

Claims

1. An expandable centre arrangement for a reactor, the arrangement comprising: an expansion tube; a centre support inside the expansion tube and three or more spring elements; the spring elements being fastened to the centre support and arcing out to the expansion tube.
2. An expandable centre arrangement according to claim 1, wherein the expansion tube is formed from tail ends of the spring elements spiralling around and overlapping each other.
3. An expandable centre arrangement according to claim 2, wherein each of the tail ends extends around at least one full circumference of the expansion tube.
4. An expandable centre arrangement according to claim 1, wherein the expansion tube is separate to the spring elements and the spring elements press outwardly against the expansion tube.
5. An expandable centre arrangement according to any preceding claim, wherein the spring elements are resilient so as to bias the expansion tube outwardly away from the centre support.
6. An expandable centre arrangement according to any preceding claim, wherein the spring elements are sheet-like elements aligned with the axial direction of the centre support and the expansion tube.
7. An expandable centre arrangement according to any preceding claim, wherein the expansion tube comprises at least one sheet wrapped around multiple times to form the circumference of the expansion tube.

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8. An expandable centre arrangement according to claim 7, wherein the at least one sheet comprises corrugations at an inner end.
9. An expandable centre arrangement according to any preceding claim, wherein the centre support comprises at least one hole to allow air blown down the centre support to lubricate the spring elements.
10. A reactor comprising: an outer tube; an expansion tube inside the outer tube; an expandable catalyst support occupying an annular space between the expansion tube and the outer tube; and three or more curved resilient spring elements arranged within the expansion tube so as to bias the expansion tube toward the outer tube.
11. A reactor according to claim 10, wherein the spring elements are mounted on a centre support.
12. A reactor according to claim 10 or claim 11, wherein the expansion tube is formed from tail ends of the spring elements spiralling around and overlapping each other.
13. A reactor according to claim 10 or claim 11, wherein the expansion tube is separate to the spring elements.
14. A reactor according to any of claims 10 to 13, wherein the spring elements are sheet-like elements aligned with the axial direction of the outer tube and the expansion tube.
15. A reactor according to any of claims 10 to 14, wherein the expansion tube comprises at least one sheet wrapped around multiple times to form the circumference of the expansion tube

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16. A method of installing an expandable centre arrangement in a reactor, the method comprising: providing an expandable centre arrangement comprising an expansion tube and spring elements arranged inside the expansion tube, inserting the centre arrangement into the reactor, introducing a pressurised gas into the expansion tube so as to expand the expansion tube, wherein the spring elements resist compression of the expansion tube after the pressurised gas is vented.
17. A method according to claim 16, wherein the centre arrangement is inserted into the reactor using a tool and the pressurised gas is introduced via the same tool.
18. A method according to claim 16 or claim 17, wherein the spring elements provide an outward biasing force to the expansion tube during the introduction of the pressurised gas.
19. A method according to any of claims 16 to 18, wherein the spring elements remain in contact with the expansion tube throughout the introduction of the pressurised gas.
20. An expandable centre arrangement for a reactor, the expandable centre arrangement being substantially as herein described with reference to the accompanying drawings.
21. A reactor substantially as herein described with reference to the accompanying drawings.
22. A method of installing an expandable centre arrangement in a reactor, the method being substantially as herein described with reference to the accompanying drawings.