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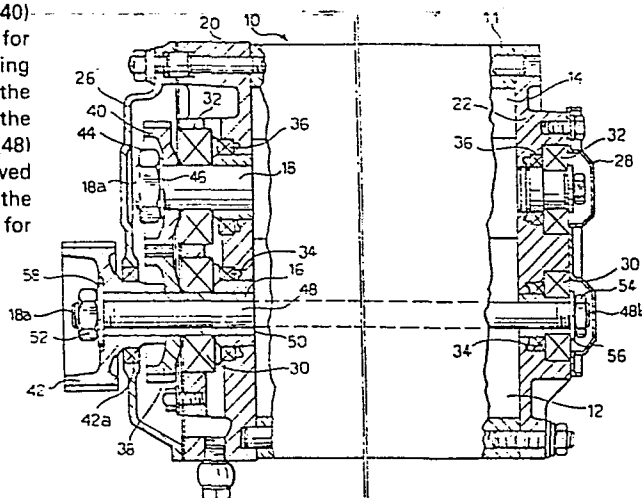
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(54) **Roots-type rotary positive-displacement compressor.**

(57) In a Roots-type rotary positive-displacement compressor (10) comprising two contra-rotating rotors (12, 14) with shafts (16, 18) carrying at one end two gear wheels (38, 40) which are meshed with each other and rendered rigid for rotation with the respective shafts by axial friction-clamping means, a central axial tie rod (48) is inserted through the rotor (12) with which the drive member (42) for the compressor is associated and its shaft (16). This tie rod (48) has screw-threaded ends (48a, 48b) onto which are screwed respective clamping nuts (52, 54) by means of which the drive member (42) and the gear wheel (38) are clamped for rotation with the rotor (12).



Roots-type rotary positive-displacement compressor

The present invention relates to a Roots-type rotary positive-displacement compressor comprising two contra-rotating rotors with shafts which carry at one end two gear wheels meshed with each other for transmitting rotation from one rotor to the other, in which the shaft of one of the rotors carries a drive member for coupling with drive means for the compressor.

More particularly, this invention constitutes an improvement over Italian Patent Application No. 67502-A/82 filed by the same Applicants on 15th April 1982 and laid open for public inspection on 15th October 1983, in which the gear wheels are rendered rigid for rotation with the respective shafts by means of simple axial friction clamping means.

In this Application, the axial clamping means comprise locking nuts screwed onto corresponding screw-threaded parts of the respective shafts and bearing frontally against the gear wheels.

With this type of solution, which makes the manufacture of the compressor simpler and more economical while at the same time allowing the achievement of a more precise phasing between the two rotors and their respective gear wheels during assembly of the compressor, there may arise the disadvantage that a phase displacement occurs between the two rotors and their gear wheels after prolonged usage of the compressor under anomalous operational conditions. In fact, it has been found that this dephasing is due mainly to a bedding of the surfaces with a loss of the clamping torque of the nut screwed onto the shaft of the rotor to which the drive member is connected.

- 1 -

The object of the present invention, therefore, is to avoid this disadvantage and to provide a compressor of the aforesaid type which is able to ensure the correct phasing of the two rotors and their gear wheels in a reliable and durable manner.

In order to achieve this object, the present invention provides a rotary positive-displacement compressor of the type defined initially, characterised in that the rotor with which the drive member is associated and its shaft are formed with a central axial through-hole in which is inserted a tie rod with screw-threaded ends onto which respective clamping nuts are screwed to clamp the respective gear wheel for rotation with the shaft of the rotor.

The use of a tie rod allows the achievement of a higher axial clamping load on the gear wheel, which is due also to the axial resilient action of the tie rod under traction which allows more secure locking of this gear wheel to be ensured in practice, and hence ensures that the correct phasing of the compressor is maintained with time.

According to the invention, the drive member for the compressor is rendered rigid for rotation with the shaft of the rotor by means of the tie rod.

This characteristic makes the manufacture of the compressor even simpler and more economical and makes its use for the supercharging of internal combustion engines of motor vehicles particularly advantageous.

The invention will now be described in detail with reference to the appended drawing which is provided purely by way of non-limiting example and illustrates a rotary positive-displacement compressor according to the invention in partial axial section.

- 3 -

In the drawing, a Roots-type rotary positive-displacement compressor for supercharging an internal combustion engine for motor vehicles is generally indicated 10.

5 The compressor 10 includes a casing 11 having external fins, not shown, in which there are rotatably mounted two double-lobed rotors 12, 14 of known type, the respective shafts 16, 18 of which are supported for rotation by a pair of end walls 20, 22 applied and sealed to the opposite ends of the casing 11. Two
10 removable covers, 26 and 28 respectively, are fitted to the two support walls 20, 22.

The rotational support of the two shafts 16, 18 by the end walls 20, 22 is achieved by respective rolling bearings 30, 32 with which lipped sealing
15 washers 34, 36 are associated.

Two gear wheels 38, 40 having the same diameters are mounted on the ends of the shafts 16, 18 nearer the end wall 20 and are meshed with each other. Furthermore, this end of the shaft 16 passes through and
20 is sealed in the cover 26, and carries a toothed pulley 42 for connection by means of a toothed belt to a drive member constituted, for example, by the shaft of the engine with which the compressor 10 is associated or the timing shaft of this engine.

25 The locking of the gear wheels 38, 40 for rotation with the respective shafts 16, 18 is effected by means of simple axial friction-clamping. In the case of the gear 40, this clamping is achieved by means of a nut 44 screwed directly onto a screw-threaded end
30 part 18a of the shaft 18 and tightened fully against the gear 40 with the interposition of a washer 46.

The coupling of the gear 38 for rotation with the shaft 16, however, is achieved, according to the invention, by means of a tie rod 48 which passes through a central axial through-hole 50 formed in the rotor 12 and its shaft 16. The tie rod 48 has screw-threaded ends 48a, 48b onto which are screwed respective clamping nuts 52, 54. The nut 54, that is, the one located nearer the end wall 22, is fully tightened against the corresponding end of the shaft 16 with the interposition of a washer 56.

The other nut 52, that is, the one located nearer the end wall 20, is fully tightened against the other end of the shaft 16 and against the hub 42a of the toothed pulley 42, with the interposition of a washer 58.

The hub 42a passes through the cover 26 and its inner end bears frontally against the gear wheel 38 to clamp it axially against the inner ring of the bearing 30.

It will thus be clear that the tightening of the nut 52 on the end 48a of the tie rod 48 clamps the pulley 42 for rotation with the shaft 16 and at the same time clamps the shaft 16 for rotation with the gear wheel 38 clamped axially between the hub 42a and the inner ring of the bearing 30. Naturally, the value of the torque achieved by the nut 52 (and the nut 54) must be such as to ensure the necessary axial clamping load on the gear wheel 38.

The operations of phasing the rotors 12, 14 and their gear wheels 36, 40 during assembly of the compressor 10 are effected in a manner much the same as that described in Italian Patent Application No. 67502-A/82, mentioned above.



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SUMMARY

1. Roots-type rotary positive-displacement compressor (10) comprising two contra-rotating rotors (12,14) with shafts (16,18) which carry at one end two gear wheels (38,40) meshed with each other for transmitting rotation from one rotor to the other, the gear wheels (38,40) being rendered rigid for rotation with the respective shafts (16,18) by axial friction-clamping means (44,52,54) and the shaft (16) of one (12) of the rotors carrying a drive member (42) for coupling with drive means for the compressor (10), characterised in that in the rotor (12) with which the drive member (42) is associated and its respective shaft (16) are formed with a central axial through-hole (50) in which is inserted a tie rod (48) with screw-threaded ends (48a,48b) onto which respective clamping nuts (52,54) are screwed to clamp the respective gear wheel (38) for rotation with the shaft (16) of the rotor (12).

2. Compressor according to Claim 1, characterised in that the drive member (42) is rendered rigid for rotation with the shaft (16) of the rotor (12) by means of the tie rod (48).

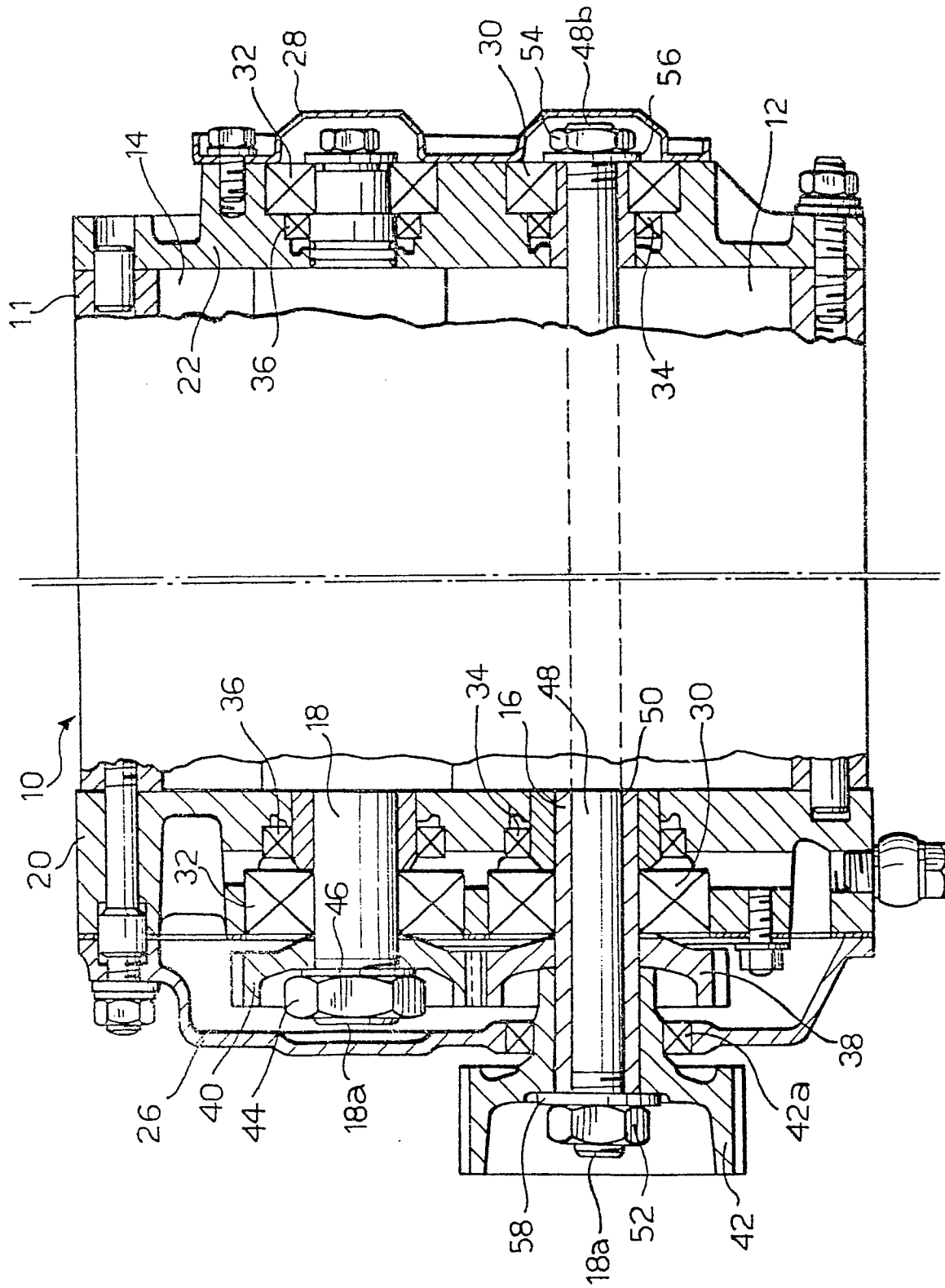


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In operation, the method of clamping the gear wheel 38 ensures the correct and stable phasing of the compressor with time, which is also due to the axial resilient action exerted by the tie rod 48 under traction.

Naturally, the principle of the invention remaining the same, the constructional details and the embodiments may be varied widely with respect to that described and illustrated without thereby departing from the scope of the present invention.







EP 84830021.6

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 7)
Y	FR - A - 776 196 (NORTHEY) * Fig. 2,4 * --	1,2	F 04 C 18/12
Y	FR - A - 1 039 761 (BRONZAVIA S.A.) * Fig. 1 * --	1,2	
Y	FR - A - 778 367 (BUCHER) * Fig. 2,3,8,9,12 * --	1,2	
Y	FR - A - 1 152 879 (VIOLET ET COUSY) * Fig. 1 * --	1,2	
Y	FR - A - 2 029 362 (CONSTANTIN) -----	1,2	TECHNICAL FIELDS SEARCHED (Int. Cl. 7) F 04 C 2/00 F 04 C 15/00 F 04 C 18/00 F 04 C 29/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 15-05-1984	Examiner WITTMANN
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			