PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improved Arrangement of the Valves in Multicylinder Internal Combustion Engines having Cupola Combustion Chambers

We, LANCIA & C. FABBRICA AUTOMOBILI-TORINO-S.A., Via Monginevro 99, Turin, Italy, an Italian Company, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to multicylinder internal combustion engines having cupola-shaped combustion chambers, and has for its object to provide an arrangement of the overhead valves which permits the aligned cylinders to be brought close together in spite of the inclined position of the valve stems made necessary by the cupola form of the explosion chamber of each cylinder.

According to the invention, the two overhead valves of each cylinder are arranged in such manner that the axes of their stems lie in a plane substantially parallel to the central longitudinal plane of the engine and that the planes which contain the axes of the stems of the valves of two adjacent cylinders are located on opposite sides of the said central longitudinal plane.

In this way the valve stems of two adjacent cylinders may be arranged without interfering with each other and if the engine cylinders are brought close to one another the stems of adjacent valves of adjacent cylinders will cross in elevation. The planes which contain the axes of the valve stems may thus be brought very close together and the bearings for the stems of adjacent valves of adjacent cylinders may be provided in a narrow region comprised between the two cylinders.

The accompanying drawing shows, by way of example, one embodiment of the invention.

In the drawing, Figure 1 is a diagrammatic plan view of three cylinders of an internal combustion engine with aligned cylinders, to which is applied the arrangement according to the invention;

Figure 2 is a plan view of the corresponding portion of the head; and

Figure 3 is a vertical section of the head on the line X—X of Figure 1.

In Figure 1 there are indicated by 1, 2 and 3, three cylinders of an engine with aligned cylinders, the head of which engine is indicated by 4.

As shown in Figure 3, each cylinder has a concave end to provide a cupola-shaped combustion chamber and each chamber has two overhead valves which are indicated by a^1 and b^1 in cylinder 1, a^2 and b^2 in cylinder 2, and a^3 and b^3 in cylinder 3.

The valves of each chamber are inclined with respect to the axis of the cylinder and they are inclined from opposite sides so that the axes of the valve stems of each cylinder meet in the interior of the said cylinder at a certain distance from the upper end of the combustion chamber.

The valves of each cylinder are arranged with their axes in a plane parallel to the central longitudinal axis of the row of cylinders and the planes which contain the axes of the valves of adjacent cylinders are displaced with the combustion chambers c^1, c^2, c^3 to opposite sides of the central longitudinal plane 0—0.

The valve stems of two adjacent cylinders may thus be located side by side without interfering with each other in such manner that the cylinders 1, 2, 3 . . . of the engine may be brought close together as in the case of valves which are not inclined, or in the case of valves which are inclined and arranged in planes transverse to the central longitudinal plane of the engine.

The arrangement described of the valves of each cylinder in planes substantially parallel to the central longitudinal axis of the engine presents the advantage that the two sides of the engine head are free and easily accessible thus permitting the different members and the sparking plugs to be arranged thereon in a suitable manner.

With a sufficiently close approach of the cylinders such, as is shown in Figure 1, the stems of adjacent valves of adjacent cylinders will cross in elevation at points which are closer to the valve

heads than to the free extremities of their stems.

Consequently the portion of the stem which is external to the point of crossing of the stems of two adjacent valves is of sufficient length for the mounting of the spring which is to surround it. The valves and the springs therefore occupy the positions shown in Figure 3 from which it will be seen that in spite of the closeness of the cylinders 1, 2 and 3, the valves a^1, b^1, a^2, b^2, a^3, b^3, are located regularly with the springs da^1, db^1, da^2, db^2, da^3, db^3, and that two adjacent valves are guided in bosses made in the same region e of the head between two cylinders.

The operation of the different valves may be effected in any suitable manner and in the example shown two different operating devices are indicated. The valves b^1, a^2, and b^2, a^3 are each operated by a lever f which acts on the extremity of the valve stem by the aid of a pivotted arm g. The valves a^1 and b^3 are, on the contrary, each operated by a double lever f^1, which acts directly on the valve stem.

Figure 2 shows the position of the sparking plugs h on the engine head and from this Figure it will be seen that the head is left free and accessible in all its parts by the valve stems and by the valve-operating members.

In the embodiment shown, the axes of the aligned cylinders fall in the longitudinal plane of the engine, whilst the combustion chambers are displaced to the two sides of such plane at relatively small distances, seeing that it is only necessary to leave space for the passage and the mounting of the stems of two adjacent valves.

A similar result could also be obtained by leaving the combustion chambers in their normal position with respect to the cylinders, and arranging the cylinders alternately in planes parallel to the two sides of the central longitudinal plane of the engine and at a small distance from this plane to allow room for the valves of the two adjacent cylinders.

In any case the arrangement of the valves as described permits of adopting the cupola-shaped combustion chambers in engines with aligned cylinders very close to each other, thus combining the advantage of the better output which can be obtained with cupola-shaped combustion chambers and the advantage of a minimum space occupied by the engine.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. An arrangment of the valves in multicylinder internal combustion engines having cupola-shaped combustion chambers and with the stems of the two overhead valves of each cylinder inclined with respect to the cylinder axis, characterised in that the axes of the valve stems of each cylinder lie in a plane substantially parallel to the central longitudinal plane of the engine and in that the planes which contain the axes of the valve stems of two adjacent cylinders lie on opposite sides with respect to the said central longitudinal plane.

2. An arrangement of valves according to Claim 1, characterised by the cylinders of the engine being aligned with their axes lying in one plane and the combustion chambers of the adjacent cylinders being displaced with the planes containing the axes of the valves to opposite sides of the said plane.

3. An arrangement of valves according to Claim 1, characterised by the cylinders of the engine being alternately displaced, like the planes containing the axes of the valve stems, to opposite sides of an intermediate longitudinal plane.

4. An arrangement of valves according to Claim 1, characterised by the position of the adjacent cylinders being such that the valve stems of adjacent valves of adjacent cylinders cross in elevation at regions not occupied by the springs.

5. An arrangement of the valves in multicylinder internal combustion engines having cupola-shaped combustion chambers, substantially as hereinbefore described and substantially as shown in the accompanying drawing.

Dated this 15th day of April, 1941.
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Fig. 1

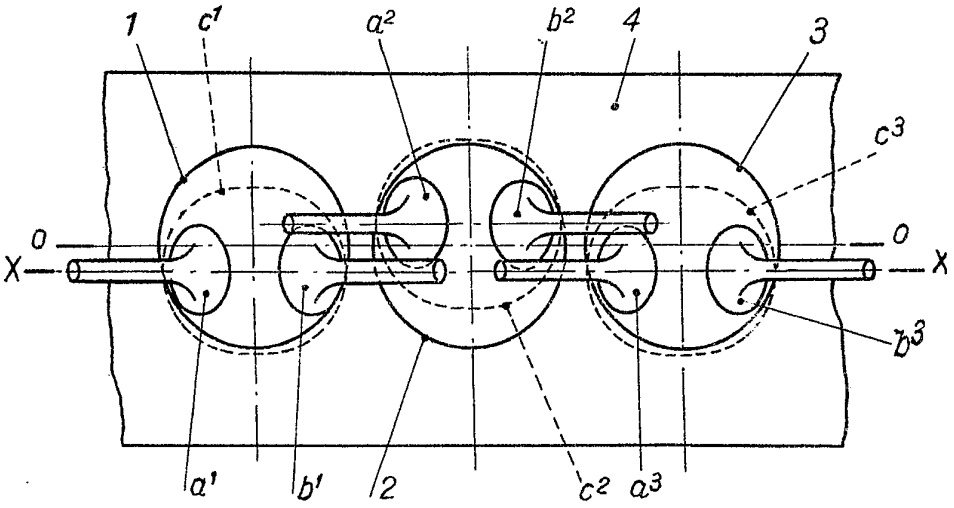


Fig. 2

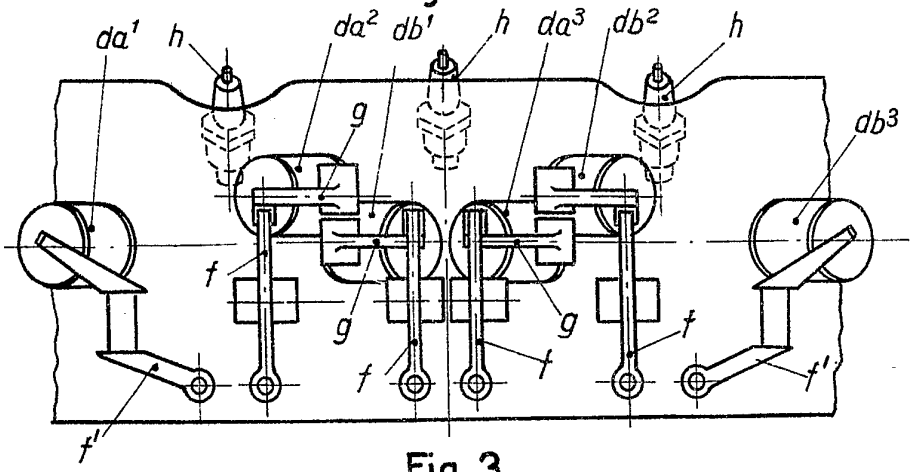
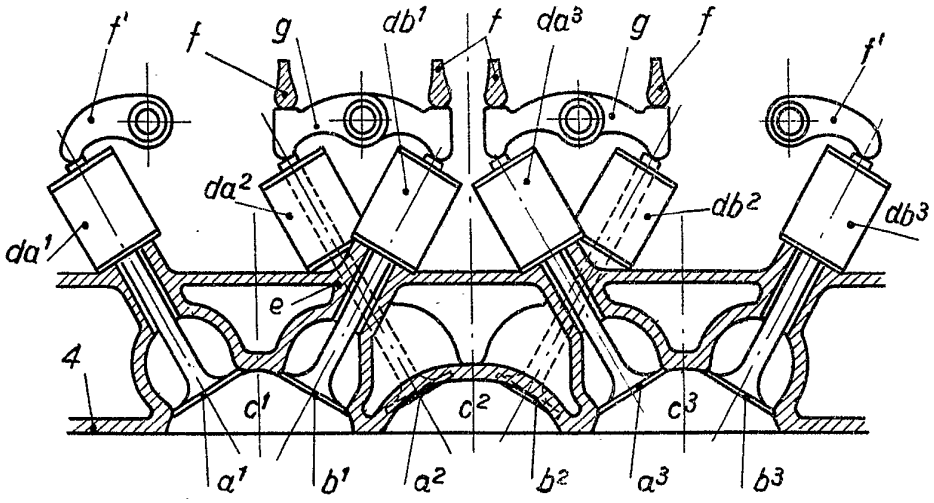


Fig. 3



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