Sept. 2, 1958 L. F. VILLAR 2,850,274

AUTOMATIC SPRING-PRESSURE LIMITING DEVICE

Filed March 4, 1954

FIG. 1.

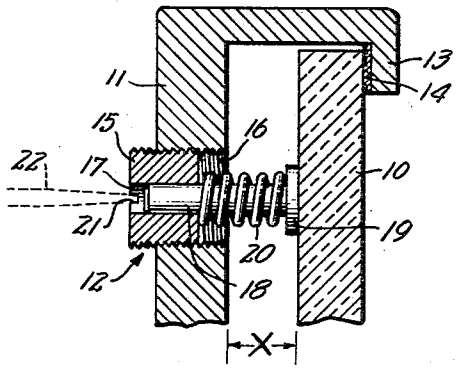


FIG. 2.

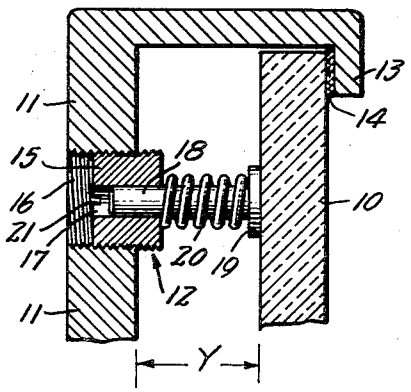


FIG. 3.

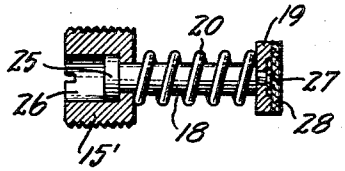


FIG. 5.

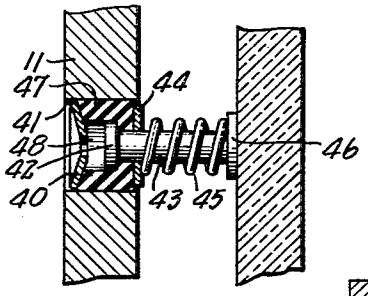


FIG. 6.

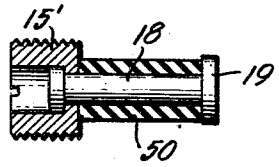
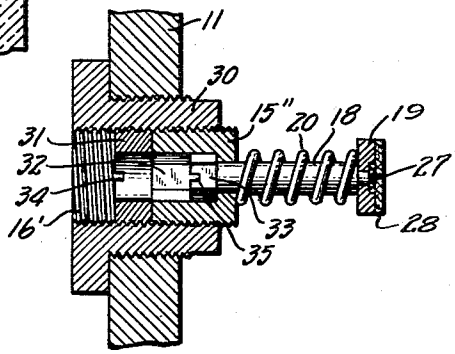


FIG. 4.



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AUTOMATIC SPRING-PRESSURE LIMITING DEVICE

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12 Claims. (Cl. 267—1)

My invention relates to a securing device particularly applicable to the safe mounting of delicate structures which are not to be overstressed when mounted.

It is an object of the invention to provide improved means of the character indicated.

It is another object to provide a securing device of the character indicated, in which it will be impossible to overstress the mounted structure.

It is another object to meet the above objects with a securing device which may be relied upon to exert the same loading pressure on a structure to be secured, regardless of variations in spacing between said structure and the housing or the like in which said structure is mounted.

It is a further object to provide securing means meeting the above objects and inherently incapable of applying excessive loading pressure to a delicate structure, even in the presence of careless use of driving tools.

Other objects and various further features of novelty and invention will be pointed out or will occur to those skilled in the art from a reading of the following specification in conjunction with the accompanying drawings. In said drawings, which show, for illustrative purposes only, preferred forms of the invention:

Figs. 1 and 2 are enlarged, fragmentary, longitudinal, sectional views through securing means incorporating features of the invention, and shown in application to the securing of a delicate structure that is variously spaced from a housing or the like in which said delicate structure is received;

Figs. 3 and 4 are longitudinal sectional views of unit-handling securing devices representing slight modifications of the device of Figs. 1 and 2; and

Figs. 5 and 6 are similar views of further modifications.

Briefly stated, my invention contemplates novel securing means in which uniform securing pressure is inherently applicable to the structure to be secured, regardless of wide variations in spacing between the delicate structure and the housing or the like in which the delicate structure is mounted.

I achieve these results with a structure utilizing adjustable securing means, such as a bushing adjustably frictionally retained in the bore of a housing, with respect to which a delicate structure, such as a glass lens or mirror, is to be secured. The bushing may have a bore slidably accommodating a gauge pin, one end of which continuously abuts or is otherwise located by the delicate structure, and the other end of which cooperates with the outer end of the bushing to define a limiting loading condiiton. Axially compressed resilient means acting on the inner end of the bushing serves to load the gauge pin against the delicate structure, and a given design loading is achieved when the outer end of the gauge pin is substantially flush with the outer end of the bushing, regardless of the extent to which the bushing must be inserted in the bore of the housing in order to achieve

such loading. Various forms of this general configuration will be separately discussed.

In Figs. 1 and 2 of the drawings, I show my invention in application to the mounting of a delicate structure 10, such as a glass mirror, lens or the like within housing means 11. Clamping is achieved by the action of my novel securing means 12, compressionally loading one side of the delicate structure 10, as limited by a retaining shoulder 13; if desired, protective pad or gasket means 14 may be carried at shoulder 13. The securing means 12 may comprise a bushing member 15, adjustably securable in a bore 16 in the housing 11, and, in the form shown, the frictional engagement at 15—16 is a threaded engagement. The bushing 15 may have an axial bore 17, slidably accommodating gauge pin means 18. The inner end of pin means 18 may directly load or abut the delicate structure 10, and, for purposes of equalizing loading pressure, I prefer that said inner end of said pin means 18 shall be formed with an enlarged head or pressure foot 19. Spring means 20, acting on the inner end of the bushing 15, may contact the pressure foot 19 and thus load the inner end of pin means 18 against the delicate structure 10.

Various means may be devised and provided for advancing the bushing 15 into the housing 11, but I have shown conventional screw-driver slot means 21 so that a commonly available tool may be employed. The walls of slot 21 may be divergent or square (as shown), depending upon the ease of which it is desired that the driving tool shall be rendered ineffective.

In use, the bushing 15 should be tightened, as by means of screw driver 22, as far as said screw-driver 22 will permit tightening because, upon advancement of the bushing 15 in the thread 16, the pin 18 will ultimately interfere with and thus prevent screw-driver manipulation. When the end of pin 18 prevents such screw-driver manipulation, the proper compressional loading of spring 20 on foot 19 will have been achieved. In the case of Fig. 1, the space X between glass 10 and housing 11 is small, and the proper spring loading will be achieved at a time when the bushing 15 still projects outside of the housing 11. In the case of Fig. 2, the spacing Y between glass 10 and the housing 11 is substantially greater, but still the desired pressure loading on foot 19 will be achieved, but of course for this condition the bushing 15 will have been recessed in the threaded bore 16.

In Fig. 3, I show a slight modification of the structure already described, and for corresponding parts I have, therefore, used similar reference numerals. In the structure of Fig. 3, the securing parts are unit-handling by virtue of an enlarged retaining head 25 formed as part of the pin means 18. The retaining head 25 may be received in a counterbore 26 in the bushing 15'. The pressure foot 19 is seen to be a separate disc secured to the pin 18, as by swaging at 27, and, if desired, a cork, rubber or other soft pad 28 may be bonded to the foot 19 in order to protect the delicate structure 10.

In Fig. 4 I show a slight modification in which an auxiliary threaded bushing 30 is received in the housing 11 for cases in which a bore in the housing 11 alone is of insufficient depth for proper accommodation of the threaded bushing 15". The auxiliary bushing 30 may thus provide as extensive a range of axial adjustment as may be needed for certain applications.

The axial extent provided by the elongated bore 16' of bushing 30 may further permit the use of lock-nut means 31 in order to secure bushing 15". To achieve lock-nut action, it is desirable that independent applications of torque shall be available for members 15" and 31. In the form shown, the counterbore 32 in bushing 15" is hexagonal, so as to accommodate the familiar

Allenhead wrench, and the head 33 on pin means 18 is also shown as hexagonal, but nevertheless slidably accommodated in bore 32. In setting the securing means of Fig. 4, the Allenhead wrench should be used to advance bushing 15'' until such time as such advance is no longer possible, because head 33 will drive the wrench out of the counterbore 32. At that time, the proper compressional force will be exerted by loading means 20. In order, then, to set the nut 31 with a locking action against bushing 15'', a spanner may engage the recess, as at 34, while a small screw driver or socket wrench is inserted in the appropriate recess 35 in head 33. Slight counterrotation of these tools will effect lock-nut action.

In Fig. 5, I show a modification in which, in place of the threaded bushings described in other forms, a radially stressed washer 40 frictionally engages the bore 41 in the housing 11. The washer 40 may be of external dimensions slightly exceeding those of the bore 41, so that, upon merely inwardly pushing the central part of the washer 40, the washer will become dished as it enters the bore 41 and upon release will hold its axial position. Of course, when the inner end of the washer 40 strikes the enlarged head 42 of pin means 43, a limit of axial insertion is determined. At that time, a backing washer or plate 44 of the securing assembly may have properly stressed the spring means 45 against the pressure foot 46. In the form shown, the body of the securing means is comprised of a bushing 47 of relatively non-yieldable material bonded at the respective ends to the washers 40—44 and having a counterbore 48 for retention of the pin means 43.

In Fig. 6, the arrangement is as described for Fig. 3, except that axially resilient action is derived from a sleeve 50 of resilient material guided by pin means 18 and acting between the back end of bushing 15' and the pressure foot 19.

It will be seen that I have described a basically simple securing device which may prevent inadvertent overstressing of a delicate structure to be mounted. The device also permits uniform application of securing stress at any desired plurality of application points, regardless of the variety of local spacings between the delicate structure to be secured and the housing in which it is secured. The basic securing device lends itself to unit-handling assembly and to application of locking techniques, once set.

While I have described the invention in detail for the preferred forms shown, it will be understood that modifications may be made within the scope of the invention as defined in the claims which follow.

I claim:

1. In combination, a housing member having a bore in a wall thereof, a glass element to be secured in spaced relation to one side of said wall, and a securing device in said bore and engaging the adjacent surface of said glass element, said securing device comprising elongated pin means having an axially inner end for abutment with said glass element and having an axially outer end for determining a limit of securing stress, adjustable securing means having a bore slidably accommodating said pin means and having external means for frictional engagement in said housing bore, said securing means having an axially outer exposed face adapted to receive insertion-driving forces and axially yieldable resilient loading means guided by said pin means and acting on said securing means and loading said inner end of said pin means against said glass element, the length of said pin means and the proportions of said loading means being such as to exert design-load force on said pin means when the outer end of said pin means is substantially at the outer end of said securing means.

2. In a securing device of the character indicated, elongated pin means including at its axially inner end an enlarged pressure foot having an enlarged flat work-engaging area substantially normal to the axis of said pin means for abutment with a first member to be clamped, adjustable securing means having a bore slidably accommodating said pin means and having external means for frictional engagement in a bore or the like of a second member with respect to which said first member is to be clamped, said securing means having an axially outer exposed face adapted to receive insertion-driving forces and axially yieldable resilient loading means guided by said pin means and acting between said securing means and said pressure foot, the length of said pin means and the proportions of said loading means being such as to exert design-load force on said pin means when the outer end of said pin means is substantially at the outer end of said securing means.

3. In a securing device of the character indicated, elongated pin means having an axially inner end for abutment with a first member to be clamped and having an axially outer end for determining a limit of securing stress, adjustable securing means having a bore slidably accommodating said pin means and having external means for frictional engagement in a bore or the like of a second member with respect to which first member is to be clamped, said securing member having an outwardly facing counterbore, a retaining head on the outer end of said pin means and slidably accommodated in said counterbore, and axially yieldable resilient loading means guided by said pin means and acting on said securing means and loading said inner end of said pin means against said first member.

4. A device according to claim 2, in which said loading means is a coil spring.

5. A device according to claim 2, in which said loading means is a sleeve of resiliently yieldable material.

6. A device according to claim 2, in which said adjustable securing means is a bushing with an external thread for frictional engagement with a threaded bore in said first member.

7. Securing means, comprising a gauge pin having a loading foot at its inner end to load a member to be secured, said foot having a work-engaging surface generally normal to the axis of said pin, an externally threaded bushing having a bore guiding said pin, the outer face of said bushing being locally recessed for limited axial insertion of a tool spanning said bore, and axially resilient loading means guided by said pin and spacing the inner end of said pin from said bushing, said loading means being of such proportions as to exert design-load force on said pin when the outer end of said pin is substantially at the outer face of said bushing.

8. Securing means, comprising a gauge pin having an inner end to directly and compressionally load a member to be secured, an externally threaded bushing having a bore guiding said pin, said bore having an outwardly facing counterbore, an enlarged retaining head on the outer end of said pin and within said counterbore, and spring means compressionally stressed between said bushing and the inner end of said pin, the depth of said counterbore being greater than the effective axial extent of said head, whereby upon loading the member by way of said inner end displacement of said head to substantially the outer limit of said counterbore may be a clear indication of limiting load on the member.

9. Securing means, comprising a gauge pin having an inner end to load a member to be secured, an externally threaded bushing having a bore guiding said pin, an enlarged retaining head on the outer end of said pin, said bushing having a counterbore slidably accommodating said head, an auxiliary externally threaded bushing having an elongated internally threaded bore receiving said first-mentioned bushing, and spring means compressionally stressed between said bushing and the inner end of said pin.

10. Securing means according to claim 9, and lock-nut

means received in said threaded bore and adjacent said first-mentioned bushing.

11. In a securing device of the character indicated, adjustable securing means having a bore and having external means for frictional engagement in a bore or the like of a first member with respect to which a second member is to be clamped, said securing means including a resilient washer of external dimensions slightly exceeding the dimensions of the bore in which it is received, whereby resilient radial action will suffice to retain said washer in said bore, said second member being spaced from said first member and on the inner side thereof, pin means slidably accommodated in the bore of said securing means and extending toward said second member and including an enlarged pressure foot for abutment with said second member, and spring means compressed between said securing means and said foot.

12. A securing device, comprising a bushing having a bore, an elongated loading pin guided by said bore, means axially resiliently compressed between said bushing and a part of said pin for axially inwardly urging said pin, and means including a dished washer at the outer end of said bushing for receiving insertion forces and for holding an inserted bushing in a bore by radially-expansive action, said washer including central parts in interfering relation with the outer end of said pin, the length of said pin and the proportions of said loading means being such as to exert design-load force on said pin when the outer end of said pin abuts said washer.

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