CLAIMS

What is claimed is:

1. A sealing system for sealing a closure to a container comprising:

a die assembly comprising:

a die having a positioning portion configured to retain a disc and a die opening adjacent the positioning portion; and

at least one clamping ring sealing member configured to move radially toward the container and die opening to compress the container outer sidewall and provide heat to seal the disc to the container; and

a mandrel assembly having a recessed position and an extended position and comprising:

an outer mandrel comprising an extending portion which is sized to fit within an inner circumference of the positioning portion in its extended position, adjacent a peripheral portion of the retained disc;

an inner mandrel configured to translate through an inner circumference of the extending portion of the outer mandrel and the die opening to its extended position,

wherein the at least one clamping ring sealing member is disposed opposite the mandrel assembly when the mandrel assembly is in its extended position; and

a gas evacuation assembly comprising:

an interior channel which extends circumferentially within an interior of the die and which extends circumferentially within the die further than it extends radially;

at least one channel opening disposed in the die which connects the interior channel to an interior surface of the die, wherein the at least one channel opening is disposed between the positioning portion of the die and the at least one clamping ring sealing member; and

a means for suctioning gas from an interior of the container, the at least one channel opening, and the channel to an exterior of the die.

2. The system of claim 1 comprising a plurality of channel openings.

3. The system of claim 1 additionally comprising at least one valve disposed within the die, connecting the channel to the exterior of the die and at least one tube connecting the at least one valve to the means for suctioning gas.

4. The system of claim 1 additionally comprising a plurality of valves disposed within the die, connecting the channel to the exterior of the die.

5. The system of claim 1 wherein the at least one channel opening is disposed between the retained disc and the container to which it is to be sealed.

6. The system of claim 1 wherein the extending portion of the outer mandrel has a greater circumference than that of the die opening.

7. The system of claim 1 wherein the extending portion of the outer mandrel constrains the disc in the positioning portion of the disc .

8. The system of claim 1 wherein the at least one channel opening is vertically disposed between the positioning portion of the die and the at least one clamping ring sealing member.

9. The system of claim 1, wherein the outer mandrel and the inner mandrel extend, translate, and retract parallel to one another.

10. The system of claim 1, wherein:

the outer mandrel extends vertically; and

the inner mandrel translates vertically.

11. The system of claim 1 wherein the closure is paper-based.

12. The system of claim 1 wherein the at least one clamping ring sealing member comprises segmented clamping brackets.

13. The system of claim 1 wherein the interior channel is disposed between the interior surface of the die and an exterior surface of the die.

14. A method for sealing a closure to a container comprising:

providing a die assembly comprising:

a die having a positioning portion configured to retain a disc and a die opening adjacent the positioning portion; and

at least one clamping ring sealing member configured to move radially toward the container and die opening to compress the container outer sidewall and provide heat to seal the disc to the container; and

providing a mandrel assembly having a recessed position and an extended position and comprising:

an outer mandrel comprising an extending portion which is sized to fit within an inner circumference of the positioning portion in its extended position, adjacent a peripheral portion of the retained disc;

an inner mandrel configured to translate through an inner circumference of the extending portion of the outer mandrel and the die opening to its extended position,

wherein the at least one clamping ring sealing member is disposed opposite the mandrel assembly when the mandrel assembly is in its extended position; and

providing a gas evacuation assembly comprising:

an interior channel which extends circumferentially within an interior of the die and which extends circumferentially within the die further than it extends radially;

at least one channel opening disposed in the die which connects the interior channel to an interior surface of the die, wherein the at least one channel opening is disposed between the positioning portion of the die and the at least one clamping ring sealing member; and

a means for suctioning gas from the interior of the container , the at least one channel opening, and the channel to an exterior of the die;

positioning the disc in the positioning portion of the die;

axially aligning the container with the positioning portion of the die;

positioning the container such that a peripheral edge of the container is in contact with a lower surface of the die;

translating the outer mandrel such that it constrains the disc in the positioning portion of the die;

suctioning gas from an interior of the container, the at least one channel opening, and the channel to an exterior of the die;

translating the inner mandrel such that it pushes the disc into the container and deforms the disc into a container end; and

sealing the container end to the container.

15. The method of claim 14 wherein when the outer mandrel constrains the disc in the positioning portion of the die, the interior of the container is sealed off from access to the atmosphere.

16. The method of claim 14 wherein when suctioning step and the translating the inner mandrel step occur simultaneously.

17. The method of claim 14 wherein when suctioning step and the translating the inner mandrel step occur nearly simultaneously.

18. The method of claim 14 comprising a plurality of channel openings.

19. The method of claim 14 additionally comprising at least one valve disposed within the die, connecting the channel to the exterior of the die and at least one tube connecting the at least one valve to the means for suctioning gas.

20. The method of claim 14 wherein the means for suctioning gas comprises a side channel pump.

21. The method of claim 14 additionally comprising a plurality of valves disposed within the die, connecting the at least one channel to the exterior of the die.

22. The method of claim 14 wherein the at least one channel openings are disposed between the retained disc and the container to which it is to be sealed.

23. The method of claim 14 wherein the extending portion of the outer mandrel has a greater circumference than that of the die opening.

24. The method of claim 14, wherein the outer mandrel and the inner mandrel extend, translate, and retract parallel to one another.

25. The method of claim 14, wherein:

the outer mandrel extends vertically; and

the inner mandrel translates vertically.

26. The method of claim 14, wherein the sealing member is disposed vertically opposite the mandrel assembly when the mandrel assembly is in its retracted position.

27. The method of claim 14, wherein the at least one channel opening is vertically disposed between the positioning portion of the die and the sealing member.

28. The method of claim 14 wherein the closure is paper-based.