United States Patent [19]

Weglage

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[54] **METHOD OF APPLYING RETAINER RINGS FROM INTERCONNECTED RETAINER RING SUPPLY**

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Related U.S. Application Data

[63] Continuation of Ser. No. 233,137, March 9, 1972, abandoned.

[52] **U.S. Cl.**..... **29/413,** 29/200 H, 29/212 D, 29/229, 206/56 AB, 206/56 DF

[51] **Int. Cl.**..... **B23p 17/00**

[58] **Field of Search**..... 29/413, 526, 200 H, 212 R, 29/212 D, 229, 235, 200 P, 225; 227/136; 206/56 AB, 59 R, 56 DF, 46 H

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Assistant Examiner—Victor A. DiPalma
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[57] **ABSTRACT**

A retaining ring supply according to which the retaining rings are arranged one behind the other in the form of a band or strip while with the exception of the foremost retaining ring, front portions of each retaining ring are connected to rear portions of the respective directly preceding retaining ring so as to establish a firm connection of the retaining rings with each other while permitting the respective foremost retaining ring to break off from the next following retaining ring when sharply bent relative to the latter. The rings are passed through a hand carried holder which is used to press the foremost ring onto a groove in an object, then the holder is used to bend the strip at the juncture of the foremost ring and the next succeeding ring thereby breaking the strip between the foremost and the directly adjacent ring.

4 Claims, 8 Drawing Figures

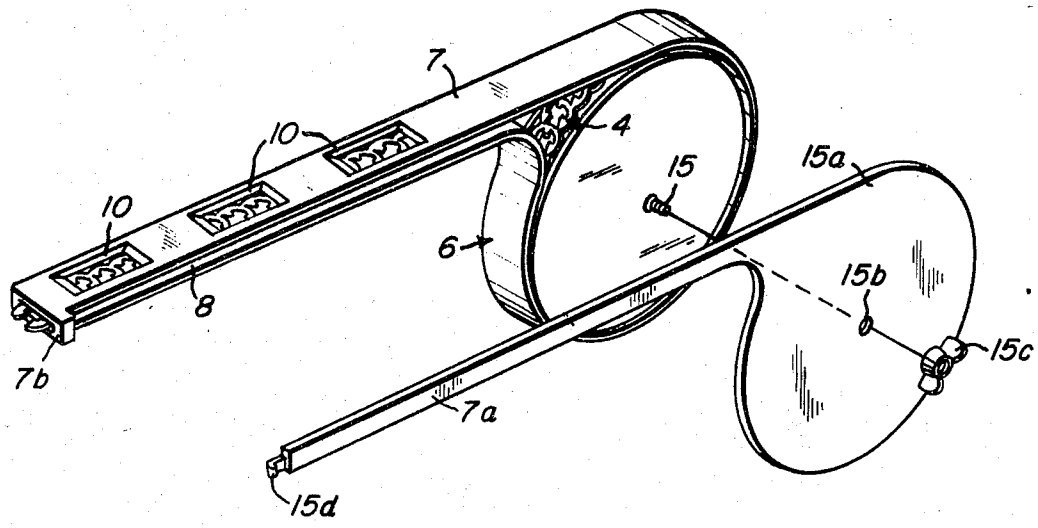
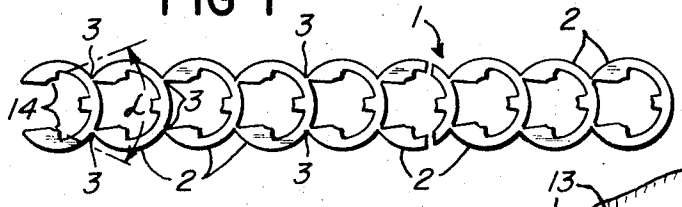


FIG-1



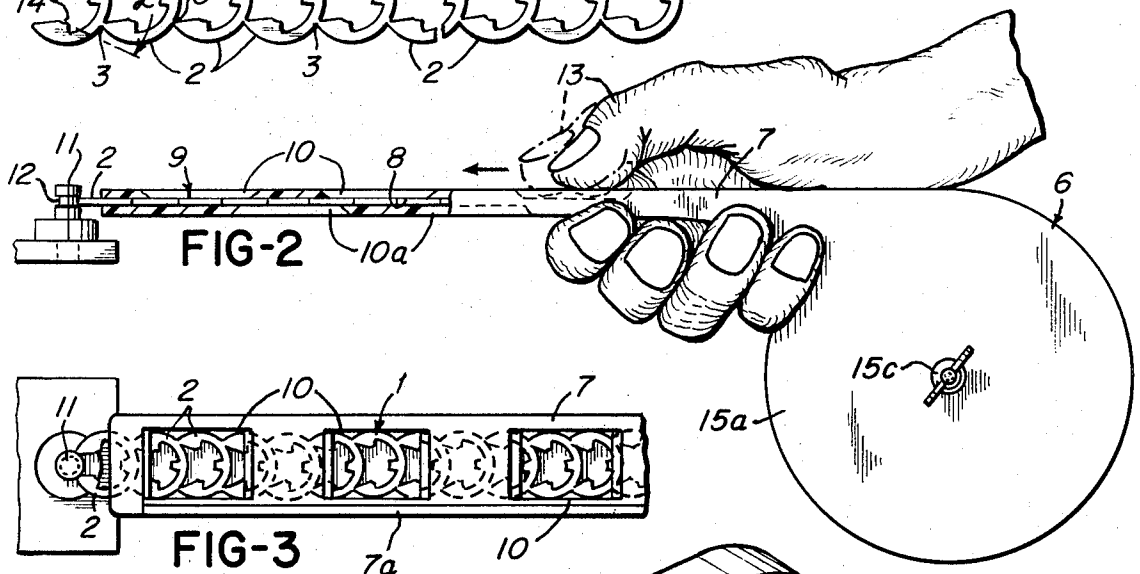


FIG-2

FIG-3

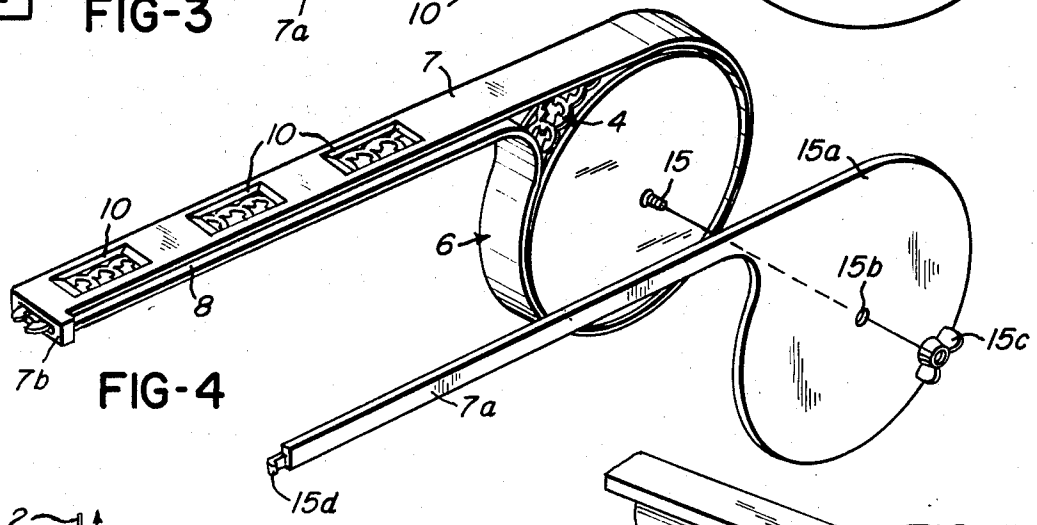


FIG-4

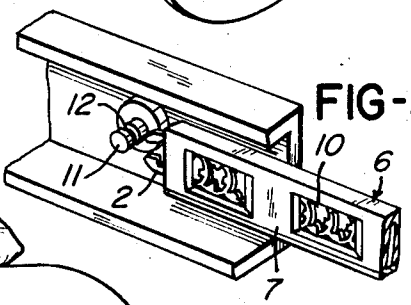


FIG-5

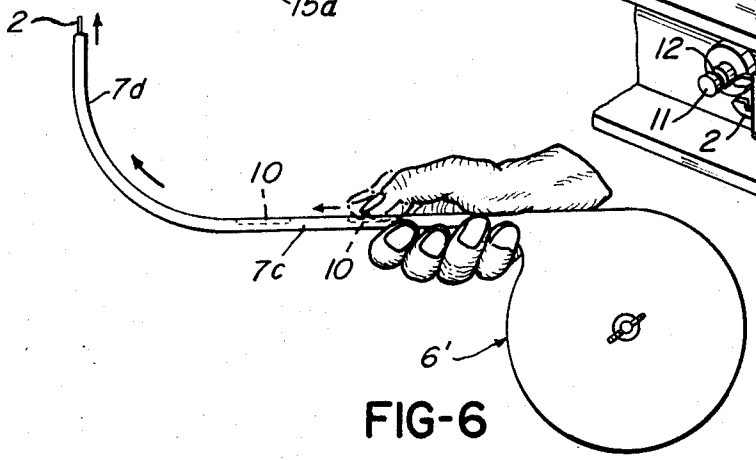


FIG-6

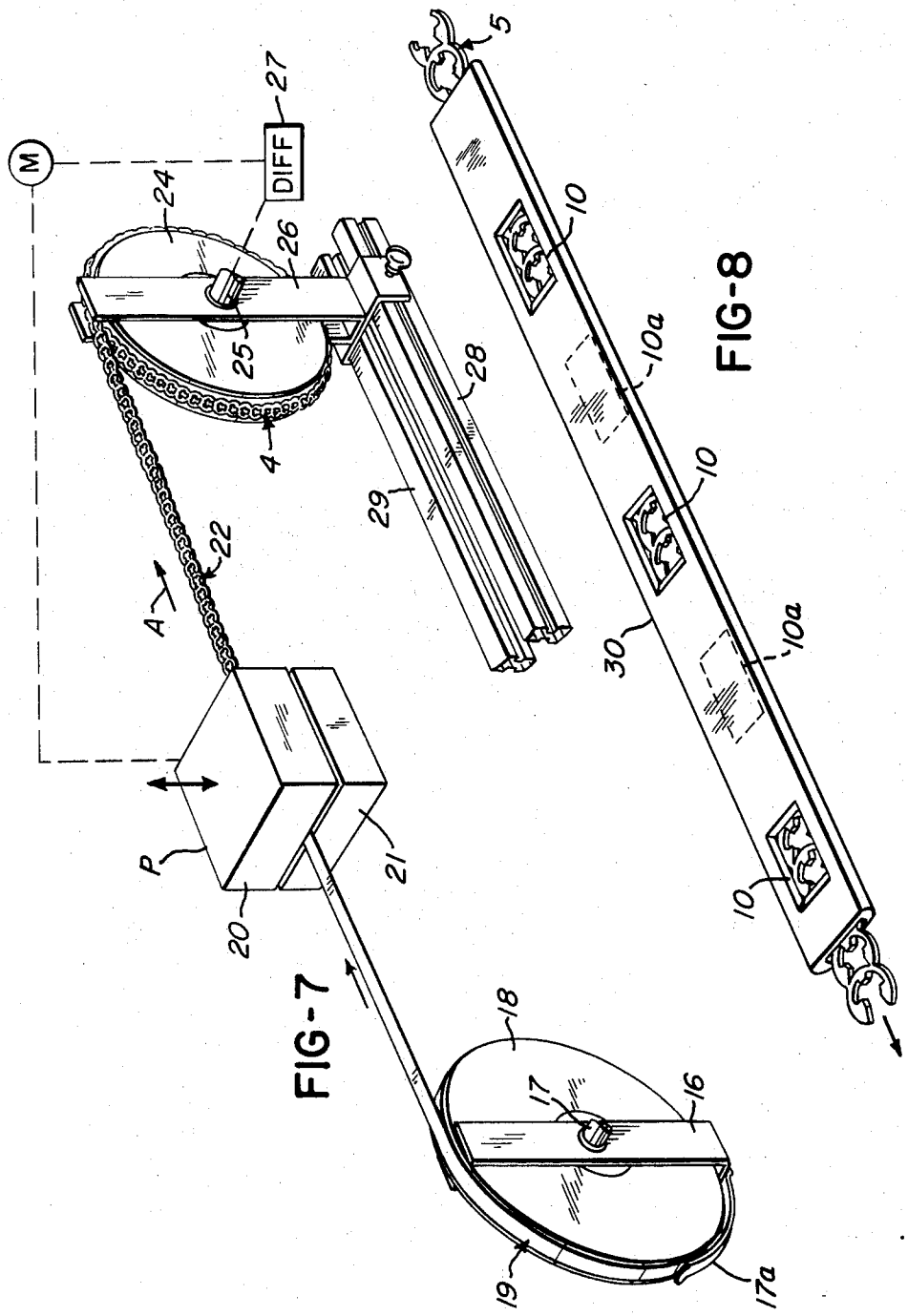


FIG-7

FIG-8

METHOD OF APPLYING RETAINER RINGS FROM INTERCONNECTED RETAINER RING SUPPLY

This a continuation of application Ser. No. 233,137, filed Mar. 9, 1972, now abandoned.

The present invention relates to retaining rings and means for applying same. Retaining rings have been known for several decades in various shapes and forms to replace cotter pins and washers, to act as shoulders so as to prevent gears or wheels from axially moving on shafts or axles, to prevent rods from axially moving in bearings, etc., and generally to retain machine components on shafts, bolts, housings, and in bores. Retaining rings of this type which are assembled by slipping them into a groove in a shaft, bolt or the like, usually are punched out from a metal sheet and the individual retaining rings are then stacked one upon the other similar to the staples of an office stapler to form a cartridge while an adhesive covered tape is placed on the cartridge along its length. When the cartridge is to be used, the cartridge is placed in a nearly vertical position on a nearly vertical rod of a dispenser, whereupon the adhesive covered tape is removed from the cartridge. By means of an applicator having a fork-shaped end, one retainer ring at a time is withdrawn from the bottom of the retaining ring cartridge or stack. This type of dispensers and applicators which has been in common use for decades has various drawbacks. First of all, it is always necessary following the punching out of the retainer rings to stack them so as to form a cartridge. Then the cartridge has to be introduced into a dispenser, and unless a rather complicated applicator is combined with the dispenser, a special applicator tool has alternately to be introduced into the dispenser for picking up a single retaining ring at a time and has to be moved onto the work piece for transferring the picked-up retainer ring to the work piece. In addition to these relatively time-consuming operations, difficulties occur when the cartridges are kept or applied in a relatively warm room because in such an instance after the removal of the adhesive tape, sufficient adhesive is retained by at least some of the retainers which then stick together whereby a proper withdrawal of each individual retaining ring, by means of the applicator tool, is not possible. Even if no adhesive holds the individual retaining rings in the dispenser together, difficulties are frequently encountered with the withdrawal of the retaining rings from the last portion of the stack or cartridge. This is due to the fact that this last portion of the cartridge or stack is not under sufficient pressure and that the retaining rings frequently occupy or adopt an inclined or canting position.

When withdrawing each retaining ring from a cartridge by means of the common applicator having a fork-shaped head with a depression of the thickness of a single retaining ring, it is not uncommon that the respective retaining ring is not properly picked up and slips out of the head so that the applicator has to be returned to the cartridge for withdrawing another retainer ring.

It is, therefore, an object of the present invention to provide a retaining ring arrangement, which will overcome the above outlined drawbacks.

It is another object of this invention so to arrange the retaining rings during their manufacture that it will no longer be necessary to stack them so as to form cartridges in order to permit their application to a work piece.

It is still another object of this invention so to produce the retaining rings that they still hang together and in this condition can directly be applied to the work piece while only one ring at a time, namely, the respective one ring which has been last applied to the work piece is separated from the retaining ring supply.

It is also an object of the invention to provide a device for manually holding a portion of the retaining ring supply and for advancing a portion of said supply so as to apply one retaining ring at a time to the work piece.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

FIG. **1** shows a top view of a retaining ring supply according to the present invention.

FIG. **2** illustrates on a somewhat smaller scale than FIG. **1**, partly in section, and partly in view, a casing with a retainer ring supply according to the invention, and also shows the mode of applying a retaining ring to a work piece.

FIG. **3** is a top view of the left-hand portion of FIG. **2**.

FIG. **4** is an isometric view of a combined retaining ring casing and feeder with the housing lid shown as having been taken off.

FIG. **5** illustrates the possibility of using the device according to the present invention within extremely narrow spaces.

FIG. **6** shows a modified combined retaining ring casing and feeder according to the invention.

FIG. **7** diagrammatically illustrates a method of making the retaining ring supply in the form called for according to the present invention.

FIG. **8** shows an isometric view of a sheath or feeder for the retaining ring supply according to the present invention.

The retaining ring supply according to the present invention is characterized primarily in that the retaining rings are arranged one behind the other in the form of a band while with the exception of the respective foremost retaining ring, front portions of each retaining ring are connected to rear portions of the respective directly preceding retaining ring so as to establish a firm connection of the retaining rings with each other while permitting the respective foremost retaining ring to break off from the next following retaining ring when sharply bent relative to the latter.

Referring now to the drawings in detail, FIG. **1** shows a supply or band **1** of retaining rings **2** which may be of any standard type. The retaining rings specifically shown in the drawing merely by way of example are so-called E-rings. As will be seen from FIG. **1**, each two retaining rings are connected to each other along small sections **3** so that the retaining rings form with each other a strip or band **1**. This strip or band may form a coil **4** as particularly clearly shown in FIG. **4**, or may be a substantially straight strip or band **5** as shown in FIG. **8**. When the strip or band **1** is in the form of a coil **4**, it may be placed into a housing **6** which has a flat neck **7** as shown in FIGS. **2** and **4**. This neck **7** which is in the form of a flattened tube or sheath has a threefold function inasmuch as it serves as handle by which the opera-

tor holds the housing **6** and thus the supply of retaining rings. Furthermore, the flattened tube forms a passage **8** which slidably accommodates the respective free end portion **9** of the coil **4.** The neck or flattened tube **7** is provided with windows **10** which may be provided at one side only of neck **7** as shown in FIGS. **3** and **4** or may also be provided at both sides of neck **7** as shown in FIG. **8.** The windows **10** are of sufficient size to permit the thumb of the operator's hand holding neck **7** to reach through the respective adjacent window and contact the respective strip or band portion in neck **7** and selectively to advance this strip or band portion by one retaining ring. Thus, assuming that a plurality of pins **11** (one only being shown in FIG. **2**) is to be provided with one retaining ring **2** each which to this end is to be inserted into a groove **12** on pin **11,** the operator by means of his thumb **13** through the adjacent window **10** engages strip or band **1** and advances the same so that, as shown in FIGS. **2** and **3** a retaining ring protrudes from neck or sheath **7.** The operator then presses the protruding retaining ring **2** into groove **12** into which said last mentioned ring snaps, particularly when the ring is provided with the commonly known inclined ring surfaces **14** forming with each other an angle α, e.g., of 45°. When neck **7** is now, with regard to FIG. **3,** tilted out of the drawing plane about an axis extending through pin **11** and at about a right angle with regard to the longitudinal extension of neck **7,** the retaining ring straddling pin **11** will break or detach itself from the next following retaining ring along the areas **3.** The operator then takes neck **7** to the next pin **11** (not shown) to repeat the operation described above in connection with FIGS. **2** and **3.**

From the above, it will be evident that the present invention not only totally eliminates the heretofore necessary stacking of the individual retaining rings, but also eliminates the use of an applicator for transferring each individual retaining ring from the supply of retaining rings to the work piece, and consequently also eliminates the difficulties occurring when with heretofore known arrangements retaining rings stick together or assume an inclined position. Also, the possibility that retaining rings accidentally drop off an applicator during the intended transfer from the retaining ring supply to the work piece, is totally eliminated.

Another outstanding advantage of the retaining ring supply according to the invention consists in the fact that it permits the insertion of the retaining rings into otherwise almost inaccessible places, as long as the available space is as wide as the rather narrow overall thickness of neck or guide section **7.**

The placing of a retaining ring strip or band, or coil into housing **6** is likewise extremely simple. It is merely necessary to place the coil onto stud **15** with the free end of the coil laid into neck **7** so as to be engageable through window **10,** and then to place lid **15***a* by means of bore **15***b* on stud **15** finally placing the wing nut **15***c* onto stud **15.** If desired, but not necessarily, the lid **15***a* may have a tongue or extension **7***a* with a hook **15***d* or any other suitable connecting element to be locked to the front end **7***b* of neck **7** which front end forms a slot just big enough to let the retaining ring strip or band slide therethrough.

While according to FIG. **2,** neck **7** is being held so that its widest surfaces are located in planes substantially perpendicular to the axis of pin **11,** the casing **6** with neck **7** may as easily be held at a 90° angle thereto as indicated in FIG. **5.**

FIG. **6** shows a housing similar to that of FIGS. **2** and **3,** but with a modified neck contour.

More specifically, the housing section **6'** for receiving the retaining ring section has connected thereto a neck with a straight section **7***c* and an adjacent curved section **7***d.* Also in this instance the neck section **7***c* is provided with windows **10** of the type shown more clearly in FIGS. **3** and **4.** The casing design of FIG. **6** makes it possible to guide the retaining rings to be inserted around a curve and thus allows the insertion of retaining rings into assembled work pieces at locations which are particularly difficult to reach. Such operations cannot be carried out at all with heretofore known applicators.

The manufacture of a retaining ring band or coil **4** is rather simple and is illustrated diagrammatically and by way of example only in FIG. **7.** FIG. **7** shows a first stand **16** comprising a removable shaft **17** normally held in its position by retaining rings of any standard type e.g., the type shown in FIG. **1,** or by any other convenient means. Rotatably placed on shaft **17** is a reel **18,** e.g., of the general type used in connection with film spools, which reel carries a steel band in the form of a coil **19** from which the retaining ring supply, e.g., that of FIG. **1** is to be made.

Stand **16** has associated therewith a spring lever or brake member **17***a* which always engages the respective outer coil winding so as to brake coil **19.** The respective steel band section wound off the coil **19** is stepwise fed between the platen **20** with punch (not shown) thereon and a die **21.** After each punching operation, the press P opens briefly, and the respective punched out retaining ring section **22** is pulled out of the press P in the direction of the arrow A while previously punched out retaining ring sections are wound upon a reel **24** similar to reel **18.** Reel **24** can be temporarily coupled to a shaft **25** which is supported by a stand **26** and is drivingly connected in a manner known per se to a Graham differential **27** or any other device which will assure that always the same length of steel band is pulled into and out of the press P and wound onto reel **24.** Stand **26** is preferably movable and arrestable on rails **28, 29** to thereby permit adjustment of stand **24** relative to press P. The differential **27** is drivingly connected to a motor M which may also drive press P. After a coil **4** of desired diameter has been wound upon reel **24,** the latter is removed from stand **26** after reel **24** which was previously coupled to shaft **25** has been disengaged therefrom.

The arrangement is so designed and the diameter of the steel band coil is, as to its original diameter, so selected that when coil **4** on stand **26** is completed, reel **18** will be empty, so that at the same time at which coil **4** with reel **24** is removed from stand **26,** a new band coil **19** with reel **18** is placed on stand **16.**

While the method of making a retaining ring coil has been described with one steel band only passing through the press P at a time, it will be evident that the arrangement of FIG. **7** can be multiplied if desired so that simultaneously a plurality of retaining ring coils or supply units can be made.

After the respective unit or units of retainer rings has or have been made, the retaining rings in band or in coil form are partially heat treated, e.g., case hardened, in

any standard manner as it is practiced, for example, in connection with spring steel.

While according to FIGS. **1** to **4**, and **6** the sheath or neck **7** forms a part of housing **6, 6'**, it is also possible to have the sheath or neck for guiding and feeding the retaining rings designed as a separate element as shown in FIG. **8.** In such an instance, the coil of retaining rings is rotatably supported by a stationary or movable stand similar to the stand on the left-hand side of FIG. **7** and described above. The operator then periodically withdraws by hand sections from the coil in the stand and guides and feeds portions of the withdrawn sections through the straight sheath **30** in the same manner as described above in connection with neck **7.** Also, instead of a coil of retaining rings, long straight strips of retaining rings may be used in connection with the present invention while using, for instance, the sheath **30** of FIG. **8.** It will be noted from FIG. **8** that sheath **30** has also windows **10***a* at the bottom side of sheath **30.** In this way, if the location of windows **10***a* is more convenient for the particular job involved, the operator merely has to turn the sheath **30** so that the bottom side forms the top side.

It is, of course, to be understood that the present invention is, by no means, limited to the specific showing in the drawings, but also comprises any modifications within the scope of the appended claims. It should also be noted that the present invention is not limited to retaining rings of steel, but is also applicable to retaining rings of plastic material or similar materials.

It is also to be understood that the present invention is not limited to the particular E retaining rings shown in the drawings merely by way of example, but also applies to other retaining rings of the general retaining ring type involved, e.g., C retainer rings.

What is claimed is:

1. The method of applying retainer rings, each of which comprises two resilient legs spaced from each other at its front portion and adapted to be forced and snapped into a groove in an object by pressing said legs into said groove initially to spread said legs apart, said rings being arranged successively in the form of a flat strip with the legs of each successive ring integrally connected to the rear portion of the respective directly preceding ring and having the leg ends of one end ring free, said method comprising passing said strip through a substantially rigid hand carried holder, projecting said one end ring from the adjacent end of the holder with its legs outward of the last mentioned end of the holder, pressing said legs of said projected ring into said groove while spreading said last mentioned legs resiliently in the plane of said projected ring and to embrace said object and to engage a portion in said groove, and bending said strip at the juncture of said one end ring with the next succeeding ring by using said holder as a handle to bend and break said strip between said one end ring and the directly adjacent ring while said one end ring is held rigid and clamped-in in said groove.

2. The method of forcing and snapping retainer rings into grooves of an object each of which retainer rings has two resilient legs interconnected at their one end portion by an arched section and spaced from each other at their other end portion by a distance less than the outer diameter of the groove into which the respective ring is to be forced, which includes the steps of: producing the retainer rings in the form of a continuous hardened flat strip in which the legs of each ring with the exception of one end ring are respectively integrally connected to two spaced portions of the arched portion of the respective directly preceding ring, preparing a rigid sheath-shaped flat and manually operable holder for receiving and closely but slidably surrounding at least a considerable length of said flat strip and provided on one of its wider sides with at least one window permitting manual access to a strip of retainer rings when received by said holder for advancing the strip in said holder and projecting said one end ring from said holder, passing said strip through said holder so that only said one end ring projects from the adjacent end of said holder with its legs outward of the adjacent end of said holder, pressing the legs of said projected ring into the respective groove into which said projected ring is to be forced while spreading said last mentioned legs resiliently in the plane of said projected ring to embrace and engage a portion of said groove and snap into the latter, and bending said strip at the juncture of said one end ring with the next succeeding ring by using said holder as a handle to bend and break said strip between said one end ring and the directly adjacent ring while said one end ring is held rigid and clamped-in in said groove.

3. A method according to claim **2,** in which said window has a length longer than the length of a retainer ring.

4. The method as claimed in claim **1** in which said method also comprises cutting said retaining rings from a strip integrally joined together, and hardening said strip to increase the resilience of said rings.

* * * * *