VACUUM PUMP

The invention relates to a vacuum pump, in particular a multi-stage vacuum pump and a stator of such a pump.

A vacuum pump may be formed by positive displacement pumps such as roots or claw pumps, having one or more pumping stages connected in series. Multi-stage pumps are desirable because they involve less manufacturing cost and assembly time compared to multiple single stage pumps in series.

Multi-stage roots or claw pumps may be manufactured and assembled in the form of a clamshell. As shown in Figure 1, the stator 100 of such a pump comprises first and second half-shell stator components 102, 104 which together define a plurality of pumping chambers 106, 108, 110, 112, 114, 116. Each of the half-shells has first and second longitudinally extending faces which mutually engage with the respective longitudinally extending faces of the other half-shell when the half-shells are fitted together. Only the two longitudinally extending faces 118, 120 of half-shell 102 are visible in the Figure. During assembly the two half-shells are brought together in a generally radial direction shown by the arrows R.

The stator 100 further comprises first and second end stator components 122, 124. When the half-shells have been fitted together, the first and second end components are fitted to respective end faces 126, 128 of the joined half-shells in a generally axial, or longitudinal, direction shown by arrows L. The inner faces 130, 132 of the end components mutually engage with respective end faces 126, 128 of the half-shells.

Each of the pumping chambers 106-116 is formed between transverse walls 134 of the half-shells. Only the transverse walls of half-shell 102 can be seen in Figure 1. When the half-shells are assembled the transverse walls provide axial separation between

CLAIMS

1. A multi-stage vacuum pump comprising:

first and second half-shell stator components defining a plurality of pumping chambers and for assembly together along respective longitudinally extending faces;

first and second end stator components for assembly at respective longitudinal end faces of the first and second half-shell stator components;

longitudinal seals for sealing between the first and second half-shell stator components when assembled together at the longitudinally extending faces; and

annular seals for sealing between the first and second end stator components and the first and second half-shell stator components when assembled;

wherein the longitudinal seals have end portions which abut against the annular seals for sealing therebetween and the first and second half-shell stator components have formations for resisting movement of the end portions away from the annular seals when the end portions are compressed between the first and second half-shell stator components.

2. A multi-stage vacuum pump as claimed in claim 1, wherein mutually engaging longitudinally extending faces of the half-shell stator components form therebetween respective longitudinal channels for locating the longitudinal seals, and wherein the formations are formed by enlarged end portions of the channels which are configured for receiving enlarged end portions of the longitudinal seals.

3. A multi-stage vacuum pump as claimed in claim 1 or 2, wherein the enlarged end portions of the channels and the longitudinal seals taper laterally outwardly from middle portions thereof.

4. A multi-stage vacuum pump as claimed in claim 3, wherein the enlarged end portions of the channels and the longitudinal seals taper outwardly in at least two orthogonal lateral dimensions from middle portions thereof.

5. A multi-stage vacuum pump as claimed in any of the preceding claims, wherein when located in the channels the end portions of the longitudinal seals extend proudly of respective end faces of the half-shell components for abutting against the annular seals.

6. A multi-stage vacuum pump as claimed in any of the preceding claims, wherein the end portions of the longitudinal seals are configured such that when compressed during assembly they deform against the annular seals to extend the sealing surface therebetween.

7. A multi-stage vacuum pump as claimed in any of the preceding claims, wherein the end portions of the longitudinal seals comprise longitudinal protrusions having a recess therebetween shaped to complement a cross-section of the annular seal so that when assembled the annular seals is located in the recess and the sealing surface is extended between the seals.

8. A multi-stage vacuum pump as claimed in any of the preceding claims, the end faces of the half-shell stator components when assembled together form annular channels for locating the annular seals, and the annular channels extend through the end portions of the longitudinal channels.

9. A multi-stage vacuum pump as claimed in any of the preceding claims, wherein the longitudinal channels are recessed into the longitudinally extending faces of the half-shells and longitudinal walls upstand from the recess and are generally flush with the longitudinally extending faces, wherein the longitudinal seals fit around the walls such that when compressed the walls prevent the longitudinal seals from the deforming away from the annular seals.

10. A multi-stage vacuum pump as claimed in any of the preceding claims, wherein the formations of the longitudinal seals and the first and second half-shell stator components resist movement of a sealing surface of the longitudinal seals away from respective annular seals.

11. A multi-stage vacuum pump as claimed in any of the preceding claims, wherein when located in position in the first and second half-shell stator components and prior to compression a gap exists between the formations of the longitudinal seals and the formations of the first and second half-shell components into which the longitudinal seals can expand during compression.

12. A multi-stage vacuum pump as claimed in any of the preceding claims, wherein the longitudinal seals are gaskets having a greater extent in two dimensions and a lesser extent in a third dimension.

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VACUUM PUMP WITH LONGITUDIAL AND ANNULAR SEALS

The invention relates to a vacuum pump, in particular a multi-stage vacuum pump and a stator of such a pump.

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Multi-stage roots or claw pumps may be manufactured and assembled in the form of a clamshell. As shown in Figure 1, the stator 100 of such a pump comprises first and second half-shell stator components 102, 104 which together define a plurality of pumping chambers 106, 108, 110, 112, 114, 116. Each of the half-shells has first and second longitudinally extending faces which mutually engage with the respective longitudinally extending faces of the other half-shell when the half-shells are fitted together. Only the two longitudinally extending faces 118, 120 of half-shell 102 are visible in the Figure. During assembly the two half shells are brought together in a generally radial direction shown by the arrows R.

The stator 100 further comprises first and second end stator components 122, 124. When the half-shells have been fitted together, the first and second end components are fitted to respective end faces 126, 128 of the joined half-shells in a generally axial, or longitudinal, direction shown by arrows L. The inner faces 130, 132 of the end components mutually engage with respective end faces 126, 128 of the half-shells.

Each of the pumping chambers 106-116 is formed between transverse walls 134 of the half-shells. Only the transverse walls of half-shell 102 can be seen in Figure 1. When the half-shells are assembled the transverse walls provide axial separation between

CLAIMS

1. A multi-stage vacuum pump comprising:

first and second half-shell stator components defining a plurality of pumping chambers and for assembly together along respective longitudinally extending faces;

first and second end stator components for assembly at respective longitudinal end faces of the first and second half-shell stator components;

longitudinal seals for sealing between the first and second half-shell stator components when assembled together at the longitudinally extending faces; and

annular seals for sealing between the first and second end stator components and the first and second half-shell stator components when assembled;

wherein the longitudinal seals have end portions which abut against the annular seals for sealing therebetween and the first and second half-shell stator components have formations for resisting movement of the end portions away from the annular seals when the end portions are compressed between the first and second half-shell stator components, wherein the longitudinal seals are gaskets having a greater extent in two dimensions and a lesser extent in a third dimension.