

Claims

- [Claim 1] Dry vacuum pump (1) having a stator (2) and two rotors (5) that are accommodated in at least one compression chamber (3) of the stator (2), the rotors (5) being configured to rotate synchronously in opposite directions so as to drive a gas to be pumped between an intake (4) and a delivery of the vacuum pump (1), characterized in that the rotors (5) and the compression chamber (3) of the stator (2) are coated with a nickel-phosphorus coating (11) comprising between 9% and 14% phosphorus and having a thickness (e) greater than 20 μm , the nickel-phosphorus coating (11) having undergone a hardening heat treatment comprising a step (102) of heating to a treatment temperature (T) greater than 250°C for a treatment duration (D) greater than one hour, so as to have a hardness greater than 700 H_V.
- [Claim 2] Vacuum pump (1) according to the preceding claim, characterized in that the treatment duration (D) is greater than 8 hours.
- [Claim 3] Vacuum pump (1) according to either of the preceding claims, characterized in that the treatment duration (D) is less than 15 hours.
- [Claim 4] Vacuum pump (1) according to one of the preceding claims, characterized in that the hardness is between 800 H_V and 1000 H_V.
- [Claim 5] Vacuum pump (1) according to one of the preceding claims, characterized in that the treatment temperature (T) is less than 350°C.
- [Claim 6] Vacuum pump (1) according to one of the preceding claims, characterized in that the nickel-phosphorus coating (11) comprises between 10% and 13% phosphorus.
- [Claim 7] Vacuum pump (1) according to one of the preceding claims, characterized in that the nickel-phosphorus coating (11) has a thickness (e) less than or equal to 60 μm , such as 25 μm +/- 5 μm .
- [Claim 8] Vacuum pump (1) according to one of the preceding claims, characterized in that it has at least two pumping stages (1a-1e) each defining a compression chamber (3), the compression chambers (3) of the successive pumping stages (1a-1e) being connected in series by at least one inter-stage channel (8) provided in the body (9) of the stator (2) that is also provided with a nickel-phosphorus coating (11).

[Claim 9] Vacuum pump (1) according to one of the preceding claims, characterized in that the nickel-phosphorus coating (11) covers all the walls of the vacuum pump (1) that are likely to be in contact with the gas to be pumped.

5 [Claim 10] Vacuum pump (1) according to one of the preceding claims, characterized in that the body (9) of the stator (2) and the bodies (10) of the rotors (5) are made from cast iron or steel.

[Claim 11] Vacuum pump (1) according to one of the preceding claims, characterized in that it is configured to rotate at more than 40 Hz.

10 [Claim 12] Method for manufacturing a dry vacuum pump (1), characterized in that it involves the following steps:

- a nickel-phosphorus coating (11) comprising between 9% and 14% phosphorus and having a thickness (e) greater than 20 μm is deposited on an internal wall of the stator (2) and on the walls of the rotors (5), and

15 - the nickel-phosphorus coating (11) of the stator (2) and of the rotors (5) is heat treated with a step (102) of heating to a treatment temperature (T) greater than 250°C for a treatment duration (D) greater than one hour, so as to have a hardness greater than 700 Hv, for example between 800 Hv and 1000 Hv.

20 [Claim 13] Method for manufacturing a vacuum pump (1) according to the preceding claim, characterized in that the treatment duration (D) is greater than 8 hours and/or less than 15 hours.

[Claim 14] Method for manufacturing a vacuum pump (1) according to either of Claims 12 and 13, characterized in that the hardening heat treatment
25 involves at least one temperature raising step (101) during which the temperature setpoint is increased from ambient temperature to the treatment temperature (T) at a raising rate of between 1°C/min and 3°C/min.

[Claim 15] Method for manufacturing a vacuum pump (1) according to one of Claims 12 to 14, characterized in that the nickel-phosphorus coating (11) is
30 deposited using a technique of immersing the body (9) of the stator (2) and the bodies (10) of the rotors (5).