United States Patent [19]

Riethmeier

[11] **3,872,734**

[45]* **Mar. 25, 1975**

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

[75] Inventor: **William C. Riethmeier,** Yorba Linda, Calif.

[73] Assignee: **Rockwell International Corporation,** Dallas, Tex.

[*] Notice: The portion of the term of this patent subsequent to Sept. 11, 1990, has been disclaimed.

[22] Filed: **Aug. 24, 1973**

[21] Appl. No.: **391,391**

Related U.S. Application Data

[62] Division of Ser. No. 243,173, April 12, 1972, Pat. No. 3,756,087.

[52] **U.S. Cl.** **74/89.15**

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

[58] **Field of Search** ..... 192/56 R; 248/361; 74/89.15

[56] **References Cited**

UNITED STATES PATENTS

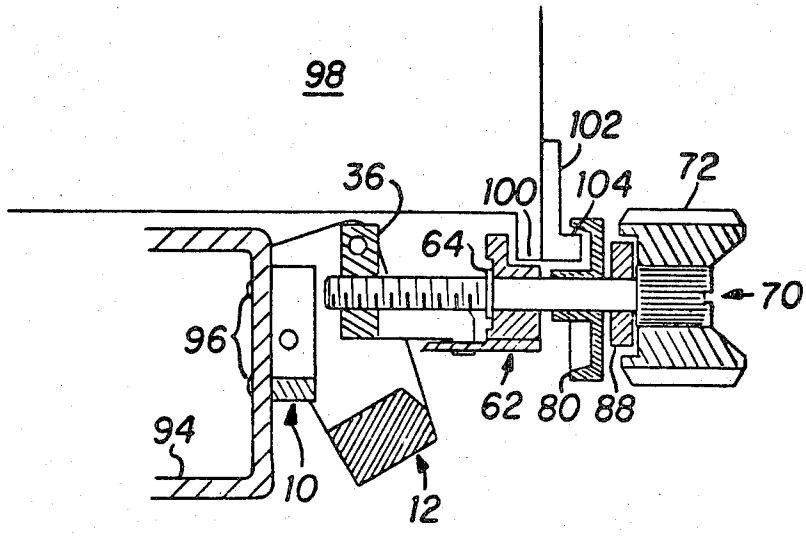
3,147,005	9/1964	Miller	248/361 R
3,480,248	11/1969	Lucchine, et al.	248/361
3,493,210	2/1970	Brenner	248/361
3,517,621	6/1970	McClaskey	248/361
3,521,845	7/1970	Sweta, et al.	248/361
3,640,141	2/1972	Hollingsead	192/56 R
3,734,444	5/1973	Throngate	248/361
3,756,087	9/1973	Riethmeier	74/89.15

Primary Examiner—Wesley S. Ratliff, Jr.
Attorney, Agent, or Firm—Bruce C. Lutz

[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.

5 Claims, 5 Drawing Figures



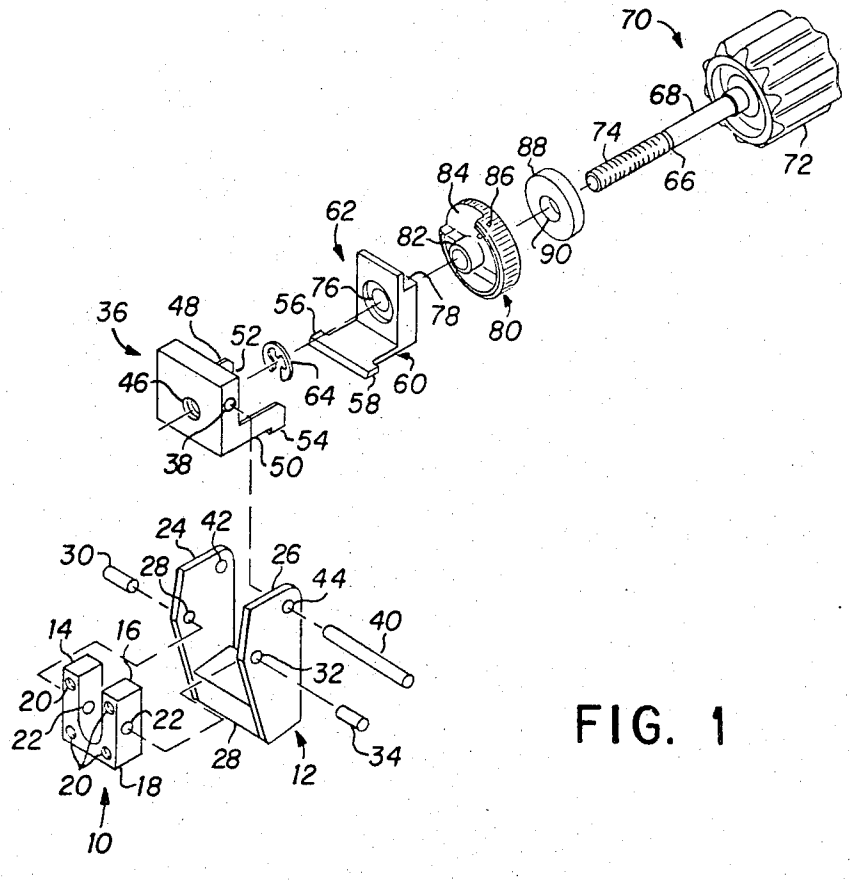

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FIG. 1

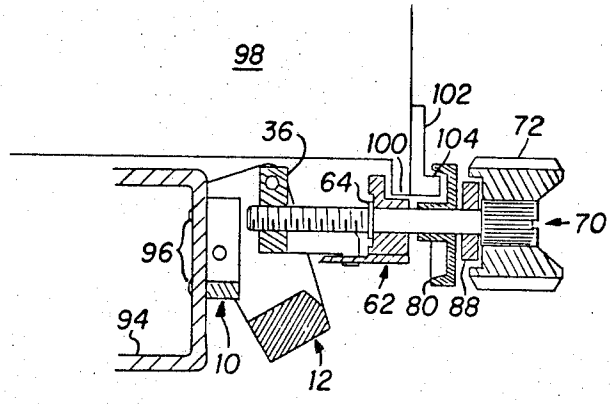

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FIG. 2

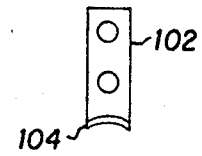


FIG. 3

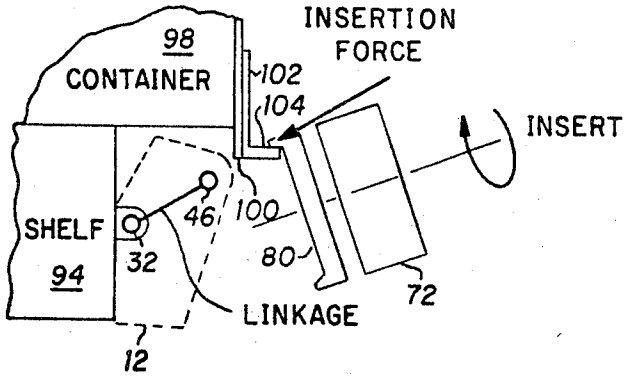


FIG. 4

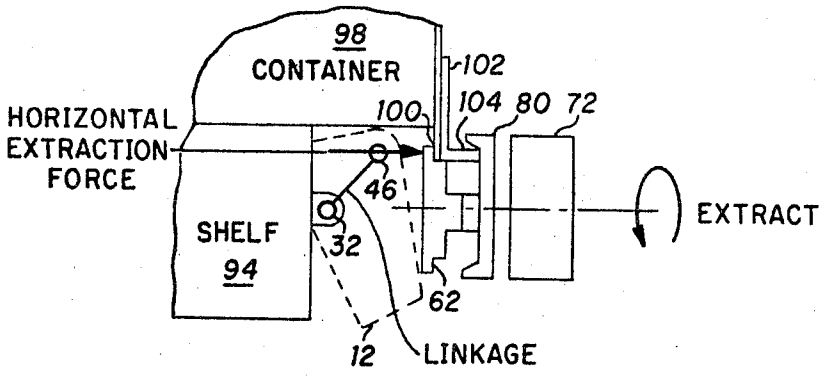


FIG. 5

HOLD-DOWN/EXTRACTION APPARATUS

This application is a division of parent application, Ser. No. 243,173 filed April 12, 1972 now U.S. Pat. No. 3,756,087.

The present apparatus pertains generally to fastening means and more specifically to an apparatus for assisting insertion and extration 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 embodiment 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 and 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. 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 **40** 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:

1. Apparatus for inserting a module into and removing it from an opening by applying forces to one end thereof with respect to the opening and comprising, in combination:

force means for attachment at one end to a module to be inserted and extracted and for attachment at the other end to a pivotal connection, an imaginary line between the points of attachment forming a reference vector;

mounting means for attachment to a structure defining an opening into which the module is to be inserted and extracted from; and

pivotal means connecting said force means to mounting means whereby insertion forces on a module move said pivotal means to a first position wherein the reference vector has a substantial component perpendicular to the base of the opening and extraction forces on a module move said pivotal means to a second position, displaced in space with respect to said first position, wherein the reference vector is substantially parallel with the base of the opening.

2. Apparatus for inserting a module into an opening in a structure in a direction parallel to the base of the structure opening and holding the module with a force component perpendicular to the base and for extracting the module from the opening in the structure comprising, in combination:

force means for providing insertion and extraction forces;

mounting means;

pivotal means connecting said force means and said mounting means, said pivotal means moving suddenly between first and second positions upon changes between insertion and extraction forces whereby the vector angle of insertion force has a substantial component perpendicular to the base and the vector angle of extraction force has a substantially zero component perpendicular to the base and said first and second positions are displaced in space one relative to the other.

3. Apparatus for 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 the direction substantially parallel with a base of the opening comprising, in combination:

means for 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 of the 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

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

4. Apparatus for inserting and extracting a container with respect to 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 force applied to said container upon extraction tends to bend or produce breakage of the electrical connections comprising, in combination;

means for applying insertion forces to said container having a substantial force component in the vertical direction; and

means for applying extraction forces wherein the vertical components of the extraction forces are substantially zero.

5. Apparatus for supplying insertion and extraction forces to a module with respect to a base comprising, in combination:

mounting means for attachment to a base;

force means for applying insertion and extraction forces, said force means having first and second ends and including means for coacting with a module at said first end thereof and including pivotal means at the second end thereof; and

means connecting said pivotal means of said force means to said mounting means for permitting movement of said pivotal means between first and second space displaced positions and thus the second end of said force means upon a change between the application of insertion and extraction forces thereby changing the angles of force vectors applied with respect to a reference.

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