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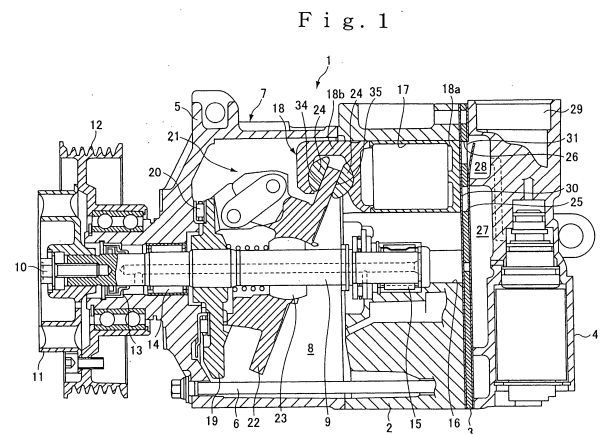
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(54) **Swash plate compressor and surface treatment method for treating surface of swash plate in swash plate compressor**

(57) A variable-capacity swash plate compressor (1) comprising a shaft (9) passing through a crank chamber (8) and rotatably supported at a housing (7), a swash plate (22) that includes an opening through which the shaft (9) is inserted, is disposed in the crank chamber (8) and rotates synchronously with rotation of the shaft (9), pistons (18), each held at a circumferential edge of the swash plate (22), which slides reciprocally in a cylinder bore (17) as the swash plate (22) rotates, and shoes (24), disposed between one of the two side surfaces of the swash plate (22) and an engaging portion of the piston (18) which slides in contact against both the swash plate (22) and the piston (18).

The swash plate (22) is constituted of an iron-based material.

The sliding contact surfaces of the swash plate (22) that slide in contact against shoes (24) undergo a gas soft-nitriding process, a removal process executed after the soft-nitriding process in order to remove a nitride-containing compound layer while retaining a hardened layer having been formed through the soft-nitriding process, and a coating process executed after the removal process to form a coating constituted of a solid lubricant.





EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2009 150344 A (HITACHI CONSTRUCTION MACHINERY) 9 July 2009 (2009-07-09)	1-3,5,6	INV. F04B27/08 F04B27/10
Y	* abstract; figures 1,2,7,9 *	4	
X	EP 1 262 661 A1 (TOYOTA JIDOSHOKKI KK [JP]) 4 December 2002 (2002-12-04) * abstract; claims 1,7; figures 1,2 * * paragraphs [0018] - [0025], [0038], [0040] *	1-6	
Y	EP 0 251 741 A2 (MITSUI TOATSU CHEMICALS [JP]) 7 January 1988 (1988-01-07) * page 3, lines 56-63 * * page 4, line 29 - page 5, line 4 * * page 7, lines 36-47 *	4	
A	EP 1 262 662 A1 (TOYOTA JIDOSHOKKI KK [JP]) 4 December 2002 (2002-12-04) * abstract; figures * * paragraphs [0009], [0010], [0030], [0031], [0032], [0034], [0036], [0037], [0044], [0047], [0067] *	1-6	
A	JP 2001 027152 A (RIKEN KK) 30 January 2001 (2001-01-30) * abstract; figure 2 * * paragraphs [0018], [0020], [0029] *	1-6	
A	JP H02 149616 A (MAZDA MOTOR) 8 June 1990 (1990-06-08) * abstract *	1-6	TECHNICAL FIELDS SEARCHED (IPC)
			F04B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 October 2017	Examiner Richmond, Robin
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	

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

EP 11 00 9216

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2009150344 A	09-07-2009	NONE	
EP 1262661 A1	04-12-2002	CN 1386977 A EP 1262661 A1 JP 3948259 B2 JP 2003042060 A KR 20020089136 A US 2002170425 A1	25-12-2002 04-12-2002 25-07-2007 13-02-2003 29-11-2002 21-11-2002
EP 0251741 A2	07-01-1988	AU 589785 B2 CA 1278396 C DE 3772280 D1 EP 0251741 A2 JP H083041 B2 JP S638455 A US 4816516 A	19-10-1989 27-12-1990 26-09-1991 07-01-1988 17-01-1996 14-01-1988 28-03-1989
EP 1262662 A1	04-12-2002	BR 0201872 A CN 1386978 A EP 1262662 A1 JP 2003042061 A KR 20020088348 A US 2003005821 A1	25-03-2003 25-12-2002 04-12-2002 13-02-2003 27-11-2002 09-01-2003
JP 2001027152 A	30-01-2001	NONE	
JP H02149616 A	08-06-1990	JP 2741222 B2 JP H02149616 A	15-04-1998 08-06-1990