May 18, 1954 C. PAULSON 2,678,788

SAFETY DEVICE FOR COUNTERBALANCED MEMBERS

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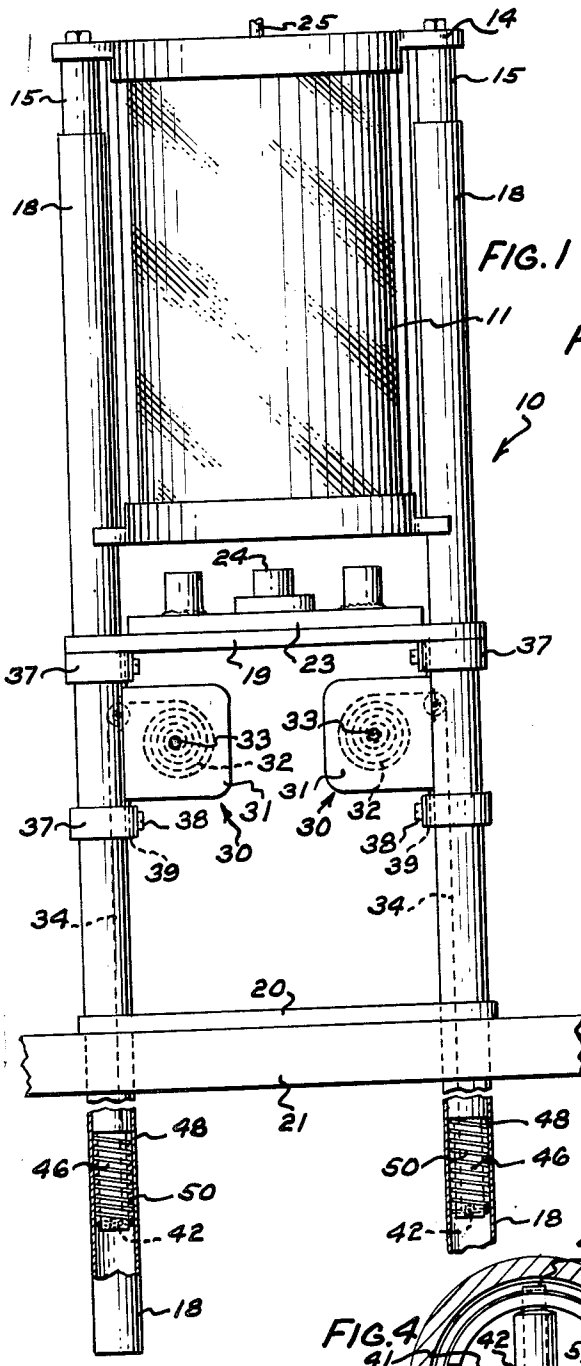


FIG. 1

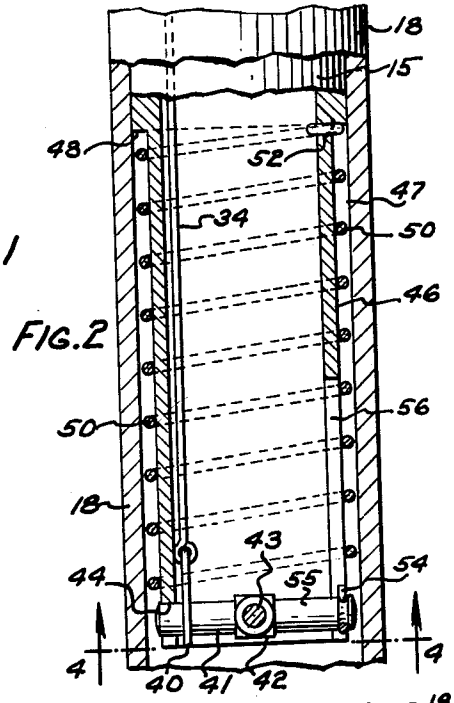


FIG. 2

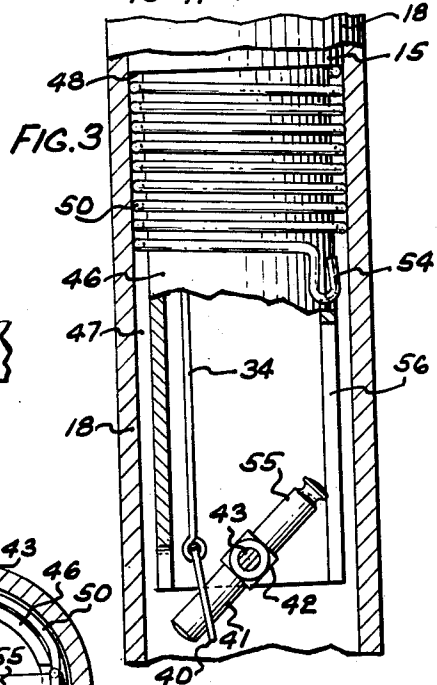


FIG. 3

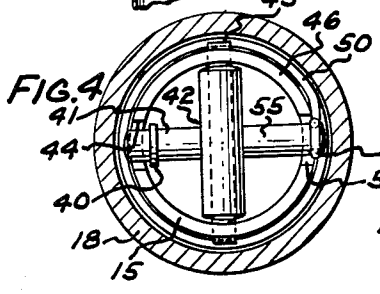


FIG. 4

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8 Claims. (Cl. 248—162)

1

This invention relates to a counterbalancing device for supporting a part in vertically adjusted positions and more particularly to a safety device associated with said movable part and said counterbalancing device for arresting the free falling movement of said part in the event of failure of said counterbalancing device.

In various forms of apparatus where a movable part such as, for example, a glass bell jar is adjustably mounted for vertical movement and yieldably held in adjusted position by a counterbalancing device, it frequently happens that as a result of prolonged use of the apparatus a component of the counterbalancing device breaks and the counterbalancing device loses its hold on the bell jar which falls and may injure the operator's hands and which frequently is damaged as a result of the fall.

It is an object of the present invention to provide a safety device for a vertically movable counterbalanced part to retard or arrest the free falling movement of the part in the event of failure of said counterbalancing device.

It is a further object of the invention to provide a mechanism applicable to one of a pair of relatively movable parts and capable of actuation to retard or arrest the relative movement of said members in one direction.

In accordance with one embodiment of the invention as applied to a bell jar mounted on a guide member slidable in a stationary tubular guide member for vertical movement to and from upper and lower positions and having a counterbalancing device associated therewith for yieldably holding the bell jar in adjusted position, there is provided a helical spring mounted on a reduced cylindrical portion of the movable guide for movement therewith within the tubular stationary guide member. The helical spring with its upper end secured to the movable guide, is stretched and maintained in axially expanded position with the other end thereof releasably interconnected through a pivoted lever on the movable guide to one end of a flexible tape of the counterbalancing device, the tape being operatively connected to the movable guide member by said pivoted lever and also serving to retain said lever in operative position to hold said spring under tension in extended position. Upon failure of the tape the pivoted lever is free to turn and the lower end of the spring is disengaged therefrom as the spring contracts towards its upper end, causing the spring to increase slightly in diameter and grip the inner surface of the stationary guide to arrest the movement of the movable guide and the bell jar.

2

Other objects and advantages of the invention will become apparent by reference to the following detailed description thereof and the accompanying drawings illustrating a preferred embodiment, in which:

Fig. 1 is an elevational view of a welding fixture having a bell jar movable thereon and a balancing device for supporting the bell jar in vertically adjusted position and showing a safety device therefor;

Fig. 2 is a vertical sectional view through a portion of the movable and stationary guide members for the bell jar showing the members and the safety device thereon in one position;

Fig. 3 is a view similar to Fig. 2 showing the parts in changed position; and

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2.

In Fig. 1 of the drawings there is shown a welding fixture 10 having a glass bell jar 11 which is secured at its upper end as by brackets 14 to a pair of movable tubular guide members 15 which are mounted for sliding movement within a pair of stationary tubular guide members 18. The stationary guide members are interconnected by a pair of cross members 19 and 20, the latter of which rests on a bench top or table 21 for supporting the welding fixture thereon. Supported on the upper cross frame member 19 is a plate 23 on which is mounted a holder 24 for the parts to be brazed. The bell jar 11 is adapted to be moved to and from an upper open position in spaced relation to the plate 23 and a closed position with the lower end thereof in engagement with the plate 23 and an inert gas is adapted to be flowed into the interior of the bell jar through a pipe 25 to provide an inert atmosphere around the parts being brazed during the brazing operation.

Counterbalancing means 30 are provided for resiliently supporting the bell jar in adjusted positions. As shown herein the counterbalancing means 30 are of a commercial type of window sash balance comprising a casing 31 enclosing a spiral spring 32, the inner end of which is secured to a pin 33 fixed in the casing and the other end of which is connected to a flexible extensible element 34 in the form of an elongated metal ribbon or tape. A pair of counterbalancing devices 30 are secured to the stationary guide members 18 by collars 37 and screws 38 engaging flanges 39 on the casing 31 of the counterbalancing device. The tape 34 is adapted to pass through an aperture in the stationary guide member 18 and through an elongated slot in the movable guide member 15 and extend down-

wardly within the tubular guide member 15 for attachment to the lower end thereof.

An apertured link 40 secured to the lower end of the tape passes over and is connected to the arm 41 of a connector element or lever 42 which is mounted for pivotal movement intermediate its ends on a pivot pin 43 secured in the lower end of the movable guide member 15. The spring 32 of the counterbalancing device 31 is tensioned to move the tape upwardly so that the tape urges the arm 41 upwardly into a notch 44 and into engagement with the end of the movable guide member 15 to form a connection between the flexible tape 34 and the movable guide member 15.

The lower portion 46 of the movable guide member 15, the outer diameter of which is slightly smaller than the inner diameter of the stationary guide member 18, is reduced in diameter to provide an annular space 47 between the lower portion 46 of the movable guide member and the inner surface of the stationary guide member and to provide a shoulder 48 on the movable guide member defining the upper limit of the annular space. A helical spring 50 is provided in the annular recess 47 encircling the portion 46 of the movable guide and has its upper end inserted through a recess 52 in the wall of the guide 15 and is secured to the guide 15 adjacent the shoulder 48. The spring 50 which has a plurality of convolutions is stretched into an extended condition with the lower end thereof, which is formed into a hook 54, looped over the end of the arm 55 of the lever 42. A slot 56 is provided in the lower end of the movable guide member 15 for receiving the arm 55 therein to provide clearance for pivotal movement thereof.

The spring 50, which, before application to the movable guide member 15, is wound with the convolutions thereof positioned close to each other, is so proportioned that in its contracted position (Fig. 3) the spring grippingly engages the inner surface of the stationary guide tube 18, and in its axially expanded position (Fig. 2) the outside diameter of the spring is reduced to provide clearance between the spring and the stationary guide member permitting free movement of the spring and the movable guide member within the stationary guide member. In its axially expanded position the spring 50 may grippingly engage the movable guide member 15.

In the event that the flexible tape 34 or other components of the counterbalancing device 30 should break or fail, the helical spring 50 would be moved from its axially expanded position (Fig. 2) into its contracted position (Fig. 3) causing the diameter of the spring to enlarge slightly and causing the outer surface thereof to move into frictional gripping engagement with the inner surface of the stationary guide member 18 to arrest the downward movement of the movable guide member and the bell jar supported thereon. Thus, the spring 50 acts as a safety member for arresting the downward falling movement of the bell jar 11 in the event of failure of the flexible tape 34 or other parts of the counterbalancing device.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of this invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. A safety stop for interconnecting an article and its counterbalance and operable to hold the article upon failure of the counterbalance comprising inner and outer telescoping tubular elements, a coil spring fixed to and encircling a portion of the inner tubular element and biased to bear against the outer tubular element for preventing relative movement between said tubular elements, said spring being movable to an axially expanded position to permit relative movement between said tubular elements, a lever pivoted intermediate its ends on the inner tubular member and having one end releasably connected to said spring for holding said spring in axially expanded position, means interconnecting the other end of the lever with the counterbalance, and means interconnecting the inner tubular element with the article.

2. In a device of the type described, the combination of a stationary guide member having a cylindrical inner surface, a movable guide member slidable within said stationary member for supporting an article for movement through a substantially vertical path, a counterbalancing device on said stationary member having an element stressed for movement upwardly for yieldably supporting said movable member in adjusted position, a helical spring within said stationary guide member having one end thereof secured to said movable guide member for movement therewith and having a normal contracted position with the outer surface thereof in gripping engagement with said cylindrical surface to prevent relative movement of said members in one direction, said helical spring having its other end axially movable away from said one end to axially expand and radially contract said spring to provide clearance between said spring and said cylindrical surface, means for interconnecting said element of said counterbalancing device and the other end of said helical spring for yieldably holding said spring in axially extended position and for effecting a connection of said element to said movable guide member.

3. In a device of the type described, the combination of an outer vertically disposed stationary tubular member, an inner movable tubular member mounted in telescoping relation to said outer member for axial movement for supporting a part for vertical movement and having a reduced portion in spaced relation to the inner surface of said outer tubular member to provide an annular space between said reduced portion of the inner tubular member and said outer tubular member and to form a shoulder on the inner tubular member, a helical spring encircling said reduced portion of said inner tubular member and having one end thereof attached thereto adjacent said shoulder, said spring having a normal contracted position with the convolutions thereof in close proximity to each other and with the outer surfaces thereof in gripping engagement with the inner surface of said outer tubular member to prevent relative movement between the outer tubular member and the spring and the inner tubular member, a counterbalancing device having an element extending into said inner tubular member and stressed for movement upwardly to yieldably support the movable tubular member and the part attached thereto in adjusted position, means for mounting said counterbalance device in fixed relation to said stationary tubular member, and means including a member pivotally mounted on said inner tubular member for interconnecting the flexible element of said counterbalancing device and the

other end of said helical spring for yieldably holding said spring in axially extended position and for effecting a connection of said flexible member to said inner tubular member.

4. The combination with a part to be supported in vertically adjusted positions of a counterbalance for retaining the part in said positions, and means for interconnecting the article and counterbalance comprising a stationary tubular guide member having a cylindrical inner surface, a movable member slidable within said stationary member for supporting said part for vertical movement, said counterbalance being mounted on said stationary member and having an extensible element stressed for movement to yieldably support said movable member in adjusted position, a helical spring within said stationary guide member having one end thereof secured to said movable guide member for movement therewith and having a normal axially contracted position with the outer surface thereof in gripping engagement with said cylindrical surface to prevent movement of said movable guide member in one direction, said helical spring having its other end axially movable away from said one end to axially expand and radially contract said spring to provide clearance between said spring and said cylindrical surface, and a connector member pivotally mounted on said movable guide member for movement therewith and having a portion thereof engageable with said extensible element and being stressed thereby to an operative position for effecting a connection between said extensible element and said movable member, said connector member having a portion engageable with the other end of said helical spring for yieldably holding said spring in axially extended position when said connector member is in said operative position, said connector member being movable from said operative position to release said spring in response to failure of said extensible element to retain said connector member in operative position.

5. In a device of the type described, the combination of a stationary tubular guide member having a cylindrical inner surface, a movable tubular guide member slidable within said stationary member for supporting an article for vertical movement, a counterbalancing device on said stationary member having an extensible element stressed for movement upwardly to yieldably support said movable member in adjusted position, said movable member having a shoulder thereon and a portion of reduced diameter extending below said shoulder, a helical spring encircling said reduced portion of the movable guide member and having one end thereof secured to said movable member adjacent the shoulder thereon for movement therewith and having a normal contracted position with the outer surface thereof in gripping engagement with said cylindrical surface to prevent movement of said movable guide member in one direction, said helical spring having its other end axially movable away from said one end to axially expand and radially contract said spring to provide clearance between said spring and said cylindrical surface, and a lever pivotally mounted intermediate its ends on said movable guide member and having a portion thereof engageable with said extensible member and movable thereby to an operative position with a portion of the lever in engagement with said movable guide member for connecting said element to said movable guide member, said lever having another portion for engaging said other end of the helical spring for yieldably retaining said spring in axially expanded position, said lever being movable from said operative position to release said spring in response to failure of said extensible element to retain said lever in operative position.

6. The combination with a first member having a cylindrical guideway and a second member movable therein of a helical spring attached to said second member for movement therewith and movable to and from an axially contracted position with the spring in gripping engagement with the cylindrical guideway to prevent relative movement of said members in one direction and an axially expanded position with the spring in spaced and disengaged relation to said guideway to permit relative movement of said members in either direction, and means for releasably maintaining said spring in axially expanded position.

7. The combination of a pair of relatively movable telescoping tubular members having portions thereof in spaced relation to each other to provide an annular space therebetween, a helical spring disposed in said annular space, means for attaching said spring to one of said tubular members, said spring being movable to and from an axially contracted position with the spring in gripping engagement with the outer tubular member and in spaced relation to said inner tubular member and an axially expanded position with the spring in spaced relation to said outer tubular member and in gripping engagement with said inner tubular member, and means for releaseably maintaining said spring in said axially expanded position.

8. In a device of the type described, the combination of a first guide member and a second guide member telescopingly disposed for movement relative to each other, said first guide member having an inner cylindrical surface encircling said second member, a helical spring within said cylindrical surface having one end thereof secured to said second member and having a normal contracted position with the outer surface thereof in gripping engagement with said cylindrical surface to prevent relative movement of said members in one direction, said spring having its other end axially movable away from said one end to longitudinally expand and radially contract said spring to provide clearance and freedom of relative movement between said spring and the inner surface of said first member, and means for releaseably holding said spring in said longitudinally expanded position.

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