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Riethmeier

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[54] **HOLD-DOWN/EXTRACTION APPARATUS**

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[52] **U.S. Cl.** **74/89.15,** 81/71, 287/92

[51] **Int. Cl.** **F16h 27/02**

[58] **Field of Search** 74/89.15; 81/71; 151/2; 287/92

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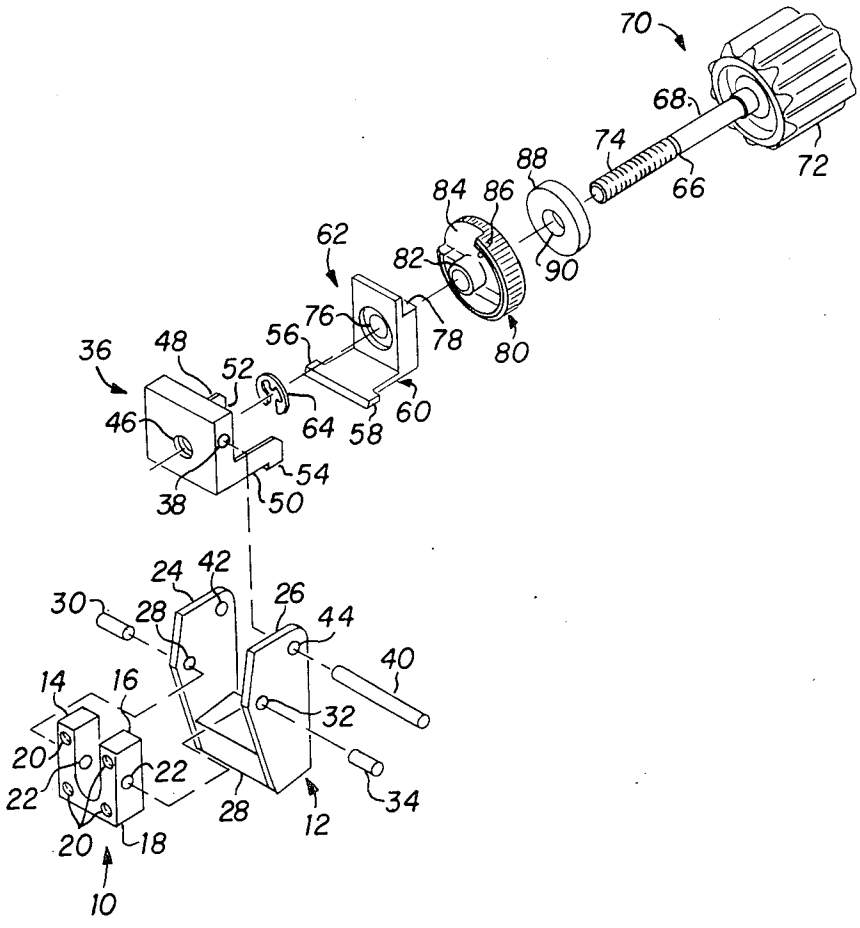
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Assistant Examiner—Wesley S. Ratliff, Jr.
Attorney—Bruce C. Lutz et al.

[57] **ABSTRACT**

A device for assisting insertion of a container into a space and for holding same in said space after insertion with the forces being applied in a first direction having a force component in a hold-down direction while providing extraction forces to said container in a direction substantially perpendicular to said hold-down direction.

7 Claims, 5 Drawing Figures



2 Sheets-Sheet 1

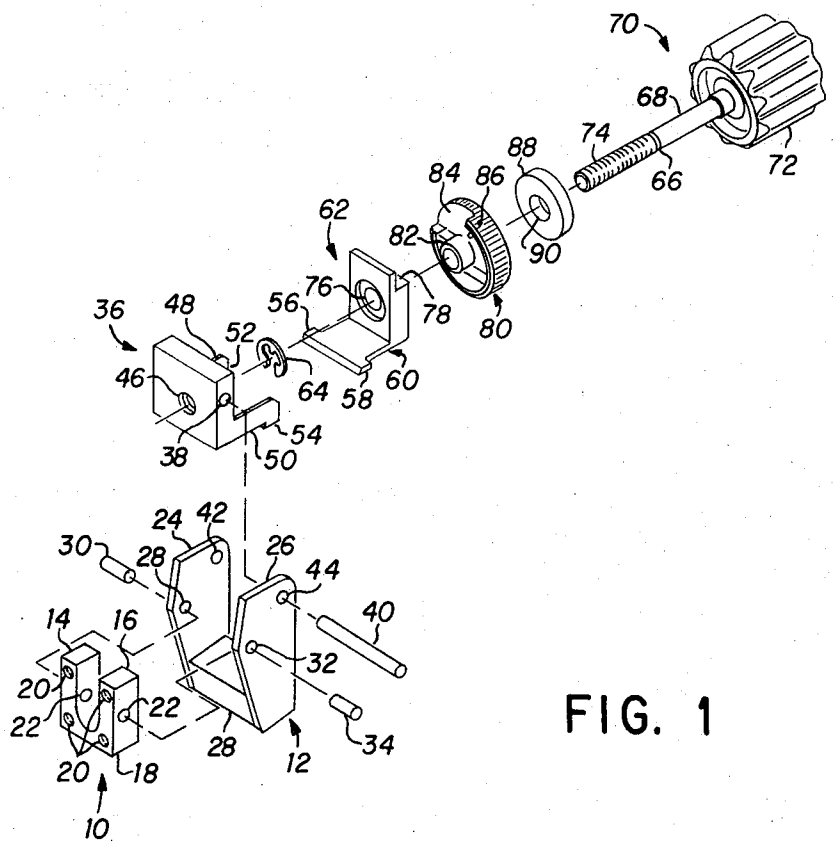


FIG. 1

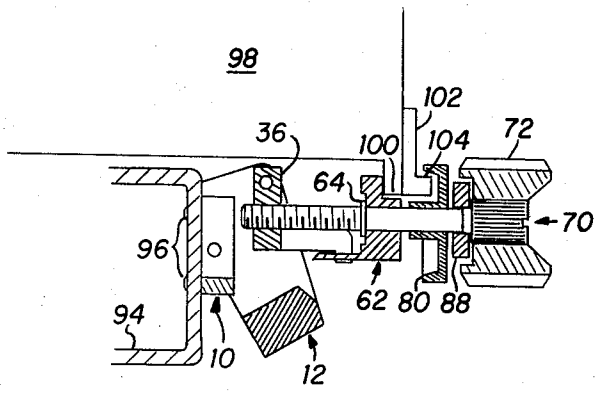


FIG. 2

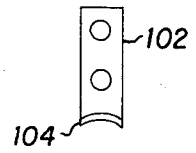


FIG. 3

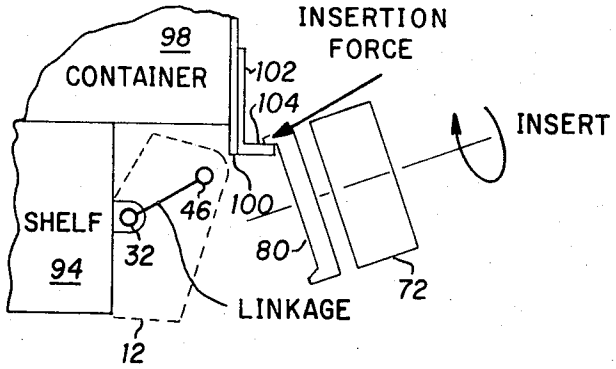


FIG. 4

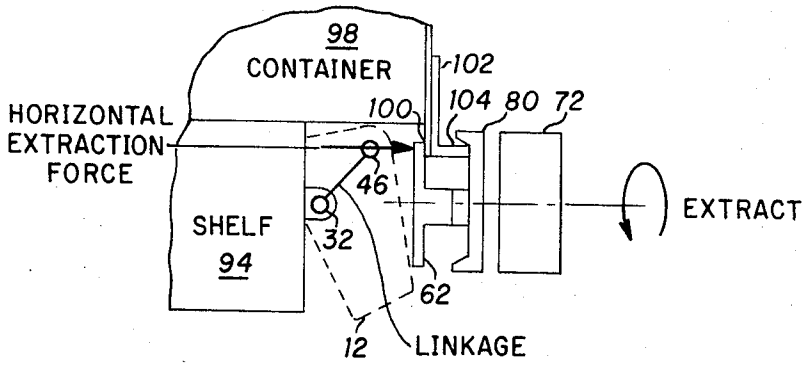


FIG. 5

HOLD-DOWN/EXTRACTION APPARATUS

THE INVENTION

The present apparatus pertains generally to fastening means and more specifically to an apparatus for assisting insertion and extraction of a container into and out of an opening.

The prior art, such as found in U.S. Pat. No. 3,640,141, has generally been designed such that there are projections extending therefrom which could be lethal if a person were accidentally thrown against the structure containing such devices. Further, since the devices being inserted and extracted generally contain a plurality of electrical connections at the rear thereof, it is important that the container or other device be extracted in a direction parallel with the electrical connection pins. The prior art such as shown in the above-referenced patent tended to provide an upward force upon extraction and on many occasions would cause breakage of the electrical connecting pins.

It is therefore an object of the present invention to provide improved insertion and extraction means.

Further objects and advantages of the present invention will be apparent from a reading of the specification and appended claims in conjunction with the drawings wherein:

FIG. 1 is an exploded view of one enbodiment of the invention;

FIG. 2 is a cross section of an assembled embodiment of the invention in the extraction process;

FIG. 3 illustrates an insertion bracket portion of FIG. 2 in more detail;

FIG. 4 is an illustrative showing of the applied forces in the insertion process; and

FIG. 5 is a schematic or illustrative showing of the applied forces in the extraction mode.

Referring first to FIG. 1, it will be realized that there are two U-shaped devices generally indicated as 10 and 12. U-shaped member 10 may be termed a mounting link for the purposes of this discussion. The mounting link 10 contains first and second arms 14 and 16 and further a bit portion 18. The mounting link 10 contains mounting holes generally designated as 20 on one face thereof. Further, each of the arms 14 16 have a pivotal mounting hole 22. The U-shaped member 12 may further be described as a link arm and has first and second legs 24 and 26 and a bit portion 28. Arm 24 has a hole 28 which receives a pivotal mounting device 30 and which connects with the hole 22 in leg 14 of mounting link 10. The pivotal means 30 may be rivet or any other appropriate type device which does not extend excessively into the inner portion of leg 14. A further opening 32 is illustrated in leg 26 and similar to that of opening 28. Opening 32 is designed to receive a pivotal means 34 which coacts with opening 22 of leg 16. Thus, mounting link 10 is pivotally mounted between the legs 24 and 26 of link arm 12. A pivot nut generally designated as 36 is illustrated having a first opening 38 extending through an upper portion thereof. Opening 38 is designed to receive a shaft or pivotal mounting means 40 which also extends through openings 42 and 44 in the legs 24 and 26 of link arm 12. Pivotal device 40 can again be a rivet or any other suitable attachment device. The pivot nut 36 also contains a threaded opening 46 for reception of a screw means to be later described. The pivot nut 36 also contains first and second extensions 48 and 50. Each of these extensions 48 and 50 have a tip designated as 52 and 54 respectively. The tips 52 and 54 coact with extensions 56 and 58 of a T-shaped portion generally designated as 60 of an extraction block generally designated as 62. Between pivot nut 36 and extraction block 62 is shown an E clamp 64. E clamp 64 fits into a slot designated as 66 in a shaft 68 of a knob generally designated as 70. Knob 70 has a head 72 and one end 74 of shaft 68 is threaded to coact with the threads in the opening 46 of pivot nut 36. Extraction block 62 also contains an opening 76 which is not threaded but allows passage of shaft 68 therethrough. The extraction block 62 also contains an upwardly extending portion 78. Portion 78 coacts with the device being removed for applying outwardly exerted forces. A retainer generally designated as 80 is illustrated having an opening 82 to allow passage of shaft 68 therethrough. One face of retainer 80 is indented and contains an opening 84 between the edge thereof and opening 82. This opening 84 is to allow positioning of the insertion apparatus over a lip on the device being inserted. The retainer 80 also contains a pin or other blocking means 86 for preventing accidental removal of the retainer from the lip of the container being extracted. A washer or bearing assembly 88 is illustrated also having an opening 90 for passage therethrough of the shaft 68. From the above description it will now be apparent that the shaft 68 including the threaded portion 74 passes through the washer assembly 88, the retainer 80 and the extraction block 62. The E clip 64 then clips to the indentation 66 on shaft 68 to prevent excessive movement of these parts and to apply extraction force to extracting block 62. The threaded portion 74 is then threadably engaged with opening 46 of pivot nut 36 which is pivotably mounted to the openings 42 and 44 of link arm 12. Link arm 12, in turn, is pivotably mounted to the mounting link 10. As will be later illustrated, link arm 12 assumes first and second positions depending upon whether extraction or insertion forces are applied.

Referring now to FIG. 2 it will now be observed that the extraction-insertion apparatus is now in an assembled condition. However, FIG. 2 is a section view with everything other than the screw or shaft portion of knob 70 and the container. The sectioning occurs along the axis of shaft 68. As will be observed, the shaft 68 has a knurled head which is force fitted into the portion 72 of the knob in the embodiment shown. Further, the mounting link 10 is attached to a shelf means or other mounting base 94. The link 10 is mounted via screws indicated as 96. A container means, module or other device generally indicated as 98 is the device being inserted into the area above shelf 94. The device 98 has a lower lip 100 against which the extraction block 62 exerts extraction forces. On the surface of the container 98 is a bracket 102 having a lip 104. The insertion means 80 coacts with lip 104 to provide the insertion forces. The stop 86 prevents accidental rotation of the retainer 80 upon extraction of the container 98 whereby the extracting device would fall away from container 98 before removal is complete.

As is obvious, the apparatus of FIG. 2 is shown in the container removal position and as will be illustrated in FIG. 4, the link arm 12 will change positions upon using the device for inserting container 98.

Referring now to FIG. 3, the device or lip bracket 102 is shown in frontal view so that the coaction of retainer 80 therewith can be more easily ascertained.

Referring now to FIG. 4, it will be observed that the container 98 is slideably coacting with and adjacent shelf 94. The retainer 80 is coacting with lip 104 in a direction which has both horizontal and vertical components. The vertical component is, of course, perpendicular to the direction of movement of container 98. The link arm 12 is illustrated in dash lines to illustrate its position in the insertion process. The extraction block is, of course, not illustrated in this figure. The downward or perpendicular force provides a positive retention of container 98 under vibration extremes.

FIG. 5 illustrates the extraction process with the forces shown and illustrates substantially the mode of operation shown in FIG. 2. It will be noted, however, that the extraction block 62 is shown as a cylindrical device as opposed to the illustration in FIG. 2. This is another possible embodiment and is shown in this configuration to illustrate that there are many possible designs available for practicing the present inventive concept. The inventive concept comprises the use of apparatus which allows insertion forces to be applied to a container or block along an axis in a first direction and to provide removal forces along an axis situated at an angle from said first axis. The second axis will generally be parallel with the base of the container being removed. Further, the forces applied along the first axis will provide a component of force perpendicular to the second axis and tend to hold the device being inserted from movement or vibration with respect to the base means into which the device is being inserted.

Although basically only one embodiment of the invention has been described, it will be realized that other embodiments may be created using the inventive concept outlined above and I therefore wish to be limited not by the specification but only by the appended claims wherein I claim:

I claim:

1. Insertion and extraction apparatus comprising, in combination:

pivotal mounting means having first and second positions and further including pivotal receiving means movable in accordance with the first and second positions; and

force supplying means, mechanically and pivotally connected to said receiving means of said pivotal mounting means along a longitudinal axis of said force supplying means, application of force in one direction along said longitudinal axis causing movement of said pivotal mounting means to said first position and application of force in the direction opposite said first direction of force causing sudden movement of said pivotal mounting means from said first to said second position whereby the pivotal receiving means of said pivotal mounting means is moved to change the position and angle of said longitudinal axis of said force supplying means with respect to a given reference.

2. Apparatus for facilitating insertion and removal of a module from a base comprising, in combination:

base means;

pivotal mounting means having first and second positions and further including pivotal receiving means;

force applying means having one end adaptable for connection to a module and having the other end mechanically connected to said receiving means of said pivotal mounting means, said force supplying means having a longitudinal axis passing through the first and second ends of said force supplying means, the application of force to said receiving means of said pivotal mounting means through said force applying means in a first direction along said longitudinal axis causing said pivotal mounting means to be quickly moved to said first position and the application of force to said receiving means of said pivotal mounting means via said force applying means along said longitudinal axis in a direction opposite from said first direction causing said pivotal mounting means to quickly move to said second position, any module connected to the first end of said force applying means being inserted into said base means upon application of force in the first direction and being removed from the base means when force is applied in the second direction and the force applying means being caused to pivot around the module upon movement of said pivotal mounting means between said first and second positions such that the movement of the longitudinal axis of said force supplying means describes an arc; and

means for pivotally attaching said mounting means to said base means whereby the first and second positions are with respect to said base means.

3. Insertion and extraction apparatus for use with a module and a base comprising, in combination:

base means;

module means including at least one force coacting means portion thereon, said module means requiring insertion into and extraction from said base means;

pivotal mounting means having first and second positions and including pivotal force receiving means movable in accordance with the first and second positions;

force applying means mechanically connected to and coacting at a first end with said force receiving means of said pivotal mounting means and mechanically coacting at a second end with and connected to a force coacting means of said module means, said force supplying means having a longitudinal axis between said first and second ends thereof, application of force in a first direction to said force receiving means via said force applying means causing said pivotal mounting means to assume a first position and facilitating mechanical insertion of said module into said base means, a force component being applied in a direction perpendicular to the base of said module means, application of force to said force receiving means via said force supplying means in a second direction coacting with said module to cause said pivotal mounting means to quickly assume said second position thereby moving said pivotal force receiving means with respect to said base means, whereby extraction forces are applied to said module in a direction which is substantially parallel with the base of said module means; and

means pivotally attaching said mounting means to said base means whereby the first and second positions are with respect to said base means.

4. Apparatus as claimed in claim 3 wherein said module means includes first and second lips and said force supplying means includes lip coacting means such that the force supplying means will be prevented from slip-

ping from the lips of said module means upon application of force in either direction.

5. The method of inserting a module into and removing it from an opening by applying forces to one end thereof with respect to the opening and wherein it is desirable that the module be inserted and removed in a direction substantially parallel with a base of the opening comprising the steps of:

applying insertion forces to the one end of said module whereby a substantial component of the insertion forces is in a direction perpendicular to the direction of movement of said module into said opening for reducing movement in either the direction of said substantial component of force or the direction of movement of the module into the opening as the insertion operation is completed; and

extracting said module at said one end of said module by applying a force having substantially no components in the direction perpendicular to the direction of movement of said module upon insertion into the opening.

6. The method of inserting and extracting a container into an opening having electrical connections at the rear thereof wherein the opening has a horizontal base and wherein the container has electrical connections at the rear thereof and force coacting means at the front thereof and further wherein vertical forces applied to said container upon extraction tends to produce breakage of the electrical connections at the rear thereof comprising the steps of:

placing said container in said opening;

applying insertion forces having a substantial component in the vertical direction; and

applying extraction forces having a substantially zero component in the vertical direction.

7. Insertion and extraction for use in securing a device to and extracting the device from a base comprising, in combination:

mounting means for attachment to a base;

pivotal means;

means for movably attaching said pivotal means to said mounting means whereby said pivotal means is movable between first and second positions when said mounting means is attached to a base;

force applying means for providing insertion and extraction forces, said force applying means having a longitudinal axis;

means for attaching said force applying means to a device at a point a given distance from said longitudinal axis;

means for movably attaching said force applying means to said pivotal means at a point substantially said given distance from said longitudinal axis for enhancing movement of said pivotal means between said first and second positions upon changing from insertion to extraction forces and thereby changing the angle of said longitudinal axis with respect to said mounting means.

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