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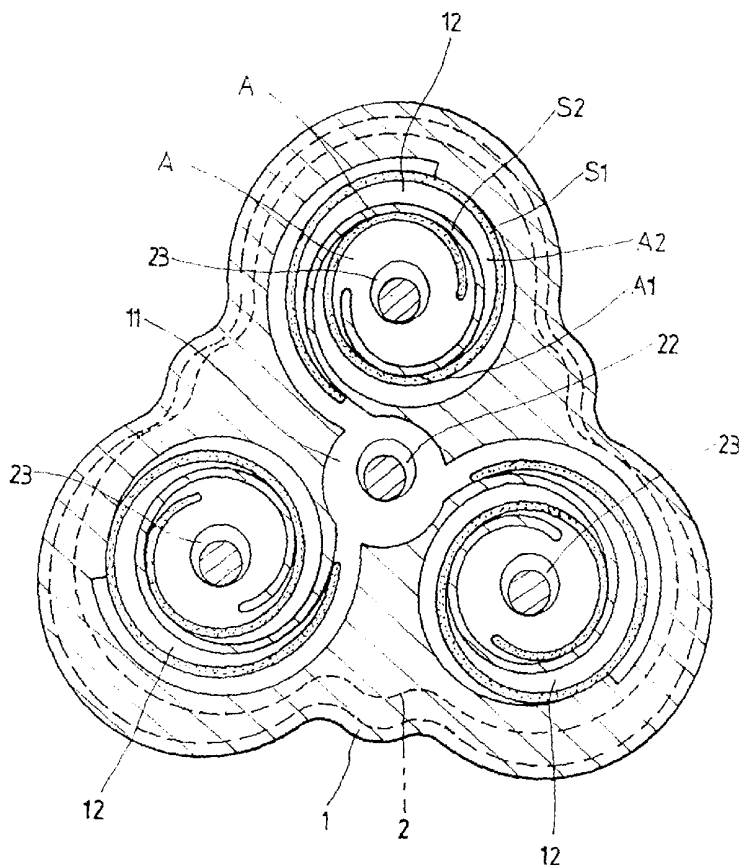
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[Continued on next page]

(54) Title: MULTI-SCROLL PUMP



(57) Abstract: Disclosed is a multi-scroll fluid machine. A housing has a fluid collecting chamber which is defined at a center portion of the housing and at least three scroll chambers which are defined around the fluid collecting chamber to be circumferentially spaced apart one from another by a predetermined angle. An oscillating member is disposed inside the housing and has a plurality of oscillating scroll sections which are respectively positioned inside the scroll chambers. A driving camshaft is mounted to a center portion of the oscillating member, and at least three interlocked camshafts are mounted to the oscillating member around the driving camshaft.



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MULTI-SCROLL PUMP

Technical Field

The present invention relates to a multi-scroll fluid machine which is adapted for compressing, expanding and pumping fluid, and more particularly, the present invention relates to a multi-scroll fluid machine in which a plurality of scroll sections are synchronously actuated in such a way as to render a high level output.

Background Art

Generally, a rotary type scroll fluid machine adopts a basic principle for a scroll which is well known in the art, and, since it can be adapted for compressing, expanding and pumping fluid, it can be used in a variety of products such as a compressor, an expander, a vacuum pump, a feeding mechanism, and the like. Hereafter, among multi-scroll fluid machines, a conventional scroll type fluid machine will be described.

A conventional scroll type fluid machine employs a compression method implemented by synchronous rotating motions of a fixed scroll member and a rotating scroll member. The fixed scroll member is fixed to a body, and the rotating scroll member is connected a separate driving section. As a consequence, when the rotating scroll member receives power and rotates, as the rotating scroll member

is brought into contact with the fixed scroll member, fluid is compressed or expanded.

These days, another rotary type scroll fluid machine is disclosed in the art, in which a fixed scroll member and a rotating scroll member are rotated in an interlocked manner in such a way as to improve efficiency.

Referring to FIG. 9, there is shown a schematic view illustrating a fluid machine in which a fixed scroll member and a rotating scroll member are rotated in an interlocked manner. A construction of this fluid machine will be described below.

The fluid machine includes a body 100, a driving scroll member 200 and a driven scroll member 300. The body 100 has one side to which a driving shaft 102 is mounted, and the other side to which a supporting shaft 103 is eccentrically mounted with respect to the driving shaft 102. The driving shaft 102 can be rotated by driving means 101. The driving scroll member 200 is coupled to an inner end of the driving shaft 102 to receive rotating force from the driving means 101. The driving scroll member 200 has a first scroll 201 which projects inwardly. The driven scroll member 300 is coupled to an inner end of the supporting shaft 103 and has a second scroll 301 which projects inwardly.

An inlet hole IH through which fluid flows into the body 100 is defined through a center portion of the driving

shaft 102, and an outlet hole OH through which fluid is discharged out of the body 100 is defined through an upper portion of the body 100.

As shown in FIG. 10, the first and second scrolls 201 and 301, which are respectively formed on the driving scroll member 200 and the driven scroll member 300, are brought into contact with each other at several parts. Due to this fact, if the driving shaft 102 to which the driving scroll member 200 is connected is rotated, by virtue of close contact of the first and second scrolls 201 and 301 which are formed on the driving and driven scroll members 200 and 300, the driven scroll member 300 as well as the driving scroll member 200 are rotated in an interlocked manner.

Hereinbelow, operations of the rotary type scroll fluid machine constructed as mentioned above will be described.

As can be readily seen from FIGs. 9 and 10, if power is applied to the driving means 101 which is mounted to the one side of the body 100, as the driving shaft 102 is rotated, the driving scroll member 200 is simultaneously rotated therewith.

Further, as described above, the driven scroll member 300 which is eccentrically arranged with respect to the driving scroll member 200 is also interlockedly rotated about the supporting shaft 103 by frictional force

generated between the first and second scrolls 201 and 301.

Therefore, after fluid flows into the body 100 through the inlet hole IH which is defined through the center portion of the driving shaft 102, the fluid is
5 compressed while passing through compression spaces which are repeatedly created by the first and second scrolls 201 and 301 of the driving and driven scroll members 200 and 300. Compressed fluid is fed into an air conditioning line (not shown) after being discharged out of the body 100
10 through the outlet hole OH which is defined through the upper portion of the body 100.

However, the conventional rotary type scroll fluid machine constructed as mentioned above suffers from defects in that, since only a pair of driving and driven scroll
15 members are used to compress fluid, it is impossible to adapt the fluid machine to a large capacity.

Also, because rotating force of the driving scroll member is transmitted by way of friction to the driven scroll member, due to power loss occurring upon continuous
20 rotating friction between the driving and driven scroll members, performance of the fluid machine is deteriorated and thereby a high level output cannot be rendered.

Further, by the fact that the first and second scrolls which are respectively formed on the driving and
25 driven scroll members are likely to be worn out due to the continuous rotating friction, the performance of the fluid

machine cannot but be further deteriorated.

Moreover, due to such worn-out phenomenon, vibration and noise are generated to a great extent while operating the fluid machine.

5 Furthermore, while a lubricating agent is used for preventing the worn-out phenomenon between the scrolls, since the lubricating agent causes slippage between the first and second scrolls to obstruct the rotation of the driven scroll member, it is difficult to attain a high
10 operational precision of the fluid machine.

Disclosure of the Invention

Accordingly, the present invention has been made in an effort to solve the problems occurring in the related art, and an object of the present invention is to provide a
15 multi-scroll fluid machine in which at least three scroll sections are synchronously actuated in such a way as to render a high level output.

Another object of the present invention is to provide a multi-scroll fluid machine wherein an oscillating member
20 which is formed with a plurality of scroll sections is actuated so that it is not fully rotated so as to realize a high speed output.

Another object of the present invention is to provide a multi-scroll fluid machine in which a driving camshaft
25 and interlocked camshafts are connected with each other by

means of gears in such a way as to maximize an output.

Another object of the present invention is to provide a multi-scroll fluid machine in which oscillating scrolls are not slid with respect to fixed scrolls but repeatedly brought into contact therewith in such a way as to prevent the scrolls from being worn out, whereby generation of vibration and noise can be suppressed upon operation of the fluid machine.

Still another object of the present invention is to provide a multi-scroll fluid machine in which a plurality of scroll sections are synchronously actuated through a single driving camshaft in such a way as to simplify a construction of the entire fluid machine.

Yet still another object of the present invention is to provide a multi-scroll fluid machine in which a lubricating agent is not used between scrolls so as to prevent the lubricating agent from being mixed with fluid.

In order to achieve the above objects, according to the present invention, there is provided a multi-scroll fluid machine comprising: a housing having a fluid collecting chamber which is defined at a center portion of the housing and at least three scroll chambers which are defined around the fluid collecting chamber to be circumferentially spaced apart one from another by a predetermined angle; an oscillating member disposed inside the housing and having a plurality of oscillating scroll

sections respectively positioned inside the scroll chambers; and a driving camshaft mounted to a center portion of the oscillating member and at least three interlocked camshafts mounted to the oscillating member
5 around the driving camshaft.

Brief Description of the Drawings

The above objects, and other features and advantages of the present invention will become more apparent after a reading of the following detailed description when taken in
10 conjunction with the drawings, in which:

FIG. 1 is a perspective view illustrating a multi-scroll fluid machine in accordance with an embodiment of the present invention;

FIG. 2 is a cross-sectional view taken along the line
15 A-A of FIG. 1;

FIG. 3 is a cross-sectional view taken along the line B-B of FIG. 2;

FIG. 4 is a schematic view illustrating a connection status of a driving camshaft according to the present
20 invention;

FIG. 5 is a schematic view illustrating a connection status of an interlocked camshaft according to the present invention;

FIG. 6 is a schematic view illustrating an assembled
25 status of gears according to the present invention;

FIG. 7 is a perspective view illustrating a multi-scroll fluid machine in accordance with another embodiment of the present invention;

FIG. 8 is a perspective view illustrating a multi-scroll fluid machine in accordance with still another embodiment of the present invention;

FIG. 9 is a schematic cross-sectional view illustrating a conventional scroll pump; and

FIG. 10 is a cross-sectional view taken along the line C-C of FIG. 9.

Best Mode for Carrying Out the Invention

Reference will now be made in greater detail to a preferred embodiment of the invention, an example of which is illustrated in the accompanying drawings. Wherever possible, the same reference numerals will be used throughout the drawings and the description to refer to the same or like parts.

FIG. 1 is a perspective view illustrating a multi-scroll fluid machine in accordance with an embodiment of the present invention, FIG. 2 is a cross-sectional view taken along the line A-A of FIG. 1, and FIG. 3 is a cross-sectional view taken along the line B-B of FIG. 2. A construction of the multi-scroll fluid machine according to this embodiment of the present invention will be described below.

The multi-scroll fluid machine includes a housing 1, an oscillating member 2, a driving camshaft 22, and at least three interlocked camshafts 23. The housing 1 has a fluid collecting chamber 11 and at least three scroll chambers 12. The fluid collecting chamber 11 is defined at a center portion of the housing 1 in a manner such that it is communicated with an outlet hole 111. The scroll chambers 12 are defined around the center portion of the housing 1 to be circumferentially spaced apart one from another by a predetermined angle. The scroll chamber 12 is communicated with an inlet hole 121 so that fluid can flow into the housing 1. Fluid which has passed through the scroll chambers 12 is collected in the fluid collecting chamber 11 to be discharged out of the housing 1 through the outlet hole 111. Grooves 13 are defined in the housing 1 in a manner such that they are respectively communicated with the scroll chambers 12. The oscillating member 2 is mounted to the housing 1 by being fitted into the grooves 13. The oscillating member 2 has at least three oscillating scroll sections 21 which are respectively arranged in the scroll chambers 12 to compress fluid flowing therein. The driving camshaft 22 is mounted to a center portion of the oscillating member 2 for actuating the oscillating member 2. The interlocked camshafts 23 are mounted to the housing 1 around the center portion of the oscillating member 2 and extend through the oscillating

member 2 to enable oscillatory rotation of the oscillating member 2 in an interlocked manner with the driving camshaft 22. At least one fluid passing hole 24 is defined through the oscillating member 2 in each scroll chamber 12.

5 Each oscillating scroll section 21 comprises a pair of oscillating scrolls S1 which are respectively formed on both surfaces of the oscillating member 2. A pair of fixed scrolls S2 are respectively formed on inner surfaces of the housing 1, which define each scroll chamber 12, to be
10 assembled with the pair of oscillating scrolls S1.

 At least two contact parts A1 and at least two compression spaces A2 are formed between the fixed scroll S2 and the oscillating scroll S1 which are assembled with each other. Consequently, if the driving camshaft 22 is
15 rotated, as the oscillating member 2 is oscillatorily rotated, the contact parts A1 and the compression spaces A2 are alternately created and vanished, whereby fluid which flows into the housing 1 through the inlet hole 121 can be discharged out of the housing 1 through the outlet hole 111.

20 Particularly, according to the present invention, even in the case that at least three interlocked camshafts 23 are mounted to the housing 1, it is possible to oscillatorily rotate the oscillating member 2 in the housing 1.

25 Hereinafter, the above-described construction of the multi-scroll fluid machine according to the present first

embodiment will be more concretely explained.

FIG. 4 is a schematic view illustrating a connection status of the driving camshaft according to the present invention. The driving camshaft 22 has a first eccentric cam 221 which is formed at a middle portion of the driving camshaft 22 and passes through the center portion of the oscillating member 2, and a pair of first rotation shafts 222 which are respectively formed at both ends of the first eccentric cam 221 and extend through the housing 1. A pair of balance weights W, each of which has an eccentric plate-shaped configuration, are respectively mounted to free ends of the first rotation shafts 222 formed at both ends of the first eccentric cam 221 in a manner such that a deviation in center of gravity, which is induced in the driving camshaft 22, can be compensated.

Hence, the driving camshaft 22, which is mounted to the center portion of the oscillating member 2, serves as a power source for oscillatorily rotating the oscillating member 2.

FIG. 5 is a schematic view illustrating a connection status of the interlocked camshaft according to the present invention. Each interlocked camshaft 23 has a second eccentric cam 231 which is formed at a middle portion of the interlocked camshaft 23 and passes through each of the oscillating scroll sections 21 formed to be circumferentially spaced apart one from another by the

predetermined angle and a pair of second rotation shafts 232 which are respectively formed at both ends of the second eccentric cam 231 and supported by the housing 1.

As shown in FIGs. 4 and 5, the first and second eccentric cams 221 and 231, which respectively constitute the driving camshaft 22 and the interlocked camshaft 23, are formed in a manner such that they have the same diameter and eccentricity. By this fact, the oscillating scroll sections 21, which are formed to be circumferentially spaced apart one from another by the predetermined angle, can undergo uniform oscillatory rotation.

A pair of first intermediate eccentric shafts 223 are respectively formed between the first eccentric cam 221 and the pair of first rotation shafts 222 which constitute the driving camshaft 22. A pair of second intermediate eccentric shafts 233 are respectively formed between the second eccentric cam 231 and the pair of second rotation shafts 232 which constitute the interlocked camshaft 23. A soft disc 25 is fitted around each of the first and second intermediate eccentric shafts 223 and 233.

The soft discs 25 function to minimize friction between the intermediate eccentric shafts 223 and 233 and the housing 1 and prevent the inner surfaces of the housing 1 and both surfaces of the oscillating member 2 from being damaged. Also, in the case of using the fluid machine for

an extended period of time, by replacing the soft discs 25 with new ones, it is possible to prevent performance of the entire fluid machine from being deteriorated.

FIG. 6 is a schematic view illustrating an assembled
5 status of gears according to the present invention. A driving gear G1 is mounted to the first rotation shaft 222 of the driving camshaft 22. A driven gear G2 which has the same tooth form and pitch circle as the driving gear G1 is mounted to the second rotation shaft 232 of each
10 interlocked camshaft 23. An idle gear G3 is intervened between the driving gear G1 and each driven gear G2 so that the driven gear G2 can be rotated in the same rotating direction as the driving gear G1.

In other words, the driving camshaft 22 to which the
15 driving gear G1 is mounted and the interlocked camshaft 23 to which the driven gear G2 is mounted, can be rotated at the same rpm.

Hereinbelow, operations of the multi-scroll fluid machine according to the present invention, constructed as
20 mentioned above, will be described.

As shown in FIGs. 1 through 3, first, if the driving camshaft 22 which passes through the center portion of the housing 1 is rotated by a non-illustrated driving section, as the first eccentric cam 221, which is formed at the
25 middle portion of driving camshaft 22, is simultaneously rotated, the oscillating member 2 which is mounted to the

first eccentric cam 221 starts to oscillatorily rotate.

Further, at the same time with this, the interlocked camshafts 23, which are mounted to the housing 1 to be circumferentially spaced apart one from another by the predetermined angle, are interlockedly rotated through oscillatory rotating motion of the oscillating member 2 as a whole, in such a way as to delimit an oscillatory rotation range of the oscillating member 2.

That is to say, if the oscillating member 2 is oscillatorily rotated as described above, as the oscillating scroll sections 21, which are mounted to the oscillating member 2 in such a way as to be circumferentially spaced apart one from another by the predetermined angle, are oscillatorily rotated in the scroll chambers 21 which are defined in the housing 1, the contact parts A1 and the compression spaces A2, which are formed by the oscillating scroll S1 of the oscillating scroll section 21 and the fixed scroll S2 inside the scroll chamber 12, are alternately and repeatedly created.

Hence, fluid which flows into the scroll chamber 12 through the inlet hole 121 is collected in the fluid collecting chamber 11 defined in the center portion of the housing 1 after passing through the alternately and repeatedly created compression spaces A2, and then, fed into an air conditioning line (not shown) through the outlet hole 111 which is communicated with the fluid

collecting chamber 11.

FIG. 7 is a perspective view illustrating a multi-scroll fluid machine in accordance with another embodiment of the present invention. A construction of the multi-scroll fluid machine according to this embodiment of the present invention will be described below.

The housing 1, the oscillating member 2 and the driving camshaft 22 are structured in the same manner as in the first embodiment of the present invention, and therefore, detailed descriptions thereof will omitted herein. In this second embodiment, each interlocked camshaft 23 is mounted so that it is positioned outward of each scroll chamber 12 and each oscillating scroll section 21.

Thus, if the driving camshaft 22 is rotated, the interlocked camshafts 23 are simultaneously rotated by the oscillating rotation of the oscillating member 2.

Namely, if the oscillating member 2 is oscillatorily rotated as described above, as the oscillating scroll sections 21, which are mounted to the oscillating member 2 in such a way as to be circumferentially spaced apart one from another by the predetermined angle, are oscillatorily rotated in the scroll chambers 12 which are defined in the housing 1, the contact parts A1 and the compression spaces A2, which are formed by the oscillating scroll S1 of the oscillating scroll section 21 and the fixed scroll S2

inside the scroll chamber 12, are alternately and repeatedly created. By this, fluid which flows into the scroll chamber 12 through the inlet hole 121 is collected in the fluid collecting chamber 11 defined in the center portion of the housing 1 after passing through the alternately and repeatedly created compression spaces A2, and then, fed into an air conditioning line (not shown) through the outlet hole 111 which is communicated with the fluid collecting chamber 11.

FIG. 8 is a perspective view illustrating a multi-scroll fluid machine in accordance with still another embodiment of the present invention. The housing 1, the oscillating member 2 and the driving camshaft 22 are structured in the same manner as in the first embodiment of the present invention, and therefore, detailed descriptions thereof will omitted herein. In this third embodiment, the fluid machine does not include any interlocked shaft, and only the driving camshaft 22 is mounted through the center portions of the oscillating member 2 and the housing 1.

In other words, if the driving camshaft 22 is rotated, the oscillating member 2 is oscillatorily rotated along with the oscillating scroll sections 21 which are mounted to the oscillating member 2 in such a way as to be circumferentially spaced apart one from another by the predetermined angle.

Consequently, as the oscillating scroll sections 21

are oscillatorily rotated as described above, the contact parts A1 and the compression spaces A2, which are formed by the oscillating scroll S1 of the oscillating scroll section 21 and the fixed scroll S2 inside the scroll chamber 12, are alternately and repeatedly created. By this, fluid which flows into the scroll chamber 12 through the inlet hole 121 is collected in the fluid collecting chamber 11 defined in the center portion of the housing 1 after passing through the alternately and repeatedly created compression spaces A2, and then fed into an air conditioning line (not shown) through the outlet hole 111 which is communicated with the fluid collecting chamber 11.

Industrial Applicability

As a result, the present invention provides the multi-scroll fluid machine capable of rendering a high level output, whereby it is possible to improve output efficiency to a level which cannot be obtained by the conventional scroll pump.

Also, since an oscillating member which is formed with a plurality of scroll sections is actuated so that it is not fully rotated, a high speed output can be realized, whereby an application range of the present fluid machine can be enlarged.

Further, because a driving camshaft and interlocked camshafts are connected with each other by means of gears,

an output can be maximized.

Moreover, since respective scrolls are brought into contact with each other to be prevented from being worn out, generation of vibration and noise can be suppressed upon
5 operation of the fluid machine, whereby operational reliability can be raised.

Furthermore, due to the fact that a construction of the entire fluid machine is simplified through provision of a single driving camshaft, a manufacturing cost of the
10 fluid machine can be reduced.

In addition, since a lubricating agent is not used between scrolls so as to prevent the lubricating agent from being mixed with fluid, it is possible to keep a quality of fluid from being degraded.

Claims

1. A multi-scroll fluid machine comprising:

5 a housing having at least three scroll chambers which are defined around a center portion of the housing to be circumferentially spaced apart one from another by a predetermined angle and into which fluid flows and a fluid collecting chamber which is defined at the center portion of the housing and in which fluid passing through the scroll chambers is collected to be discharged out of the
10 housing;

an oscillating member disposed in the housing and having a plurality of oscillating scroll sections which respectively correspond to the scroll chambers and are capable of compressing fluid flowing into the scroll
15 chambers;

a driving shaft mounted to a center portion of the oscillating member for actuating the oscillating member; and

20 at least three interlocked shafts mounted to the housing around the center portion of the oscillating member and extending through the oscillating member for enabling oscillation of the oscillating member in an interlocked manner with the driving shaft.

2. The multi-scroll fluid machine as claimed in
25 claim 1, wherein the driving shaft comprises a driving

camshaft; and the driving camshaft has a first eccentric cam which passes through the center portion of the oscillating member and a pair of first rotation shafts which are respectively formed at both ends of the first
5 eccentric cam and extend through the housing.

3. The multi-scroll fluid machine as claimed in claim 2, wherein a pair of balance weights, each of which has an eccentric plate-shaped configuration, are respectively mounted to free ends of the first rotation
10 shafts in a manner such that a deviation in center of gravity, which is induced in the driving camshaft, can be compensated.

4. The multi-scroll fluid machine as claimed in claim 1, wherein each interlocked shaft comprises an
15 interlocked camshaft; and the interlocked camshaft has a second eccentric cam which is formed at a middle portion of the interlocked camshaft and passes through the oscillating member and a pair of second rotation shafts which are respectively formed at both ends of the second eccentric
20 cam and supported by the housing.

5. The multi-scroll fluid machine as claimed in claims 1 or 4, wherein each interlocked camshaft is mounted so that it passes through a center of each scroll chamber

and a center portion of each oscillating scroll section.

6. The multi-scroll fluid machine as claimed in claims 1 or 4, wherein each interlocked camshaft is mounted so that it is positioned outward of each scroll chamber and
5 each oscillating scroll section.

7. The multi-scroll fluid machine as claimed in claim 1, wherein each oscillating scroll section comprises a pair of oscillating scrolls which are respectively formed on both surfaces of the oscillating member; and a pair of
10 fixed scrolls are respectively formed on inner surfaces of the housing, which define each scroll chamber, to be assembled with the pair of oscillating scrolls.

8. The multi-scroll fluid machine as claimed in claim 7, wherein at least two contact parts and at least
15 two compression spaces are formed between the fixed scroll and the oscillating scroll which are assembled with each other.

9. The multi-scroll fluid machine as claimed in claim 7, wherein at least one fluid passing hole is defined
20 in each scroll chamber through the oscillating member so that fluid can be delivered into the compression spaces which are defined on both surfaces of the oscillating

member.

10. The multi-scroll fluid machine as claimed in claim 1, wherein an outlet hole is defined in the housing in a manner such that it is communicated with the fluid
5 collecting chamber, and at least one fluid passing hole is defined in the fluid collecting chamber through the oscillating member so that fluid can pass through the oscillating member in the fluid collecting chamber.

11. The multi-scroll fluid machine as claimed in
10 any one of the claims 1, 2 and 4, wherein the first and second eccentric cams, which respectively constitute the driving camshaft and the interlocked camshaft, have the same diameter and eccentricity.

12. The multi-scroll fluid machine as claimed in
15 any one of the claims 1, 2 and 4, wherein a driving gear is mounted to the first rotation shaft of the driving camshaft, a driven gear which has the same tooth form and pitch circle as the driving gear is mounted to the second rotation shaft of each interlocked camshaft, and an idle
20 gear is intervened between the driving gear and each driven gear so that the driven gear can be rotated in the same rotating direction as the driving gear.

13. The multi-scroll fluid machine as claimed in any one of the claims 1, 2 and 4, wherein a pair of first intermediate eccentric shafts are respectively formed between the first eccentric cam and the pair of first rotation shafts which constitute the driving camshaft, a pair of second intermediate eccentric shafts are respectively formed between the second eccentric cam and the pair of second rotation shafts which constitute the interlocked camshaft, and a soft disc is fitted around each of the first and second intermediate eccentric shafts in a manner such that friction between the intermediate eccentric shaft and the housing is minimized.

14. The multi-scroll fluid machine as claimed in claims 1 or 2, wherein the fluid machine does not include any interlocked shaft, and only the driving shaft which comprises the driving camshaft is mounted through the center portions of the oscillating member and the housing.

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FIG. 1

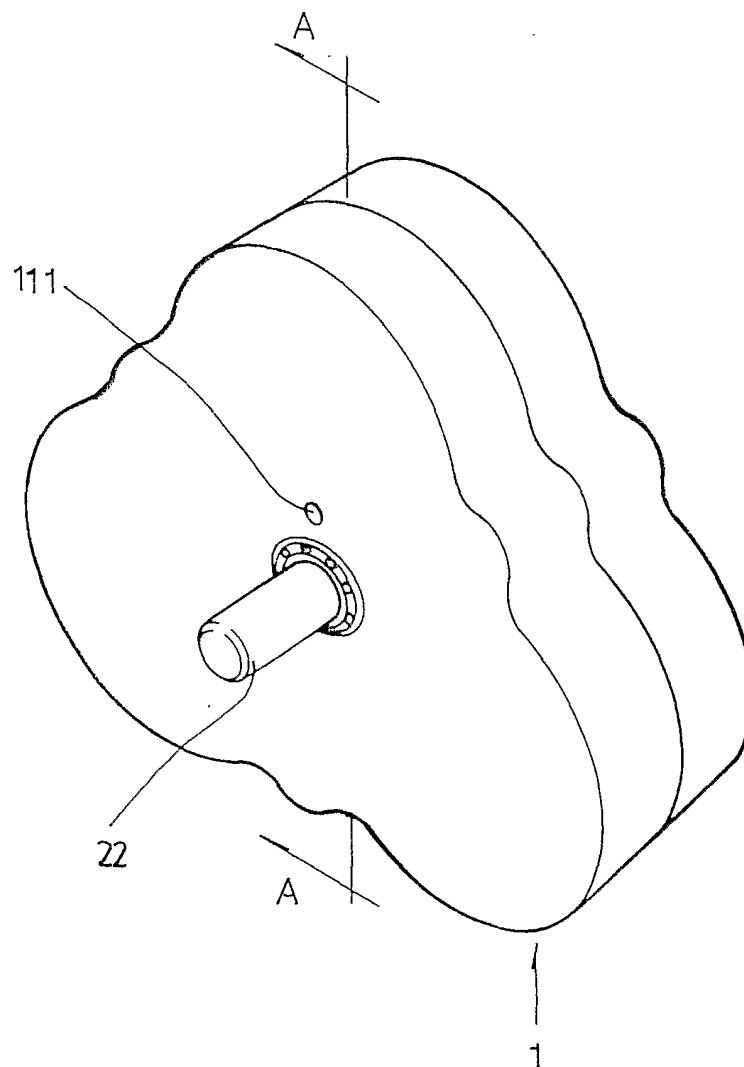
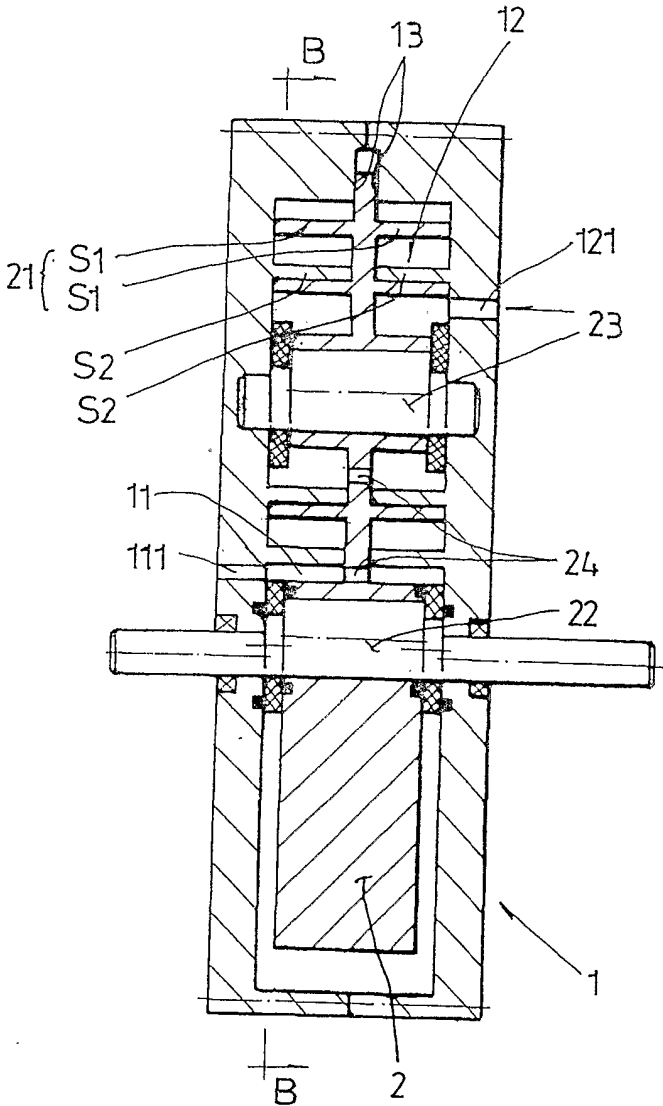


FIG. 2



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FIG. 3

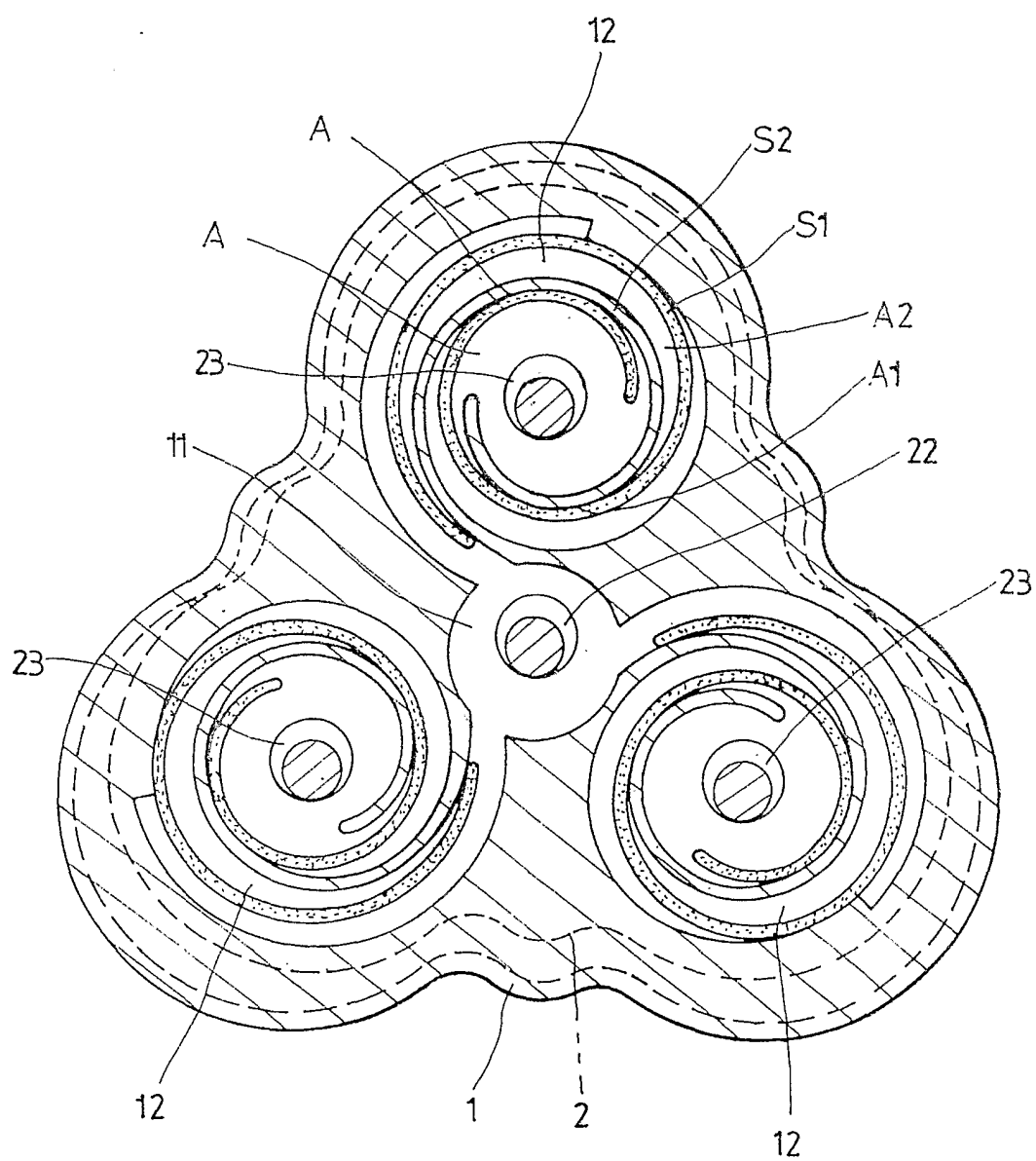


FIG. 4

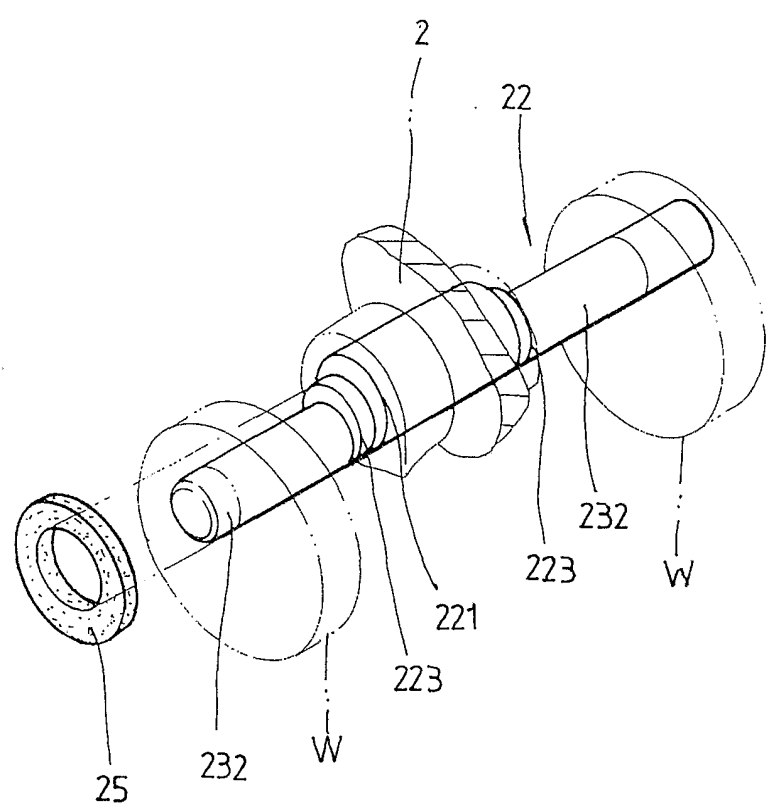
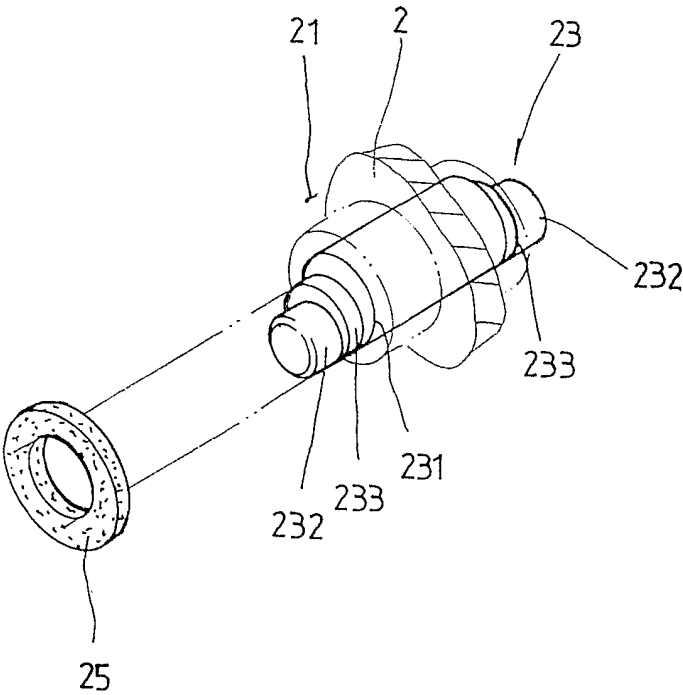
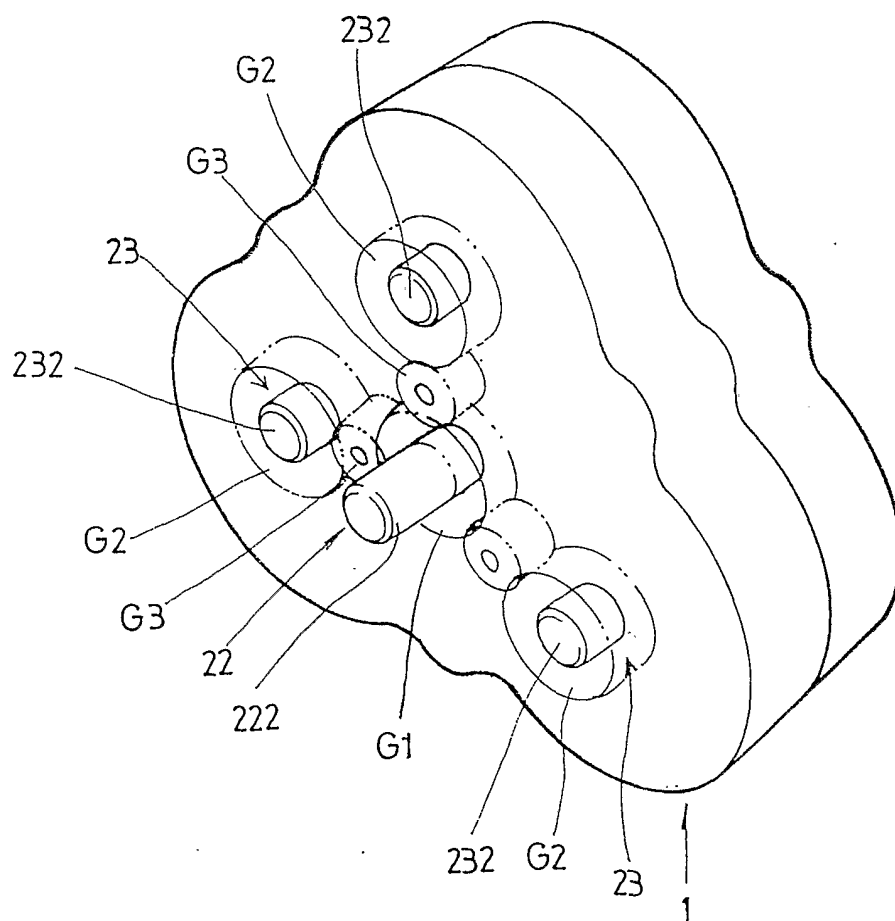


FIG. 5



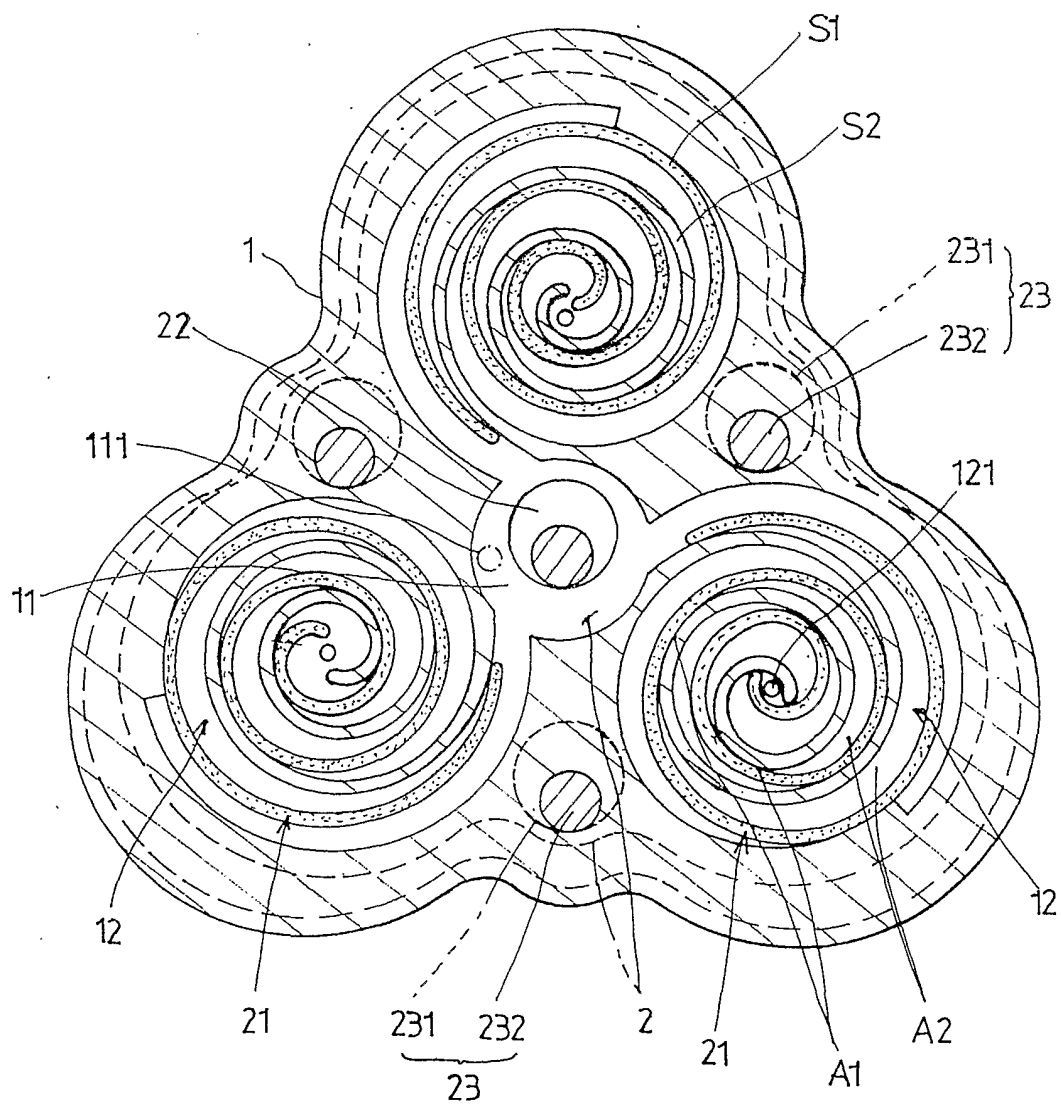
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FIG. 6



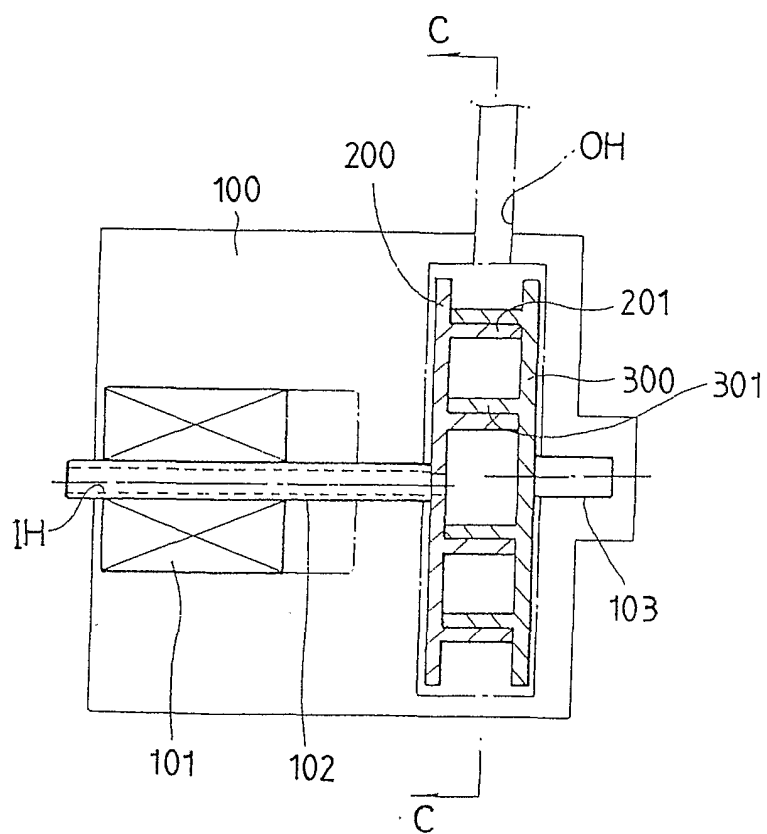
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FIG. 7



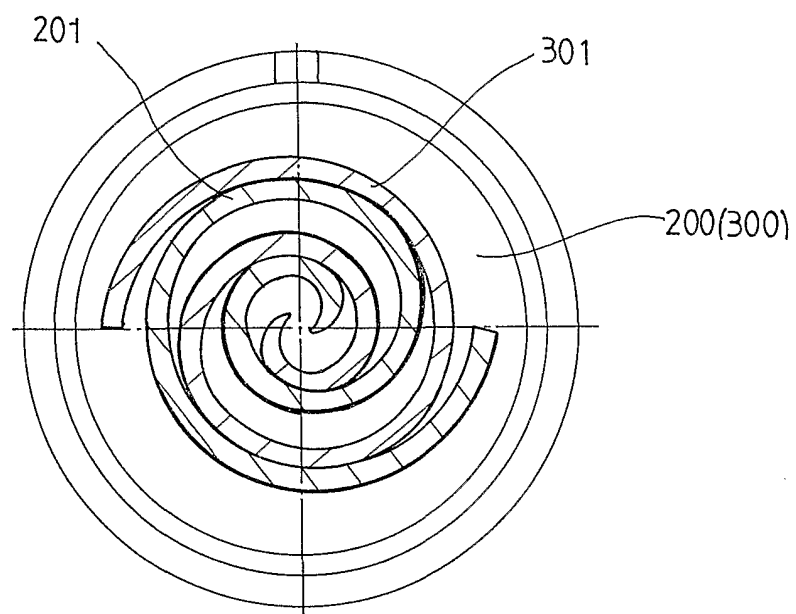
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FIG. 9



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FIG. 10



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR01/00973

A. CLASSIFICATION OF SUBJECT MATTER**IPC7 F04C 18/02**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 F04C 18/02 F04C 18/04 F04C 2/04 F04C 2/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Patents and applications for inventions since 1975

Japanese Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 7-317667 A (SEN DEN CO) 5 DECEMBER, 1995	1 - 14
Y	JP 57-171528 A (IND and GMBH CO) 25 JUNE, 1982	1 - 14
A	JP 64-7779 A (MATSUSHITA CO) 23 MARCH, 1989	1 - 14
A	JP 56-126692 A (HITACHI CO) 12 MARCH, 1980	1 - 14

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

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