

A WEIGHT RELEASE MECHANISM

TECHNICAL FIELD

This invention relates generally to a weight release mechanism for effecting release of a weight from an elevated position within a test rig.

Background

In glass production, there is usually a need to determine or ensure that the formed glass has a level of impact resistance. Such formed glass comprises laminated glass panels or the like glass articles and are subjected to regulatory requirements, and in some cases reliability requirements, in strength and impact resistance. The typical approach is to subject the glass to impact from a weight under impact test requirements. These impact test requirements have some basic parameters to abide by when considering how a weight released from an elevated position should be physically impacting the glass article. In many cases, the manner in which the weight is release from an elevated position will determine how the weight will physically impact glass article, for example the angle of approach to a planar surface of the glass article.

Typical release approaches uses either a draw-pin implement, which will a lateral side sway at the point of release, or a gripper type mechanism which may introduce sudden jerking movements due to the nature of the mechanism. These, amongst other movement introduced to the weight by the weight release mechanism will often affect the outcome of the test results and may compromise the validity and/or accuracy the performed test. Hence, a clean controlled release of the weight can hardly be achieved with typical weight release mechanism. Further, such weight release mechanisms have complex control requirements for arming and releasing the weight. Therefore, there exists a need for an improved release method/mechanism for addressing the foregoing problems.

Summary

In accordance with an aspect of the invention, there is disclosed a weight release mechanism comprising a post and a finger extending from the post to terminate at a free end. The finger is rotatably coupled to the post to enable the free end thereof to be displaced away from the post to an open position and towards the post to a closed position. The finger is shaped and dimensioned for defining a gap between the post and at least a portion of the finger when in the closed position. The weight release mechanism further comprises an abutment mechanism comprising an abutment structure displaceable for reciprocating between a first position for substantially impeding displacement of the finger away from the closed position and a second position for enabling displacement of the finger between the closed position and the open position. When an attachment structure of a weight is held in the gap with the finger being held by the abutment structure in the closed position for suspending the weight therefrom, displacing the abutment structure from the first position to the second position enables the weight to displace the finger away from the closed position to thereby release the attachment structure and consequently the weight from the weight release mechanism.

Brief Description of the Drawings

FIG. 1 shows an exemplary partial plan view of a weight release mechanism in accordance with an aspect of the invention with a finger thereof held in a closed position by an abutment structure in a first position for retaining an attachment structure of a weight in a gap defined between a post and the finger when in the closed position;

FIG. 2 shows an exemplary partial plan view of the weight release mechanism of FIG. 1 with the abutment structure being displaced to a second position with the attachment structure of the weight displacing the finger away from the closed position;

FIG. 3 shows an exemplary partial plan view of the weight release mechanism of FIG. 1 with the finger being substantially in the open position subsequent the attachment structure and the weight being released therefrom;

FIG. 4 shows an exemplary partial front view of a test rig utilizing the weight release mechanism of FIG. 1 with a raised arm positioning the weight coupled to the weight release mechanism in a release position;

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FIG. 5 shows an exemplary partial front view of a test rig of FIG. 4 with the weight impacting an impact surface subsequent to release thereof from the weight release mechanism and with the arm remaining raised; and

10 FIG. 6 shows an exemplary partial front view of a test rig of FIG. 4 with the weight at rest at an impact zone and with the arm being lowered for recoupling the weight to the weight release mechanism for effecting retrieval and repositioning of the weight to the release position.

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Detailed Description

An exemplary embodiment of the present invention, a weight release mechanism 20 is described hereinafter with reference to FIG. 1 to FIG. 6.

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The weight release mechanism 20 comprises a post 22 and a finger 24 extending from the post 22 to terminate at a free end 26. The finger 24 is rotatably coupled to the post 22 to enable the free end 26 thereof to be displaced away from the post 22 to an open position and towards the post 22 to a closed position. The finger 24 is shaped and dimensioned for
10 defining a gap 28 between the post 22 and at least a portion of the finger 24 when in the closed position. The weight release mechanism 20 further comprises an abutment mechanism 30 comprising an abutment structure 32 displaceable for reciprocating between a first position for substantially impeding displacement of the finger 24 away from the closed position and a second position for enabling displacement of the finger 24 between the closed
15 position and the open position. When an attachment structure 34 of a weight 36 is held in the gap 28 with the finger 24 being held by the abutment structure 34 in the closed position for suspending the weight 36 therefrom, displacing the abutment structure 32 from the first position to the second position enables the weight 36 to displace the finger 24 away from the closed position to thereby release the attachment structure 34 and consequently the weight
20 36 from the weight release mechanism 20. Hence, the abutment structure 32 is shaped for abutting the finger 24 when in the first position to impede displacement of the finger 24 away from the closed position.

Once the attachment structure 34 has been released from the weight release mechanism 20,
25 the finger 24 may be manually displaced back to the closed position by a user of the weight release mechanism 20. Alternatively, the finger 24 is biased, for example by spring loading, to the closed position and will be displaced to the closed position once the attachment structure 34 of the weight 36 is released therefrom.

30 The abutment mechanism 30 further comprises an abutment actuator for conveying motion to the abutment structure 32. Preferably, the abutment mechanism 30 further comprises a

motion convertor for converting linear rotary motion from the abutment actuator into reciprocating rotary motion for conveyance to the abutment structure 32.

Preferably, the abutment actuator comprises an electric motor coupled with the abutment structure 32 to convey motion thereto about an abutment axis 42 defined by the abutment mechanism 30. As an alternative, other types of actuators, for example pneumatic actuators, may be employed as an alternative to the electric motor. If the abutment actuator generates prismatic motion as opposed to rotary motion, the motion convertor utilised can be one that converts prismatic motion into reciprocating rotary motion. Further alternatively, the motion convertor may convert linear rotary motion into reciprocating prismatic motion. In such an implement, the abutment structure 32 is still configurable with the finger 24 to effect the same function of holding the finger 24 in the closed position for suspending the weight 36 therefrom and for displacement from the first position to the second position to enable the weight 36 to displace the finger away from the closed position to thereby release the attachment structure 34 and consequently the weight 36 from the weight release mechanism 20.

The post 22 and the finger 24 are inter-configured to enable resting of the attachment structure 34 substantially on the finger 24. The attachment structure 34 is preferably one of a rigid hook structure, a rigid loop structure and a cable formed on or affixed onto to the weight 36. Preferably, the finger 24 is rotatably displaceable about a post pivot 50 defined by the post 22 with the attachment structure 34 being disposed adjacent the post pivot 50 when the finger 24 is in the closed position. The abutment structure 34 abuts the finger 24 one of at and adjacent the free end 26 thereof when in the first position.

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The post 22 is formed on and extends from a base structure 52 along a post axis 54 formed on the base structure 52. The finger 24 preferably has a first segment 56 and a second segment 58 being substantially perpendicular the first segment 56 for forming an L-shape. The second segment 58 is substantially parallel the post axis 54 with the attachment

structure 34 being supported on the first segment 56 when the finger 24 is in the closed position.

The weight 36 is suspended from a swing pivot 59a by a swing cable 59b interposing the swing pivot 59a and the weight 36. The weight release mechanism 20 further comprises an arm 60 being rotatably coupled to and extending from a rig pivot 62 to terminate at the base structure 52. The arm 60 is displaceable to raise the base structure 52 to a release position wherefrom the weight 36 is releasable, and to lower the base structure 52 towards an impact zone 66. The weight 36 is gravitationally displaced about the swing pivot 59a towards the impact zone 66 subsequent to release thereof from the release position for impacting an impact surface 68 wherefrom the weight 36 is subsequently retrievable for repositioning at the release position. The rig pivot 62 is defined on a test rig whereon the impact surface 68 is presented for physical impact with the weight 36. Both the swing pivot 59a and the rig pivot are preferably defined with reference to the test rig.

The abutment actuator may be in wired or wireless communication with a central controller for controlling operation of the test rig. Alternatively, the abutment actuator can be remotely and wirelessly controlled through the central controller or independently using a standalone remote controller. The reciprocating motion of the abutment structure 32 simplifies control of the abutment mechanism 30 as the abutment structure 32 will cycle between the closed position and the open position. For example, a single channel remote controller may be employed to toggle between initiation or continuance of the reciprocating motion and pausing of the reciprocating motion which is more than adequate to not only control displacement of the abutment structure 32 between the closed position for coupling with the attachment structure 34 and the open position for release of the attachment structure 34, but also anywhere in between to effect adjustments to the attachment structure 34.

The weight release mechanism 20 further comprises a rig actuator assembly (not shown) configured with the arm 60 for raising and lowering the arm 60 about the rig pivot 62. The rig actuator assembly comprises a motorized winch and a pulley assembly intercoupling the

motorised winch and the arm 60. Preferably, the motorized winch is fixably coupled to the test rig and is configured with the pulley assembly to be operated to raise and lower the arm for positioning the base structure 52.

- 5 When in use, the weight 36 is initially suspended by the swing cable 59b from the swing pivot 59a and is at rest adjacent or within the impact zone 66. An article to be subjected to impact testing, for example a glass panel or a laminated glass panel, is disposed on the test rig and supported on a frame 78 for presenting a portion thereof as the impact surface 68. Next, the rig actuator assembly is operated for lowering the arm to displace the base
10 structure 52 towards the weight 36. When or before the base structure 52 reaches the weight 36, the abutment mechanism 30 is operated to displace the abutment structure 32 towards the second position to enable the finger 24 to be displaced to the open position. This will enable the attachment structure 34 of the weight 36 to be positioned relative the base structure 52 so that when the finger 24 is brought back to the closed position, the attachment
15 structure 34 is disposed in the gap 28 defined between the post 22 and the finger 24. The abutment mechanism 30 is then operated to displace the abutment structure 32 to the first position to impede movement of the finger 24 away from the closed position and to keep the weight 36 coupled to the base structure 52.
- 20 Next, the rig actuator assembly is operated to raise the arm 60 for positioning the base structure 52 to the release position. Preferably, the attachment structure 34 of the weight should be resting on the first segment 56 of the finger 24 when the base structure 52 is in the release position. Once the base structure 52 is at the release position with the weight 36 coupled thereto, the abutment actuator can then be remotely operated to displace the
25 abutment structure 32 to the second position. Once the abutment structure 32 is substantially in the second position, the finger 24 will no longer be held in the closed position thereby. As the weight 36 resting on the first segment 56 of the finger 24 will be applying a force thereto in a direction generally parallel to the post axis 54, the removal of the abutment structure 32 will result in the finger 24 being displaced away from the closed
30 position by the force to thereby release the attachment structure 34 and consequently the

weight therefrom. Once released, the weight will depart from the base structure 52 in a direction that is generally parallel the post axis 54.

As the finger 24 is displaced from the closed position about the post pivot 50, the weight 36 is able to be gravitationally displaced along a clean arcuate path about the swing pivot 59a towards the impact zone 66 for impacting the impact surface 68. This is opposed to approaches that uses a draw-pin instead of the finger 24. Implementations using the draw-pin requires the draw-pin to be to be drawn away substantially across the attachment structure 34 perpendicular the post axis 54 which may introduce a sideways motion to the weight 36 resulting in a slightly oblique pathway when travelling towards the impact zone 66 or does not squarely impact the impact surface 68. By implementing the finger 34 as
aforescribed, the finger 34 is able to cleanly rotate about the post pivot 50 substantially without affecting the travel path of the weight towards the impact zone 66. The adaptation of the abutment mechanism 30 to generate the smooth and consistent continuous reciprocating motion substantially ensures that release of the weight is performed without introducing unwanted jerking motions which may affect the test conditions.

Once the weight has physically impacted the impact surface 68, the weight may again be retrieved by the arm 60 for repositioning to the release position. The impact surface 68 and the article can then be inspected before or subsequent to retrieval and displacement of the weight by the arm 60 to the release position.

Aspects of particular embodiments of the present disclosure address at least one aspect, problem, limitation, and/or disadvantage associated with existing weight release mechanisms. While features, aspects, and/or advantages associated with certain embodiments have been described in the disclosure, other embodiments may also exhibit such features, aspects, and/or advantages, and not all embodiments need necessarily exhibit such features, aspects, and/or advantages to fall within the scope of the disclosure. It will be appreciated by a person of ordinary skill in the art that several of the above-disclosed structures, components, or alternatives thereof, can be desirably combined into alternative

structures, components, and/or applications. In addition, various modifications, alterations, and/or improvements may be made to various embodiments that are disclosed by a person of ordinary skill in the art within the scope of the present disclosure, which is limited only by the following claims.

Claims

1. A weight release mechanism comprising:

a post;

5 a finger extending from the post to terminate at a free end, the finger being rotatably coupled to the post to enable the free end thereof to be displaced away from the post to an open position and towards the post to a closed position, the finger being shaped and dimensioned for defining a gap between the post and at least a portion of the finger when in the closed position; and

10 an abutment mechanism comprising an abutment structure displaceable for reciprocating between a first position for substantially impeding displacement of the finger away from the closed position and a second position for enabling displacement of the finger between the closed position and the open position,

15 wherein when an attachment structure of a weight is held in the gap with the finger being held by the abutment structure in the closed position for suspending the weight therefrom, displacing the abutment structure from the first position to the second position enables the weight to displace the finger away from the closed position to thereby release the attachment structure and consequently the weight from the weight release mechanism.

20 2. The weight release mechanism as in claim 1, the abutment structure is shaped for abutting the finger when in the first position to impede displacement of the finger away from the closed position.

25 3. The weight release mechanism as in claim 1, the abutment mechanism further comprising an abutment actuator for conveying motion to the abutment structure.

30 4. The weight release mechanism as in claim 3, the abutment mechanism further comprising a motion convertor for converting linear rotary motion from the abutment actuator into reciprocating rotary motion for conveyance to the abutment structure.

5. The weight release mechanism as in claim 3, the abutment actuator comprising an electric motor coupled with the abutment structure to convey motion thereto about an abutment axis defined by the abutment mechanism.
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6. The weight release mechanism as in claim 1, the post and the finger are inter-configured to rest the attachment structure substantially on the finger.
7. The weight release mechanism as in claim 6, the finger being rotatably displaceable about a post pivot defined by the post with the attachment structure being disposed adjacent the post pivot when the finger is in the closed position.
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8. The weight release mechanism as in claim 7, the abutment structure abuts the finger one of at and adjacent the free end thereof when in the first position.
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9. The weight release mechanism as in claim 6, the post being formed on and extending from a base structure along a post axis, the finger having a first segment and a second segment being substantially perpendicular the first segment for forming an L-shape, the second segment being substantially parallel the post axis with the attachment structure being supported on the first segment when the finger is in the closed position.
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10. The weight release mechanism as in claim 9, further comprising an arm being rotatably coupled to and extending from a rig pivot to terminate at the base structure, the arm being displaceable to raise the base structure to a release position wherefrom the weight is releasable, and to lower the base structure towards an impact zone, the weight being gravitationally displaced towards the impact zone subsequent to release thereof from the release position for impacting an impact surface wherefrom the is subsequently retrievable for repositioning at the release
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position, the rig pivot is defined on a test rig whereon the impact surface is presented for physical impact with the weight.

- 5 11. The weight release mechanism as in claim 10, further comprising a rig actuator assembly configured with the arm for raising and lowering the arm about the rig pivot.
- 10 12. The weight release mechanism as in claim 11, the rig actuator assembly comprises a motorized winch and a pulley assembly intercoupling the motorised winch and the arm.