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ROTARY COMPRESSOR

TECHNICAL FIELD

The present invention relates to a rotary compressor primarily for use in a refrigerator.

5 BACKGROUND ART

Generally, a rotary compressor has a motor-driven compression member provided within a closed casing. This compression member comprises: a cylinder which has a cylinder chamber, and a suction port and a discharge port
10 both opened to the cylinder chamber; a roller which is insertedly fitted to an eccentric shaft of a drive shaft extending from the motor and which revolves in the cylinder chamber along with rotation of the drive shaft; and a blade which is supported at an intermediate portion between the
15 suction port and discharge port of the cylinder so as to be free to advance and retreat radially. The blade is so arranged that part of high-pressure gas discharged from the discharge port acts on its back face as back pressure, which back pressure in turn causes the tip of the blade to
20 be always kept in contact with the outer peripheral surface of the roller. As a result, the interior of the cylinder chamber is partitioned into a low-pressure chamber





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communicating with the suction port and a high-pressure chamber communicating with the discharge port.

However, when the blade is supported to the cylinder so as to be free to advance and retreat, and has
5 back pressure given on its back face side so that the tip of the blade is always kept in contact with the outer peripheral surface of the roller as described above, the contact portion between the blade and the outer peripheral surface of the roller is poorly fed with lubricating oil so
10 as to be brought into metallic contact, during relative rotation of the roller and the blade. The result would be greater friction loss due to sliding resistance and therefore greater power loss, to a disadvantage. Further, high-pressure gas compressed in the high-pressure chamber
15 may leak through the contact portion between the tip side of the blade and the roller into the low-pressure chamber. This would cause another problem that compression efficiency deteriorates.

Thus, the present inventor has before proposed a
20 rotary compressor which can solve the above problems (Japanese Patent Application No. HEI 4-252750). Although this patent application has not been laid open yet, nor is it the prior art of the present invention, yet it is here described for an easier understanding of the present
25 invention. The rotary compressor, as shown in Fig. 8,



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comprises a cylinder A having a cylinder chamber A1, and a roller C fitted to an eccentric shaft B1 of a drive shaft B and internally provided in the cylinder chamber A1. In the rotary compressor, a blade D is coupled with an outer peripheral portion of the roller C so as to protrude radially outward, while a retainer hole A5 of circular shape in cross section having an opening A4 opened to the cylinder chamber A1 is formed at an intermediate portion between a suction port A2 and a discharge port A3 both provided in the cylinder A. In this retainer hole A5 is provided a swinging bush E which has a receptive groove E1 for receiving the protruding tip side of the blade D in such a way that the tip side of blade D is free to advance and retreat, and which is swingably retained to the cylinder A. In this arrangement, the protruding tip side of the blade D is inserted into the receptive groove E1 of the bush E so as to be free to advance and retreat, whereby the interior of the cylinder chamber A1 is partitioned into a low-pressure chamber Y communicating with the suction port A2 and a high-pressure chamber X communicating with the discharge port A3. Besides, the blade D is inserted into the bush E, whereby the roller C is non self-rotary type and operates along the inner peripheral surface of the cylinder chamber A1. It is noted that, in Fig. 8, reference character F denotes a valve plate disposed on the



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outer side of the discharge port A3 and G denotes a receptive plate of the valve plate F.

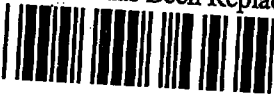
With the roller C in operation within the cylinder chamber A1 by the drive of the drive shaft B, the blade D coupled with the outer peripheral portion of the roller C is moved to advance and retreat with respect to the receptive groove E1 in accompaniment by the swing of the bush E. By this operation, the interior of the cylinder chamber A1 is partitioned into the high-pressure chamber X and the low-pressure chamber Y. Gas fluid is sucked through the suction port A2 into the low-pressure chamber Y, while gas fluid compressed in the high-pressure chamber X is discharged through the discharge port A3 to outside.

As described above, in the so-called swinging type blade in which the blade D is provided on the outer peripheral surface of the roller C so as to protrude radially outward and the protruding tip side of the blade D is inserted into the receptive groove E1 of the bush E so as to be free to advance and retreat, the blade D and the roller C will not be moved relative to each other and the blade D will not be brought into contact with the outer peripheral surface of the roller C, either, unlike the conventional counterpart in which the protruding tip of the blade D is always kept in contact with the outer peripheral



surface of the roller C. As a result, friction loss due to the contact between the roller C and the blade D can be suppressed so that power loss can be reduced. Yet, high-pressure gas in the high-pressure chamber X can be prevented from leaking through the contact surface between the blade D and the roller C into the low-pressure chamber Y, so that compressive efficiency can be improved.

However, according to the above-described arrangement, with the roller C in operation within the cylinder chamber A1, the tip side of the blade D protrusively provided on the outer peripheral surface of the roller C moves to advance and retreat within the receptive groove E1 of the bush E, while the bush E swingingly moves after the movement of the roller C within the retainer hole A5. As a result, when the roller C is operated, for example, clockwise in the figure, tensile stress in the direction of arrow Z in Fig. 8 concentrates on the low-pressure chamber Y side in the joint portion of the blade D to the roller C, while compressive stress concentrates on the high-pressure chamber X side in the joint portion of the blade D to the roller C. Due to this fact, the blade D has been easily fracture-damaged at the joint portion, to a problem.



DISCLOSURE OF THE INVENTION

5 It is a primary object of the present invention to provide a rotary compressor which, despite the construction having a swinging type blade, can be improved in reliability by preventing the blade from being fracture-
damaged at its joint portion to the roller and yet which can be improved in volumetric efficiency of the compressor by reducing ineffective volume on the high-pressure chamber X side.

10 To achieve the above object, according to the present invention as described in claim 1, the rotary compressor comprises: a cylinder 2 having a cylinder chamber 21; a roller 3 which is fitted to an eccentric shaft 61 of a drive shaft 6 and which is internally
15 provided in the cylinder chamber 21; a blade 4 which is protrusively coupled with an outer peripheral portion of the roller 3 and which partitions the interior of the cylinder chamber 21 into a low-pressure chamber Y communicating with a suction port 22 and a high-pressure
20 chamber X communicating with a discharge port 23; and a swinging bush 5 which has a receptive groove 51 for receiving the protruding tip side of the blade 4 in such a way that the tip side of the blade 4 is free to advance and retreat, and which is swingably supported to a retainer
25 hole 25 provided in the cylinder 2, characterized in that



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the rotary compressor further comprises a swelling portion 41 formed at the joint portion of the blade 4 to the roller 3, and a recessed portion 52 formed in the bush 5 and for receiving the swelling portion 41.

5 Also, according to the present invention as described in claim 2, the swelling portion 41 is formed on the high-pressure chamber side of the joint portion of the blade 4 to the roller 3, and the recessed portion 52 for receiving the swelling portion is provided on the high-
10 pressure chamber side of the swinging bush 5.

 Further, according to the present invention as described in claim 3, the swelling portions 41, 41 are formed in a pair on both the high-pressure chamber side and the low-pressure chamber side at the joint portion of the
15 blade 4 to the roller 3, and the recessed portions 52, 52 for receiving the swelling portions 41, 41 are provided on both the high-pressure chamber side and the low-pressure chamber side of the swinging bush 5.

 Further, according to the present invention as
20 described in claim 4, the swinging bush 5 comprises a pair of unitary bushes 5a, 5b having a semi-circular cross section, the receptive groove 51 is formed between opposite surfaces of the unitary bushes 5a, 5b, and the unitary bushes 5a, 5b are provided with recessed portions 52 of



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identical shape, respectively, for receiving the swelling portion 41 formed at the joint portion of the blade 4.

Further, according to the present invention as described in claim 5, the roller 3 has, on an outer peripheral portion opposite to the swinging bush 5, a fitting groove 31 extending in parallel to the drive shaft 6, and the blade 4 comprises an inserting portion 4a to be inserted into the receptive groove 51 in such a way that the inserting portion 4a is free to advance and retreat, a coupling portion 4b which is thicker than the inserting portion 4a and which is to be securely fitted to the fitting groove 31, and the swelling portion 41 formed between the inserting portion 4a and the coupling portion 4b.

According to the invention as described in claim 1, the blade 4 is reinforced by the swelling portion 41 provided at the joint portion of the blade 4 to the roller 3 so that the blade 4 can be prevented from being fracture-damaged at its joint portion to the roller 3, despite its construction that the blade 4 is protrusively provided on an outer peripheral portion of the roller 3 and the protruding tip side of the blade 4 is inserted into the receptive groove 51 of the bush 5 so as to be free to advance and retreat. Still, the swinging bush 5 is provided with the recessed portion 52 for receiving the



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swelling portion 41. Therefore, when the roller 3 has reached the top dead center position during its operation within the cylinder chamber 21, i.e. when the tip side of the blade 4 is inserted deeply inside of the receptive
5 groove 51 of the bush 5 until the outer peripheral surface of the roller 3 is brought into contact with a portion of the inner wall surface of the cylinder chamber 21 opposite to the bush 5, the swelling portion 41 provided at the joint portion of the blade 4 is inserted into the recessed
10 portion 52 of the bush 5. As a result, ineffective volume formed between the outer peripheral surface of the roller 3 and the bush 5 in the top dead center position on the high-pressure chamber X side can be reduced, as compared to when the recessed portion 52 is not provided. Accordingly, when
15 the discharge stroke is finished and shifted to the suction stroke with the joint portion of the blade 4 reinforced, where suction gas is sucked into the low-pressure chamber Y, high-pressure gas remaining in the ineffective volume can be suppressed from flowing back toward the low-pressure
20 chamber Y to re-expand, so that the volumetric efficiency of the compressor will never deteriorate.

Also, according to the invention as described in claim 2, the swelling portion 41 is formed on the high-pressure chamber X side at the joint portion of the blade 4
25 to the roller 3, and the recessed portion 52 for receiving



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the swelling portion 41 is provided on the high-pressure chamber X side of the bush 5. As a result, compressive stress that acts on the blade 4 can be relieved by the swelling portion 41, so that the blade 4 can be effectively prevented from being fracture-damaged. Moreover, when the roller 3 has reached the top dead center position of the cylinder chamber 21 during its operation within the cylinder chamber 21, the swelling portion 41 of the blade 4 on the high-pressure chamber X side is inserted into the recessed portion 52 of the bush 5, whereby ineffective volume formed between the outer peripheral surface of the roller 3 and the bush 5 on the high-pressure chamber X side can be further lessened, while the joint portion of the blade 4 can be reinforced. Accordingly, the volumetric efficiency of the compressor can be improved in proportion.

Further, according to the invention as described in claim 3, a pair of swelling portions 41, 41 are formed on both the high-pressure chamber X side and the low-pressure chamber Y side at the joint portion of the blade 4 to the roller 3, and recessed portions 52, 52 for receiving the swelling portions 41, 41 are provided on both the high-pressure chamber X side and the low-pressure chamber Y side of the bush 5. As a result, when the roller 3 has reached the top dead center position during its operation within the cylinder chamber 21, the swelling portions 41, 41 of

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the blade 4 on the high- and low-pressure chamber X and Y sides are inserted into the recessed portions 52, 52 of the bush 5, respectively. Accordingly, ineffective volume formed between the outer peripheral surface of the roller 3 and the bush 5 can be lessened so that the volumetric efficiency can be enhanced. At the same time, both compressive stress and tensile stress can be relieved by the swelling portions 41, 41, so that the blade 4 can be further reinforced. Thus, the rigidity of the joint portion of the blade 4 can be further enhanced by the two swelling portions 41, 41.

Further, according to the invention as described in claim 4, the swinging bush 5 is composed of a pair of unitary bushes 5a, 5b of semi-circular shape in cross section, the receptive groove 51 is formed between opposite faces of these unitary bushes 5a, 5b, and recessed portions 52 of identical shape for receiving the swelling portion 41 formed at the joint portion of the blade 4 are provided in the unitary bushes 5a, 5b. Therefore, the unitary bushes 5a, 5b can be formed into the same shape, making it possible to standardize component parts for common use. As a result, the machinability of the swinging bush 5 can be improved while the unitary bushes 5a, 5b can be prevented from being mis-assembled.

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Further, according to the invention as described in claim 5, a fitting groove 31 is provided at an outer peripheral portion of the roller 5 opposite to the swinging bush 5 so as to extend axially, and a coupling portion 4b which is thicker than the inserting portion 4a of the blade 4 and which ranges to the inserting portion 4a via the swelling portion 41 is fitted to the fitting groove 31. As a result, the rigidity of not only the joint portion but also the coupling portion 4b can be enhanced.

10 BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan view showing the main part of the rotary compressor according to the present invention;

Fig. 2 is an enlarged cross-sectional view of the same main part;

15 Fig. 3 is an enlarged cross-sectional view of the main part, showing another embodiment of the present invention;

Fig. 4 is an enlarged cross-sectional view of the main part, showing still another embodiment of the invention;

20 Fig. 5 is an enlarged cross-sectional view of the main part, showing still another embodiment of the invention;

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Fig. 6 is an enlarged cross-sectional view of the main part, showing still another embodiment of the invention;

5 Fig. 7 is an enlarged cross-sectional view of the main part, showing still another embodiment of the invention; and

Fig. 8 is a cross-sectional view showing a conventional rotary compressor.

BEST MODE FOR CARRYING OUT THE INVENTION

10 Fig. 1 illustrates cylinder part of the compression member in the rotary compressor. This compression member 1 comprises a cylinder 2 which has a cylinder chamber 21 in its inside and which are provided with a suction port 22 and a discharge port 23 both opened
15 to the cylinder chamber 21, and a roller 3 internally fitted to the cylinder chamber 21. A blade 4 is formed at a portion of the outer periphery of the roller 3 integrally therewith so as to protrude radially outward. Further, at an intermediate portion between the suction port 22 and the
20 discharge port 23 of the cylinder 2 is formed a retainer hole 25, circular in cross section, having an opening 24 opened to the cylinder chamber 21. Further in the retainer hole 25 is provided a swinging bush 5, which has a receptive groove 51 for receiving the protruding tip side
25 of the blade 4 in such a way that the tip side of the blade

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4 is free to advance and retreat, and which is swingably supported by the cylinder 2. By the protruding tip side of the blade 4 being inserted into the receptive groove 51 of the bush 5 in such a way that the tip side of the blade 4 is free to advance and retreat, the interior of the cylinder chamber 21 is partitioned into a low-pressure chamber Y communicating with the suction port 22 and a high-pressure chamber X communicating with the discharge port 23. Furthermore, by the blade 4 being inserted into the bush 5, the roller 3 is made not to rotate but to move along the inner peripheral surface of the cylinder chamber 21. It is noted that, in Fig. 1, reference numeral 6 denotes a drive shaft having its eccentric shaft 61 press fitted to the roller 3.

With the above-described arrangement, a swelling portion 41 is formed so as to be outwardly protuberant at the joint portion of the blade 4 to the roller 3 on at least one side of the high-pressure chamber X side and the low-pressure chamber Y side. Moreover, the bush 5 is provided with a recessed portion 52 for receiving the swelling portion 41.

In the actual case, as apparent from Fig. 2, in which the installing portion between the joint portion of the blade 4 and the bush 5 is shown enlarged, the swelling portion 41 that is linearly protuberant over the range from



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a portion of the outer periphery of the roller 3 to the joint portion of the blade 4 is formed over the entire width of the blade 4 at the joint portion of the blade 4 to the roller 3 on the high-pressure chamber X side. Besides,
5 the recessed portion 52 for receiving the swelling portion 41 is formed at a position of the bush 5 opposite to the opening 24 of the retainer hole 25 on the high-pressure chamber X side.

Otherwise, the swelling portion 41 provided at
10 the joint portion of the blade 4 may be shaped into a circular arc, as shown in Fig. 3.

With the above arrangement, the adoption of a swinging type blade 4 allows the various advantages as described before to be exhibited. Further, at the same
15 time, the blade 4 can be reinforced by the swelling portion 41 provided at the joint portion of the blade 4 on the high-pressure chamber X side, so that the blade 4 can be prevented from being fracture-damaged at the joint portion to the roller 3. Yet, when the roller 3 has reached the
20 top dead center position during its operation within the cylinder chamber 21, i.e., when the tip side of the blade 4 is inserted deeply inside of the receptive groove 51 of the bush 5 until the outer peripheral surface of the roller 3 comes into contact with a position opposite to the bush 5
25 on the inner wall surface of the cylinder chamber 21, the

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swelling portion 41 of the blade 4 is inserted into the recessed portion 52 of the bush 5. Therefore, ineffective volume formed between the outer peripheral surface of the roller 3 and the bush 5 in the top dead center position on the high-pressure chamber X side can be reduced. As a result, when the discharge stroke is finished and shifted to the suction stroke, where suction gas is sucked into the low-pressure chamber Y, high-pressure gas remaining in the ineffective volume can be prevented from flowing back toward the low-pressure chamber Y to re-expand. Accordingly, the volumetric efficiency of the compressor can be improved.

As described above, when the swelling portion 41 is provided at the joint portion of the blade 4 on the high-pressure chamber X side, and besides when the recessed portion 52 for receiving the swelling portion 41 is formed on the high-pressure chamber X side of the bush 5, as shown in Fig. 2, it is preferable that a linear notch 53 is formed in the vicinity of the opening end of the receptive groove 51 on the low-pressure chamber Y side of the bush 5 so as to extend along a line that connects a point of intersection between an oblique line forming the recessed portion 52 and an circular arc forming the profile of the bush 5 with another point of intersection between a line forming the opening 24 on the low-pressure chamber Y side

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and the foregoing circular arc. The reason of this is as follows. When the recessed portion 52 is formed only on one side of the bush 5 opposite to the high-pressure chamber X, and when a locus drawn from a point of the recessed portion 52 opposite to the opening 24 to a point of the bush 5 on the low-pressure chamber Y side opposite to the opening 24 is shaped into a circular arc as indicated by imaginary line in Fig. 2, the roller 3, when having reached the top dead center position, is brought into contact with the arc portion of the bush 5. Accordingly, the bush 5 needs to be disposed radially outward with respect to the inner wall surface of the cylinder chamber 21. As a result, the clearance between the outer peripheral surface of the roller 3 and the bush 5 could not be lessened due to the disposition of the bush 5.

Further, the swelling portion 41 may also be formed so as to be protuberant at the joint portion of the blade 4 to the roller 3 on the low-pressure chamber Y side, linearly from a portion of the outer periphery of the roller 3 to the joint portion of the blade 4, as shown in Fig. 4. In this case, the recessed portion 52 for receiving the swelling portion 41 is provided at a portion of the bush 5 opposite to the opening 24 of the retainer hole 25 on the low-pressure chamber Y side.

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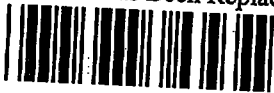


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Otherwise, the swelling portion 41 provided at the joint portion of the blade 4 on the low-pressure chamber Y side may be shaped into a circular arc, as shown in Fig. 5.

5 Thus, also with the arrangement of Fig. 4, the blade 4 is reinforced by the swelling portion 41 formed at the joint portion of the blade 4 on the low-pressure chamber Y side, as in the foregoing case. As a result, the blade 4 can be prevented from being fracture-damaged at its
10 joint portion to the roller 3. Further, at the same time, when the roller 3 has reached the top dead center position during its operation within the cylinder chamber 21, the swelling portion 41 of the blade 4 is inserted into the recessed portion 52 of the bush 5. Accordingly,
15 ineffective volume formed between the outer peripheral surface of the roller 3 and the bush 5 in the top dead center position and on the high-pressure chamber X side can be lessened as compared to a case where the recessed portion 52 is not provided.

20 As described hereinabove, when the swelling portion 41 is provided at the joint portion of the blade 4 on the low-pressure chamber Y side, and besides when the recessed portion 52 for receiving the swelling portion 41 is formed on the low-pressure chamber Y side of the bush 5,
25 it is preferable that a linear notch 53 is formed in the



vicinity of the opening end of the receptive groove 51 on the high-pressure chamber X side of the bush 5 so as to extend along a line that connects a point of intersection between an oblique line forming the recessed portion 52 and a circular arc forming the profile of the bush 5 with another point of intersection between a line forming the opening 24 on the high-pressure chamber X side and the foregoing circular arc, as shown in Fig. 4. The reason of this is as follows. When the recessed portion 52 is formed only on the low-pressure chamber Y side of the bush 5 as in the cases of Figs. 2 and 3, and when a locus drawn from a point of the recessed portion 52 opposite to the opening 24 to a point of the bush 5 on the high-pressure chamber X side opposite to the opening 24 is a circular arc as indicated by imaginary line in Fig. 4, the roller 3, when having reached the top dead center position, is brought into contact with the arc portion of the bush 5. Accordingly, the bush 5 needs to be disposed radially outward of the inner wall surface of the cylinder chamber 21. As a result, the clearance between the outer peripheral surface of the roller 3 and the bush 5 could not be lessened due to the disposition of the bush 5.

Further, the swelling portion 41 may also be formed on both the high-pressure chamber X side and the low-pressure chamber Y side at the joint portion of the



blade 4 to the roller 3, as shown in Fig. 6. In this case,
recessed portions 52, 52 for receiving the swelling
portions 41, 41 are provided on both the high-pressure
chamber X side and the low-pressure chamber Y side of the
5 bush 5, respectively.

With the above arrangement, when the roller 3 has
reached the top dead center position during its operation
within the cylinder chamber 21, the swelling portions 41,
41 of the blade 4 on the high- and low-pressure chamber X,
10 Y sides are inserted into the recessed portions 52, 52,
respectively, of the bush 5. As a result, ineffective
volume formed between the outer peripheral surface of the
roller 3 and the bush 5 can be lessened so that the
volumetric efficiency of the compressor can be improved.
15 Further, at the same time, the blade 4 can be even more
reinforced by the swelling portions 41, 41 so that the
rigidity of the joint portion of the blade 4 can be further
enhanced, with improved reliability.

Otherwise, the bush 5 may be formed into a
20 cylindrical shape having a receptive groove 51 with its one
radial side opened to the cylinder chamber 21 and the other
side closed. Moreover, the bush 5 may also be formed of a
pair of unitary bushes 5a, 5b of semi-circular shape in
cross section as shown in Fig. 6, and a receptive groove 51
25 for receiving the protruding tip side of the blade 4 is



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formed between opposite faces of these unitary bushes 5a, 5b. Further, at one end of the unitary bushes 5a, 5b in the circular arc direction are provided recessed portions 52 of identical shape and for receiving the swelling portions 41 provided on the high- and low-pressure chamber sides at the joint portion of the blade 4, so that the unitary bushes 5a, 5b are supported by the retainer hole 25. By so doing, when the swelling portions 41 are provided on the high- and low-pressure chamber sides at the joint portion of the blade 4 as shown in Fig. 6, the receptive groove 51 and the recessed portion 52 can be easily formed in the swinging bush 5, which is advantageous in its manufacturing process. Yet, since the unitary bushes 5a, 5b are of identical shape, component parts involved can be standardized for common use. Moreover, when the unitary bushes 5a, 5b are assembled symmetrically to the retainer hole 25 of the cylinder 2, the unitary bushes 5a, 5b can be prevented from being mis-assembled, by virtue of their identical shape.

Although the above embodiments have been described taking the case where the blade 4 is protrusively formed integrally with part of the outer peripheral surface of the roller 3, yet the present invention of course can be applied to other cases where, for example, a fitting groove 31 extending in the axial direction is provided on the

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outer peripheral surface of the roller 3, as shown in Fig. 7, and the base side of the blade 4 is coupled with the fitting groove 31 in a buried state. In such a case, while the swelling portions 41 are formed at the joint portion of the blade 4 as shown in Fig. 7, the coupling portion 4b of the blade 4 with the fitting groove 31 is formed thicker than the inserting portion 4a to the receptive groove 51 so that not only the rigidity of the joint portion is enhanced, but also the rigidity of the coupling portion 4b with the fitting groove 31 is also enhanced. Further, when the blade 4 is formed independently of the roller 3, the swelling portion 41 may also be formed on only either one side of the high- or low-pressure chamber side, other than formed on both the high- and low-pressure chamber sides as shown in Fig. 7.

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CLAIMS

1. A rotary compressor which comprises: a cylinder (2) having a cylinder chamber (21); a roller (3) fitted to an eccentric shaft (61) of a drive shaft (6) and internally
5 provided in the cylinder chamber (21); a blade (4) which is protrusively coupled with an outer peripheral portion of the roller (3) and which partitions interior of the cylinder chamber (21) into a low-pressure chamber (Y) communicating with a suction port (22) and a high-pressure
10 chamber (X) communicating with a discharge port (23); and a swinging bush (5) which has a receptive groove (51) for receiving a protruding tip side of the blade (4) in such a way that the tip side of the blade (4) is free to advance and retreat, and which is swingably supported to a retainer
15 hole (25) provided in the cylinder (2), characterized in that the rotary compressor further comprises:

a swelling portion (41) formed at a joint portion of the blade (4) to the roller (3); and a recessed portion (52) formed in the bush (5) and serving for receiving the
20 swelling portion (41).

2. The rotary compressor as claimed in claim 1, wherein the swelling portion (41) is formed on the high-pressure chamber side of the joint portion of the blade (4) to the roller (3), and the recessed portion (52) for receiving the





swelling portion (41) is provided on the high-pressure chamber side of the swinging bush (5).

3. The rotary compressor as claimed in claim 1, wherein the swelling portions (41)(41) are formed in a pair on both the high-pressure chamber side and the low-pressure chamber side at the joint portion of the blade (4) to the roller (3), and the recessed portions (52)(52) for receiving the swelling portions (41)(41) are provided on both the high-pressure chamber side and the low-pressure chamber side of the swinging bush (5).

4. The rotary compressor as claimed in claim 3, wherein the swinging bush (5) is composed of a pair of unitary bushes (5a)(5b) having a semi-circular cross section, the receptive groove (51) is formed between opposite faces of the unitary bushes (5a)(5b), and recessed portions (52) of identical shape for receiving the swelling portions (41) formed at the joint portion of the blade (4) are provided in the unitary bushes (5a)(5b).

5. The rotary compressor as claimed in claim ^{1or}3, wherein the roller (3) has, on an outer peripheral portion thereof opposite to the swinging bush (5), a fitting groove (31) extending in parallel to the drive shaft (6), and the blade





(4) comprises an inserting portion (4a) to be inserted into the receptive groove (51) in such a way that the inserting portion (4a) is free to advance and retreat, a coupling portion (4b) thicker than the inserting portion (4a) and securely fitted to the fitting groove (31), and the swelling portion (41) formed between the inserting portion (4a) and the coupling portion (4b).

6. The rotary compressor as claimed in claim 2, wherein the roller (3) has, on an outer peripheral portion thereof opposite to the swinging bush (5), a fitting groove (31) extending in parallel to the drive shaft (6), and the blade (4) comprises an inserting portion (4a) to be inserted into the receptive groove (51) in such a way that the inserting portion (4a) is free to advance and retreat, a coupling portion (4b) thicker than the inserting portion (4a) and securely fitted to the fitting groove (31), and the swelling portion (41) formed between the inserting portion (4a) and the coupling portion (4b).

7. The rotary compressor as claimed in claim 3, wherein the roller (3) has, on an outer peripheral portion thereof opposite to the swinging bush (5), a fitting groove (31) extending in parallel to the drive shaft (6), and the blade (4) comprises an inserting portion (4a) to be inserted into



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the receptive groove (51) in such a way that the inserting
portion (4a) is free to advance and retreat, a coupling
portion (4b) thicker than the inserting portion (4a) and
securely fitted to the fitting groove (31), and the
5 swelling portions (41)(41) formed between the inserting
portion (4a) and the coupling portion (4b).



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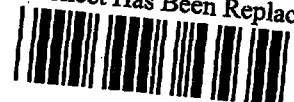
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ABSTRACT

A construction which includes a swinging type blade and yet which allows compressor reliability to be improved by preventing a blade from being fracture-damaged at its joint portion. Still, ineffective volume can be reduced.

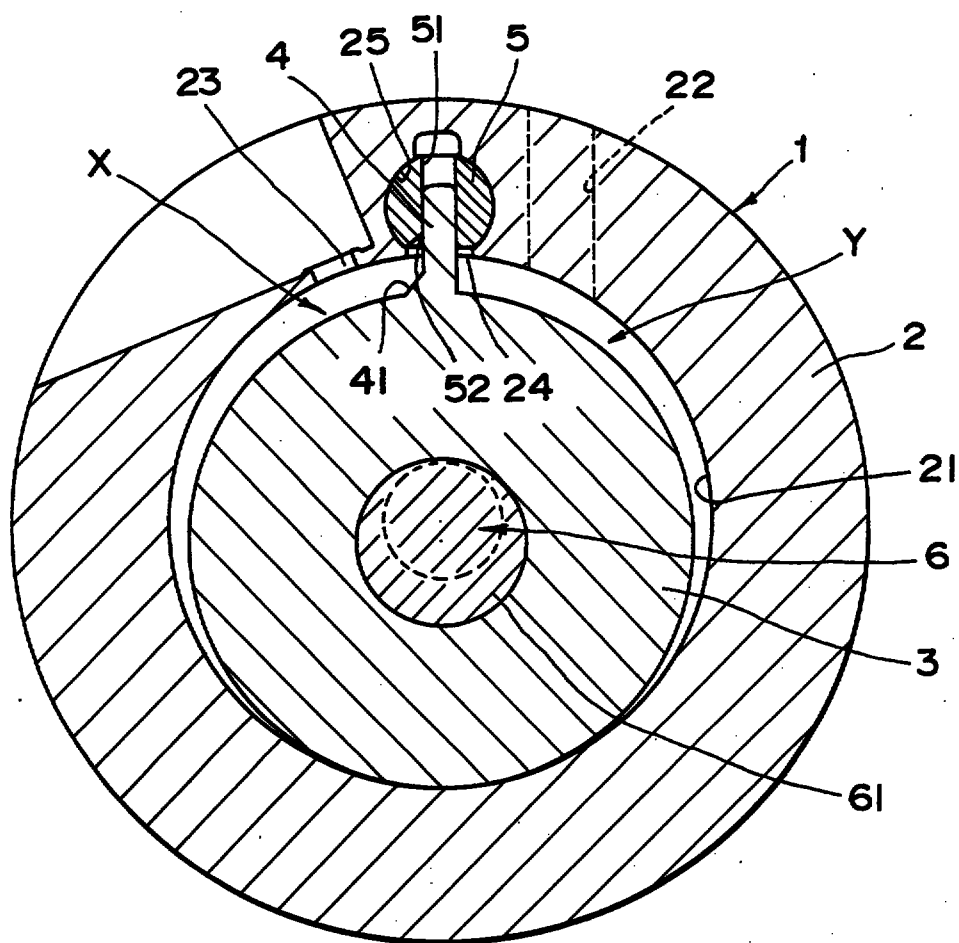
In a rotary compressor adopting a swinging type blade, a swelling portion (41) is formed at the joint portion of the blade (4) with a roller (3). Further, a recessed portion (52) for receiving the swelling portion (41) is provided in a swinging bush (5).

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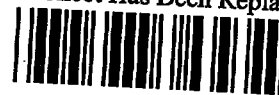


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Fig. 1



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Fig. 2

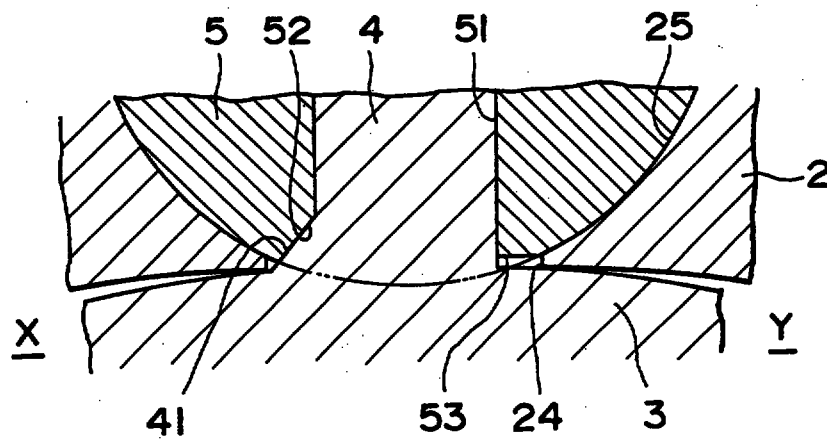
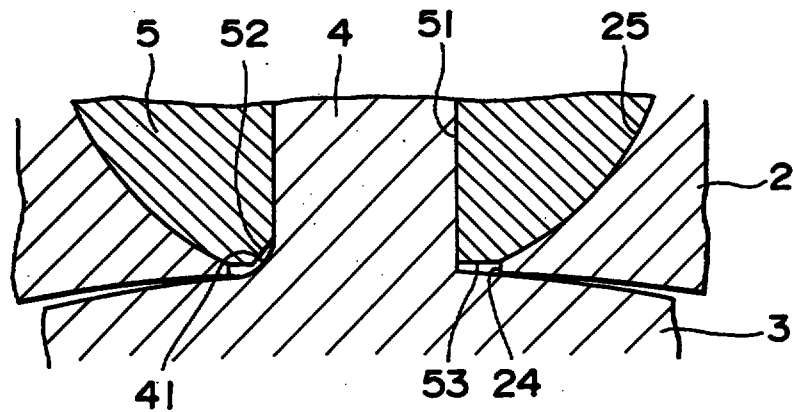


Fig. 3



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Fig. 4

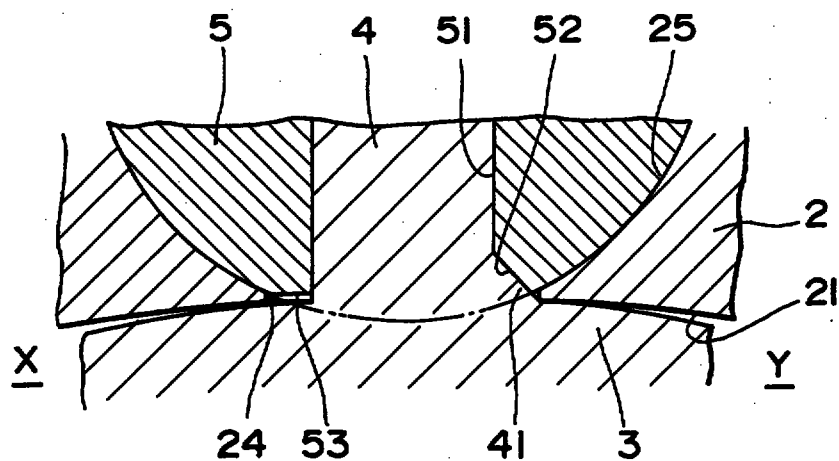
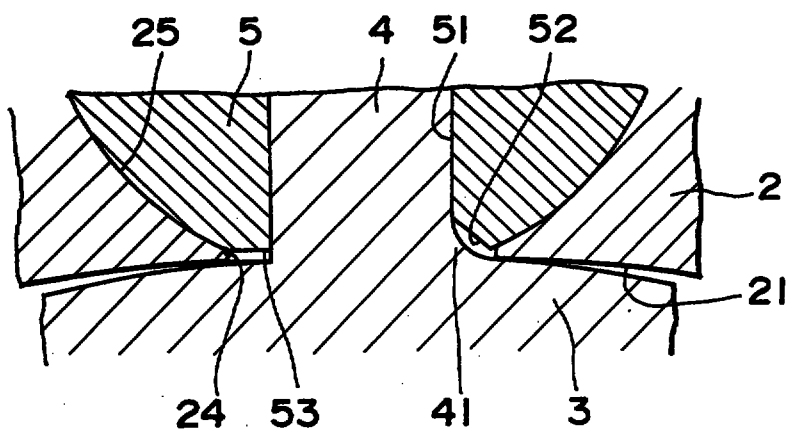


Fig. 5

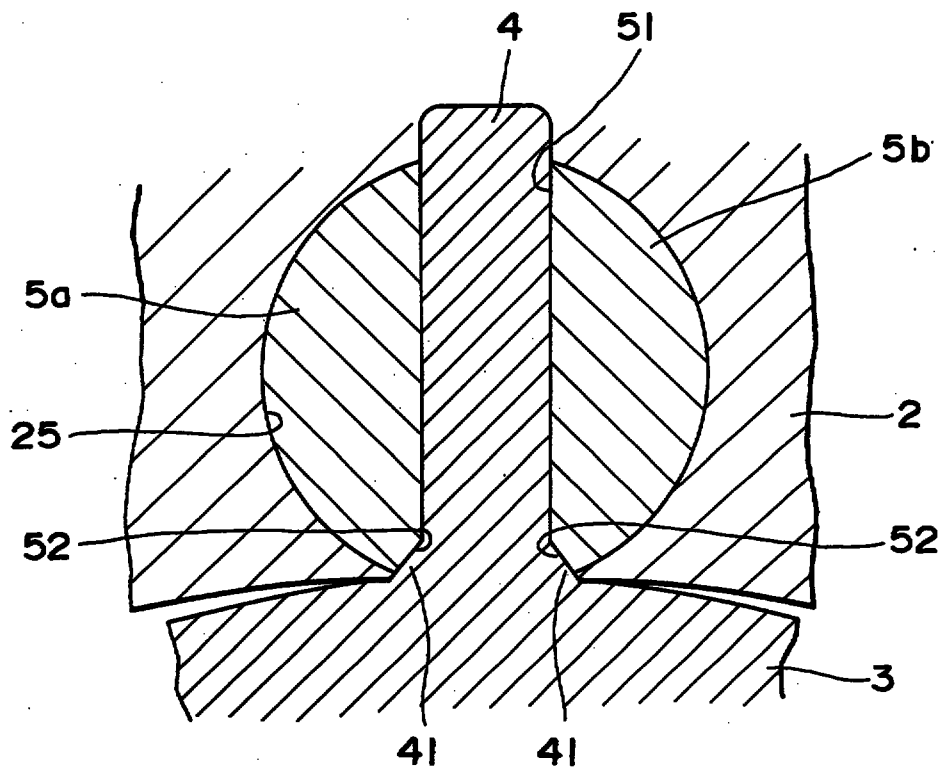


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Fig. 6

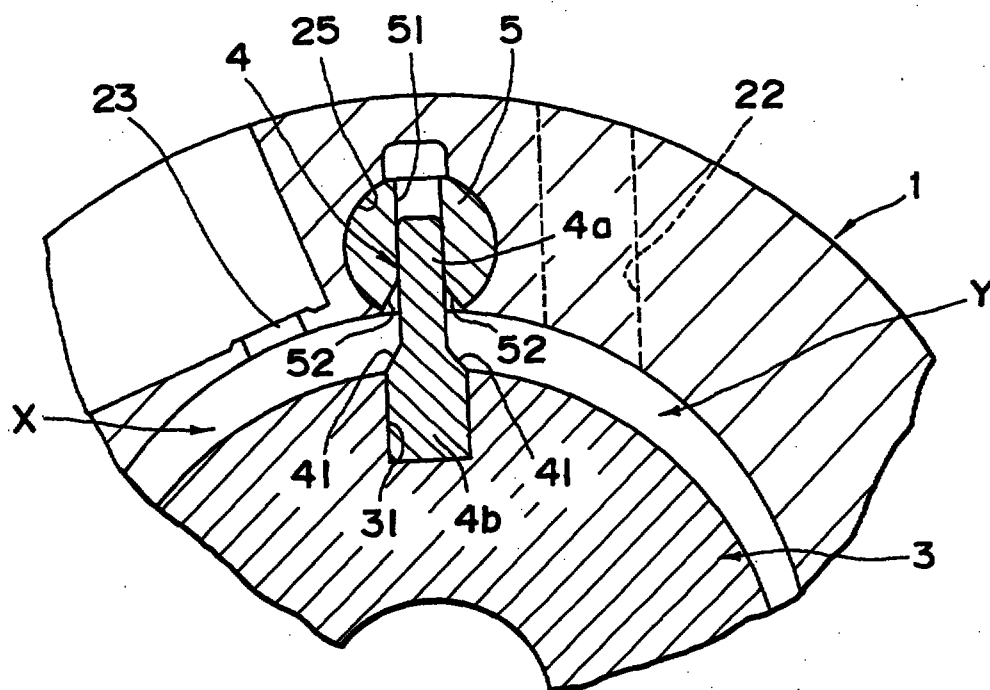


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Fig. 7

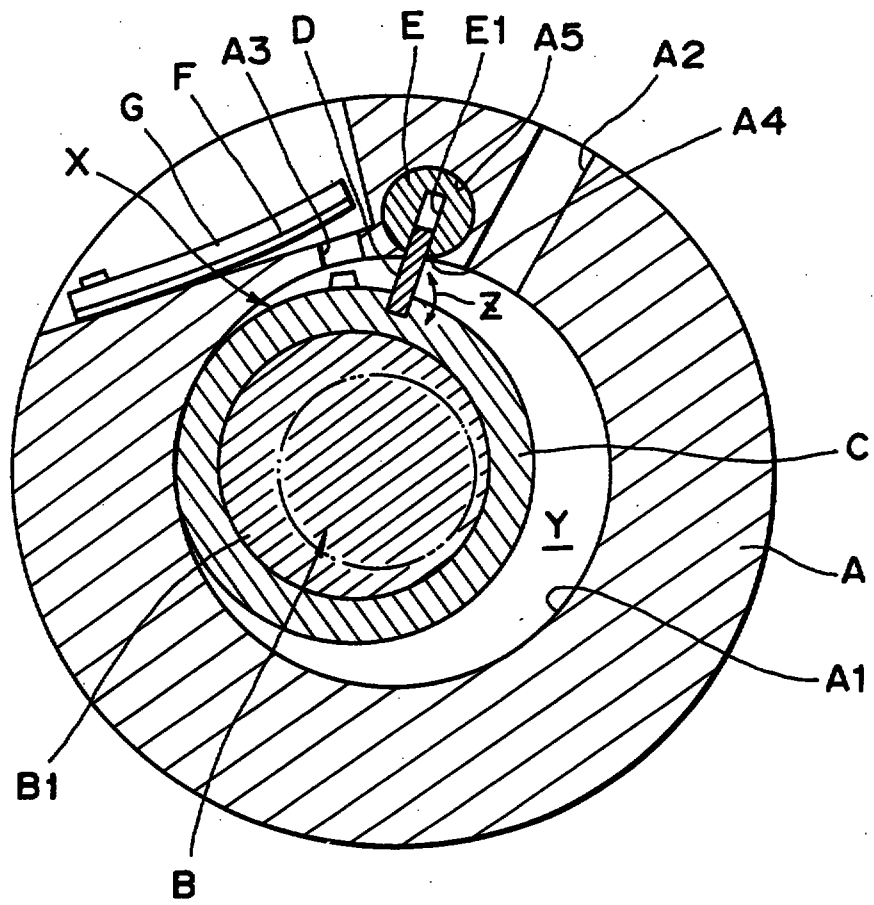


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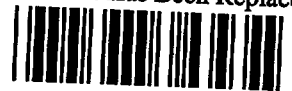


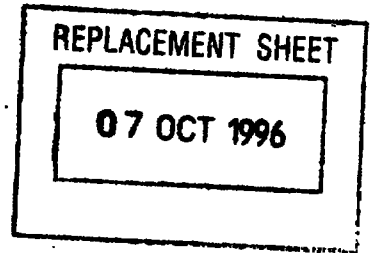
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Fig. 8



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ROTARY COMPRESSOR

TECHNICAL FIELD

The present invention relates to a rotary compressor primarily for use in a refrigerator.

BACKGROUND ART

Generally, a rotary compressor has a motor-driven compression member provided within a closed casing. This compression member comprises: a cylinder which has a cylinder chamber, and a suction port and a discharge port both opened to the cylinder chamber; a roller which is insertedly fitted to an eccentric shaft of a drive shaft extending from the motor and which revolves in the cylinder chamber along with rotation of the drive shaft; and a blade which is supported at an intermediate portion between the suction port and discharge port of the cylinder so as to be free to advance and retreat radially. The blade is so arranged that part of high-pressure gas discharged from the discharge port acts on its back face as back pressure, which back pressure in turn causes the tip of the blade to be always kept in contact with the outer peripheral surface of the roller. As a result, the interior of the cylinder chamber is partitioned into a low-pressure chamber

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communicating with the suction port and a high-pressure chamber communicating with the discharge port.

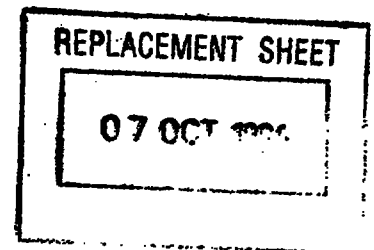
However, when the blade is supported to the cylinder so as to be free to advance and retreat, and has back pressure given on its back face side so that the tip of the blade is always kept in contact with the outer peripheral surface of the roller as described above, the contact portion between the blade and the outer peripheral surface of the roller is poorly fed with lubricating oil so as to be brought into metallic contact, during relative rotation of the roller and the blade. The result would be greater friction loss due to sliding resistance and therefore greater power loss, to a disadvantage. Further, high-pressure gas compressed in the high-pressure chamber may leak through the contact portion between the tip side of the blade and the roller into the low-pressure chamber. This would cause another problem that compression efficiency deteriorates.

Thus, the present inventor has before proposed a rotary compressor which can solve the above problems (Japanese Patent Application No. HEI 4-252750). Although this patent application has not been laid open yet, nor is it the prior art of the present invention, yet it is here described for an easier understanding of the present invention. The rotary compressor, as shown in Fig. 8,

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comprises a cylinder A having a cylinder chamber A1, and a roller C fitted to an eccentric shaft B1 of a drive shaft B and internally provided in the cylinder chamber A1. In the rotary compressor, a blade D is coupled with an outer peripheral portion of the roller C so as to protrude radially outward, while a retainer hole A5 of circular shape in cross section having an opening A4 opened to the cylinder chamber A1 is formed at an intermediate portion between a suction port A2 and a discharge port A3 both provided in the cylinder A. In this retainer hole A5 is provided a swinging bush E which has a receptive groove E1 for receiving the protruding tip side of the blade D in such a way that the tip side of blade D is free to advance and retreat, and which is swingably retained to the cylinder A. In this arrangement, the protruding tip side of the blade D is inserted into the receptive groove E1 of the bush E so as to be free to advance and retreat, whereby the interior of the cylinder chamber A1 is partitioned into a low-pressure chamber Y communicating with the suction port A2 and a high-pressure chamber X communicating with the discharge port A3. Besides, the blade D is inserted into the bush E, whereby the roller C is non self-rotary type and operates along the inner peripheral surface of the cylinder chamber A1. It is noted that, in Fig. 8, reference character F denotes a valve plate disposed on the



outer side of the discharge port A3 and G denotes a receptive plate of the valve plate F.

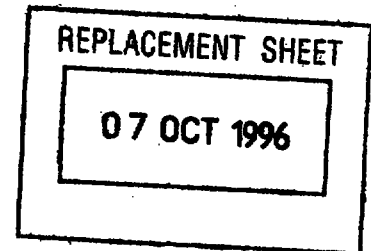
With the roller C in operation within the cylinder chamber A1 by the drive of the drive shaft B, the blade D coupled with the outer peripheral portion of the roller C is moved to advance and retreat with respect to the receptive groove E1 in accompaniment by the swing of the bush E. By this operation, the interior of the cylinder chamber A1 is partitioned into the high-pressure chamber X and the low-pressure chamber Y. Gas fluid is sucked through the suction port A2 into the low-pressure chamber Y, while gas fluid compressed in the high-pressure chamber X is discharged through the discharge port A3 to outside.

As described above, in the so-called swinging type blade in which the blade D is provided on the outer peripheral surface of the roller C so as to protrude radially outward and the protruding tip side of the blade D is inserted into the receptive groove E1 of the bush E so as to be free to advance and retreat, the blade D and the roller C will not be moved relative to each other and the blade D will not be brought into contact with the outer peripheral surface of the roller C, either, unlike the conventional counterpart in which the protruding tip of the blade D is always kept in contact with the outer peripheral

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surface of the roller C. As a result, friction loss due to the contact between the roller C and the blade D can be suppressed so that power loss can be reduced. Yet, high-pressure gas in the high-pressure chamber X can be prevented from leaking through the contact surface between the blade D and the roller C into the low-pressure chamber Y, so that compressive efficiency can be improved.

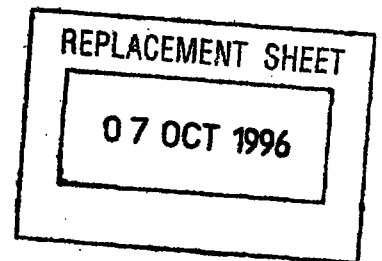
However, according to the above-described arrangement, with the roller C in operation within the cylinder chamber A1, the tip side of the blade D protrusively provided on the outer peripheral surface of the roller C moves to advance and retreat within the receptive groove E1 of the bush E, while the bush E swingingly moves after the movement of the roller C within the retainer hole A5. As a result, when the roller C is operated, for example, clockwise in the figure, tensile stress in the direction of arrow Z in Fig. 8 concentrates on the low-pressure chamber Y side in the joint portion of the blade D to the roller C, while compressive stress concentrates on the high-pressure chamber X side in the joint portion of the blade D to the roller C. Due to this fact, the blade D has been easily fracture-damaged at the joint portion, to a problem.



DISCLOSURE OF THE INVENTION

It is a primary object of the present invention to provide a rotary compressor which, despite the construction having a swinging type blade, can be improved in reliability by preventing the blade from being fracture-damaged at its joint portion to the roller and yet which can be improved in volumetric efficiency of the compressor by reducing ineffective volume on the high-pressure chamber X side.

To achieve the above object, according to the present invention as described in claim 1, the rotary compressor comprises: a cylinder 2 having a cylinder chamber 21; a roller 3 which is fitted to an eccentric shaft 61 of a drive shaft 6 and which is internally provided in the cylinder chamber 21; a blade 4 which is protrusively coupled with an outer peripheral portion of the roller 3 and which partitions the interior of the cylinder chamber 21 into a low-pressure chamber Y communicating with a suction port 22 and a high-pressure chamber X communicating with a discharge port 23; and a swinging bush 5 which has a receptive groove 51 for receiving the protruding tip side of the blade 4 in such a way that the tip side of the blade 4 is free to advance and retreat, and which is swingably supported to a retainer hole 25 provided in the cylinder 2, characterized in that

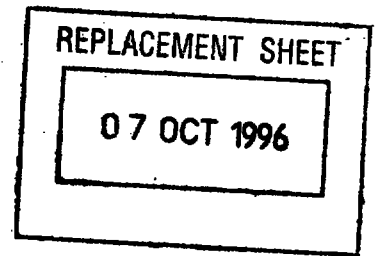


the rotary compressor further comprises a swelling portion 41 formed at the joint portion of the blade 4 to the roller 3, and a recessed portion 52 formed in the bush 5 and for receiving the swelling portion 41.

Also, according to the present invention as described in claim 2, the swelling portion 41 is formed on the high-pressure chamber side of the joint portion of the blade 4 to the roller 3, and the recessed portion 52 for receiving the swelling portion is provided on the high-pressure chamber side of the swinging bush 5.

Further, according to the present invention as described in claim 3, the swelling portions 41, 41 are formed in a pair on both the high-pressure chamber side and the low-pressure chamber side at the joint portion of the blade 4 to the roller 3, and the recessed portions 52, 52 for receiving the swelling portions 41, 41 are provided on both the high-pressure chamber side and the low-pressure chamber side of the swinging bush 5.

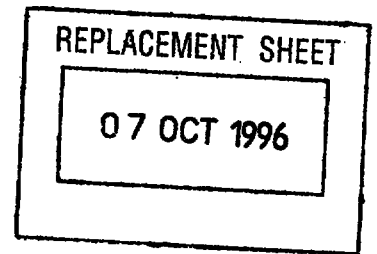
Further, according to the present invention as described in claim 4, the swinging bush 5 comprises a pair of unitary bushes 5a, 5b having a semi-circular cross section, the receptive groove 51 is formed between opposite surfaces of the unitary bushes 5a, 5b, and the unitary bushes 5a, 5b are provided with recessed portions 52 of



identical shape, respectively, for receiving the swelling portion 41 formed at the joint portion of the blade 4.

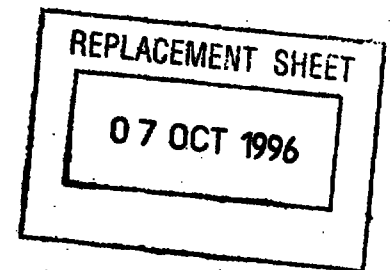
Further, according to the present invention as described in claim 5, the roller 3 has, on an outer peripheral portion opposite to the swinging bush 5, a fitting groove 31 extending in parallel to the drive shaft 6, and the blade 4 comprises an inserting portion 4a to be inserted into the receptive groove 51 in such a way that the inserting portion 4a is free to advance and retreat, a coupling portion 4b which is thicker than the inserting portion 4a and which is to be securely fitted to the fitting groove 31, and the swelling portion 41 formed between the inserting portion 4a and the coupling portion 4b.

According to the invention as described in claim 1, the blade 4 is reinforced by the swelling portion 41 provided at the joint portion of the blade 4 to the roller 3 so that the blade 4 can be prevented from being fracture-damaged at its joint portion to the roller 3, despite its construction that the blade 4 is protrusively provided on an outer peripheral portion of the roller 3 and the protruding tip side of the blade 4 is inserted into the receptive groove 51 of the bush 5 so as to be free to advance and retreat. Still, the swinging bush 5 is provided with the recessed portion 52 for receiving the



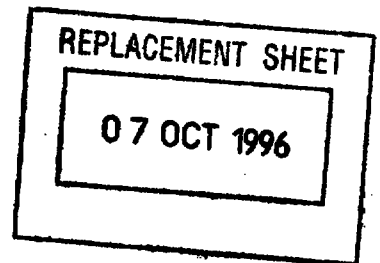
swelling portion 41. Therefore, when the roller 3 has reached the top dead center position during its operation within the cylinder chamber 21, i.e. when the tip side of the blade 4 is inserted deeply inside of the receptive groove 51 of the bush 5 until the outer peripheral surface of the roller 3 is brought into contact with a portion of the inner wall surface of the cylinder chamber 21 opposite to the bush 5, the swelling portion 41 provided at the joint portion of the blade 4 is inserted into the recessed portion 52 of the bush 5. As a result, ineffective volume formed between the outer peripheral surface of the roller 3 and the bush 5 in the top dead center position on the high-pressure chamber X side can be reduced, as compared to when the recessed portion 52 is not provided. Accordingly, when the discharge stroke is finished and shifted to the suction stroke with the joint portion of the blade 4 reinforced, where suction gas is sucked into the low-pressure chamber Y, high-pressure gas remaining in the ineffective volume can be suppressed from flowing back toward the low-pressure chamber Y to re-expand, so that the volumetric efficiency of the compressor will never deteriorate.

Also, according to the invention as described in claim 2, the swelling portion 41 is formed on the high-pressure chamber X side at the joint portion of the blade 4 to the roller 3, and the recessed portion 52 for receiving



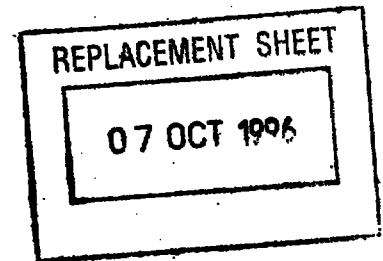
the swelling portion 41 is provided on the high-pressure chamber X side of the bush 5. As a result, compressive stress that acts on the blade 4 can be relieved by the swelling portion 41, so that the blade 4 can be effectively prevented from being fracture-damaged. Moreover, when the roller 3 has reached the top dead center position of the cylinder chamber 21 during its operation within the cylinder chamber 21, the swelling portion 41 of the blade 4 on the high-pressure chamber X side is inserted into the recessed portion 52 of the bush 5, whereby ineffective volume formed between the outer peripheral surface of the roller 3 and the bush 5 on the high-pressure chamber X side can be further lessened, while the joint portion of the blade 4 can be reinforced. Accordingly, the volumetric efficiency of the compressor can be improved in proportion.

Further, according to the invention as described in claim 3, a pair of swelling portions 41, 41 are formed on both the high-pressure chamber X side and the low-pressure chamber Y side at the joint portion of the blade 4 to the roller 3, and recessed portions 52, 52 for receiving the swelling portions 41, 41 are provided on both the high-pressure chamber X side and the low-pressure chamber Y side of the bush 5. As a result, when the roller 3 has reached the top dead center position during its operation within the cylinder chamber 21, the swelling portions 41, 41 of



the blade 4 on the high- and low-pressure chamber X and Y sides are inserted into the recessed portions 52, 52 of the bush 5, respectively. Accordingly, ineffective volume formed between the outer peripheral surface of the roller 3 and the bush 5 can be lessened so that the volumetric efficiency can be enhanced. At the same time, both compressive stress and tensile stress can be relieved by the swelling portions 41, 41, so that the blade 4 can be further reinforced. Thus, the rigidity of the joint portion of the blade 4 can be further enhanced by the two swelling portions 41, 41.

Further, according to the invention as described in claim 4, the swinging bush 5 is composed of a pair of unitary bushes 5a, 5b of semi-circular shape in cross section, the receptive groove 51 is formed between opposite faces of these unitary bushes 5a, 5b, and recessed portions 52 of identical shape for receiving the swelling portion 41 formed at the joint portion of the blade 4 are provided in the unitary bushes 5a, 5b. Therefore, the unitary bushes 5a, 5b can be formed into the same shape, making it possible to standardize component parts for common use. As a result, the machinability of the swinging bush 5 can be improved while the unitary bushes 5a, 5b can be prevented from being mis-assembled.



Further, according to the invention as described in claim 5, a fitting groove 31 is provided at an outer peripheral portion of the roller 5 opposite to the swinging bush 5 so as to extend axially, and a coupling portion 4b which is thicker than the inserting portion 4a of the blade 4 and which ranges to the inserting portion 4a via the swelling portion 41 is fitted to the fitting groove 31. As a result, the rigidity of not only the joint portion but also the coupling portion 4b can be enhanced.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan view showing the main part of the rotary compressor according to the present invention;

Fig. 2 is an enlarged cross-sectional view of the same main part;

Fig. 3 is an enlarged cross-sectional view of the main part, showing another embodiment of the present invention;

Fig. 4 is an enlarged cross-sectional view of the main part, showing still another embodiment of the invention;

Fig. 5 is an enlarged cross-sectional view of the main part, showing still another embodiment of the invention;

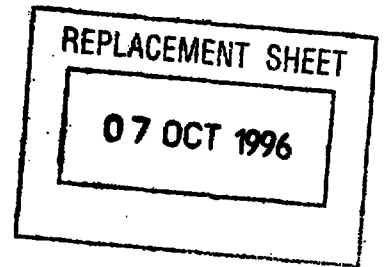


Fig. 6 is an enlarged cross-sectional view of the main part, showing still another embodiment of the invention;

Fig. 7 is an enlarged cross-sectional view of the main part, showing still another embodiment of the invention; and

Fig. 8 is a cross-sectional view showing a conventional rotary compressor.

BEST MODE FOR CARRYING OUT THE INVENTION

Fig. 1 illustrates cylinder part of the compression member in the rotary compressor. This compression member 1 comprises a cylinder 2 which has a cylinder chamber 21 in its inside and which are provided with a suction port 22 and a discharge port 23 both opened to the cylinder chamber 21, and a roller 3 internally fitted to the cylinder chamber 21. A blade 4 is formed at a portion of the outer periphery of the roller 3 integrally therewith so as to protrude radially outward. Further, at an intermediate portion between the suction port 22 and the discharge port 23 of the cylinder 2 is formed a retainer hole 25, circular in cross section, having an opening 24 opened to the cylinder chamber 21. Further in the retainer hole 25 is provided a swinging bush 5, which has a receptive groove 51 for receiving the protruding tip side of the blade 4 in such a way that the tip side of the blade

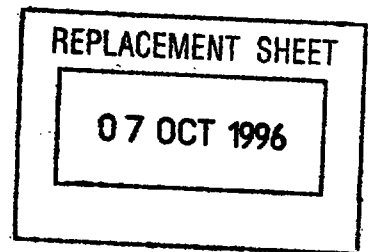
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4 is free to advance and retreat, and which is swingably supported by the cylinder 2. By the protruding tip side of the blade 4 being inserted into the receptive groove 51 of the bush 5 in such a way that the tip side of the blade 4 is free to advance and retreat, the interior of the cylinder chamber 21 is partitioned into a low-pressure chamber Y communicating with the suction port 22 and a high-pressure chamber X communicating with the discharge port 23. Furthermore, by the blade 4 being inserted into the bush 5, the roller 3 is made not to rotate but to move along the inner peripheral surface of the cylinder chamber 21. It is noted that, in Fig. 1, reference numeral 6 denotes a drive shaft having its eccentric shaft 61 press fitted to the roller 3.

With the above-described arrangement, a swelling portion 41 is formed so as to be outwardly protuberant at the joint portion of the blade 4 to the roller 3 on at least one side of the high-pressure chamber X side and the low-pressure chamber Y side. Moreover, the bush 5 is provided with a recessed portion 52 for receiving the swelling portion 41.

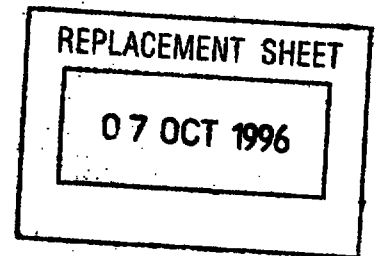
In the actual case, as apparent from Fig. 2, in which the installing portion between the joint portion of the blade 4 and the bush 5 is shown enlarged, the swelling portion 41 that is linearly protuberant over the range from



a portion of the outer periphery of the roller 3 to the joint portion of the blade 4 is formed over the entire width of the blade 4 at the joint portion of the blade 4 to the roller 3 on the high-pressure chamber X side. Besides, the recessed portion 52 for receiving the swelling portion 41 is formed at a position of the bush 5 opposite to the opening 24 of the retainer hole 25 on the high-pressure chamber X side.

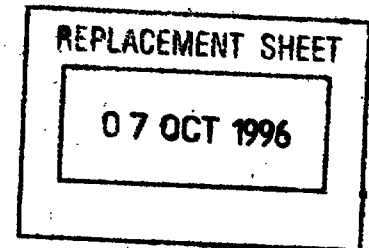
Otherwise, the swelling portion 41 provided at the joint portion of the blade 4 may be shaped into a circular arc, as shown in Fig. 3.

With the above arrangement, the adoption of a swinging type blade 4 allows the various advantages as described before to be exhibited. Further, at the same time, the blade 4 can be reinforced by the swelling portion 41 provided at the joint portion of the blade 4 on the high-pressure chamber X side, so that the blade 4 can be prevented from being fracture-damaged at the joint portion to the roller 3. Yet, when the roller 3 has reached the top dead center position during its operation within the cylinder chamber 21, i.e., when the tip side of the blade 4 is inserted deeply inside of the receptive groove 51 of the bush 5 until the outer peripheral surface of the roller 3 comes into contact with a position opposite to the bush 5 on the inner wall surface of the cylinder chamber 21, the



swelling portion 41 of the blade 4 is inserted into the recessed portion 52 of the bush 5. Therefore, ineffective volume formed between the outer peripheral surface of the roller 3 and the bush 5 in the top dead center position on the high-pressure chamber X side can be reduced. As a result, when the discharge stroke is finished and shifted to the suction stroke, where suction gas is sucked into the low-pressure chamber Y, high-pressure gas remaining in the ineffective volume can be prevented from flowing back toward the low-pressure chamber Y to re-expand. Accordingly, the volumetric efficiency of the compressor can be improved.

As described above, when the swelling portion 41 is provided at the joint portion of the blade 4 on the high-pressure chamber X side, and besides when the recessed portion 52 for receiving the swelling portion 41 is formed on the high-pressure chamber X side of the bush 5, as shown in Fig. 2, it is preferable that a linear notch 53 is formed in the vicinity of the opening end of the receptive groove 51 on the low-pressure chamber Y side of the bush 5 so as to extend along a line that connects a point of intersection between an oblique line forming the recessed portion 52 and an circular arc forming the profile of the bush 5 with another point of intersection between a line forming the opening 24 on the low-pressure chamber Y side



and the foregoing circular arc. The reason of this is as follows. When the recessed portion 52 is formed only on one side of the bush 5 opposite to the high-pressure chamber X, and when a locus drawn from a point of the recessed portion 52 opposite to the opening 24 to a point of the bush 5 on the low-pressure chamber Y side opposite to the opening 24 is shaped into a circular arc as indicated by imaginary line in Fig. 2, the roller 3, when having reached the top dead center position, is brought into contact with the arc portion of the bush 5. Accordingly, the bush 5 needs to be disposed radially outward with respect to the inner wall surface of the cylinder chamber 21. As a result, the clearance between the outer peripheral surface of the roller 3 and the bush 5 could not be lessened due to the disposition of the bush 5.

Further, the swelling portion 41 may also be formed so as to be protuberant at the joint portion of the blade 4 to the roller 3 on the low-pressure chamber Y side, linearly from a portion of the outer periphery of the roller 3 to the joint portion of the blade 4, as shown in Fig. 4. In this case, the recessed portion 52 for receiving the swelling portion 41 is provided at a portion of the bush 5 opposite to the opening 24 of the retainer hole 25 on the low-pressure chamber Y side.

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Otherwise, the swelling portion 41 provided at the joint portion of the blade 4 on the low-pressure chamber Y side may be shaped into a circular arc, as shown in Fig. 5.

Thus, also with the arrangement of Fig. 4, the blade 4 is reinforced by the swelling portion 41 formed at the joint portion of the blade 4 on the low-pressure chamber Y side, as in the foregoing case. As a result, the blade 4 can be prevented from being fracture-damaged at its joint portion to the roller 3. Further, at the same time, when the roller 3 has reached the top dead center position during its operation within the cylinder chamber 21, the swelling portion 41 of the blade 4 is inserted into the recessed portion 52 of the bush 5. Accordingly, ineffective volume formed between the outer peripheral surface of the roller 3 and the bush 5 in the top dead center position and on the high-pressure chamber X side can be lessened as compared to a case where the recessed portion 52 is not provided.

As described hereinabove, when the swelling portion 41 is provided at the joint portion of the blade 4 on the low-pressure chamber Y side, and besides when the recessed portion 52 for receiving the swelling portion 41 is formed on the low-pressure chamber Y side of the bush 5, it is preferable that a linear notch 53 is formed in the

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vicinity of the opening end of the receptive groove 51 on the high-pressure chamber X side of the bush 5 so as to extend along a line that connects a point of intersection between an oblique line forming the recessed portion 52 and a circular arc forming the profile of the bush 5 with another point of intersection between a line forming the opening 24 on the high-pressure chamber X side and the foregoing circular arc, as shown in Fig. 4. The reason of this is as follows. When the recessed portion 52 is formed only on the low-pressure chamber Y side of the bush 5 as in the cases of Figs. 2 and 3, and when a locus drawn from a point of the recessed portion 52 opposite to the opening 24 to a point of the bush 5 on the high-pressure chamber X side opposite to the opening 24 is a circular arc as indicated by imaginary line in Fig. 4, the roller 3, when having reached the top dead center position, is brought into contact with the arc portion of the bush 5. Accordingly, the bush 5 needs to be disposed radially outward of the inner wall surface of the cylinder chamber 21. As a result, the clearance between the outer peripheral surface of the roller 3 and the bush 5 could not be lessened due to the disposition of the bush 5.

Further, the swelling portion 41 may also be formed on both the high-pressure chamber X side and the low-pressure chamber Y side at the joint portion of the

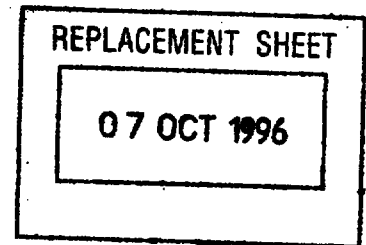
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blade 4 to the roller 3, as shown in Fig. 6. In this case, recessed portions 52, 52 for receiving the swelling portions 41, 41 are provided on both the high-pressure chamber X side and the low-pressure chamber Y side of the bush 5, respectively.

With the above arrangement, when the roller 3 has reached the top dead center position during its operation within the cylinder chamber 21, the swelling portions 41, 41 of the blade 4 on the high- and low-pressure chamber X, Y sides are inserted into the recessed portions 52, 52, respectively, of the bush 5. As a result, ineffective volume formed between the outer peripheral surface of the roller 3 and the bush 5 can be lessened so that the volumetric efficiency of the compressor can be improved. Further, at the same time, the blade 4 can be even more reinforced by the swelling portions 41, 41 so that the rigidity of the joint portion of the blade 4 can be further enhanced, with improved reliability.

Otherwise, the bush 5 may be formed into a cylindrical shape having a receptive groove 51 with its one radial side opened to the cylinder chamber 21 and the other side closed. Moreover, the bush 5 may also be formed of a pair of unitary bushes 5a, 5b of semi-circular shape in cross section as shown in Fig. 6, and a receptive groove 51 for receiving the protruding tip side of the blade 4 is



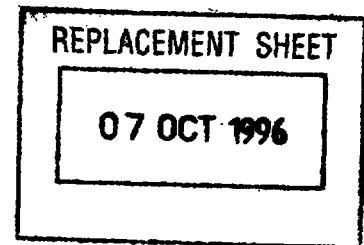
formed between opposite faces of these unitary bushes 5a, 5b. Further, at one end of the unitary bushes 5a, 5b in the circular arc direction are provided recessed portions 52 of identical shape and for receiving the swelling portions 41 provided on the high- and low-pressure chamber sides at the joint portion of the blade 4, so that the unitary bushes 5a, 5b are supported by the retainer hole 25. By so doing, when the swelling portions 41 are provided on the high- and low-pressure chamber sides at the joint portion of the blade 4 as shown in Fig. 6, the receptive groove 51 and the recessed portion 52 can be easily formed in the swinging bush 5, which is advantageous in its manufacturing process. Yet, since the unitary bushes 5a, 5b are of identical shape, component parts involved can be standardized for common use. Moreover, when the unitary bushes 5a, 5b are assembled symmetrically to the retainer hole 25 of the cylinder 2, the unitary bushes 5a, 5b can be prevented from being mis-assembled, by virtue of their identical shape.

Although the above embodiments have been described taking the case where the blade 4 is protrusively formed integrally with part of the outer peripheral surface of the roller 3, yet the present invention of course can be applied to other cases where, for example, a fitting groove 31 extending in the axial direction is provided on the

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outer peripheral surface of the roller 3, as shown in Fig. 7, and the base side of the blade 4 is coupled with the fitting groove 31 in a buried state. In such a case, while the swelling portions 41 are formed at the joint portion of the blade 4 as shown in Fig. 7, the coupling portion 4b of the blade 4 with the fitting groove 31 is formed thicker than the inserting portion 4a to the receptive groove 51 so that not only the rigidity of the joint portion is enhanced, but also the rigidity of the coupling portion 4b with the fitting groove 31 is also enhanced. Further, when the blade 4 is formed independently of the roller 3, the swelling portion 41 may also be formed on only either one side of the high- or low-pressure chamber side, other than formed on both the high- and low-pressure chamber sides as shown in Fig. 7.

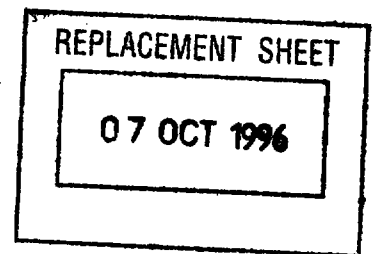


CLAIMS

1. A rotary compressor which comprises: a cylinder (2) having a cylinder chamber (21); a roller (3) fitted to an eccentric shaft (61) of a drive shaft (6) and internally provided in the cylinder chamber (21); a blade (4) which is protrusively coupled with an outer peripheral portion of the roller (3) and which partitions interior of the cylinder chamber (21) into a low-pressure chamber (Y) communicating with a suction port (22) and a high-pressure chamber (X) communicating with a discharge port (23); and a swinging bush (5) which has a receptive groove (51) for receiving a protruding tip side of the blade (4) in such a way that the tip side of the blade (4) is free to advance and retreat, and which is swingably supported to a retainer hole (25) provided in the cylinder (2), characterized in that the rotary compressor further comprises:

a swelling portion (41) formed at a joint portion of the blade (4) to the roller (3); and a recessed portion (52) formed in the bush (5) and serving for receiving the swelling portion (41).

2. The rotary compressor as claimed in claim 1, wherein the swelling portion (41) is formed on the high-pressure chamber side of the joint portion of the blade (4) to the roller (3), and the recessed portion (52) for receiving the



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swelling portion (41) is provided on the high-pressure chamber side of the swinging bush (5).

3. The rotary compressor as claimed in claim 1, wherein the swelling portions (41)(41) are formed in a pair on both the high-pressure chamber side and the low-pressure chamber side at the joint portion of the blade (4) to the roller (3), and the recessed portions (52)(52) for receiving the swelling portions (41)(41) are provided on both the high-pressure chamber side and the low-pressure chamber side of the swinging bush (5).

4. The rotary compressor as claimed in claim 3, wherein the swinging bush (5) is composed of a pair of unitary bushes (5a)(5b) having a semi-circular cross section, the receptive groove (51) is formed between opposite faces of the unitary bushes (5a)(5b), and recessed portions (52) of identical shape for receiving the swelling portions (41) formed at the joint portion of the blade (4) are provided in the unitary bushes (5a)(5b).

5. The rotary compressor as claimed in claim ^{10r/}3, wherein the roller (3) has, on an outer peripheral portion thereof opposite to the swinging bush (5), a fitting groove (31) extending in parallel to the drive shaft (6), and the blade



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(4) comprises an inserting portion (4a) to be inserted into the receptive groove (51) in such a way that the inserting portion (4a) is free to advance and retreat, a coupling portion (4b) thicker than the inserting portion (4a) and securely fitted to the fitting groove (31), and the swelling portion (41) formed between the inserting portion (4a) and the coupling portion (4b).

6. The rotary compressor as claimed in claim 2, wherein the roller (3) has, on an outer peripheral portion thereof opposite to the swinging bush (5), a fitting groove (31) extending in parallel to the drive shaft (6), and the blade (4) comprises an inserting portion (4a) to be inserted into the receptive groove (51) in such a way that the inserting portion (4a) is free to advance and retreat, a coupling portion (4b) thicker than the inserting portion (4a) and securely fitted to the fitting groove (31), and the swelling portion (41) formed between the inserting portion (4a) and the coupling portion (4b).

7. The rotary compressor as claimed in claim 3, wherein the roller (3) has, on an outer peripheral portion thereof opposite to the swinging bush (5), a fitting groove (31) extending in parallel to the drive shaft (6), and the blade (4) comprises an inserting portion (4a) to be inserted into



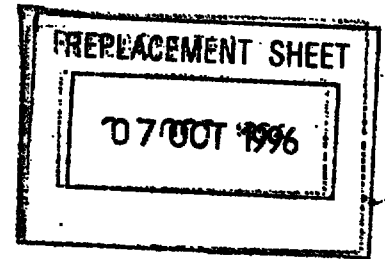
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the receptive groove (51) in such a way that the inserting portion (4a) is free to advance and retreat, a coupling portion (4b) thicker than the inserting portion (4a) and securely fitted to the fitting groove (31), and the swelling portions (41)(41) formed between the inserting portion (4a) and the coupling portion (4b).

ROTARY COMPRESSOR



ABSTRACT

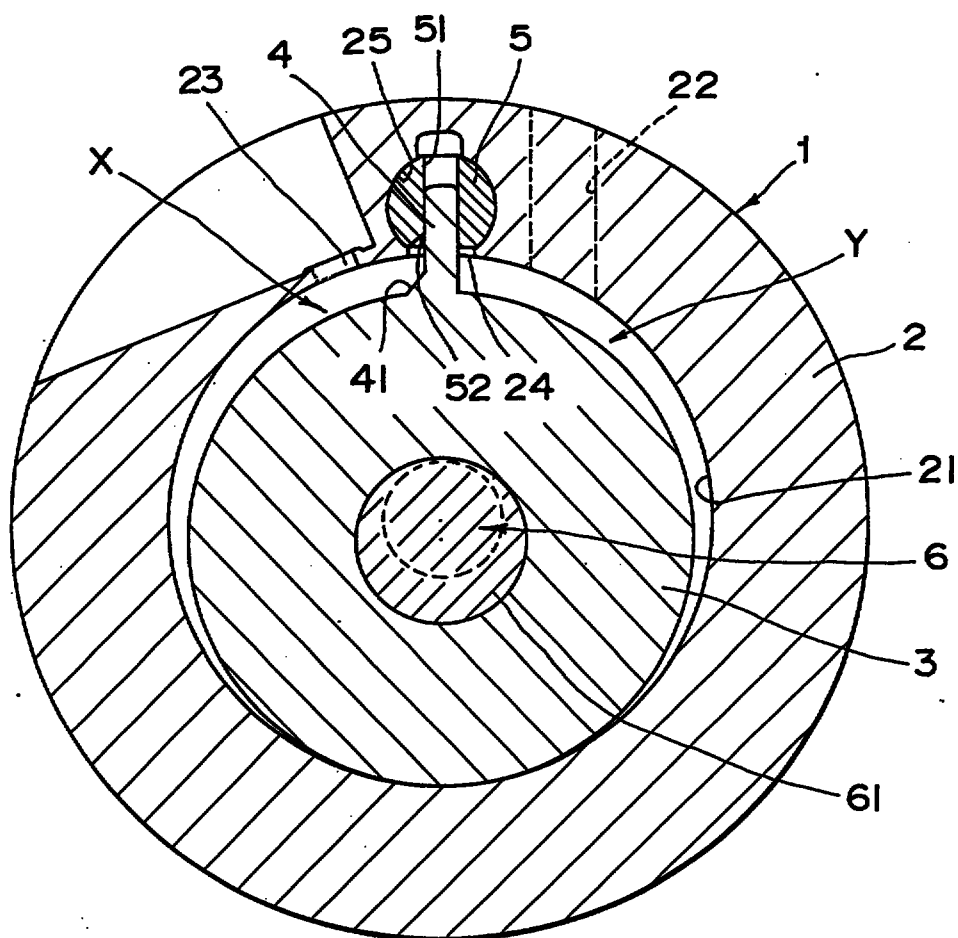
A construction which includes a swinging type blade and yet which allows compressor reliability to be improved by preventing a blade from being fracture-damaged at its joint portion. Still, ineffective volume can be reduced.

In a rotary compressor adopting a swinging type blade, a swelling portion (41) is formed at the joint portion of the blade (4) with a roller (3). Further, a recessed portion (52) for receiving the swelling portion (41) is provided in a swinging bush (5).

FIGURE 1.

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Fig. 1



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Fig. 2

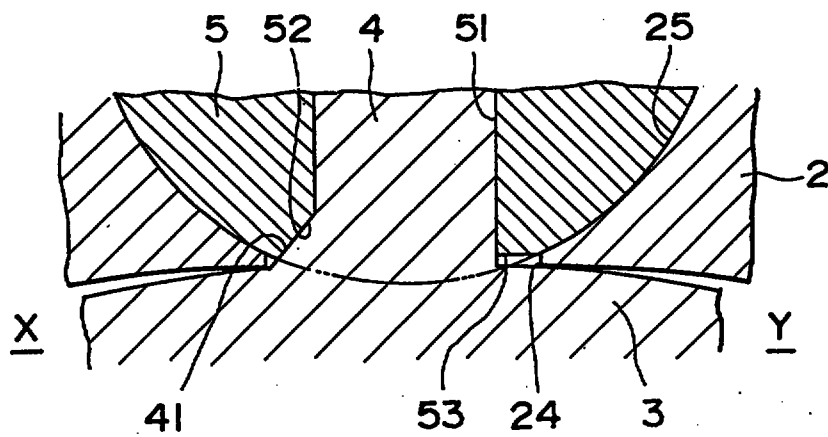
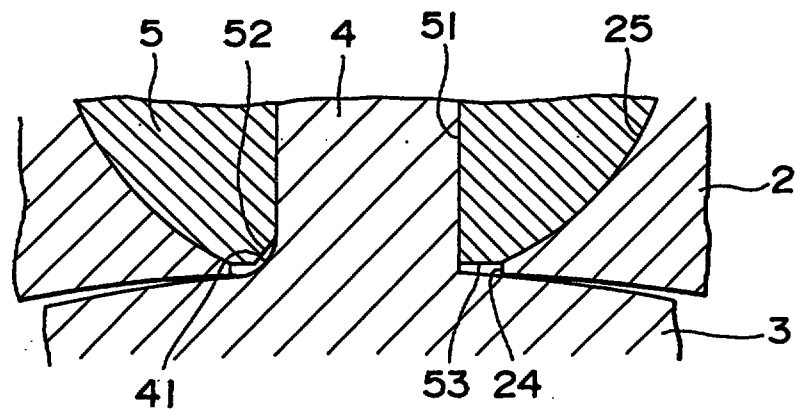
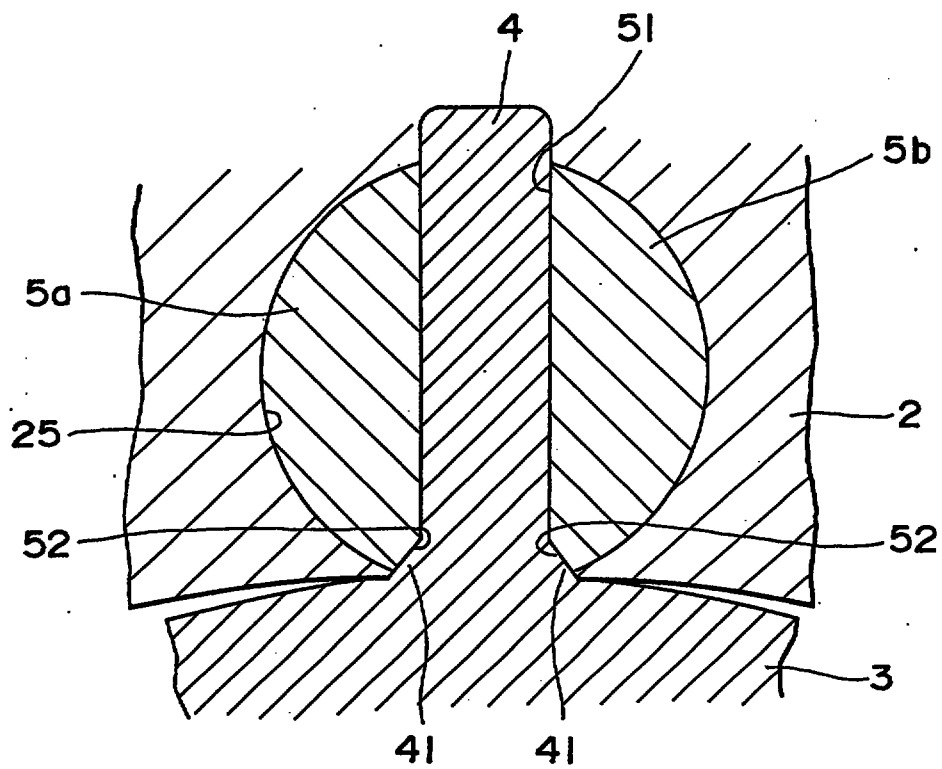


Fig. 3



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Fig. 6



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Fig. 8

