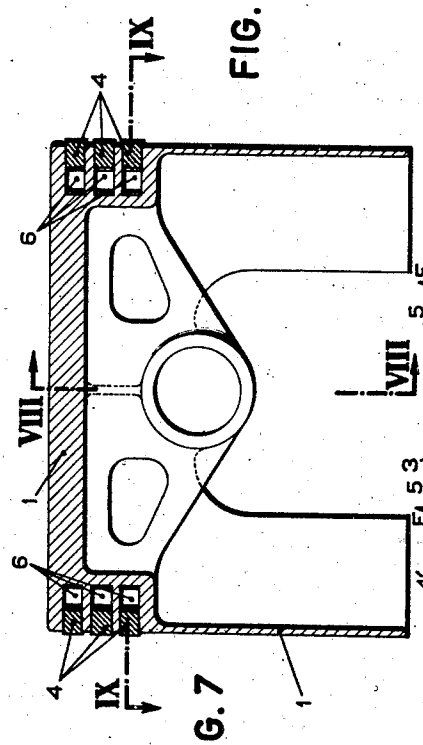


FIG. 7

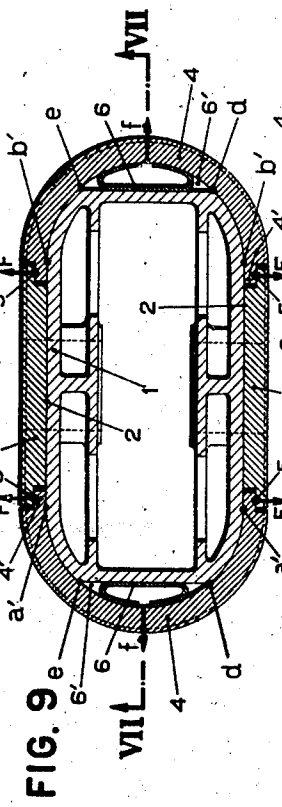


FIG. 9

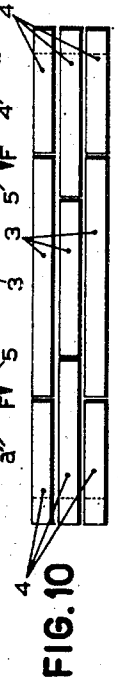


FIG. 10

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Patented Oct. 15, 1946

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UNITED STATES PATENT OFFICE

2,409,555

PISTON ENGINE

Eugène Marius Gadoux, Cormeilles-en-Parisis, and Jacques Fouré, Paris, France

Application June 15, 1945, Serial No. 599,577
In France February 2, 1945

2 Claims. (Cl. 309—4)

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The present invention has for its object improvements in piston engines (and machines) and more particularly in the engines (and machines) whose cylinders are arranged in line with a view to reducing in a substantial proportion the longitudinal bulk and the weight of such engines and machines and consequently to reducing also the permanent deformations and vibrations, while retaining the same cross-sectional piston area.

These results are obtained, according to the chief feature of my invention, by giving to the cross-section of the cylinder and piston, instead of the usual circular shape, an elongated shape perpendicular to the axis of the crankshaft and constituted preferably by two parallel straight parts connected together by two half-circles.

The invention has also for its object a piston ring which has been specially designed for its application to pistons having an elongated cross-section.

Lastly the invention covers also, as a novel product of manufacture, a piston engine (or machine), the cylinder and piston of which show the above defined characteristic features.

In the accompanying drawings, there has been shown diagrammatically, by way of example only and without any limitation as to the scope of the invention, a particular form of execution thereof.

In said drawings,

Figs. 1 and 2 are plan views illustrating at the same scale, respectively an engine provided with six cylinders in line of the usual type and an engine designed in accordance with the invention and having exactly the same cross-sectional area for its pistons.

Figs. 3 and 4 are vertical cross-sections respectively of a six cylinder block of the ordinary type and of a six cylinder block executed in accordance with the invention.

Figs. 5 and 6 show respectively the crank-shaft of the engine of Figs. 1 and 3 and that of the engine of Figs. 2 and 4.

Figs. 7 to 9 show respectively cross-sections through line VII—VII of Fig. 9, through line VIII—VIII and through line IX—IX of Fig. 7, said cross-sections showing the details of a piston designed for equipping an engine (or machine) built in accordance with the invention.

Fig. 10 is an elevational view of three packing rings associated for use on the piston.

Fig. 11, lastly, is a perspective view of an expansion spring adapted to cooperate with the above mentioned packing rings.

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As will be readily understood by comparing Figs. 1 and 2, an engine built in conformity with the invention, i. e. with cylinders whose bore, instead of having the shape of a straight cylinder with a circular base, has an elongated or oblong cross-section, comprising two parallel rectilinear parts *a—b*, *a—b*, connected with one another by means of two half circles *aca*, *bcb*, has a total length which is much smaller than that of an ordinary engine of same cylinder volume. The reduction in length obtained is of the order of 30% while the surface of the piston remains the same in both cases (Figs. 1 and 2).

This reduction in the length of the cylinder block carries along with it other consequences which are also of great advantage:

The weight of the engine is reduced in a very substantial proportion, which is of considerable interest chiefly in the case of engines intended for use on board of aircraft;

The rigidity of the motor unit is increased.

The reduction in length of the cylinder block has naturally as a consequence the reduction in length of the engine frame and of the crankshaft (see Figs. 5 and 6) and thereby these two essential elements of the engine are submitted to lesser permanent deformations, which permanent deformations are very prejudicial for the proper operation of the engine.

Lastly the disclosed arrangement provides also a reduction of the vibrations during the running, chiefly as concerns the crankshaft.

In the cylinders of an engine (or the like machine) built in conformity with the invention, the reciprocating pistons have a shape which obviously corresponds to that of the bore of said cylinders. Fig. 9 shows such a piston comprising two parallel planes *a'b'* connected with one another through two half-cylinders *a'dea'*, *b'deb'*.

The piston 1 comprises in the usual manner a certain number, three in the embodiment illustrated by way of example, of grooves 2 adapted to receive packing rings. Each packing-ring (see Fig. 9) includes two small rectilinear bars 3—3 corresponding to the rectilinear parts *ab*, *a'b'* of the cylinder and of the piston, and two semi-circular elements 4—4, the radius of which before their introduction inside the cylinder is somewhat greater than that of the half circle *aca*; these elements are elastic and they urge the small bars 3—3 in the direction of the arrows F of Fig. 9 through the agency of the heels 4' formed at their ends and acting on similar heels provided at the ends of the small bars 3—3. Pins 5 engaging the contacting surfaces of said cooperating heels

ensure the assembling of the elements of each packing-ring.

Springs 6, appearing under the form illustrated in Figs. 9 and 11, are located in recesses 6' cut through the grooves 2 of the pistons. The springs serve to push the semi-circular elements 4 against the wall of the cylinder in the direction of the arrows F (Fig. 9).

In order to ensure fluid tightness with the maximum desirable efficiency, the packing-rings of each piston will be set at 120° as shown in Fig. 10.

Obviously the details of execution described and illustrated have been given solely by way of example and they may be modified in different manners and certain of the arrangements described may be replaced by other equivalent arrangements without modifying thereby the principles underlying the invention.

In particular the oblong sections may be oval or rectangular or even be formed by the association of two or more circular or square cross-sections inscribed inside a rectangle. The application of elongated cross-sections is of interest for engines whose bulk should be reduced to a minimum i. e. for aircraft engines, for steam engines on locomotives, etc.

On the other hand, the piston-rings adapted to cooperate with elongated pistons may assure the most varied shapes.

What we claim is:

1. In a piston, the provision of an elongated grooved piston, a cylinder of corresponding shape inside which said piston is adapted to reciprocate and a plurality of superposed packing-rings fitting inside the grooves of the pistons and constituted by rectilinear bars and two semi-circular elements connecting said bars together.

2. In a piston, the provision of an elongated grooved piston, a cylinder of corresponding shape inside which said piston is adapted to reciprocate and a plurality of fluidtight superposed packing-rings fitting inside the grooves of the pistons and constituted by two rectilinear bars, two semi-circular elements engaging said bars through their terminal heels for forming a closed structure and springs urging the semi-circular elements outwardly.

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