CLAIMS

1. A jarring apparatus, comprising:

first and second jarring assemblies rotatable relative to each other;

a first impact surface provided on the first jarring assembly and a second impact surface provided on the second jarring assembly, wherein, in use, the first and second impact surfaces are biased together; and

a first lifting structure rotatably fixed relative to the first jarring assembly and a second lifting structure rotatably fixed relative to the second jarring assembly, the first and second lifting structures being configured to cooperate during relative rotation therebetween to cause cyclical relative displacement in one axial direction to define a lifting phase and relative displacement in a reverse axial direction to define a dropping phase,

wherein the first and second lifting structures are axially fixed relative to their associated jarring assembly during the lifting phase to provide axial separation between the first and second impact surfaces, and the second lifting structure is axially released relative to the second jarring assembly prior to initiation of the dropping phase to permit the first and second impact surfaces to be axially impacted together.

2. The jarring apparatus according to claim 1, wherein loading between the first and second jarring assemblies is applied between the first and second lifting structures when the second lifting structure is axially fixed relative to the second jarring assembly, and axial release of the second lifting structure reduces loading applied between the first and second lifting structures prior to initiation of the dropping phase.

3. The jarring apparatus according to any preceding claim, wherein the second lifting structure is axially released relative to the second jarring assembly prior to completion of the lifting phase.

4. The jarring apparatus according to any preceding claim, wherein the first and second lifting structures comprise inter-engaging profiles which cooperate during relative rotation of the lifting structures to cause the cyclical lifting and dropping phases, the inter-engaging profiles being configured such that a surface area of contact therebetween reduces as the lifting phase progresses.

optionally wherein the inter-engaging profiles comprise rotary cam surfaces,

and/or wherein the inter-engaging profiles of the first and second lifting structures are prevented from axial engagement during or following the dropping phase,

optionally wherein the inter-engaging profiles remain separated during a portion of relative rotation between the first and second lifting structures following the dropping phase, and wherein the inter-engaging profiles are brought into contact to initiate a subsequent lifting phase.

~~5. The jarring apparatus according to claim 4, wherein the inter-engaging profiles comprise rotary cam surfaces.~~

~~6. The jarring apparatus according to claim 4 or 5, wherein the inter-engaging profiles of the first and second lifting structures are prevented from axial engagement during or following the dropping phase.~~

~~7. The jarring apparatus according to claim 6, wherein the inter-engaging profiles remain separated during a portion of relative rotation between the first and second lifting structures following the dropping phase, and wherein the inter-engaging profiles are brought into contact to initiate a subsequent lifting phase.~~

~~8~~5. The jarring apparatus according to any preceding claim, wherein the first lifting structure is permanently axially fixed relative to the first jarring assembly at least in a direction of loading applied between the first and second lifting structures.

~~9~~6. The jarring apparatus according to any preceding claim, wherein one of the first and second jarring assemblies axially extends into the other of the first and second jarring assemblies~~.~~,

and/or wherein the first and second lifting structures are radially interposed between the first and second jarring assemblies.

~~10. The jarring apparatus according to any preceding claim, wherein the first and second lifting structures are radially interposed between the first and second jarring assemblies.~~

~~11~~7. The jarring apparatus according to any preceding claim, comprising a locking system for selectively axially fixing and releasing the second lifting structure relative to the second jarring assembly~~.~~,

optionally wherein the locking system is operated in response to relative rotational movement between the first and second jarring assemblies.

~~12. The jarring apparatus according to claim 11, wherein the locking system is operated in response to relative rotational movement between the first and second jarring assemblies.~~

~~13~~8. The jarring apparatus according to claim ~~11 or 12~~7, wherein the locking system comprises a ~~hydraulic~~mechanical locking system for ~~hydraulically~~mechanically locking and releasing the second lifting structure relative to the second jarring assembly.

~~14~~9. The jarring apparatus according to claim ~~13~~7, wherein the locking system comprises a hydraulic locking system for hydraulically locking and releasing the second lifting structure relative to the second jarring assembly,

optionally wherein the hydraulic locking system, when locked, hydraulically locks a volume of hydraulic fluid axially between the second lifting structure and the second jarring assembly such that axial forces are transmitted between the second lifting structure and second jarring assembly via the hydraulically locked fluid.

~~15~~10. The jarring apparatus according to claim ~~13 or 14~~9, wherein the hydraulic locking system comprises a first hydraulic chamber, and is configured to:

lock hydraulic fluid within the first hydraulic chamber to hydraulically lock the second lifting structure relative to the second jarring assembly; and:

release the hydraulically locked fluid from the first hydraulic chamber to permit axial release of the second lifting structure relative to the second jarring assembly~~.~~,

optionally wherein the hydraulic locking system comprises a valve assembly which is closed to hydraulically lock fluid within the first hydraulic chamber, and which is opened to release the hydraulically locked fluid from the first hydraulic chamber,

optionally wherein the valve assembly is selectively opened and closed by relative rotation between the first and second jarring assemblies.

~~16. The jarring apparatus according to claim 15, wherein the hydraulic locking system comprises a valve assembly which is closed to hydraulically lock fluid within the first hydraulic chamber, and which is opened to release the hydraulically locked fluid from the first hydraulic chamber.~~

~~17. The jarring apparatus according to claim 16, wherein the valve assembly is selectively opened and closed by relative rotation between the first and second jarring assemblies.~~

~~18~~11. The jarring apparatus according to claim ~~16 or 17~~10, wherein the valve assembly comprises a first valve portion rotatably fixed relative to the first jarring assembly and a second valve portion rotatably fixed relative to the second jarring assembly such that relative rotation between the first and second jarring assemblies causes corresponding relative rotation between the first and second valve portions~~.~~,

optionally wherein the first and second valve portions each comprise at least one port, wherein the ports are sequentially aligned and misaligned during relative rotation between the first and second valve portions.

~~19. The jarring apparatus according to claim 18, wherein the first and second valve portions each comprise at least one port, wherein the ports are sequentially aligned and misaligned during relative rotation between the first and second valve portions.~~

~~20~~12. The jarring apparatus according to ~~any one of claims 16 to 19~~claim 10 or 11, wherein the hydraulic locking system comprises a second hydraulic chamber and the valve assembly is interposed between the first and second hydraulic chambers, the valve assembly being configurable between open and closed configurations such that when the valve assembly is closed the first and second chambers are isolated from each other, and when the valve assembly is open the first and second chambers are presented in communication with each other~~.~~,

optionally wherein the second hydraulic chamber is defined by a flow path through the jarring apparatus,

optionally wherein the second hydraulic chamber extends between the valve assembly and a moveable barrier, wherein the moveable barrier is biased in a direction to displace hydraulic fluid from the second fluid chamber into the first fluid chamber when the valve assembly is open to provide relative displacement between the first and second lifting structures during the dropping phase.

~~21. The jarring apparatus according to claim 20, wherein the second hydraulic chamber is defined by a flow path through the jarring apparatus.~~

~~22. The jarring apparatus according to claim 20 or 21, wherein the second hydraulic chamber extends between the valve assembly and a moveable barrier, wherein the moveable barrier is biased in a direction to displace hydraulic fluid from the second fluid chamber into the first fluid chamber when the valve assembly is open to provide relative displacement between the first and second lifting structures during the dropping phase.~~

~~23~~13. The jarring apparatus according to any preceding claim, wherein the first and second jarring assemblies are rotatable relative to each other when configured in a first mode of operation, and the first and second jarring assemblies are rotatably fixed relative to each other when configured in a second mode of operation~~.~~,

optionally wherein the jarring assemblies are reconfigurable between the first and second modes of operation by relative axial movement therebetween.

~~24. The jarring apparatus according to claim 23, wherein the jarring assemblies are reconfigurable between the first and second modes of operation by relative axial movement therebetween.~~

~~25~~14. A method for providing jarring, comprising:

providing a jarring apparatus which includes a first jarring assembly having a first impact surface and a first lifting structure rotatably and axially fixed relative to the first jarring assembly, and a second jarring apparatus having a second impact surface and a second lifting structure rotatably fixed relative to the second jarring assembly;

axially fixing the second lifting assembly relative to the second jarring assembly;

establishing relative rotational movement between the first and second jarring assemblies to cause corresponding relative rotational movement between first and second lifting structures which cooperate to cause relative axial displacement in a lifting phase to cause axial separation between the first and second impact surfaces; and

axially releasing the second lifting structure relative to the second jarring assembly to permit the first and second impact surfaces to be axially impacted together.

~~26~~15. The method according to claim ~~25~~14, wherein axially releasing the second lifting structure is performed by relative rotation between the first and second lifting ~~structures.~~assemblies,

and/or wherein the method comprises, following axially releasing the second lifting structure, continuing relative rotational movement between the first and second jarring assemblies to cause reverse relative axial displacement in a dropping phase.

~~27. The method according to claim 25 or 26, comprising, following axially releasing the second lifting structure, continuing relative rotational movement between the first and second jarring assemblies to cause reverse relative axial displacement in a dropping phase.~~