Claims

1. A seal member (80) for a rotary regenerative scrubber (10) comprising:

a hub (82);

a rim (84) circumferentially surrounding the hub (82); and

a plurality of spokes (86) extending from the hub (82) to the rim (84),

wherein the hub (82), rim (84), and spokes (86) define an axially facing seal face (88) configured to form a sealing engagement with an opposed seal surface of a rotary regenerative scrubber (10), and a mounting face (90) axially opposed to the seal face (88) configured for mounting to a rotor assembly (20) of a rotary regenerative scrubber (10), characterized in that the seal face (88) includes a labyrinth seal (92) defined therein.

2. A seal member (80) as recited in claim 1, wherein each spoke (86) includes a spoke portion (104) of the labyrinth seal (92) with troughs extending radially defined in the seal face (88).

3. A seal member (80) as recited in claim 1 or 2, wherein the hub (82) includes a hub portion (106) of the labyrinth seal (92) with troughs defined in the seal face (88) extending circumferentially around the hub (82), and comprising a plurality of radially extending ridges (108), each ridge (108) interrupting the troughs in the hub portion (106) of the labyrinth seal (92), with a circumferential segment of hub troughs defined between each circumferentially adjacent pair of ridges (108).

4. A seal member (80) as recited in any of claims 1 to 3, wherein the rim (84) includes a rim portion (110) of the labyrinth seal (92) with troughs defined in the seal face (88) extending circumferentially around the rim (84), and comprising a plurality of radially extending ridges (112), each ridge (112) interrupting the troughs in the rim portion (110) of the labyrinth seal (92), with a circumferential segment of rim troughs defined between each circumferentially adjacent pair of ridges (112).

5. A seal member (80) as recited in any of claims 1 to 4, further comprising

a plurality of circumferentially extending ridges (114), each separating a portion of the labyrinth seal (92) defined in the rim (84) from a portion of the labyrinth seal (92) defined in a respective one of the spokes (86), and/or

a plurality of circumferentially extending ridges (116), each separating a portion of the labyrinth seal (92) defined in the hub (82) from a portion of the labyrinth seal (92) defined in a respective one of the spokes (86).

6. A seal member (80) as recited in any of claims 1 to 5, further comprising a screen (96), wherein the screen (96) spans passages between the spokes (86), wherein the screen (96) is configured to allow a gas flow therethrough and to retain a regenerative absorbent material from passing therethrough, wherein the screen (96) includes a stainless steel material.

7. A seal member (80) as recited in any of claims 1 to 6, wherein the hub, rim (84), and spokes (86) include a self-lubricating polymer material.

8. A seal member (80) as recited in any of claims 1 to 7, wherein the labyrinth seal (92) includes a plurality of interior ridges (98) defining troughs therebetween in the seal face (88), and opposed edge ridges (102) bounding the seal face (88) peripherally, wherein the edge ridges (102) have a greater thickness than the interior ridges (98) in a lateral direction normal to the interior and edge ridges (98, 102).

9. A seal member (80) as recited in any of claims 1 to 8, wherein the mounting face (90) defines a grove (94), wherein the rim (84) includes a rim portion (110) of the groove (94), each spoke (86) includes a spoke portion (104) of the groove (94), and the hub (82) includes a hub portion (106) of the groove (94), and wherein the groove (94) is configured to engage an end face of a rotor (22) wherein the end face of the rotor (22) has a smaller area than the seal face (88).

10. A rotary regenerative scrubber (10) for removing a selected gaseous component from a flow of gas to be cleaned, the scrubber (10) comprising:

a housing (26) defining a first flow passage for a flow of gas to be cleaned and a second flow passage for a flow of regenerating gas;

a rotor assembly (20) disposed in the housing (26) for rotation through the first flow passage and the second flow passage, the rotor assembly (20) carrying a regenerative absorbent material capable of absorbing the selected gaseous component;

a first plate seal (60) disposed between a first seal seat of the housing (26) and the rotor assembly (20);

a second plate seal (60) disposed between a second seal seat of the housing (26) and the rotor assembly (20); and

a first seal member (80) connected for common rotation to a first end of the rotor assembly (20) and a second seal member (80) connected for common rotation to an opposed second end of the rotor assembly (20), wherein each of the first and second seal members (80) is a seal member (80) as recited in one of the preceding claims.

11. A rotary regenerative scrubber (10) as recited in claim 10

wherein the rotor assembly

(20) includes a rotor (22) mounted to a shaft (24) for rotation with the shaft (24), the rotor (22) having a central hub (30), a circumferential wall (32), and a plurality of radially directed partitions (34) extending from the central hub (30) to the circumferential wall (32), wherein the rim (84) of each of the first and second seal members (80) is mounted to a respective end of the circumferential wall (32), wherein the hub (82) of each of the first and second seal members (80) is mounted to a respective end of the central hub (30) of the rotor assembly (20), and wherein each of the spokes (86) of the first and second seal members (80) is mounted to a respective end of a respective radially directed partition (34) of the rotor assembly (20).

12. A rotary regenerative scrubber (10) as recited in claim 11, wherein the housing (26) includes a first housing section (40) and a second housing section (50), the first housing section (40) defining a first gas manifold section (42) and the second housing section (50) defining a second gas manifold section (52), the first seal seat disposed across the first gas manifold section (42) and the second seal seat disposed across the second gas manifold section (52), and wherein the first and second plate seals (60) seal with the first and second seal members (80),

respectively, to seal a first flow passage between the first and second gas manifold sections (42, 52) from a second flow passage between the first and second gas manifold sections (42, 52).

13. A rotary regenerative scrubber (10) as recited in claim 11 or 12, wherein a seal gap (101) is defined between the first seal member (80) and the first plate seal (60), wherein a seal gap (101) is defined between the second seal member (80) and the second plate seal (60), and wherein the seal gaps (101) are superficial and are about 0.015 inches (0.381 mm) wide.

14. A rotary regenerative scrubber (10) as recited in any of claims 11 to 13, wherein the mounting face (90) of each of the first and second seal members (80) defines a grove (94), wherein the rim (84) includes a rim portion (110) of the groove (94), each spoke (86) includes a spoke portion (104) of the groove (94), and the hub (82) includes a hub portion of the groove (94), and wherein the groove is configured (94) to engage an end face of the rotor assembly (20) wherein the end face of the rotor assembly (20) has a smaller area than the seal face (88).

15. A rotary regenerative scrubber (10) as recited in any of claims 11 to 14, wherein each of the first and second seal members (80) forms a hard interface dynamic seal wherein the seal face (88) of each of the first and second seal members (80) is in direct physical contact with a respective one of the first and second plate seals (60), wherein the seal faces (88) of the first and second seal members (80) include a self-lubricating polymer material, and wherein the first and second plate seals include aluminum in in direct physical contact with the self-lubricating polymer material of the first and second seal members (80), respectively.