

A WEIGHT ARRESTOR SYSTEM

TECHNICAL FIELD

This invention relates generally to a weight arrestor system.

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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. However, such impact test requirements typically require that the glass be inspected after a first impact thereon. As the weight used will often bounce off the glass after the first physical impact, there is a need that the weight does not physically re-impact the glass to ensure consistency and accuracy of the impact test. A typical approach is to have an operator of an impact test rig catch the weight when it bounces off the glass after the first physical impact to prevent subsequent occurrence of re-impact of the weight with the glass. This approach is difficult to execute as it requires the operator to have a level of physical agility and strength. Further, this may subject the operator to the dangers of being hit by the weight or be shoved against the glass by the weight which can potentially shatter. Therefore, there exists a need for an improved weight arresting approach the foregoing problems.

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Summary

In accordance with an aspect of the invention, there is disclosed a weight arrestor system comprising a retractor, a sensor and a controller. The retractor is coupled to a weight suspended from a swing pivot and operable between a release mode and a retract mode. The weight is configured for travel from a first position towards a second position whereat the weight impacts an impact surface when the retractor is in the release mode. The sensor is for sensing at least one of impact of the weight with the impact surface and approach of the weight towards the impact surface. The controller is in signal communication with the

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retractor and the sensor for operating the retractor between the release mode and the retract mode. Wherein when the sensor senses one of impact of the weight with the impact surface and approach of the weight to the impact surface, the controller switches the retractor from the release mode to the retract mode one of prior to, during and subsequent to impact of the weight with the impact surface to arrest the weight during bounce thereof from the impact surface to thereby limit travel of the weight towards and eliminate re-impact of the weight with the impact surface.

10 **Brief Description of the Drawings**

FIG. 1 shows an exemplary partial side configuration view of a weight arrestor system according to an aspect of the invention with a weight being held by a coupling device in a first position and a retractor in a release mode;

15 FIG. 2 shows an exemplary partial side configuration view of the weight arrestor system of FIG. 1 with the weight at a second position and impacting an impact surface with the retractor in the release mode;

FIG. 3 shows an exemplary partial side configuration view of the weight arrestor system of
20 FIG. 1 with the retractor in a retract mode for arresting fall of the weight subsequent to bouncing off the impact surface after physically impacting therewith; and

FIG. 4 shows a process flow diagram of an impact testing process for use with the weight arrestor system of FIG. 1.

Detailed Description

An exemplary embodiment of the present invention, a weight arrestor system 20 is described hereinafter with reference to FIG. 1 to FIG. 4.

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Preferably, the weight arrestor system 20 comprises a retractor 22, a sensor 24 and a controller. The retractor 20 is coupled to a weight 28 suspended from a swing pivot 30 and operable between a release mode and a retract mode. The weight 28 is configured and adapted for travel from a first position 32 towards a second position 34 whereat the weight
10 28 impacts an impact surface 36 when the retractor 22 is in the release mode. The sensor 24 is for sensing at least one of impact of the weight 28 with the impact surface 36 and approach of the weight 28 towards the impact surface 36. The controller is in signal communication with the retractor 22 and the sensor 24 with the retractor 22 being operable between the release mode and the retract mode by the controller. Functionally, when the
15 sensor 24 senses one of impact of the weight 28 with the impact surface 36 and approach of the weight 28 to the impact surface 36, the controller switches the retractor 22 from the release mode to the retract mode one of prior to, during and subsequent to impact of the weight 28 with the impact surface 36 to arrest the weight 28 during bounce thereof from the impact surface to thereby limit travel of the weight 28 towards and eliminate re-impact of
20 the weight 28 with the impact surface 36.

Preferably, the retractor 22 comprises a winch 40 and an arrestor cable 42 having a free-end 44 coupled to the weight 28 and extending between the weight 28 and the winch 40. The winch 40 is operable for retracting the arrestor cable 42 into and the free-end 44 thereof
25 towards the winch 40 when in the retract mode and extending the arrestor cable 42 from the winch 40 when in the release mode. The winch 40 is preferably electrically actuator for rotationally displacing a spool for taking up and dispensing the arrestor cable 42 therefrom. However, other forms of actuation may be employed for the winch 40.

The free-end 44 of the arrestor cable 42 is preferably attached to an attachment point 46 on the surface of the weight 28 which outwardly opposes the swing pivot 30 when being suspended from the swing pivot 30.

- 5 Preferably, the weight 28 is suspended from a swing cable 48 extending between the weight 28 and the swing pivot 30. Functionally, the weight 28 is initially positioned at the first position 32 prior to release therefrom for travel towards the second position 34 whereat the weight 28 physically impacts the impact surface 36. Preferably, the first position 32 and the second position 34 are equidistance from the swing pivot 30 with the first position 32 being
10 spatially superior, or spatially elevated from, the second position 34.

Each of the swing cable 48 and the arrestor cable 42 may be made from metal, for example braided steel strands, or from other material such as braided Kevlar strands. The weight 28 preferably has a tear-drop shape or the like bulbous shape.

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Preferably, the weight arrestor system 20 further comprises a coupling mechanism 50 in signal communication with the controller for control thereby. The weight 28 is couplable to the coupling mechanism 50 when in the first position 32. It is preferred that the retractor 22 is in the release mode when the weight 28 is coupled to the coupling mechanism 50

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- Preferably, the sensor 24 is disposed whereat the swing cable 48 is positioned when the weight 28 approaches the second position 34. When in use, the weight 28 is gravitationally displaced along an arcuate pathway 52 about the swing pivot 30 when travelling between the first position 32 and the second position 34. The sensor 24 may employ a resiliently
25 biased sensing filament to sense passage of the swing cable 48 thereacross. The sensing filament employed may be a single output type activate-deactivate sensor or could be a multiple-output sensor for detecting direction of activation of the sensor 24 by the swing cable 48. In employing a directional sensor, the controller is able to determine if the weight 28 is moving towards the impact surface 36 in performance of an impact test, or moving
30 away from the impact surface 36 for readying the weight arrestor system 20 for performing

a test. If a simple single output type activate deactivate sensor is employed, the sensor 24 may allow a manual reset by an operator and/or work in conjunction with other sensors or switches to determine if the retractor 22 should switch to the retract mode as an impact test is ongoing, or should be in the release mode as the test impact test has just concluded and the weight 28 is being brought back to its initial position for priming for a subsequent impact test.

The weight arrestor system 20 is preferably adapted for use with an impact testing rig 60 or the like system for performing impact testing on articles like glass structures, glass panels or laminated glass panels. Hence, it is preferred that the impact surface 36 is a surface of a planar glass structure. The impact testing rig 60 preferably comprises a frame 64 for holding the planar glass structure in position for presenting the impact surface 36 at the second position 34. The weight arrestor system 20 may form part of the impact testing rig 60 at the point of manufacture thereof or be retro-fitted or removably configured to the impact testing rig 60.

In an impact testing process 100, the controller switches the retractor 22 to the release mode in a step 110. Next, the weight 28 is displaced towards the first position 32 for coupling with the coupling mechanism 50 in a step 112. Next, the planar glass structure to be subjected to impact testing is placed and affixed in the frame 64 in a step 114. The planar glass structure may be paced into the frame 64 prior to the steps 110 and 114. However, access to the frame 64 for affixing the planar glass structure if the weight is not first moved out of the way as effected in the step 112. Once the planar glass structure is affixed in the frame 64, an operator of the impact testing rig 60 may operate a user interface (UI) for communicating with the controller to initiate the impact test. The impact test is initiated by the controller operating the coupling mechanism 50 to release the weight 28 therefrom and to allow the weight to be gravitationally displaced away from the first position 32 in a step 116, When the weight 28 is released from the first position 32, it travels substantially along the arcuate pathway 52 towards the second position 34. As the weight 28 approaches the

second position 34, the swing cable 28 travels across the sensor 24 for activating the sensor 24 in a step 118.

5 Once the sensor 24 has been activated, the retractor 22 switches to the retract mode in a step 120. It is important that the retraction of the arrestor cable 42 be timed to prevent tugging of the weight 28 thereby prior to impact of the weight 28 onto or bounce of the weight 28 off the impact surface 36 to comply with impact test requirements.

10 When retraction of the arrestor cable 42 is accurately timed and performed at an appropriate retraction rate, retraction of the arrestor cable 42 will be completed or in the process of being completed when the weight 28 starts to bounce off the impact surface 36. With the retractor 22 in the retract mode, the fall of the weight 28 towards the impact surface 36 will be arrested by the retracted arrestor cable 42 to prevent the weight from physically impacting the impact surface 36 a second time when the impact test requirements only
15 requires or allow physical impact on the impact surface 36 to occur only once. For clarity, retracting of the arrestor cable 42 when in the retract mode include retracting only a part of the arrestor cable 42 into the winch 40 to shorten the cable extending between the winch 40 and the weight 28 substantially to a pre-determined length when in the retract mode.

20 In situations where the impact test requirements requisites two, or more, consecutive physical impacts to the impact surface 36 with the second, or subsequent, impact occurring after the weight 28 bounces off the impact surface 36, the controller may be reprogrammed or adapted to determine the number of times the weight physically impacts the impact surface 36 by counting the number of times the swing cable 48 passages across the sensor
25 24 along the arcuate pathway 52 prior to switching the retractor 22 to the retract mode in the step 120.

Aspects of particular embodiments of the present disclosure address at least one aspect, problem, limitation, and/or disadvantage associated with existing weight arrestor systems
30 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 arrestor system comprising:

a retractor coupled to a weight suspended from a swing pivot and operable between a release mode and a retract mode, the weight being configured for travel from a first position towards a second position whereat the weight impacts an impact surface when the retractor is in the release mode;

a sensor for sensing at least one of impact of the weight with the impact surface and approach of the weight towards the impact surface; and

a controller in signal communication with the retractor and the sensor, the controller for operating the retractor between the release mode and the retract mode,

wherein when the sensor senses one of impact of the weight with the impact surface and approach of the weight to the impact surface, the controller switches the retractor from the release mode to the retract mode one of prior to, during and subsequent to impact of the weight with the impact surface to arrest the weight during bounce thereof from the impact surface to thereby limit travel of the weight towards and eliminate re-impact of the weight with the impact surface.

2. The weight arrestor system as in claim 1, the retractor comprising a winch and an arrestor cable having a free-end coupled to the weight and extending between the weight and the winch, the winch being operable for retracting the arrestor cable into and the free-end thereof towards the winch when in the retract mode and extending the arrestor cable therefrom when in the release mode.

3. The weight arrestor system as in claim 2, the arrestor cable being attached to an attachment point on the surface of the weight which outwardly opposes the swing pivot when being suspended from the swing pivot.

4. The weight arrestor system as in claim 1, the impact surface being a surface of a planar glass structure.

5. The weight arrestor system as in claim 1, the weight being suspended from a swing cable extending between the weight and the swing pivot.
- 5 6. The weight arrestor system as in claim 5, the weight being initially positioned at the first position prior to release therefrom for travel towards the second position whereat the weight impacts the impact surface, the first position and the second position being equidistance from the swing pivot and the first position being spatially superior the second position.
- 10 7. The weight arrestor system as in claim 6, further comprising a coupling mechanism in signal communication with the controller for control thereby, the weight being coupled to the coupling mechanism when in the first position, the retractor being in the release mode when the weight is coupled to the coupling mechanism.
- 15 8. The weight arrestor system as in claim 7, an axis coinciding with the swing pivot and the coupling mechanism, the axis being substantially parallel the impact surface.
9. The weight arrestor system as in claim 5, the sensor being disposed whereat the swing cable is positioned when the weight approaches the second position.
- 20 10. The weight arrestor system as in claim 5, the weight being gravitationally displaced along an arcuate pathway about the swing pivot when travelling between the first position and the second position.