Oct. 31, 1933. L. M. WOOLSON 1,933,293

INTERNAL COMBUSTION ENGINE

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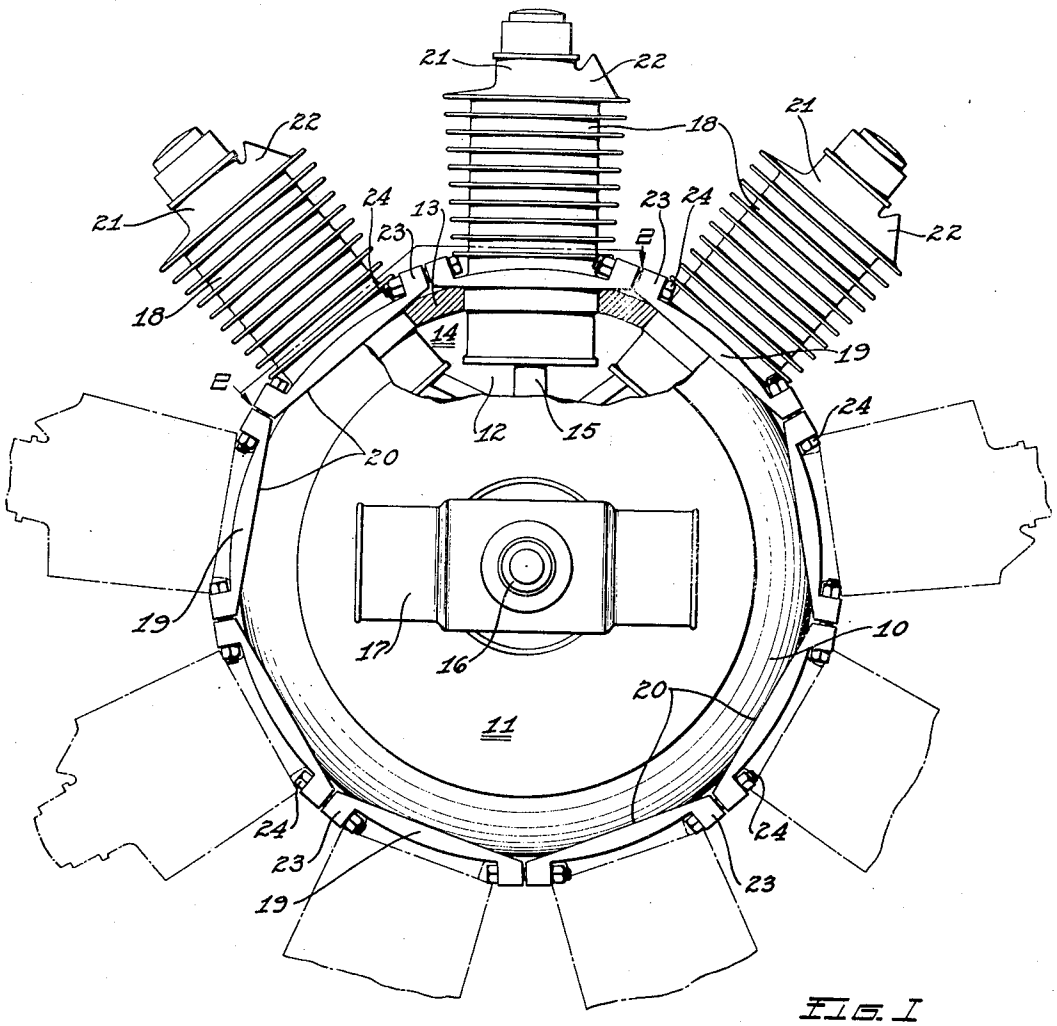


FIG. 1

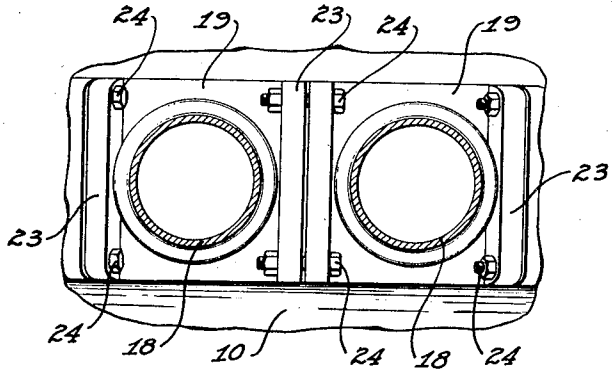


FIG. 2

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INTERNAL COMBUSTION ENGINE

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Serial No. 417,336

10 Claims. (Cl. 121—194)

This invention relates to internal combustion engines and more particularly to a cylinder and crank case structure.

An object of my invention is to provide an internal combustion engine in which the explosion loads in the cylinders are distributed in a manner such that there will be no localized stresses in the crank case.

Another object of my invention is to associate cylinders and a crank case in a manner such that thin walls can be utilized to form the crank case even though compression pressure in the cylinders may reach more than 500 pounds per square inch.

A further object of the invention is to provide an engine in which the cylinders are fastened around the crank case by tension means to secure them in position in a manner distributing explosive loads so that there will be no localized stresses.

These and other objects of the invention will appear from the following description taken in connection with the drawing which forms a part of the specification, and in which:

Fig. 1 is a front elevational view of an airplane engine, partially broken away, constructed in accordance with my invention;

Fig. 2 is a sectional view of the same taken on line 2—2 of Fig. 1.

Referring now to the drawing by characters of reference, 10 represents generally the crank case of a radial type of internal combustion engine adapted particularly for use as the power plant of an airship. The crank case is preferably formed of duralumin and consists of a plurality of transversely extending spaced walls as indicated at 11 and 12 and a peripheral wall 13. The crank case is substantially in the form of a barrel, and the transverse walls form a compartment 14 in which the connecting rod assembly 15 is associated with the crank shaft 16 which extends axially through the crank case. Secured to the exterior end of the crank shaft is a propeller hub 17.

A plurality of cylinders 18 project radially through openings formed in the peripheral wall of the crank case and are each formed with a flange 19 which extends transversely relative to the axis thereof, such flanges being flat on their under side in order that they may be seated against the flat faces 20 formed on the crank case adjacent the openings through which the cylinders project. It will be seen that the inner ends of the cylinders project into the compartment 14 and the fit between the cylinders and the peripheral wall of the crank case can be close or not as may be desired. Cylinder heads 21 are each provided with a neck 22 through which a passage extends for the admission of air and for the escape of exhaust, there being suitable valve mechanism controlling such passages.

The engine illustrated is of the Diesel type, and while no fuel injection device has been illustrated some suitable arrangement is provided for injecting liquid fuel into the compressed air in the cylinders in order to form the combustion charge. Engines operating upon other than the Diesel principle can, however, be constructed in accordance with this invention.

The flanges 19 are formed so that they extend adjacent each other when assembled with the crank case, and for the purpose of securing the same they are provided with upstanding end portions 23. Each adjacent pair of such end portions 23 are drawn toward each other and connected in tension by the bolts 24. The connected flanges of the cylinders provide tension means extending around the peripheral wall of the crank case in two lines and such tension is sufficient to cause compression of the crank case. Any explosion loads in the cylinders will be transmitted, through the bolts and the connected flanges, around the crank case and in this manner the explosion loads are widely distributed so that there will be no localized stresses in the crank case. The manner of connecting the cylinders together, which serves as a tension or hoop means, also fastens the cylinder structures securely in position upon the crank case. The bolts are detachable, and when detached the cylinders can be readily removed from each other and from the crank case, the accessories associated therewith (not shown) must of course be first disconnected to permit such removal.

Because of this manner of transmitting explosion loads to the crank case so that localized stresses therein are eliminated, the crank case can be formed of very thin metal which permits the building of an engine for use with airships which is capable of withstanding the compression pressures and explosion loads developed when using the Diesel principle.

While I have herein described in some detail a specific embodiment of my invention, which I deem to be new and advantageous and may specifically claim, I do not desire it to be understood that my invention is limited to the exact details of the construction, as it will be apparent that changes may be made therein without departing from the spirit or scope of my invention.

What I claim is:

1. In an internal combustion engine, a crank case, a plurality of cylinders each having a flange extending therefrom normal to the axis thereof, said flanges bearing against the crank case and the adjacent flanges of adjacent cylinders being in spaced relation, and means connecting each adjacent pair of spaced flanges together in tension.

2. In an internal combustion engine, a crank case, a plurality of cylinders each having a flange extending therefrom normal to the axis thereof, said flanges bearing against the crank case and the adjacent flanges of adjacent cylinders being in spaced aligned relation, and adjustable means connecting the spaced adjacent flanges of adjacent cylinders together in tension.

3. In an internal combustion engine, a crank case, a plurality of cylinders each having a flange extending therefrom substantially normal to the axis thereof and bearing against the crank case, the crank case, the adjacent flanges of adjacent cylinders being arranged in spaced aligned relation, and detachable means connecting the adjacent flanges of adjacent cylinders together in tension.

4. In an internal combustion engine having a barrel type crank case and a plurality of radially disposed cylinders, tension means for securing the cylinders to the crank case comprising a flange extending from each cylinder and bearing against the crank case, the adjacent flanges of adjacent cylinders being in spaced relation, and means initially securing adjacent ends of adjacent spaced flanges together in tension.

5. In an internal combustion engine having a barrel type crank case and a plurality of radially disposed cylinders, means for securing the cylinders to the crank case comprising flanges extending from each cylinder normal to the axis thereof and engaging the crank case, the adjacent ends of the flanges being out-turned and spaced apart, and tension means engaging and securing together the adjacent out-turned ends of the adjacent flanges in tension.

6. In an internal combustion engine having a barrel type crank case and a plurality of radially disposed cylinders, means for securing the cylinders to the crank case comprising flanges extending from each cylinder and terminating at adjacent ends in upturned flanges, the upturned flanges of adjacent cylinders being in spaced relation, and tension means connecting the adjacent upturned ends of adjacent flanges.

7. In an engine, the combination of a crank case, a plurality of cylinders disposed radially around the crank case, cylinder extensions bearing against the periphery of the crank case, the adjacent extensions of adjacent cylinders being in alignment and spaced apart, and means engaging the adjacent portion of adjacent extensions and holding them together in tension.

8. In a radial engine, a crank case, cylinders extending radially through the crank case, flanges extending laterally from the cylinders and seating against the peripheral wall of the crank case, the adjacent ends of the flanges of adjacent cylinders being upturned and spaced apart, and means connecting each adjacent pair of upstanding portions of adjacent flanges in tension.

9. In an internal combustion engine having a barrel-type crank case and a plurality of cylinders disposed radially around the crank case, means for securing the cylinders to the crank case comprising flanges having their end portions extending between the cylinders turned out, said flanges bearing against the periphery of the crank case and with the adjacent turned out portions of adjacent flanges in spaced relation, and means similarly engaging the turned out end portions of the adjacent pairs of flanges and maintaining them in tension extending in two lines around the crank case.

10. In an internal combustion engine, a crank case, a plurality of radially extending cylinders, flanges extending around the cylinders and bearing against the crank case, the adjacent portions of the flanges of adjacent cylinders being spaced relatively and from the crank case, and means connecting the adjacent spaced flanges of adjacent cylinders together in tension.

LIONEL M. WOOLSON.

CERTIFICATE OF CORRECTION.

October 31, 1933.

Patent No. 1,933,293.

LIONEL M. WOOLSON.

It is hereby certified that error appears in the printed specifications of the above numbered patent requiring correction as follows: Page 2, line 95, claim 8, strike out the words "peripheral wall of the" and insert the same after "through the" in line 93, of same claim; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 19th day of December, A. D. 1933.

Richard Spencer

Acting Commissioner of Patents.

(Seal)