MEANS FOR ASSEMBLING OPEN RETAINING RINGS ON SHAFTS, PINS AND THE LIKE

FIG. 1

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This invention relates to improvements in means for assembling open retaining rings on shafts, pins and the like, and more particularly to an improved combination ring dispensing and applying tool of the general type disclosed in my application Serial No. 558,041, filed October 3, 1955.

According to one form of such a retaining ring dispensing and applying tool, a plurality of the open retaining rings being assembled, and which are disposed in stack formation, are positively advanced along a generally horizontal path by spring means acting axially on the ring stack to the upwardly opening ring cut-out of a vertically arranged applicator blade mounting a retractable slide which normally serves as an end stop or abutment for the rings being pressed therewith. The workpiece to which the ring is to be assembled and which usually comprises a grooved shaft or pin with its fixture is manually fed from above the applicator after the operator has first positioned said workpiece axially so that the shaft or pin groove is vertically aligned with the then most advanced ring held in the cut-out by the jaws of the applicator blade. Obviously, such manual positioning and feed operations require an appreciable degree of dexterity and skill on the part of the operator.

Stated broadly, a principal object of the present invention is to eliminate the aforesaid requirement by providing a combination ring dispensing and applying tool of the stated type incorporating workpiece positioning and feed means effective both to position the workpiece so that its groove in which a ring is to be assembled is accurately aligned with the applicator blade and hence with the most advanced ring in "assembly readiness" position held thereby, and also to positively feed said workpiece to the applicator blade as required to effect the assembly operation.

A more particular object of the invention is the provision of a combination ring dispensing and applying tool incorporating workpiece positioning and feed means as aforesaid, characterized in that said means includes a simple hand-operated plunger mounted for vertical reciprocation and which is provided with a transverse workpiece opening disposed to insure mounting of the workpiece in horizontal position above the vertical applicator blade, in conjunction with abutment means serving to permit insertion of the workpiece into said opening only the exact amount as to accurately align the workpiece groove into which a ring is to be assembled with the most advanced ring of the tool then in the "assembly readiness" position.

Yet another object of the invention is the provision of a combination ring dispensing and applying tool incorporating workpiece positioning and feeding means as aforesaid, wherein the abutment means is capable of horizontal adjustment thereby to adapt the tool to workpieces whose grooves are differently located axially along the length of the shaft or pin thereof.

Still further object of the invention is the provision of a combination retaining ring dispensing and applying tool of the type in which a plurality of rings disposed in horizontal stack formation are positively pressed against a retractable slide mounted on the applicator blade and normally serving as an end stop or wall for the ring stack, and which further incorporates a manually operated plunger or push rod for bodily mounting and feeding the workpiece vertically downwardly to the applicator blade as necessarily also effects retraction of the slide, characterized in that movement of the slide is entirely independent of that of the slide when the workpiece is removed from the plunger, whereby said plunger may be freely reciprocated without corresponding retracting movement of the slide as is desirable in demonstrating the tool and/or training an operator in the use thereof.

The above and other objects and features of advantage of a combination ring-dispensing and applying tool incorporating workpiece positioning and feed means of the invention will appear from the following detailed description, in which reference is had to the accompanying drawings illustrating a preferred physical embodiment thereof, wherein:

Fig. 1 is a side elevation, partly in section, of a tool incorporating the improvements of the invention, the view illustrating a workpiece in the process of being positioned for a ring assembly operation;

Fig. 2 is a front elevation of the tool illustrated in Fig. 1 with the workpiece omitted;

Fig. 3 is a broken-away detail view illustrating the workpiece positioned for a ring dispensing and assembly operation;

Fig. 4 is a view similar to Fig. 1 but illustrating the feed plunger in its lowestmost position in which it completely the ring-assembly operation; and

Fig. 5 is a separated view of the parts making up the feed plunger guide means as herein proposed.

Referring to the drawings, reference numeral 10 designates the base and reference numeral 11 the upright frame or standard of the tool, the top rear edge portion of the latter being bent over as at 12 and serving to mount a generally horizontally disposed stack rod in the form of a spring rail 13 so that its forward end which is unsecured is free to flex. The front vertical edge of the frame is shown to be bent at a right angle, thus forming a flange 14 serving to mount an applicator blade 16 so that it extends vertically and has its ring-receiving cut-out opening upwardly and disposed in line with the stack rod or rail 13.

Preferably, the aforesaid applicator blade 16 corresponds to the applicator blade disclosed in my prior application Serial No. 508,264, filed May 13, 1955; that is to say, it comprises two springy side arms 17, 17a which terminate in plane jaw members 18, 18a whose adjacent edges are curved so that they together form a substantially circular ring-receiving cut-out 20 contoured to conform to the outer-edge contour of the rings being assembled. It will be understood that said plane jaw members have thickness equalling that of the rings being assembled, and hence the axial depth of the cut-out 20 corresponds to that of the axial thickness of said rings. It is also to be noted that the free end of the aforesaid rail 13 terminates just short of said jaw members 18, 18a whereby it is free to flex without obstruction by said jaw members.

As will be understood from my prior application Serial No. 558,041 aforesaid, a plurality of retaining rings R to be assembled are mounted in stack formation on the stack rod 13 and are positively fed in a generally horizontal path by spring means preferably comprising a flexible tape 22 normally urged to coiled position within a reel housing 23 by means of a spring (not shown) contained therein, the free end of the flexible tape being affixed to
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Illustratively, movement of the slide block 24 towards the applicator blade 16 is limited by a stop lug 25 over which the spring rail 13 extends and which also serves to prevent undue flexing of the same at the free end of said rail during the assembly operation. Consequently to the spring pressure exerted by the aforesaid spring means on the rear (right) end of the stack of rings mounted on said rail, the rings are positively biased to move into the applicator blade cut-out 20 when free to do so. To prevent the rings from being pushed from bottom to top through the said slot by the applicator blade, the latter mounts a slide 26 which is normally biased upwardly to a cut-out closing position shown in Fig. 1 by means of a spring 27. However, the slide is free to partake of retraction movement with respect to the applicator blade upon its forward (topmost) edge being abutted by a workpiece being pressed against same in the ring-assembly operation.

From the above it will be appreciated that a tool as aforesaid functions both to dispense single retaining rings from a stack therefrom disposed in generally horizontal relation and to assemble each said ring in the groove of a workpiece shaft or pin responsive to the workpiece being positioned horizontally above the applicator blade 20 and so that its groove is in vertical alignment with the ring cut-out 20 of the applicator, followed by lowering of the workpiece so that the grooved portion of the shaft or pin moves into said cut-out, thereby to pick off and place the most advanced ring of the stack thereof in then in the "assembly readiness" position. Consequently to the workpiece moving vertically downwardly, it abuts against the top edge of the retractable slide 26, causing the latter to retract as is necessary for the shaft or pin to move into the applicator cut-out. However, upon the workpiece being withdrawn, the slide follows the same, thus again moving to close the side of the cut-out against which the stack of rings is pressed.

It will be obvious that the heretofore manual horizontal positioning of the workpiece directly above the applicator blade, as well as its axial positioning necessary to the shaft or pin groove being exactly aligned with the applicator cut-out, plus the controlled feed movement of the workpiece to complete the assembly operation, requires a substantial degree of dexterity and skill on the part of the operator. To eliminate this requirement, the invention provides mechanical workpiece positioning and feed means which will now be described: As best seen in Figs. 1 and 4, such means includes a vertically disposed push rod or plunger 30 mounted for reciprocatory movement in a guide means 31 (to be described) which is affixed to the frame 11 and prevents to the front-edge flange 14 thereof. Said plunger is normally maintained in elevated position (Fig. 1) by means of a spring 32 reactive between the base 10 and the lower end of said plunger, but it is adapted to be activated downwardly by hand pressure on its upper end, which, for this purpose is preferably formed as a rounded knob 35a. Adjacent its upper end the plunger 30 is provided with a horizontal through opening 33 arranged with its axis disposed parallel to that of the applicator cut-out 20 and having diameter as readily yet snugly to receive the workpiece W, illustratively a cylindrical sleeve 34 with shaft pin 35 horizontally for the length of the slot as required to fix the forward end of the finger at the exact position that it is abutted by the adjacent end of the workpiece upon the latter being inserted in the plunger opening 33 the right amount required to align the workpiece groove g with the applicator cut-out 20 of the applicator blade. The operation of the plunger automatically effects assembly of the endmost ring then in the "assembly readiness" position within the blade cut-out in said groove g.

According to a further feature of the invention, movement of the plunger 30 as aforesaid is entirely independent of that of the slide 26, of course excepting movement of the slide resulting from the latter being engaged by a workpiece inserted in the plunger opening 33. That is to say, without a workpiece cooperated therewith as aforesaid, the plunger 30 may be freely depressed without corresponding retracting movement of the slide 26, as is a feature of advantage when it is desired to demonstrate the operation of the tool, for example, without at the same time pushing the stack of rings completely through the ring cut-out, as could happen if the slide were retracted without the workpiece or some other element being actually retracted thereby to pick off and place the most advanced ring of the stack thereof in the "assembly readiness" position. Consequently to the workpiece moving vertically downwardly, it abuts against the top edge of the retractable slide 26, causing the latter to retract as is necessary for the shaft or pin to move into the applicator cut-out. However, upon the workpiece being withdrawn, the slide follows the same, thus again moving to close the side of the cut-out against which the stack of rings is pressed.

Illustratively, the plunger guide means 31 are secured to the tool frame flange 14 by the same seated-head bolts 43, 45 which secure the applicator blade 16 in place. However, other securing means individual to said guide means and said applicator blade may be substituted if desired.

Without further analysis, it will be seen that the above described combination retaining-ring dispensing and applying means incorporating workpiece positioning and feeding means achieves the desirable features and objectives therefor explained in the foregoing. However, as many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. Means for dispensing open retaining rings singly from a supply thereof and for applying the single rings to grooved shafts, pins and the like, including, in combination, a vertically disposed applicator blade terminating at its upper end in a pair of resilient jaws defining a semi-circular ring-receiving cut-out for a single ring which opens upwardly, retractable means slidably mounted on said applicator blade and normally closing one side of the cut-out, means disposed on the other side

2. Means
of the cut-out for maintaining a supply of the retaining rings being assembled in substantially horizontal alignment with one another and with said cut-out, spring means positively biasing said rings towards said cut-out and effective to cause said rings to feed one-by-one to the cut-out upon said cut-out being conditioned to receive same means for positively feeding a grooved shaft and the like into said cut-out so as to effect transfer of a ring contained in the cut-out to the groove of said shaft including, a vertically disposed plunger mounted for vertical reciprocating movement in a plane closely adjacent to but which is offset relatively forwardly of the applicator blade and retractible means mounted thereon an amount permitting the plunger to reciprocate independently of said retractible means and without engaging the applicator blade, said plunger having provision adjacent its upper end for receiving the grooved end of said shaft and being operative to dispose the same vertically above the applicator blade and with its axis horizontal and parallel to that of said cut-out, and means for locating said shaft end in an axial position such that its groove is vertically aligned with said cut-out whereby said plunger is adapted when actuated in downward direction to lower the shaft into said cut-out with its groove in exact alignment therewith, and spring means normally maintaining said plunger raised and being also effective to return said plunger to raised position following downward actuation thereof.

2. Means for dispensing and applying open retaining rings substantially as set forth in claim 1, wherein said plunger provision includes a horizontally disposed through opening in which said shaft and the like is insertible, said opening having its axis parallel to that of the cut-out and being at a level as normally to position said shaft above said applicator blade as aforesaid.

3. Means for dispensing and applying open retaining rings substantially as set forth in claim 1, wherein the means for axially locating said shaft and the like as required to vertically align the groove of said shaft with the cut-out comprises a stop finger engageable by the end face of the shaft end received in said plunger provision.

4. Means for dispensing and applying open retaining rings substantially as set forth in claim 1, wherein said plunger provision includes a through opening for receiving said shaft, pin or the like, and whose axis is parallel to that of the cut-out, and which is disposed at a level as normally to position said shaft above the applicator blade as aforesaid, and wherein said shaft-end locating means comprises a stop finger operative to limit the depth of insertion of the shaft in said plunger opening to that required to vertically align the groove of said shaft with the applicator blade cut-out.

5. Means for dispensing open retaining rings singly from a supply thereof and for applying the single rings to grooved shafts, pins and the like comprising, in combination, a vertically disposed support, a vertically disposed applicator blade fixedly carried along one side edge of said support, said blade terminating at its upper end in a pair of resilient jaws defining a substantially semicircular upwardly opening cut-out for a single ring moving horizontally thereinto, means extending generally along the top edge of said support for maintaining a plurality of the rings to be assembled in horizontal alignment with one another and with said cut-out, spring means effective on said plurality of rings for feeding the most advanced ring to said cut-out, vertically disposed plunger-guide means affixed to said side edge of the support a small distance forwardly of said applicator blade, a plunger mounted in said guide means for vertical reciprocatory movement, in a plane which is disposed relatively forwardly of the applicator blade an amount permitting the plunger to reciprocate without engaging said applicator blade, spring means normally maintaining said plunger in raised position, the plunger being provided in its upper portion with a transverse opening of size to snuggly receive the grooved end of a shaft, pin or the like on which a retaining ring is to be assembled, said opening being normally disposed above and with its axis parallel to that of said cut-out, means on said support disposed in substantially horizontal alignment with said opening when the plunger is in its normal raised position for limiting the amount of insertion of said shaft end into said opening to that required to vertically align the groove of said shaft with the cut-out, said plunger being provided at its upper end with a hand knob to facilitate its being lowered by hand pressure against the force of said spring means thereby to feed a shaft, pin or the like inserted in the plunger opening and with its groove positioned to receive a ring contained in the cut-out to said applicator.

6. Means for dispensing and applying open retaining rings substantially as set forth in claim 5, wherein said stop means is adjustable horizontally thereby to accommodate said means to the assembly of rings on shafts whose grooves are differently located along the length thereof.

7. Means for dispensing and applying open retaining rings substantially as set forth in claim 5, wherein said applicator blade mounts a retractible slide serving normally to provide a side-face closure for said cut-out and being retracted by engagement therewith of the shaft feeding to said applicator.

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