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(54) **Structure of high-output engine**

(57) A high-output engine is constructed to include a cylinder (11), a piston (12) adapted to reciprocate in the cylinder (11), the piston (12) being provided with a pivot pin (13), a crank (15) having a crank arm (151) and a crank shaft (152), and a link (14), the link (14) having a first end pivoted to the pivot pin (13) of the piston (12) and a second end pivoted to the crank arm (151) of the crank (15), the crank arm (151) being an eccentric arm coupled to the second end of the link such that the center of the second end of the link (14) is at an eccentric status relative to the piston (12) and spaced from one side of the center line (a) passing through the center of the piston (12) and the axis of rotation of the crank when the piston (12) moved to the upper limit position.

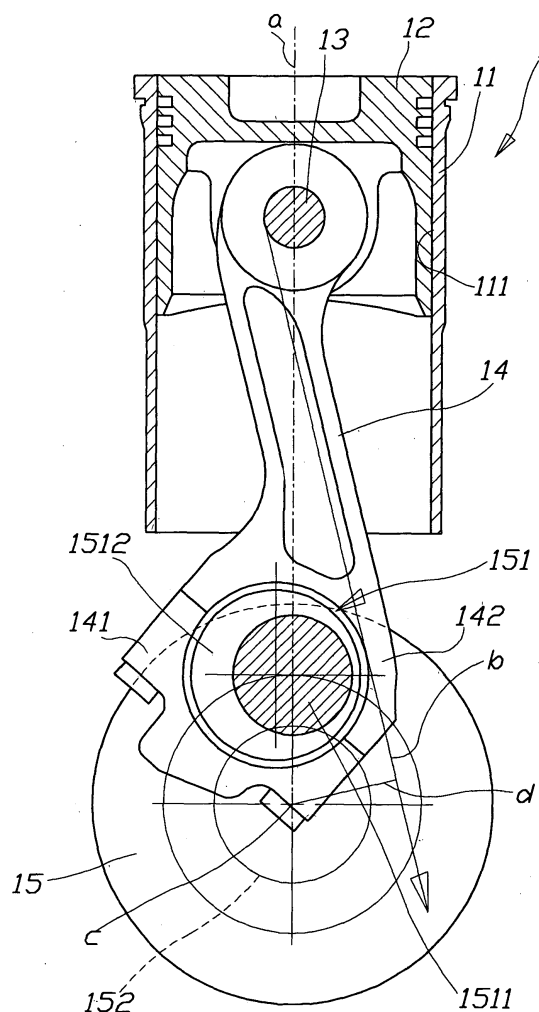


FIG. 3

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention:

[0001] The present invention relates an engine and, more particularly, to a high-output engine, which has the crank arm of the crank made eccentric so as to impart an upward pressure to the piston when the link coupled between the piston and the crank moved to a predetermined angle, achieving an enhanced output of the engine.

2. Description of the Related Art:

[0002] FIGS. 1 and 3 show the structure and operation of an engine according to the prior art. As illustrated, the engine comprises a cylinder 11', a piston 12' reciprocating in the cylinder 11', a crank 15', and a link 14', which has one end pivoted to the piston 12' by a pivot pin 13' and the other end provided with a connector 141' pivoted to the crank 14'. As illustrated, the link is a straight rod member coupled between the piston and the crank. During reciprocating motion of the piston, the link drives the crank to make a rotary motion. The maximum torque of the link is equal to the radius of the arm of rotation of the crank arm 151' (when the crank arm at 45°). The thrust force reaches the maximum when the engine ignited to explode. However, the torque is reduced to the minimum statue at this time. When the piston lowered, the thrust force is gradually reduced, and the torque is relatively increased. Due to the aforesaid problem, the performance of the aforesaid engine cannot be effectively improved.

[0003] Further, the engine is ignited to explode when the piston moved to the upper limited position, i.e., the dead line position where the center of the piston and the center of the link and the center of the crank are vertically aligned in a line). At this time, the volume of the chamber of the cylinder is minimized, providing the best compression ratio. Therefore, this time is the best time for explosion. When passed over the dead line, the piston starts to move downwards, and the best compression ratio and the best explosion time cannot be maintained. The maximum output of the engine is when the crank moved from 0° toward 90° (the moving distance "e" of the piston). After this angle, the output of the engine is gradually reduced. The output power of the engine has a great concern with the variation of the volume of the cylinder chamber 111'. When the volume of the cylinder chamber 111' relatively increased, the explosion pressure is relatively reduced, resulting in a reduction of output power of the engine. On the contrary, when the volume of the cylinder chamber is relatively reduced during this stage and same explosion pressure is maintained, the fuel mixture can be completely burned to relatively increase the output power of the engine.

[0004] Further, in order to obtain the optimum compression ratio, the engine igniting time must be before the dead line. The engine provides no power output or a negative power before the dead line after the explosion. This drawback results in low engine performance, a waste of fuel energy, and a big amount of exhaust gas. Further, because the piston is reciprocated at a high speed when the combustion chamber of the engine is ignited to explode, fuel gas is not completely burned before a next cycle. This problem reduces the efficiency of the engine and, causes the engine to produce much waste gas.

[0005] Therefore, it is desirable to have a high-output engine that eliminates the aforesaid drawbacks.

SUMMARY OF THE INVENTION

[0006] The present invention has been accomplished under the circumstances in view. It is the main object of the present invention to provide a high-output engine, which enhances the output, saves fuel gas, and reduces the production of waste gas. According to the invention, the engine comprises a cylinder, a piston adapted to reciprocate in the cylinder, the piston being provided with a pivot pin, a crank having a crank arm and a crank shaft, and a link, the link having a first end pivoted to the pivot pin of the piston and a second end pivoted to the crank arm of the crank, the crank arm being an eccentric arm coupled to the second end of the link such that the center of the second end of the link is at an eccentric status relative to the piston and spaced from one side of the center line passing through the center of the piston and the axis of rotation of the crank when the piston moved to the upper limit position. When the piston moved to the upper limit position, the link is at an eccentric position relative to the piston, and the connection area between the link and the crank is moved to a position away from the axis passing through the center of the piston and the axis of rotation of the crank. Therefore, the eccentric crank arm of the crank forces the piston upwards to reduce the volume of the cylinder chamber when the crank moved to a particular angle, enabling the fuel mixture to be completely burned to increase the output power of the engine. Further, the link has a curved portion turning in one direction and terminating in the second end so that the direction of applied force of the link passes over the axis of rotation of the crank at one side of the axis passing through the center of the piston and the axis of rotation of the crank opposite to the longitudinal central axis of the crank.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

FIG. 1 is a sectional view of an engine according to the prior art.

FIG. 2 is similar to FIG. 1 but showing the crank

moved to 90°.

FIG. 3 is a sectional view of showing the basic architecture of the present invention.

FIG. 4 is a sectional view of the present invention, showing the crank moved to 0°.

FIG. 5 is a sectional view of the present invention, showing the crank moved to 90°.

FIG. 6 is a sectional view of the present invention, showing the crank moved to 180°.

FIG. 7 is a sectional view of the present invention, showing the crank moved to 270°.

FIG. 8 illustrates the status of the present invention and the status of the prior art design when the crank moved to 0°.

FIG. 9 illustrates the status of the present invention and the status of the prior art design when the crank moved to 45°.

FIG. 10 illustrates the status of the present invention and the status of the prior art design when the crank moved to 90°.

FIG. 11 illustrates the status of the present invention and the status of the prior art design when the crank moved to 180°.

FIG. 12 illustrates the status of the present invention and the status of the prior art design when the crank moved to 270°.

FIG. 13 is a schematic drawing showing one embodiment of the crank arm of the crank according to the present invention.

FIG. 13a is a top plain view of FIG. 13.

FIG. 14 is a sectional view showing an alternate form of the crank arm of the crank according to the present invention.

FIG. 15 is a sectional view showing another alternate form of the crank arm of the crank according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0008] Referring to FIG. 3, a high-output engine 1 in accordance with the present invention is shown comprising a cylinder 11, a piston 12 adapted to reciprocate in the cylinder 11, a crank 15, and a link 14 coupled between the piston 12 and the crank 15. The link 14 has a first end pivoted to the piston 12 by a pivot pin 13, and a second end fixedly mounted with a crank arm connector 141, which is coupled to the crank arm 151 of the crank 15. The crank arm 151 of the crank 15 has an arm shaft 1511 and an eccentric portion 1512 at the arm shaft 1511. The eccentric portion 1512 is coupled to the crank arm connector 141 at the link 14 in such a manner that when the piston 12 moved to the upper limit position, the center of the second end remote from the pivot pin 13 is disposed in an eccentric status relative to the piston 12 and spaced from one side of the center line "a" passing through the center of the piston 12 and the axis of rotation of the crank 15. When the crank 15

moved to 0°, the line of action of force "b" of the link 14 extends over the center "c" of the crank 15 to act against the arm of force "d" of the crank 15, preventing the dead line problem of the conventional design and, relatively prolonging the length of the arm of force "d" of the crank 15. Because the arm of force "d" of the crank 15 is prolonged, the output power of the engine 1 is relatively enhanced. Because the link 14 and the crank arm 151 are biased from one side of the center line "a" passing through the center of the piston 12 and the axis of rotation of the crank 15, the eccentric portion 1512 forces the piston 12 upwards during rotary motion of the crank arm 151 (i.e., the eccentric portion 1512 buffers downward stroke of the piston 12), therefore the down stroke of the piston 12 is relatively shortened to relatively reduce the compressive chamber 111 in the cylinder 11 without reducing the cylinder pressure after explosion, enabling fuel mixture to be completely burned to enhance the output of the engine. The eccentric portion 1512 of the crank arm 151 is preferably integrated with the arm shaft 1511 to achieve the best effect in pushing the piston 12 upwards. Alternatively, the eccentric portion 1512 may be coupled to the arm shaft 1511 of the crank arm 151 by a slip joint, however this arrangement provides an amount of compensation less than the design of having the eccentric portion 1512 integrated with the arm shaft 1511. Further, the link 14 has a curved portion 142 turning in one direction and terminating in the crank arm connector 141 such that the line of action of force of the link 14 is biased toward one side of the crank shaft 152 opposite to the connecting area between the crank arm 151 and the crank arm connector 141. This design eliminates the output loss resulted from the dead line problem seen in the prior art design.

[0009] FIGS. 4~7 show the operation of the present invention. When the crank arm 151 turned to 0°, the eccentric portion 1512 is at the left side (see FIG. 4). When the eccentric portion 1512 turned toward the top side, as shown in FIG. 5, the compensation of the eccentric portion 1512 prolongs the distance between the piston 12 and the crank 14, thereby causing the down stroke time of the piston 12 to be delayed. When the crank arm 151 moved to 0°, the arm of force "d" of the crank 15 passed over the center "c" of the crank 15 to act against the arm of force "d" of the crank 15, preventing the dead line problem of the conventional design and, relatively prolonging the length of the arm of force "d" of the crank 15, and therefore the crank torque is relatively increased to enhance the output power of the engine 1. FIGS. 6 and 7 show the action continued, completing one cycle.

[0010] FIGS. 8~11 show a comparison between the invention and the prior art design in which A'~E' show the actions of the prior art design; A~E show the actions of the present invention. With reference to FIG. 8, when the crank 15 moved to 0°, the engine 1 is ignited to start the explosion stroke, at this time the output force reaches the maximum status, and the torque of the prior art design is on the dead line and zeroed; the arm of force

"d" of the crank **15** according to the present invention is great, providing a relatively greater output torque. FIG. 9 shows the crank **15** moved to 45°. At this time, the piston of the prior art design moving downwards at a high speed and the push force is gradually reducing, the arm of force "d" of the crank **15** of the present invention is at the maximum status, and the downward displacement of the piston **12** of the present invention is about one half of the prior art design. Therefore, the invention provides much greater thrust force than the prior art design, enabling fuel mixture to be completely burned. When moved to the position shown in FIGS. 10 and 11, the thrust force of the prior art design is going to be ended, however the invention still works effectively. When moved to 180° as shown in FIG. 12, the arm of force "d" of the crank **15** of the present invention is reduced to zero. As indicated in the drawings, the arm of force "d" of the crank **15** of the present invention is much greater than the prior art design, and therefore the invention provides a relatively greater output torque. During one full cycle, the piston **12** of the present invention is lowered at a relatively slow speed during working, for enabling fuel mixture to be burned completely and the output thrust to be concentrated when the arm of force "d" of the crank **15** reached the maximum status.

[0011] FIGS. 13 and 13 show one embodiment of the crank arm. As illustrated, the crank arm **151** of the crank **15** is an eccentric arm having an eccentric portion **1512** in the arm shaft **1511**. When the crank arm **151** turned to 0°, the link **14** is in an eccentric status.

[0012] FIG. 14 shows an alternate form of the crank arm. As illustrated, the crank arm **151** of the crank **15** is comprised of a straight arm shaft **1511** and an eccentric portion **1512**, which is an eccentric axle bush formed of two symmetrical halves **1512'** and arranged around the straight arm shaft **1511**.

[0013] FIG. 15 shows another alternate form of the crank arm. As illustrated, the crank arm **151** of the crank **15** is comprised of a straight arm shaft **1511** and an eccentric portion **1512**, which is an eccentric axle bearing having an inner diameter **1514** coupled to the straight arm shaft **1511** and an outer diameter **1516** eccentrically spaced around the inner diameter **1514**.

[0014] Although particular embodiments of the invention have been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.

Claims

1. A high-output engine comprising a cylinder, a piston adapted to reciprocate in said cylinder, said piston being provided with a pivot pin, a crank having a crank arm and a crank shaft, and a link, said link having a first end pivoted to the pivot pin of said pis-

ton and a second end pivoted to the crank arm of said crank, wherein the crank arm of said crank is an eccentric arm coupled to the second end of said link such that the center of the second end of said link is at an eccentric status relative to said piston and spaced from one side of the center line passing through the center of said piston and the axis of rotation of said crank when said piston moved to the upper limit position.

2. The high-output engine as claimed in claim 1, wherein said link has a curved portion turning in one direction and terminating in said second end such that the line of action of force of said link is biased toward one side of the crank shaft of said crank opposite to the connecting area between said crank arm and the second end of said link.

3. The high-output engine as claimed in claim 1, wherein the crank arm of said crank comprises an arm shaft, said arm shaft having an eccentric portion disposed on the middle and coupled to the second end of said link.

4. The high-output engine as claimed in claim 1, wherein said crank arm of said crank comprises a straight arm shaft and an eccentric axle bush mounted on said arm shaft and fastened pivotally with the second end of said link.

5. The high-output engine as claimed in claim 4, wherein said eccentric axle bush is fixedly fastened to said arm shaft and fastened pivotally with the second end of said link.

6. The high-output engine as claimed in claim 4, wherein said eccentric axle bush is axially movably sleeved onto said arm shaft and fastened pivotally with the second end of said link.

7. The high-output engine as claimed in claim 1, wherein said crank arm of said crank comprises a straight arm shaft and an eccentric axle bush mounted on said arm shaft and fastened pivotally with the second end of said link, said eccentric axle bush being formed of two symmetrical halves.

8. The high-output engine as claimed in claim 5, wherein the two symmetrical halves of said eccentric axle bush are abutted against each other and fixedly fastened to the periphery of said arm shaft.

9. The high-output engine as claimed in claim 4, wherein the two symmetrical halves of said eccentric axle bush are abutted against each other and axially slidably sleeved onto said arm shaft.

10. The high-output engine as claimed in claim 1,

wherein said crank arm of said crank comprises a straight arm shaft and an eccentric axle bearing mounted on said arm shaft and fastened pivotally with the second end of said link.

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11. The high-output engine as claimed in claim 10, wherein said eccentric axle bearing having an inner diameter fastened pivotally with said arm shaft, and an outer diameter eccentrically disposed around said inner diameter and fastened pivotally with the second end of said link.

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12. The high-output engine as claimed in claim 10, wherein said eccentric axle bearing having an inner diameter fixedly fastened to the periphery said arm shaft, and an outer diameter eccentrically disposed around said inner diameter and fastened pivotally with the second end of said link.

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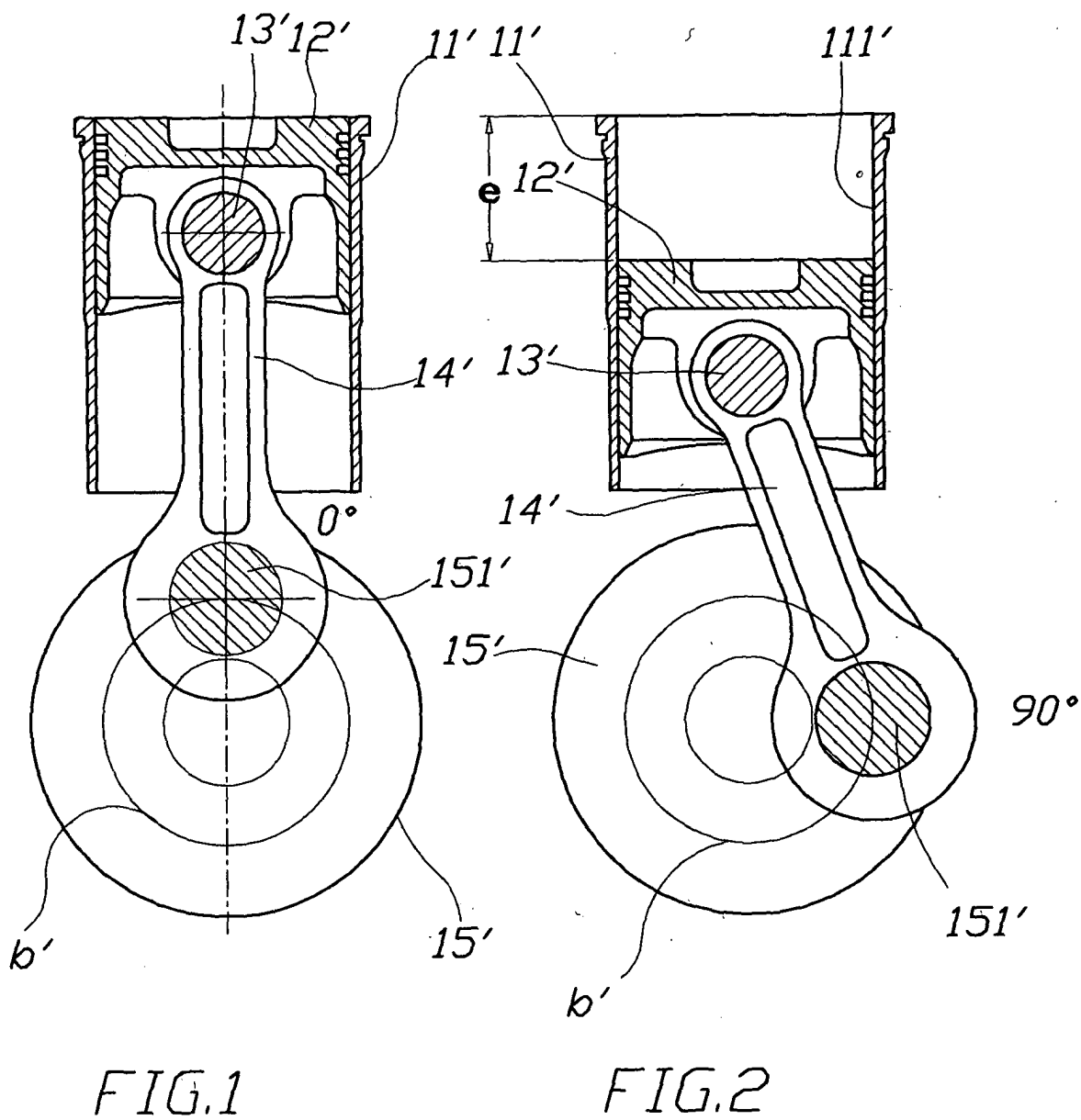
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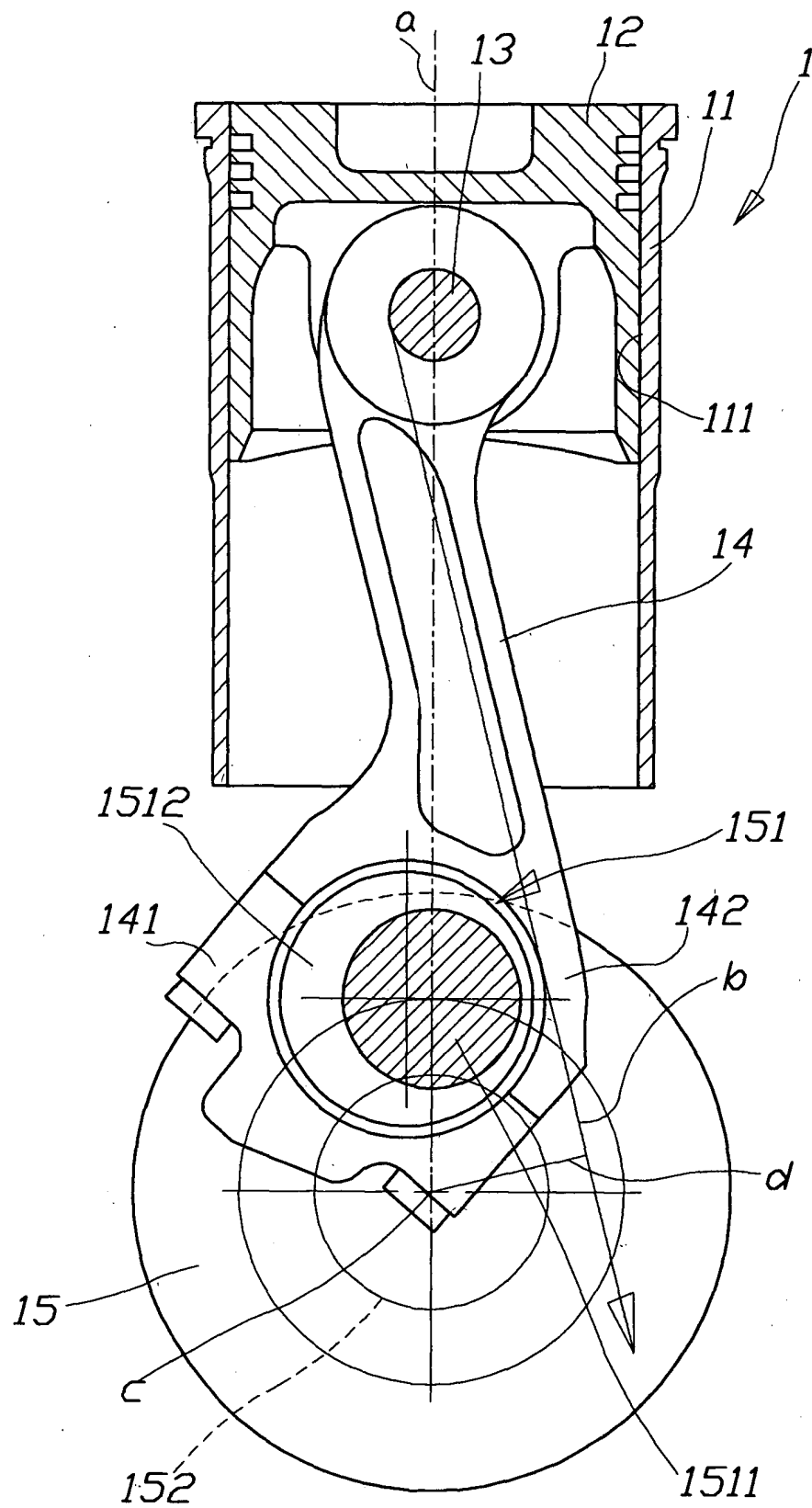


FIG. 3

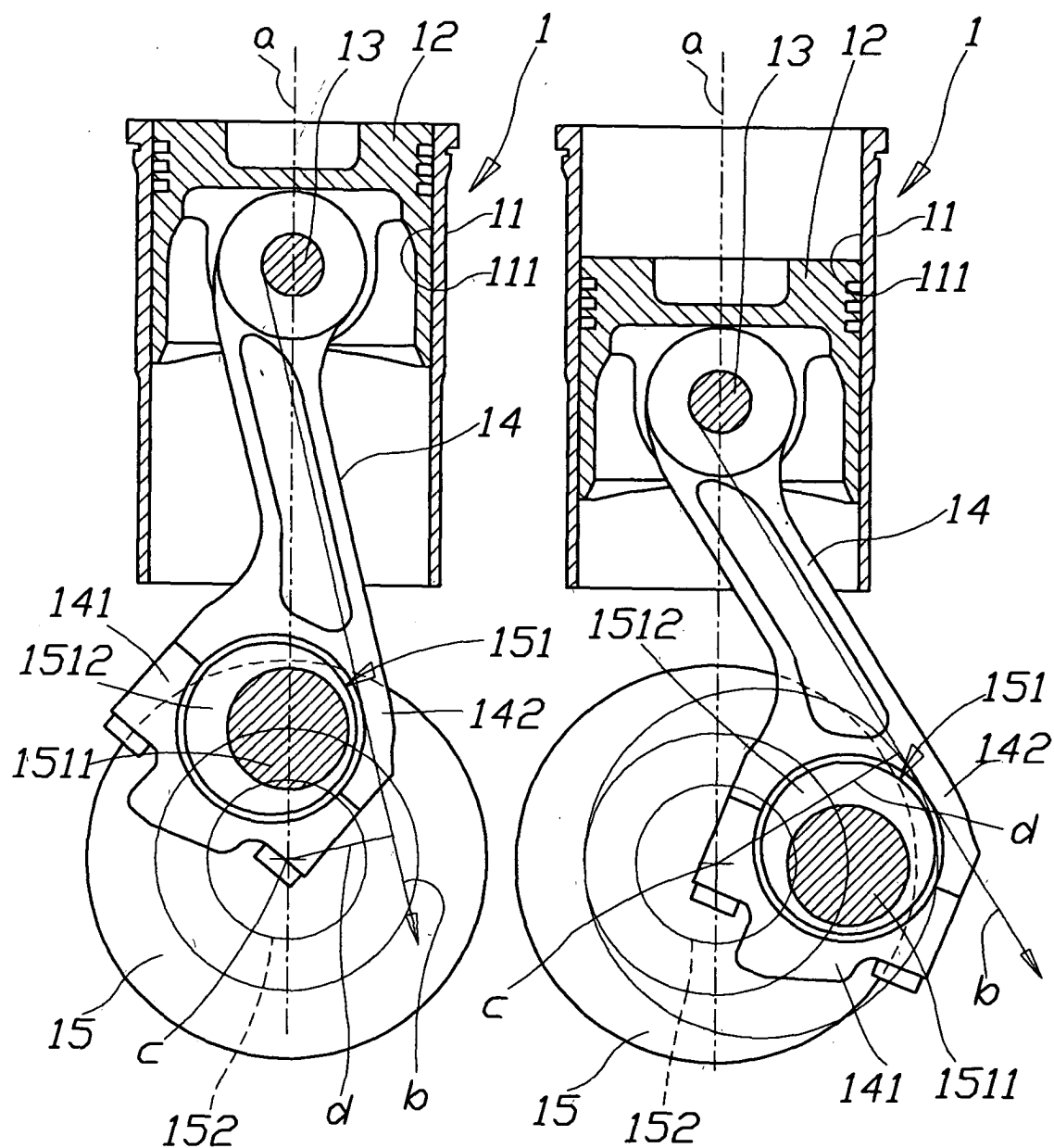


FIG. 4

FIG. 5

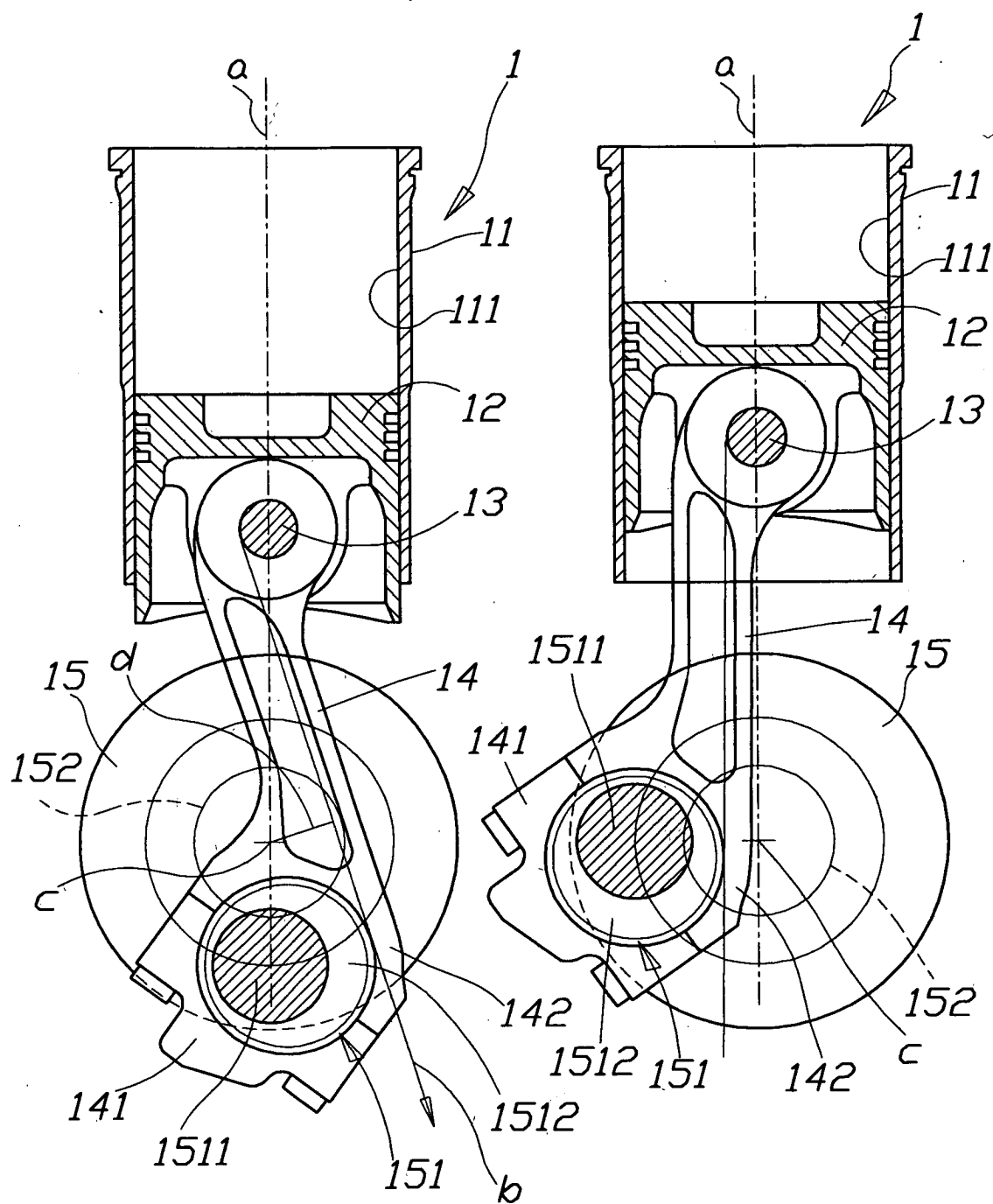


FIG.6

FIG.7

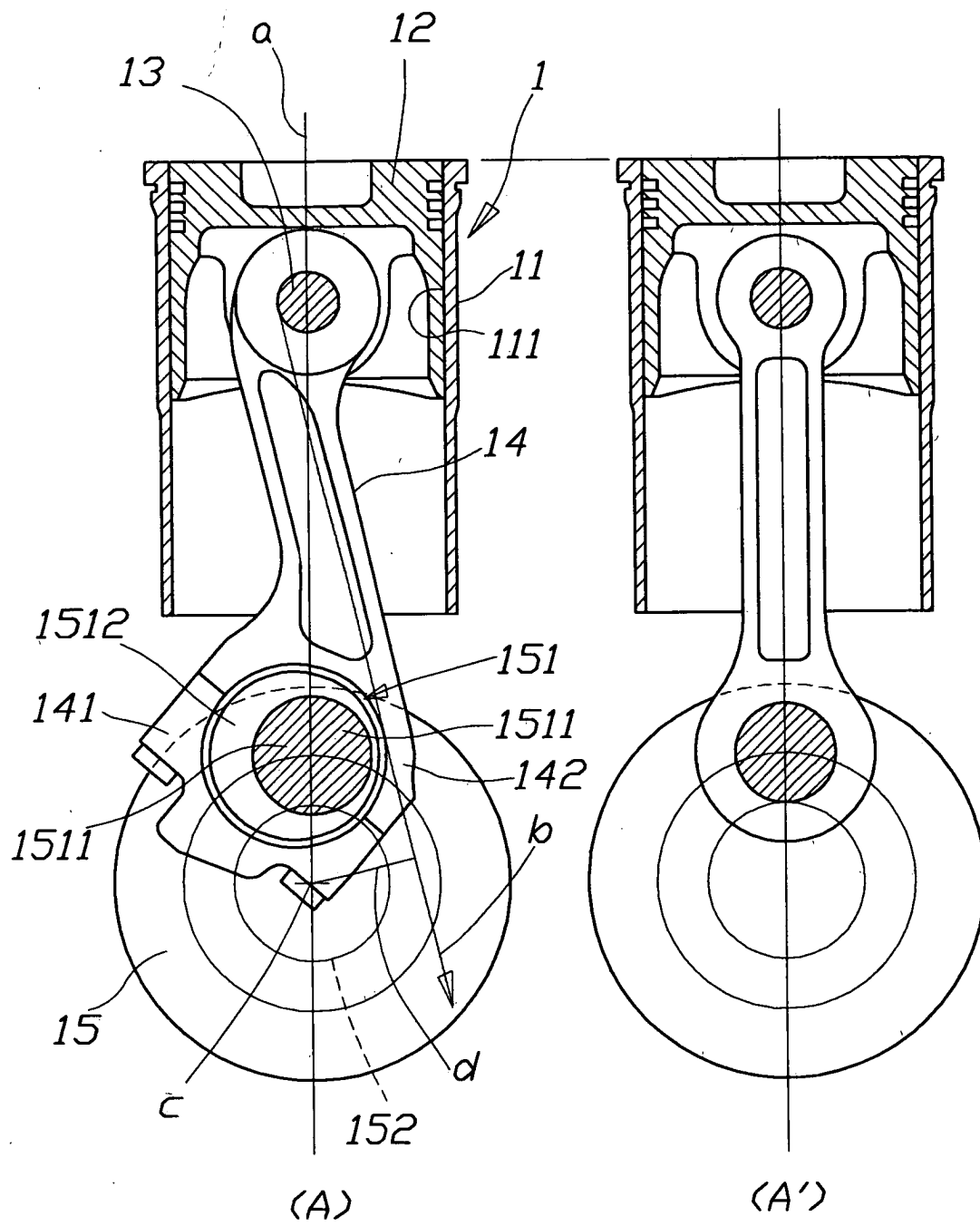


FIG.8

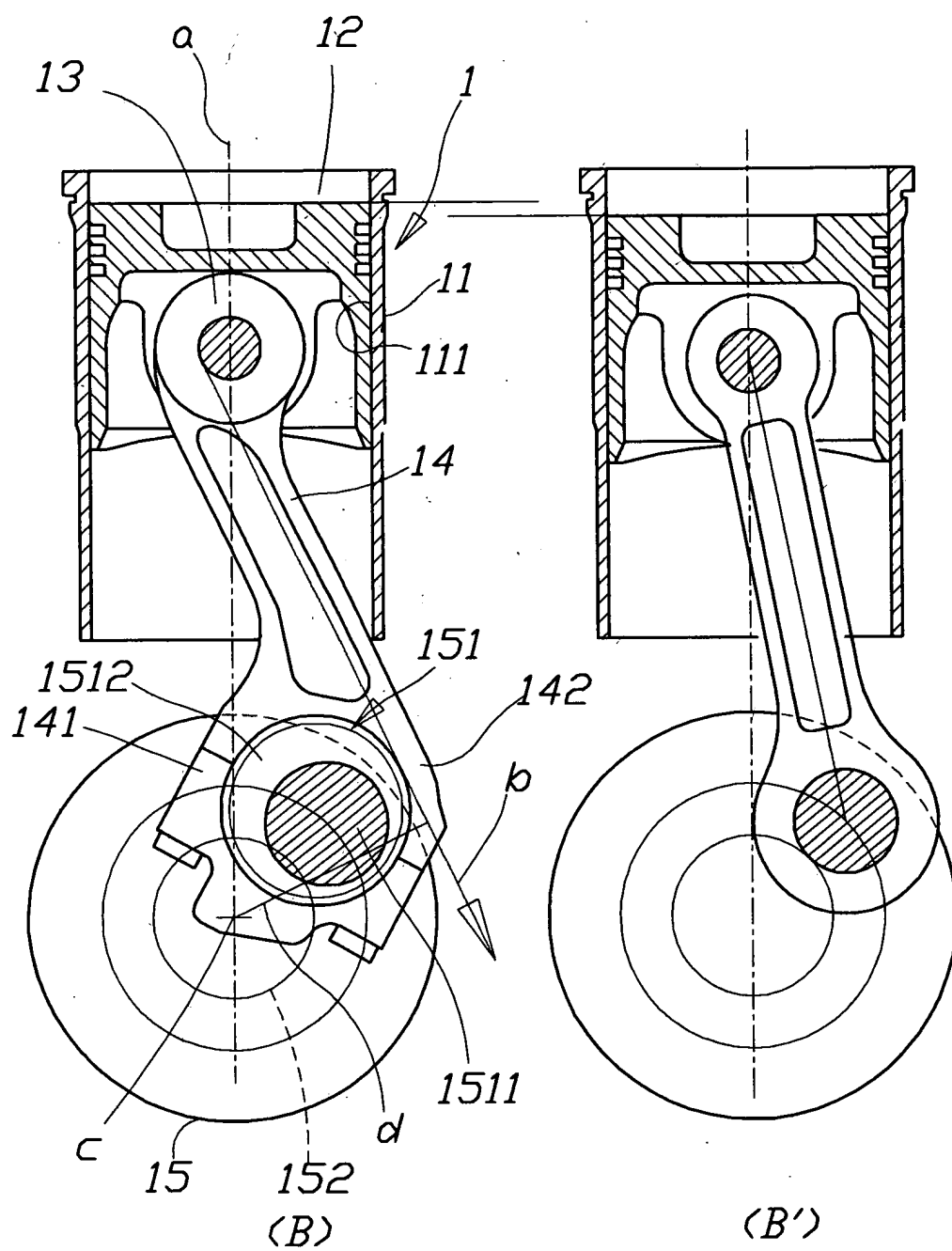


FIG. 9

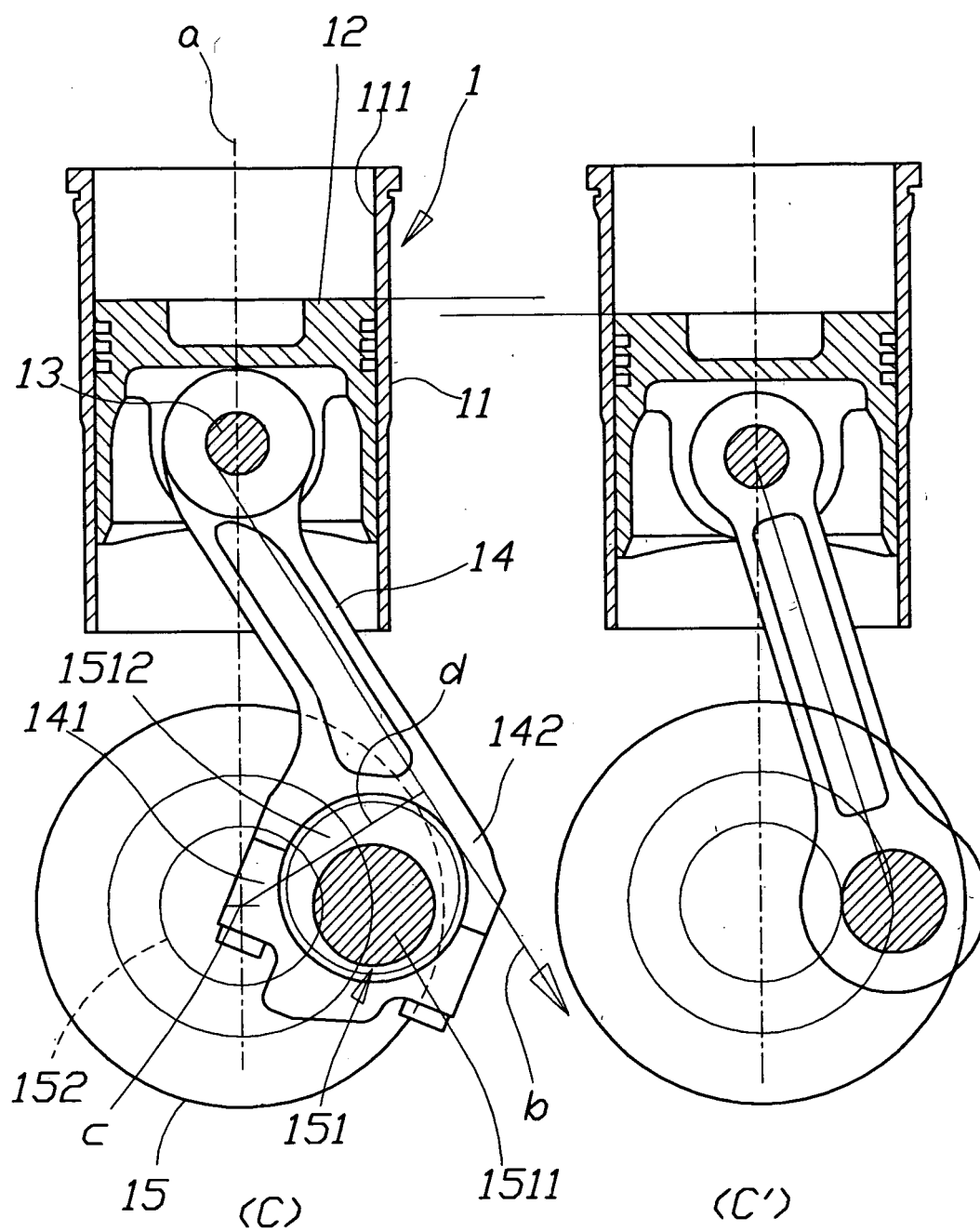


FIG.10

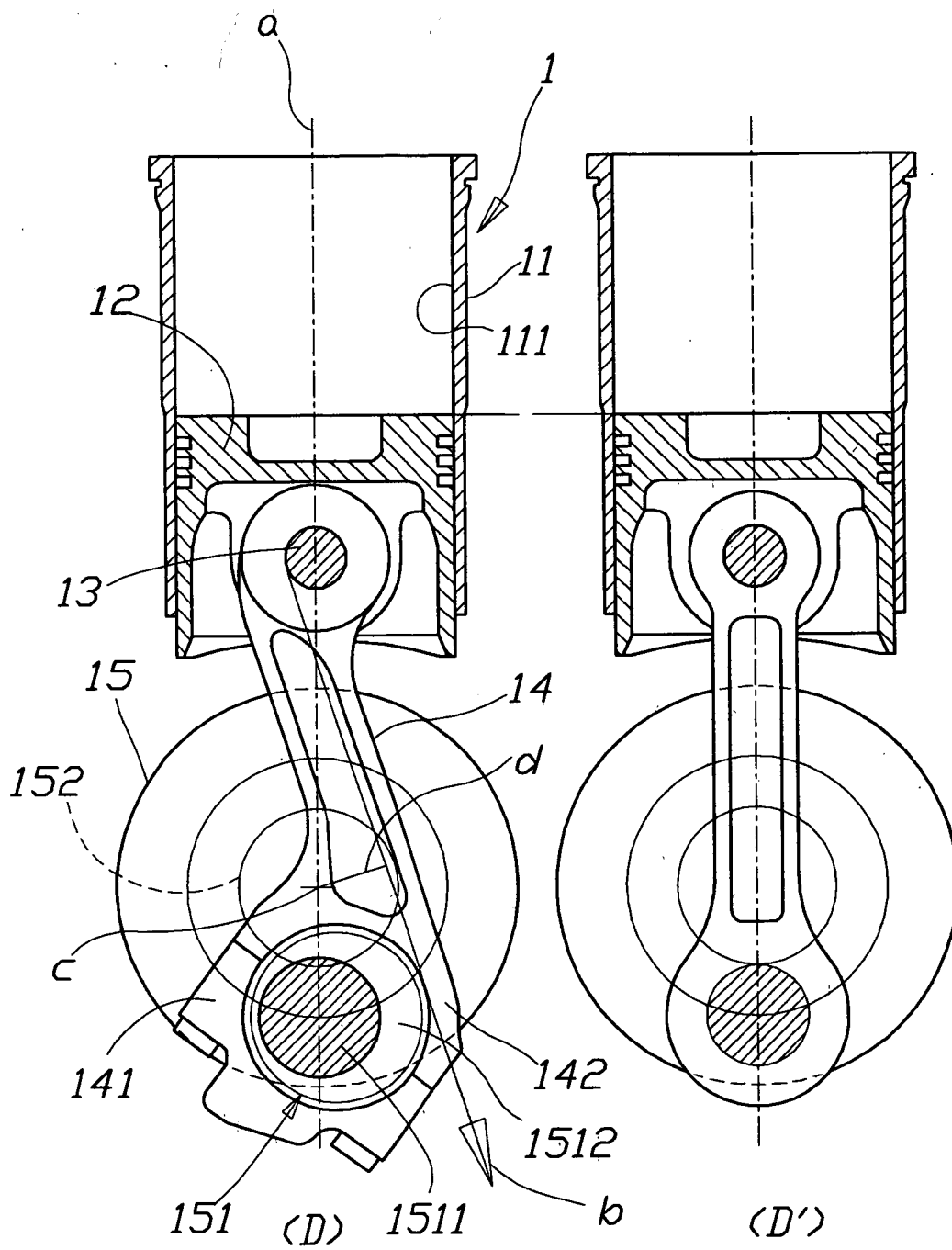
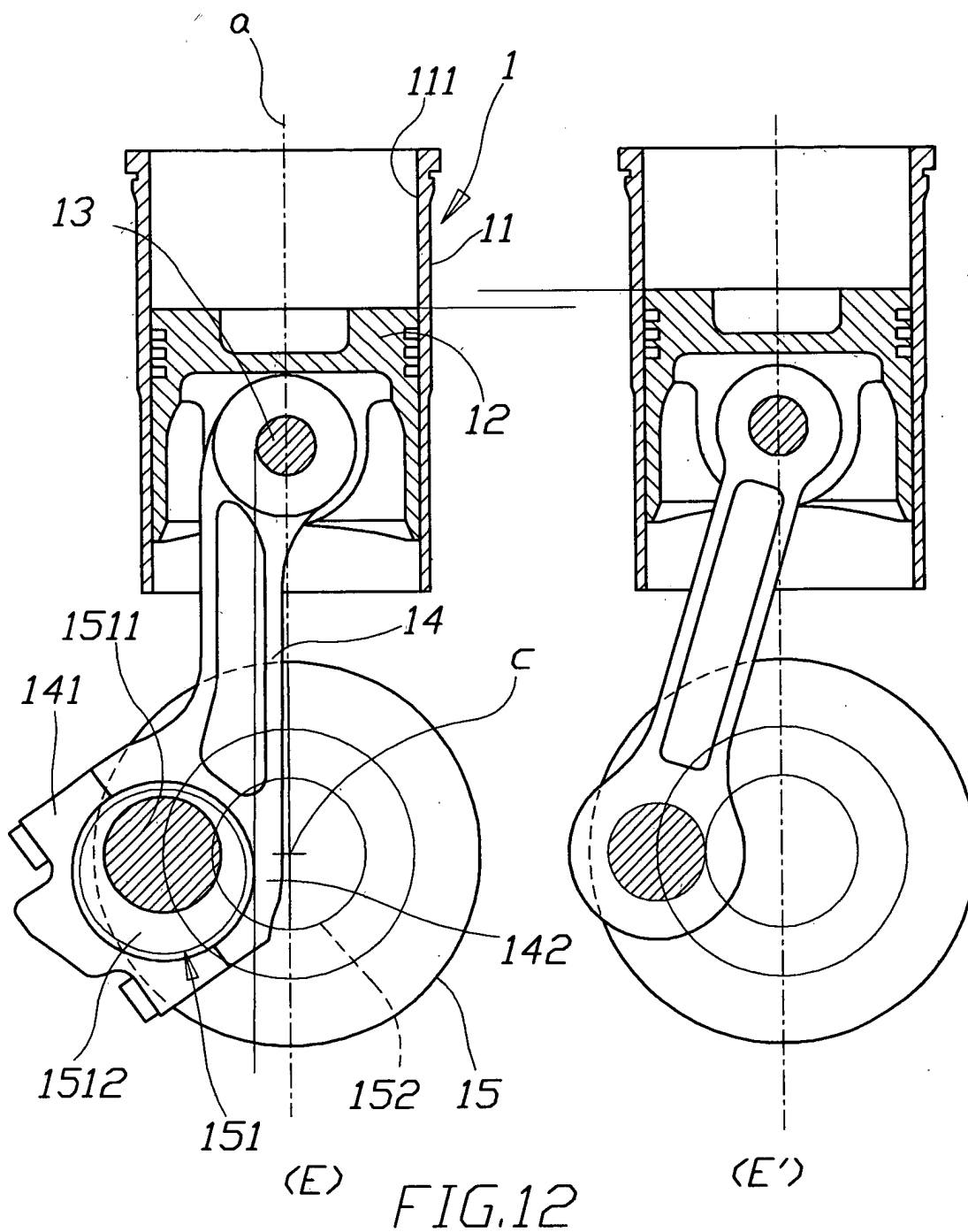
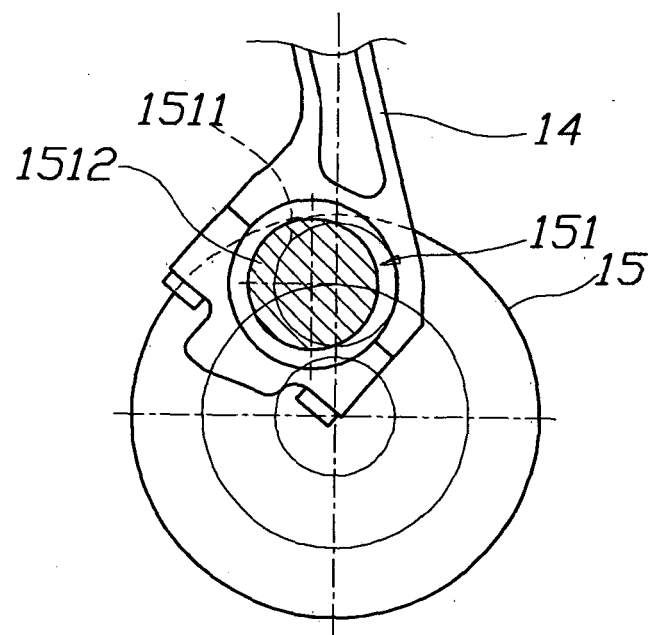
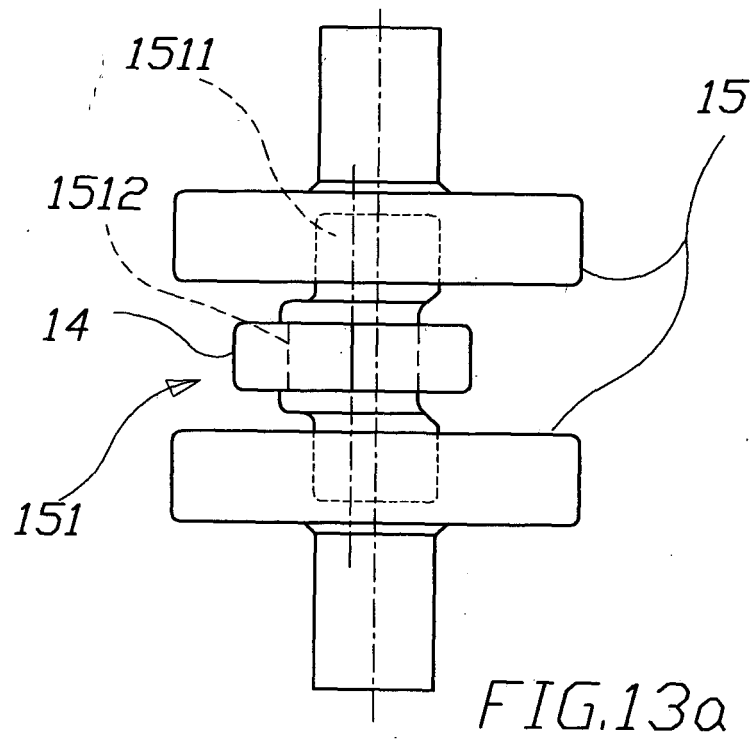


FIG.11





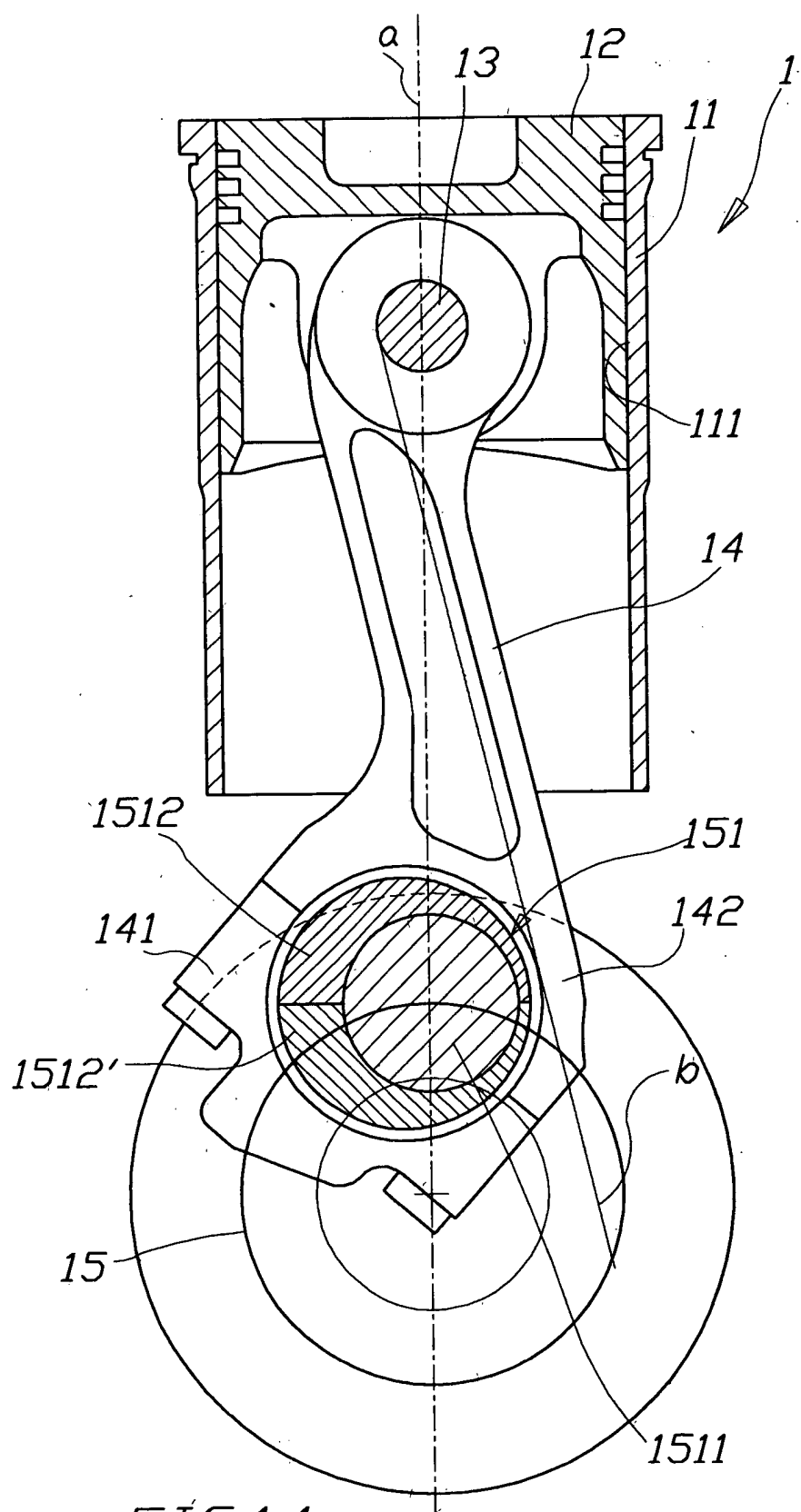


FIG.14

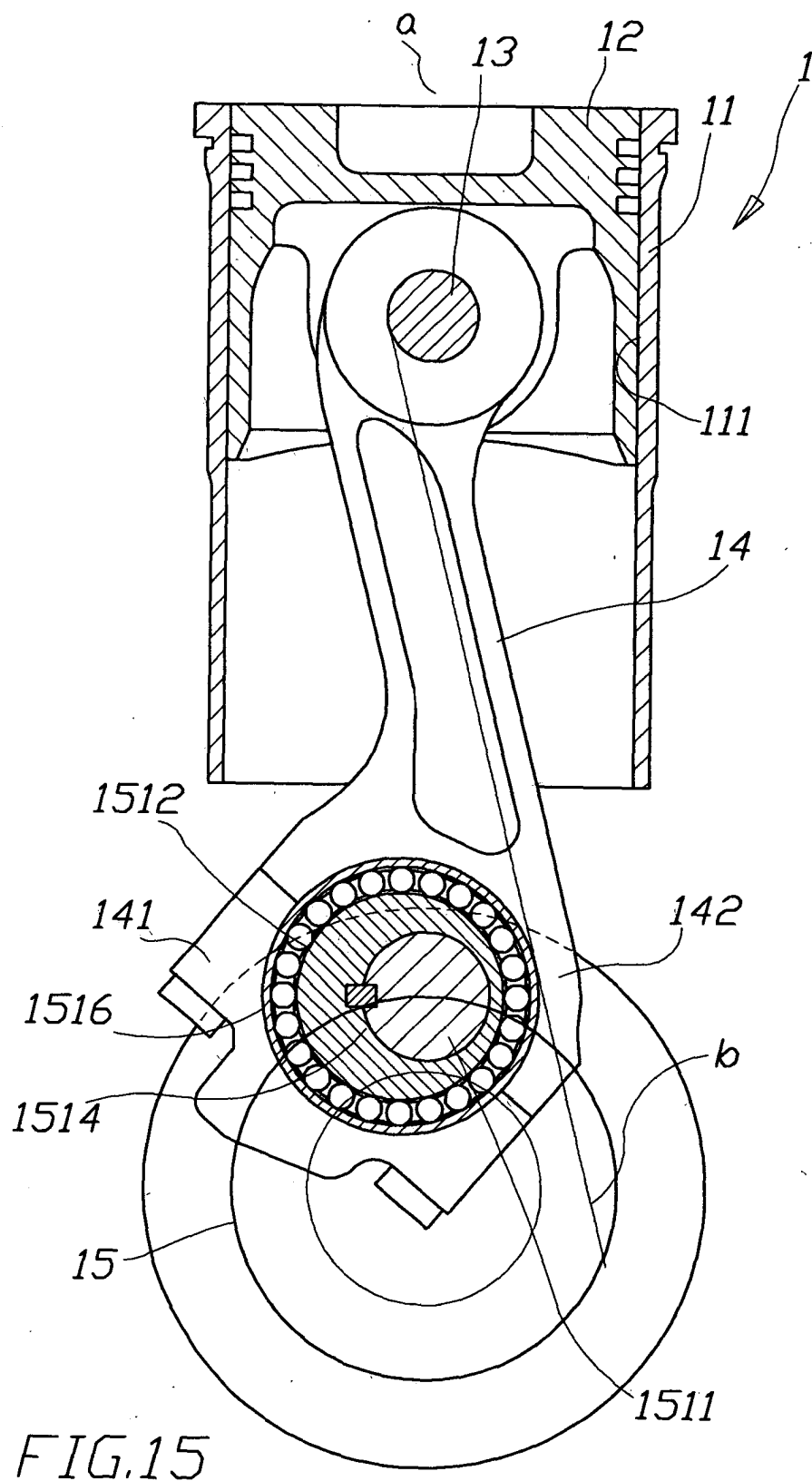


FIG.15



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 03 00 6562

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22 July 2003	Examiner Van Zoest, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 00 6562

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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