ORIGINAL

TURBOMACHINE

Abstract of the Invention

A variable geometry turbine comprising a turbine wheel mounted for rotation about a turbine axis within a housing, the housing defining an annular inlet surrounding the turbine wheel and defined between first and second inlet sidewalls; and a cylindrical sleeve axially movable across the annular inlet to vary the size of a gas flow path through the inlet; wherein the annular inlet is divided into a first annular inlet portion and a second annular inlet portion axially offset from the first inlet portion, inlet vanes extending axially into each of the first and second inlet portions, the inlet vanes defining axially adjacent inlet passages; wherein the configuration of the inlet vanes extending into the first inlet portion differs from the configuration of the inlet vanes extending into the second inlet portion in that the vanes extending into the first inlet portion are circumferentially offset from the vanes extending into the second inlet portion.

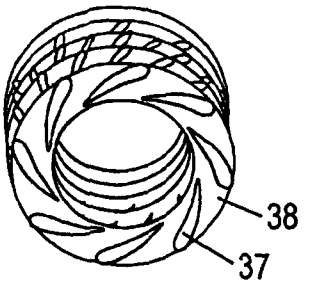

Fig. 8c

WE CLAIM :

1. A variable geometry turbine comprising

a turbine wheel mounted for rotation about a turbine axis within a housing, the housing defining an annular inlet surrounding the turbine wheel and defined between first and second inlet sidewalls; and

a cylindrical sleeve axially movable across the annular inlet to vary the size of a gas flow path through the inlet;

wherein the annular inlet is divided into a first annular inlet portion and a second annular inlet portion axially offset from the first inlet portion, equal numbers of inlet vanes extending axially into each of the first and second inlet portions, the inlet vanes defining axially adjacent inlet passages;

wherein the configuration of the inlet vanes extending into the first inlet portion differs from the configuration of the inlet vanes extending into the second inlet portion in that the vanes extending into the first inlet portion are circumferentially offset from the vanes extending into the second inlet portion such that the gas flow path for gases exiting the inlet passages in the first inlet portion is circumferentially offset from the gas flow path for gases exiting the inlet passages in the second inlet portion.

2. A variable geometry turbine according to claim 1, wherein the first and second inlet portions are adjacent one another.

3. A variable geometry turbine according to claim 1 or 2, wherein the vanes extending into the first inlet portion are circumferentially offset from the vanes extending into the second inlet portion by a circumferential distance which is generally half that of the circumferential distance separating two adjacent vanes in either the first inlet portion or the second inlet portion.

4. A variable geometry turbine according to any preceding claim, wherein the vanes in the first and second inlet portions have substantially the same outer diameter and different inner diameters.

5. A variable geometry turbine according to any one of claims 1 to 3, wherein the vanes in the first and second inlet portions have different outer diameters and substantially the same inner diameters.

6. A variable geometry turbine comprising

a turbine wheel mounted for rotation about a turbine axis within a housing, the housing defining an annular inlet surrounding the turbine wheel and defined between first and second inlet sidewalls; and

a cylindrical sleeve axially movable across the annular inlet to vary the size of a gas flow path through the inlet;

wherein the annular inlet is divided into a first annular inlet portion and a second annular inlet portion axially offset from the first inlet portion, inlet vanes extending axially into each of the first and second inlet portions, the inlet vanes defining axially adjacent inlet passages;

wherein the configuration of the inlet vanes extending into the first inlet portion differs from the configuration of the inlet vanes extending into the second inlet portion in that the circumferential distribution of the vanes extending into the first inlet portion is different to the circumferential distribution of the vanes extending into the second inlet portion;

and wherein the circumferential distribution of the vanes extending into the first inlet portion is non-uniform.

7. A variable geometry turbine according to claim 6, wherein the configuration of the inlet vanes extending into the first inlet portion differs from the configuration of the inlet vanes extending into the second inlet portion.

8. A variable geometry turbine according to claim 6 or 7, wherein the first and second inlet portions are adjacent one another.

9. A variable geometry turbine according to any one of claims 6 to 8, wherein the circumferential distribution of the vanes extending into the second inlet portion is non-uniform.

10. A variable geometry turbine comprising

a turbine wheel mounted for rotation about a turbine axis within a housing, the housing defining an annular inlet surrounding the turbine wheel and defined between first and second inlet sidewalls; and

a cylindrical sleeve axially movable across the annular inlet to vary the size of a gas flow path through the inlet;

wherein the annular inlet is divided into a first annular inlet portion and a second annular inlet portion axially offset from the first inlet portion, inlet vanes extending

axially into each of the first and second inlet portions, the inlet vanes defining axially adjacent inlet passages;

wherein the configuration of the inlet vanes extending into the first inlet portion differs from the configuration of the inlet vanes extending into the second inlet portion in that the vanes extending into the first inlet portion are circumferentially offset from the vanes extending into the second inlet portion

and wherein the number of vanes in the first inlet portion is more than 50 % of the number of vanes in the second inlet portion.

11. A variable geometry turbine according to claim 10, wherein the number of vanes in the first inlet portion is more than 75 % of the number of vanes in the second inlet portion.

12. A variable geometry turbine according to claim 10 or 11, wherein the number of vanes in the first inlet portion is substantially similar but less than the number of vanes in the second inlet portion.

13. A variable geometry turbine according to any one of claims 10 to 12, wherein the first and second inlet portions are adjacent one another.

14. A variable geometry turbine according to any one of claims 10 to 13, wherein the vanes in the first and second inlet portions have (i) substantially the same outer diameter and different inner diameters, or (ii) different outer diameters and substantially the same inner diameters.

15. A variable geometry turbine according to any one of claims 10 to 14, wherein the circumferential distribution of the vanes extending into the first and/or second inlet portion is non-uniform.

16. A variable geometry turbine according to any preceding claim, wherein the cylindrical sleeve is movable across an outside diameter of the annular inlet to selectively block upstream ends of respective inlet passages or portions relative to gas flow through the turbine.

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