July 21, 1959 H. ERDMANN 2,895,214

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

Filed Dec. 12, 1956 4 Sheets-Sheet 1

FIG. 1

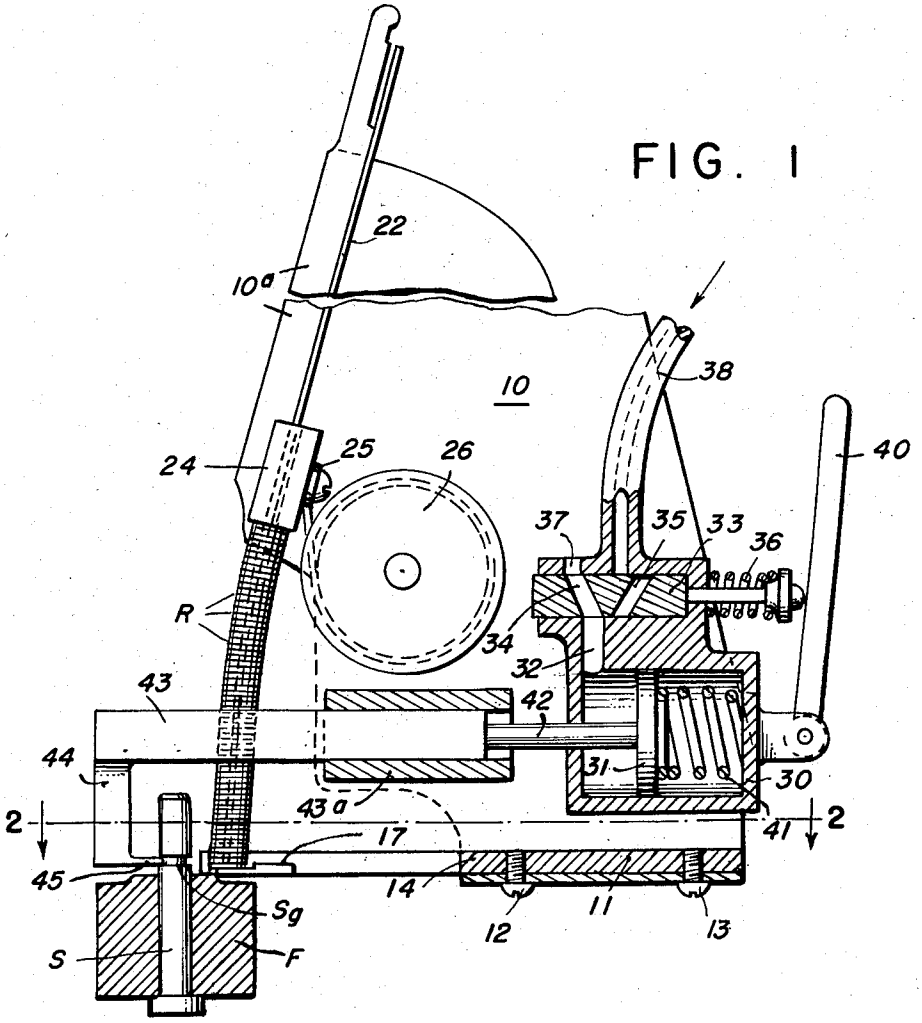
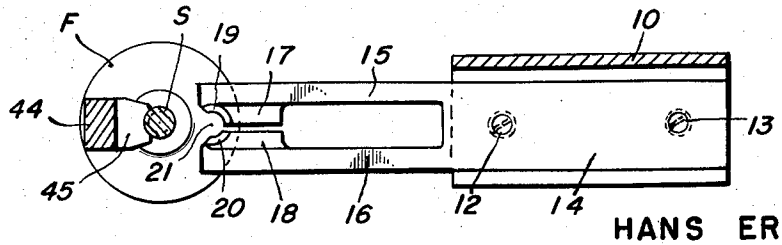


FIG. 2



INVENTOR
HANS ERDMANN

BY J. Harold Kilcoyne

ATTORNEY

July 21, 1959 H. ERDMANN 2,895,214

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

Filed Dec. 12, 1956 4 Sheets-Sheet 2

FIG. 3

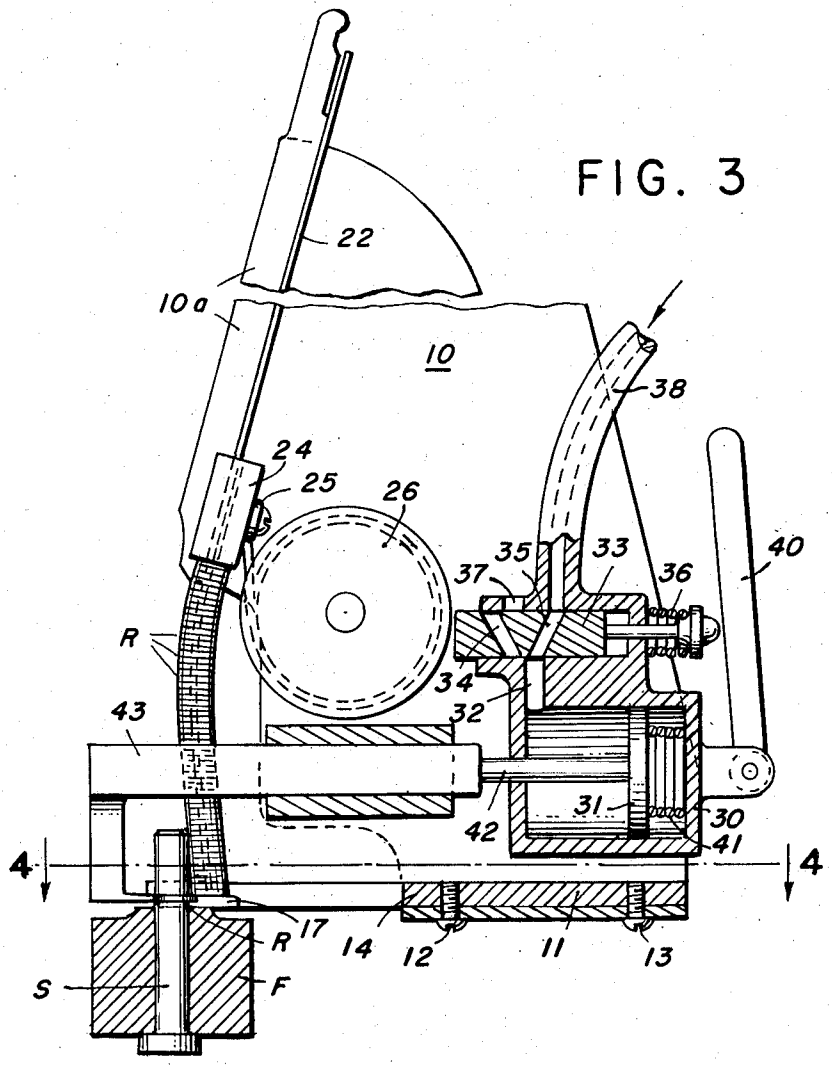
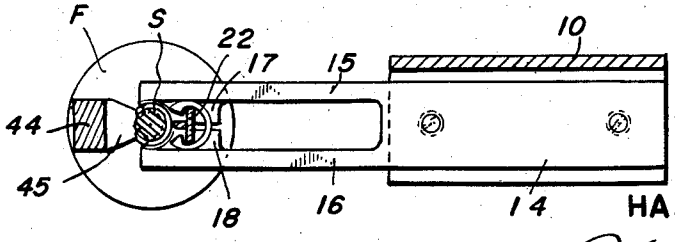


FIG. 4



INVENTOR
HANS ERDMANN

BY J. Harold Kissane

ATTORNEY

July 21, 1959 H. ERDMANN 2,895,214

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

Filed Dec. 12, 1956 4 Sheets-Sheet 3

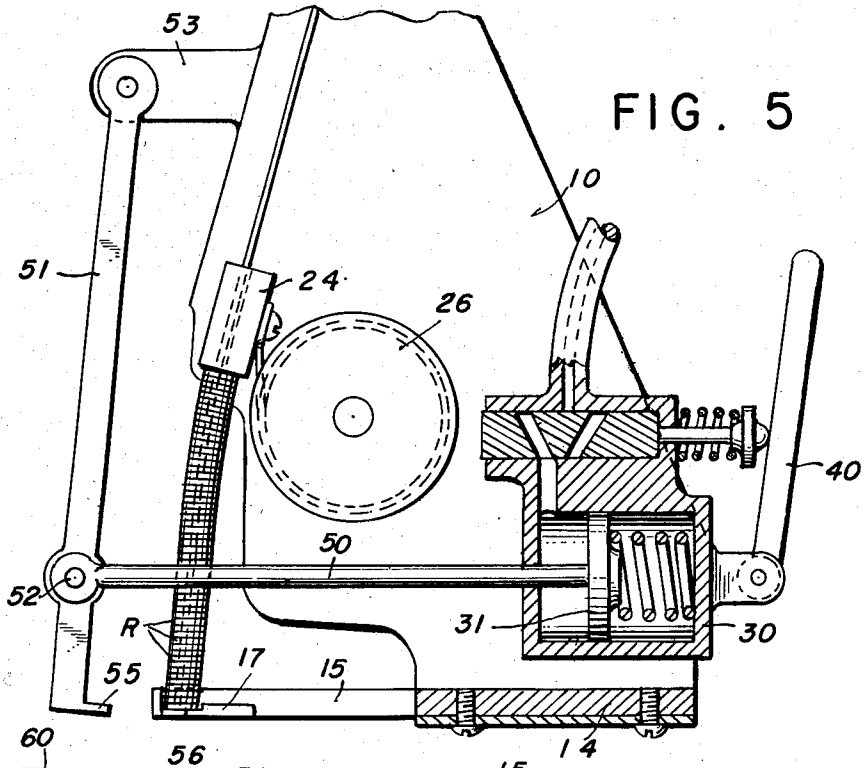


FIG. 5

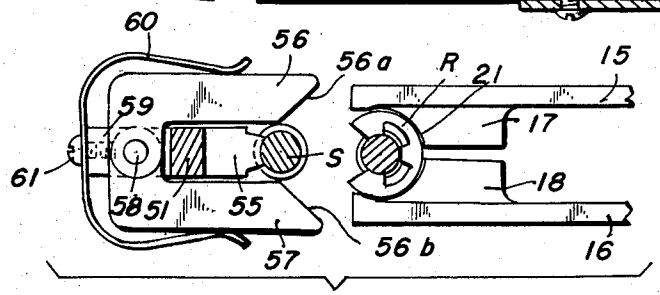


FIG. 6

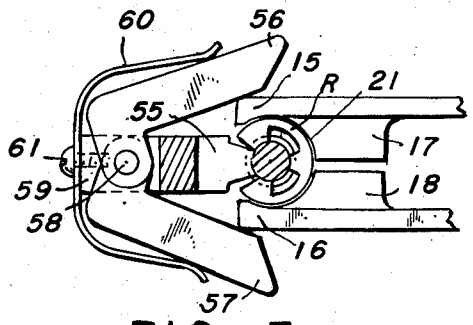


FIG. 7

INVENTOR

HANS ERDMANN

BY J. Harold Kilcoyne

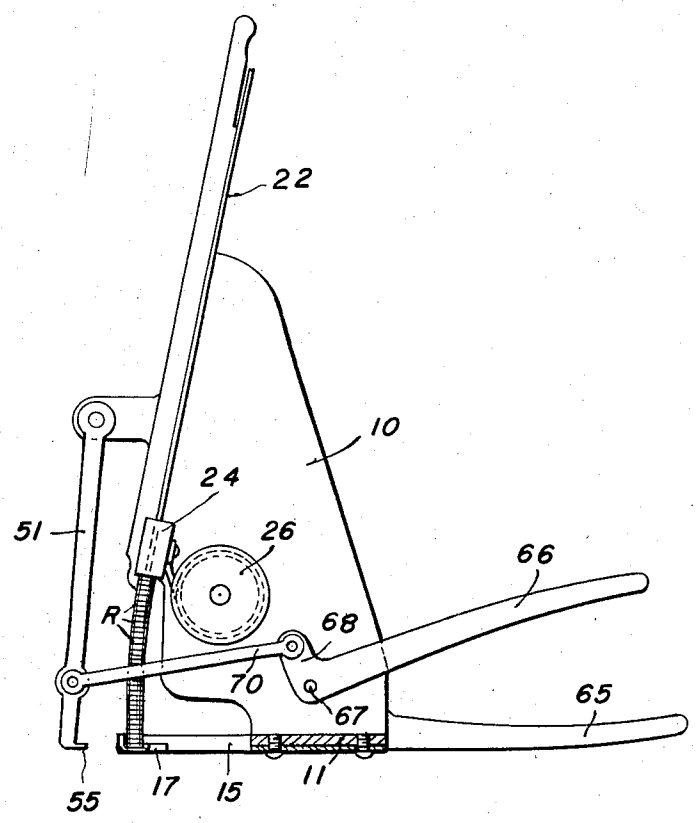
ATTORNEY

July 21, 1959 H. ERDMANN 2,895,214

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

Filed Dec. 12, 1956 4 Sheets-Sheet 4

FIG. 8



INVENTOR
HANS ERDMANN

BY J. Harold Kilcoyne
ATTORNEY

United States Patent Office 2,895,214 Patented July 21, 1959

2,895,214

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

Hans Erdmann, Maplewood, N.J., assignor to Waldes Kohinoor, Inc., Long Island City, N.Y., a corporation of New York

Application December 12, 1956, Serial No. 627,865

10 Claims. (Cl. 29—229)

This invention relates to improvements in means for assembling open retaining rings on shafts, pins, or the like (hereinafter for convenience termed a "workpiece), and more particularly to an improved combination ring dispensing and applying tool featured by special means for aligning the applicator member of the tool with the workpiece groove as insures not only that a ring to be assembled is initially presented to the workpiece in exact alignment with said groove, but also that such alignment is maintained until the ring is fully assembled.

Various forms of such tools incorporating guide means which serve to present the ring being assembled to the workpiece in alignment with a groove thereof are disclosed and claimed in my prior copending applications Serial No. 485,785, filed February 2, 1955, and Serial No. 508,264, filed May 13, 1955, now abandoned. However, while highly effective in initially guiding the ring into the workpiece groove, the prior guide means were found to be open to the objection of failing to maintain the ring-to-groove alignment until the ring has been fully assembled, with the result that such guide means did not fully realize their intended purpose.

Stated broadly, an object of the invention is the provision of guide means for a combination retaining ring dispensing and applying tool, which is fully effective not only to initially present a ring to the groove in which it is to be assembled in exact alignment therewith, but which is also equally effective to maintain such alignment until the ring has been fully assembled.

Another important object of the invention is the provision of a combination ring dispensing and applying tool having ring-to-groove guide means as aforesaid, which is so constructed and arranged as to permit the operator to manually engage the tool with the grooved workpiece in position as insures that the ring to be assembled is initially in accurate alignment with its groove, and which thereupon is mechanically operated to positively drive the workpiece and applicator relatively towards one another, as results not only in the ring being fully assembled, but also in the desired exact alignment of ring-with-groove being maintained during the assembly operation.

Yet another object of the invention is the provision of a powered combination ring dispensing and applying tool for assembling open retaining rings on grooved workpieces such as shafts, pins and the like, which incorporates improved guide means serving both to initially present each ring being assembled in accurate alignment with the workpiece groove in which assembly is to be effected and thereupon to maintain such alignment during the course of the assembly operation.

A still further object of the invention is the provision of a combined ring dispensing and applying tool as last aforesaid characterized in that the guide means takes the form of a tool locating and guide finger adapted to be inserted into the workpiece groove by hand from the side thereof opposite that from which the ring being assembled enters the groove, and by a fluid-pressure operated motor for positively actuating the finger towards the applicator member of the tool, thereby to impart relative approach movement of finger and applicator member as results in the ring being positively forced into its groove during the time that the finger is exercising its ring-guiding function.

The above and other objects and advantages of the invention will appear from the following detailed description thereof, in which reference is had to the accompanying drawings illustrating various forms which the ring-to-tool guide means as herein proposed may take, in which:

Fig. 1 is a side elevation, partly in section, of a combined ring dispensing and applying tool incorporating an improved ring-to-groove guide means according to the invention, the view illustrating the guide-means finger as initially inserted into the workpiece groove and prior to its being positively actuated throughout its working (ring assembling) stroke;

Fig. 2 is a section taken along line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 1 but illustrating the position and relation of parts when the finger has completed its working stroke as results in the bottommost ring of the column thereof being positively driven into its groove;

Fig. 4 is a section taken along line 4—4 of Fig. 3;

Fig. 5 is a view similar to Fig. 1, illustrating a modified form of guide-finger actuating means;

Figs. 6 and 7 are views similar to Figs. 2 and 4, respectively, which illustrate the action of additional tool-to-workpiece centering jaws with which the tool may be supplied; and

Fig. 8 is a view illustrating another form of combined ring dispensing or applying tool more suited for use with small-size rings, which is similar in certain respects to the Fig. 5 form but employs a simpler plier-handle type of actuating means.

Referring to the drawings, and more particularly to Figs. 1–4, reference numeral **10** designates a tool bracket or frame having an angled foot flange **11**, to the upper face of which is secured, as by screws **12**, **13**, one end of a blade-like applicator member **14**. While the herein tool is illustrated in a position such that its frame **10** extends vertically and its applicator blade **14** extends horizontally, it will be understood that the tool may be set up and/or held in any desired position necessary to a particular application or usage.

The aforesaid applicator blade **14** as usual comprises a pair of resilient arms **15**, **16** terminating at their free ends in ring-gripping jaws **17**, **18**, having thickness corresponding to the axial thickness of one of the retaining rings being assembled and semi-circular end edges **19**, **20**, which latter together form a ring recess or cut-out **21**. Connected to the frame **10** in position to extend substantially at a right angle to the recess at the free end of the applicator blade **14** is a spring rail **22** functioning as a so-called stack rod. Preferably, the rail is secured along one end portion to the edge of a U-bent extension **10***a* formed along the front side edge of the frame **10**, thereby to dispose the rail slightly spaced from and at a right angle to the frame. The aforesaid frame extension **10***a* terminates a substantial distance above the applicator blade **14**, such resulting in the lower end portion of the spring rail **22**, which is unsecured and terminates just short of the upper line of the recess **21**, extending as a spring leaf towards the applicator blade.

As is well understood, the stack rod **22** has width only slightly less than the inner diameter of a plurality of the open rings R being assembled which are stacked thereon in column formation, said rings, as seen in Fig. 4, being

usually formed with middle and end lugs or protrusions extending radially inwardly from their inner edge. Accordingly, when a plurality of open rings R turned so that their open ends face in the same direction as the cut-out **21** are threaded on the stack rod **22**, they are slidable along the stack rod but nevertheless held thereto by their end lugs. Illustratively, means for positively feeding the rings along the rail **22** on which they are stacked towards the applicator recess **21** is provided, such preferably including a slide block **24** slidable on the rail **22** and being urged toward the applicator **14** by a tape **25** wound on a spring-loaded reel **26**, all as disclosed in my copending application Serial No. 538,041, filed October 3, 1955.

As will be understood from my said prior application, the flexible lower end of the stack rod **22** permits the endmost ring of the column thereof feeding along the stack rod, and which is gripped in "assembly-readiness" position in the applicator recess **21**, to be assembled in its workpiece groove without interference resulting from engagement of the next endmost rings of the column with the workpiece. That is to say, and as shown in Fig. 3, the lower end of the stack rod flexes rearwardly when such engagement occurs, as results in said next endmost rings also moving rearwardly on to the upper surfaces of the aforesaid gripping jaws **17**, **18**.

Also mounted to the frame **10** is a fluid-pressure motor comprising cylinder **30** and its piston **31**. Pressure fluid, preferably compressed air, is supplied to and exhausted from the piston-rod end of the cylinder through a common air inlet and exhaust passage **32** controlled by a slide valve **33** which is provided with an air inlet port **34** and an air exhaust port **35**. In one end position of the valve **33**, to which it is normally urged as by a spring **36**, valve port **35** connects the passage **32** to a cylinder exhaust opening to atmosphere, designated **37**, the valve in such position closing off communication between a compressed air line **38** and the cylinder interior. However, when slide valve **33** is actuated to its other end position, as by means of a pivoted, operator-controlled handle **40** provided for this purpose, valve port **34** establishes communication between the compressed air line **38** and the passage **32** to the cylinder interior. When such communication is established, the piston **31** is actuated throughout its working stroke against the bias of spring **41** interposed between said piston and the head end of the cylinder, this spring, it will be understood, returning the piston **31** to normal (leftwise) position when the slide valve **33** returns to its normal (rightwise) position under the urge of spring **36**.

Reciprocatory travel of the piston **31** within the cylinder **30** is transmitted by piston rod **42** to a preferably squared extension **43** thereof which has a sliding bearing in a correspondingly squared bearing sleeve **43***a* affixed to a face of the frame **10** to which the air motor is mounted. It will be observed that the length of the squared piston-rod extension **43** is substantial and thus its outer end overhangs the free end of the applicator blade **14**. Connected to said outer overhanging end is a depending arm terminating at its lower end in a finger **45** which points toward the recessed end of the applicator blade **14** and is disposed both parallel to the squared piston-rod extension **43** and in the plane containing the aforesaid ring recess **21**. As seen in Fig. 2, the inner free edge of the finger **45** is preferably shaped to extend along an arc of radius corresponding to shaft groove radius and said finger is normally spaced substantially from the applicator blade recess **21**, thereby to permit the end of a grooved shaft to which a ring is to be assembled to be freely inserted between finger and applicator blade. Moreover, the thickness of the finger **45** substantially equals the axial thickness of a retaining ring and accordingly also substantially equals the width of the shaft groove *Sg*, whereby the finger is readily insertable in said groove but without any substantial play.

The operation of a combination ring applying and dispensing tool provided with ring-to-groove guide means as described is as follows: A shaft S (termed the workpiece), having a groove *Sg*, is mounted in a fixture F which may be and preferably is supported by a work-supporting means or table (not shown) mounted for reciprocatory movement toward and away from the fixed applicator blade, as disclosed in my aforesaid prior application Serial No. 538,041. A plurality of the open rings R to be assembled are mounted in column formation on the stack rod **22**, and accordingly the endmost (lowermost) ring of the column is contained in the applicator blade recess **21** in assembly-readiness position therein. With slide valve **33** urged to its normal (rightwise) end position by spring **36**, the air motor piston **31** is in its normal (leftwise) position, as results in the guide finger **45** being substantially spaced forwardly of the applicator recess **21**.

The tool is initially set manually; that is to say, it is moved over the grooved end of the workpiece S and is lowered thereon until the guide finger **45** is aligned with the groove *Sg*, whereupon the finger is inserted into the groove by hand, it being observed that the finger moves into the groove from the side thereof opposite that from which ring assembly is to be effected. Upon insertion of the finger **45** into the workpiece groove *Sg* aforesaid, the endmost ring R then in assembly-readiness position of necessity is in accurate alignment with said groove. To complete the assembly operation, it is only necessary for the operator to press on the handle **40**, as results in compressed air being admitted to the cylinder **30**. Such actuates piston **31** towards the head end of the air cylinder and causes positive movement of the finger **45** towards the applicator blade, as in turn results in the workpiece S being driven towards and finally into the applicator blade recess **21**, as is indicated in Figs. 3 and 4. Consequent to the finger **45** having located the workpiece groove *Sg* exactly in the plane of the ring contained in said recess, this forceful movement of the workpiece towards and into the applicator recess effects positive assembly of said ring in the workpiece groove. Moreover, since the finger is enabled to perform its aforesaid function only by its continued engagement with the bottom of the groove *Sg*, it is clear that it maintains exact ring and groove alignment during the entire ring assembly operation. Thus it will be appreciated that the herein guide means overcomes such objection as might be directed towards the ring-to-groove guide means of my prior applications Serial Nos. 485,785 and 508,264, namely, that the guide means did not continue to exercise its initial guiding function up until the instant that full ring assembly had been effected.

According to the Fig. 5 modification, a somewhat different although functionally similar means is employed to translate travel of the piston **31** throughout its working stroke into positive movement of the guide finger towards the applicator blade **14**. That is to say, the piston rod **50** (corresponding to the piston rod **42** of the prior modification) is extended well beyond the end of the applicator member **14** and is pivotally connected at its outer end to an arm **51** as by a pivot **52** located above the lower end thereof, said arm being pivotally connected at its upper end to the frame **10** via a sidewardly projecting lug **53** thereon. The lower end of the arm **51** terminates in a finger **55** corresponding in all substantial respects to the aforedescribed finger **45** of the prior modification. Accordingly, when handle **40** is pressed manually in counterclockwise direction, finger **55** (assuming same has been inserted in the workpiece groove in a preliminary operation) drives the workpiece towards and into the ring recess **21** of the applicator blade, thus to effect a powered seating of the ring contained in the recess in said groove, as in the prior modification.

To facilitate initial centering of finger **55** with respect to the workpiece, or vice versa, said arm **51** may be provided with centering means as illustrated in Figs. 6 and 7. Preferably, such means comprise a pair of

oppositely acting jaws **56, 57** having outwardly divergent free-end edges *56a, 57a*, the jaws being pivotally connected at their other ends to one another and to the arm **51** so as to swing in opposite directions. Preferably, such is effected by a pivot pin **58** having bearing in a shoulder or ledge **59** extending from the side of the arm **51** opposite that from which the finger **55** projects and which locates the jaws **56, 57** in a plane slightly above that of the finger **55**, whereby the jaws are adapted to bear on the periphery of the workpiece slightly above the groove, rather than to enter the groove. The jaws are shown to be biased to closed position by means of a U-shaped spring **60** disposed so that its legs bear against the outer side edges of the jaws, the spring being secured in position as by means of a screw **61** threading into the aforesaid ledge **59**.

As will be understood from Fig. 6, the jaws **56, 57** serve to center the finger **55**, and thereby the tool as a whole, to the workpiece as the finger is initially inserted into the workpiece groove, the inclined or divergent free-end edges *56a, 57a* of the jaws automatically insuring the desired centered relationship of said parts. Moreover, the jaws do not interfere with the relative advance movement of the finger and applicator blade, since, as indicated in Fig. 7, the pivotal mounting of the jaws enables the forward ends of the applicator arms **15, 16** to cam the jaws outwardly when engaging the same.

For the ring of the small sizes for which the pneumatic or gun type drive as aforesaid may be impractical, a simpler plier-type tool as shown in Fig. 8 is recommended. Preferably, such a tool retains the feature of mounting the guide finger **55** at the lower end of a pivoted arm **51** characterizing the Fig. 5 form of tool, but substitutes for the fluid-pressure motor drive of said form a simpler plier-type finger drive or actuating means. As illustrated, such comprise a plier-type handle arm **65** affixed to and extending rearwardly from the tool frame **10**, a cooperatively related swinging handle arm **66** pivoted to said frame as at **67** to swing toward and away from said fixed handle arm. The swinging handle arm **66** constitutes one arm of a bellcrank lever whose other arm **68** is connected to one end of a connecting rod or link **70** connected at its other end to the aforesaid pivoted swing arm **51**, similarly to the piston **50** of the Fig. 5 form. Accordingly, the finger **55** may be driven throughout its working stroke, thereby to forcibly move the workpiece towards the ring in the assembly-readiness position in the applicator recess **21**, simply by compression of the handle arms **65, 66**, with opening of said handle arms serving to retract the finger, it being understood that the handle arms are biased to open position by suitable spring means (not shown).

Without further analysis, it is manifest that a combination ring dispensing and applying tool incorporating workpiece-to-tool guide means according to the invention achieves in simple, effective and thoroughly dependable manner the objectives of the invention as 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 assembling open retaining rings in the grooves of shafts, pins and the like comprising, in combination, a frame member, a blade-like applicator operatively mounted on said frame member and having a receiving recess to accommodate a retaining ring opening through its front end-edge, a ring magazine operatively affixed to said frame member and extending therefrom in position to mount a supply of the retaining rings to be assembled in alignment with the recess and with the endmost ring of the supply accommodated in said recess in assembly-readiness position, means for aligning said endmost ring with the groove of a shaft in which ring assembly is to be effected preliminary to the assembly operation and being also effective to positively drive the shaft into the applicator recess during said assembly operation comprising a finger operatively associated with the applicator and being disposed forwardly and in the plane of, and pointing towards, the applicator recess, said finger having a thickness substantially equaling the thickness of a retaining ring, means positioned on said frame member mounting said finger for reciprocatory movement towards and away from said applicator recess, and means for actuating said finger throughout its reciprocatory travel as aforesaid, the construction and arrangement being such that preliminary to the assembly of said endmost ring in its groove said finger may be inserted in such groove of a shaft interposed between the finger and applicator and from the side of the groove opposite the applicator recess thereby to align the groove with said endmost ring, and thereupon said finger may be reciprocated towards the applicator thereby to effect forcible assembly of said endmost ring in the groove while the finger is maintained inserted therein.

2. Means for assembling open retaining rings in the grooves of shafts, pins or the like substantially as set forth in claim 1, wherein said finger-actuating means comprises a fluid-pressure motor operatively mounted on said frame member and manually operated valve means for controlling operation of said motor.

3. Means for assembling open retaining rings in the grooves of shafts, pins or the like substantially as set forth in claim 2, wherein said guide finger is operatively connected to the piston of said motor so as to be actuable thereby.

4. Means for assembling open retaining rings in the grooves of shafts, pins or the like substantially as set forth in claim 1, wherein said actuating means comprises a fluid-pressure motor including a piston driving a piston rod, and wherein the guide finger depends from said piston rod and moves in a plane substantially parallel thereto.

5. Means for assembling open retaining rings in the grooves of shafts, pins or the like substantially as set forth in claim 1, wherein said finger is additionally provided with a pair of spreadable oppositely acting jaws for engaging the shaft during insertion of the finger in the shaft groove, thereby to center the finger with respect to the shaft in its movement into the groove.

6. Means for assembling open retaining rings in the grooves of shafts, pins or the like substantially as set forth in claim 1, wherein said finger-actuating means comprises a fluid motor including a piston driving a piston rod, said piston rod being connected to a depending arm from which said guide finger extends in generally lateral direction, said arm carrying a pair of oppositely acting jaws for centering the finger with respect to the shaft on which ring assembly is to be effected.

7. Means for assembling open retaining rings in the grooves of shafts, pins or the like substantially as set forth in claim 6, wherein said jaws terminate in oppositely tapered edges adapted to engage against a shaft during insertion of the finger in the groove thereof, said jaws being pivoted for opposite spreading movement, and spring means effective on said jaws for urging them to relatively closed position.

8. Means for assembling open retaining rings in the grooves of shafts, pins and the like substantially as set forth in claim 1, wherein said finger-actuating means comprises a pair of plier-type handle arms operatively connected to the finger in such manner that compression of said handle arms imparts positive movement of the finger towards the applicator.

9. Means for assembling open retaining rings in the grooves of shafts, pins and the like substantially as

set forth in claim 1, wherein said finger is mounted at the free end of an arm mounted for swinging movement about an axis spaced a substantial distance from the applicator, and said finger actuating means comprises a pair of pivotally related plier-type handle arms, one of said handle arms being operatively connected to said swinging arm adjacent its free end, whereby compression of said handles imparts positive movement of the finger towards the applicator.

10. Means for assembling open retaining rings in the grooves of shafts, pins or the like substantially as set forth in claim 1, wherein said applicator includes a pair of resiliently interconnected jaws defining said recess and wherein said ring magazine comprises a spring rail maintaining the supply of retaining rings in column formation.

References Cited in the file of this patent

UNITED STATES PATENTS

1,073,280	Owen	Sept. 16, 1913
1,459,020	Eytchison	June 19, 1923
1,596,678	Miller	Aug. 17, 1926
1,959,888	Wilkins	May 22, 1934
1,983,397	Polzer	Dec. 4, 1934
2,091,500	Clark	Aug. 31, 1937
2,145,461	Smith	Jan. 31, 1939
2,172,847	Nydegger	Sept. 12, 1939
2,208,819	Smith	July 23, 1940
2,480,037	Luckins	Aug. 23, 1949
2,483,379	Brell	Sept. 27, 1949
2,650,722	Stabile	Sept. 1, 1953
2,712,398	Erdmann	July 5, 1955
2,769,978	Berluti	Nov. 13, 1956