

Feb. 11, 1947.

J. H. GREENOUGH

2,415,482

COLLET

Filed March 10, 1944

4 Sheets-Sheet 1

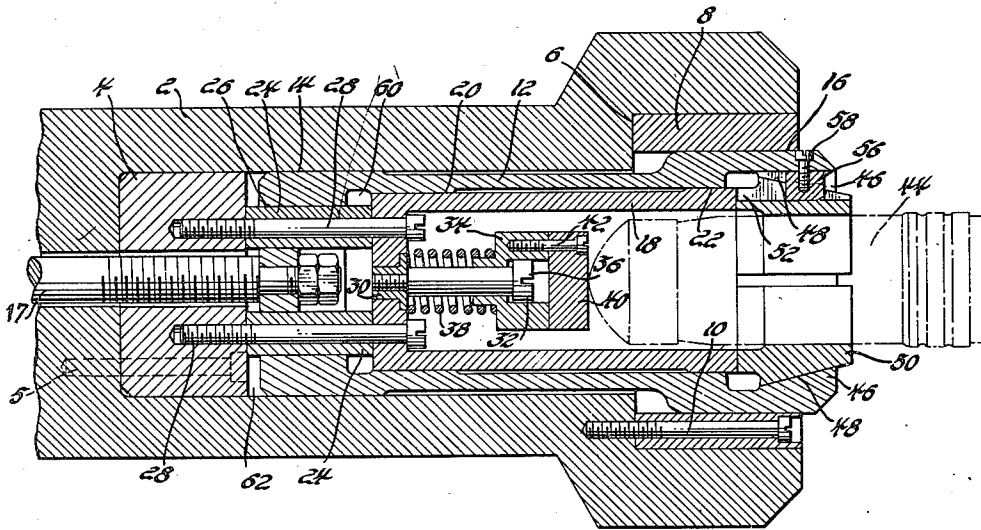


Fig. 1

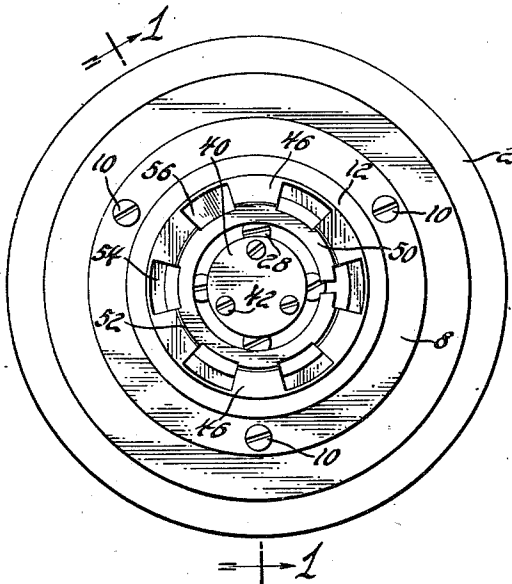


Fig. 2

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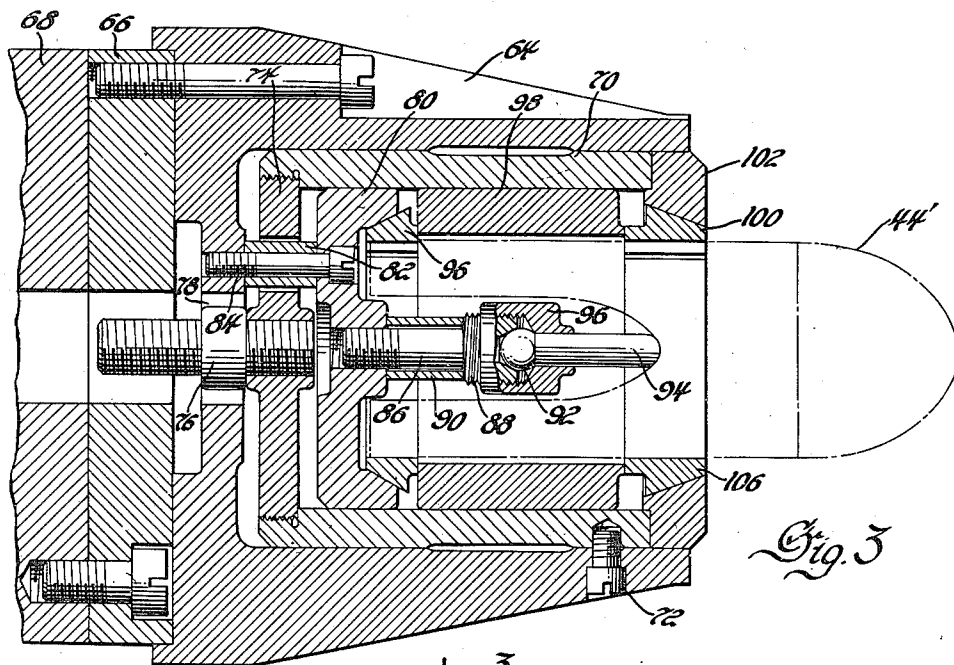


Fig. 3

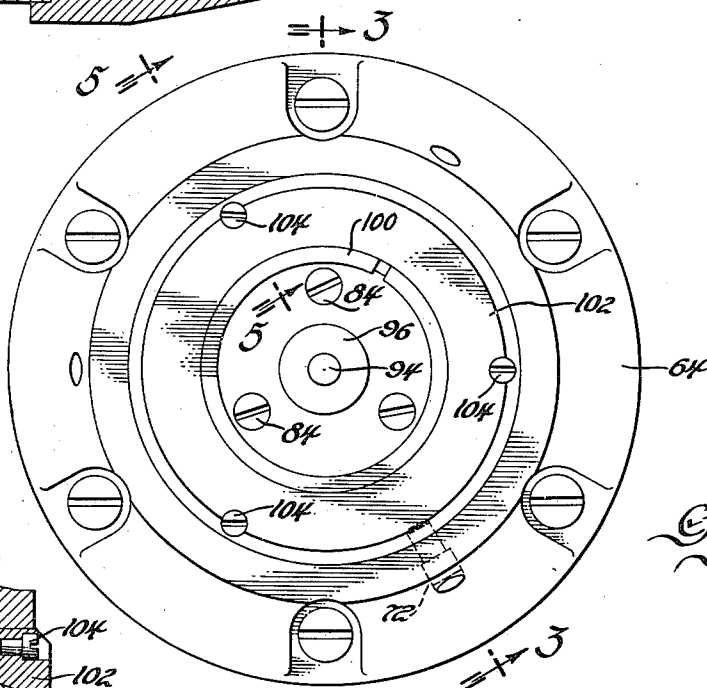


Fig. 4

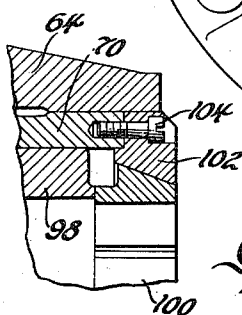


Fig. 5

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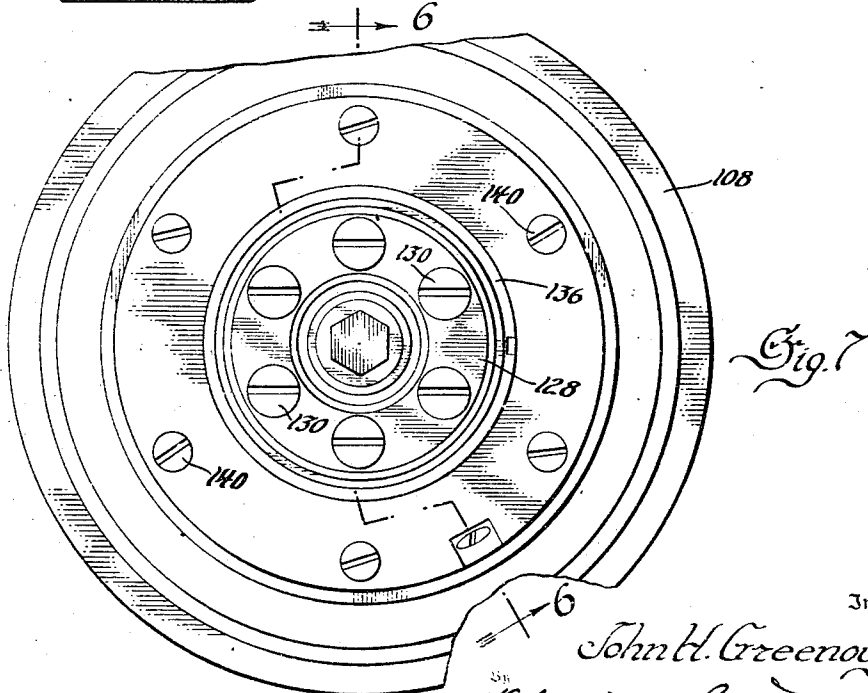
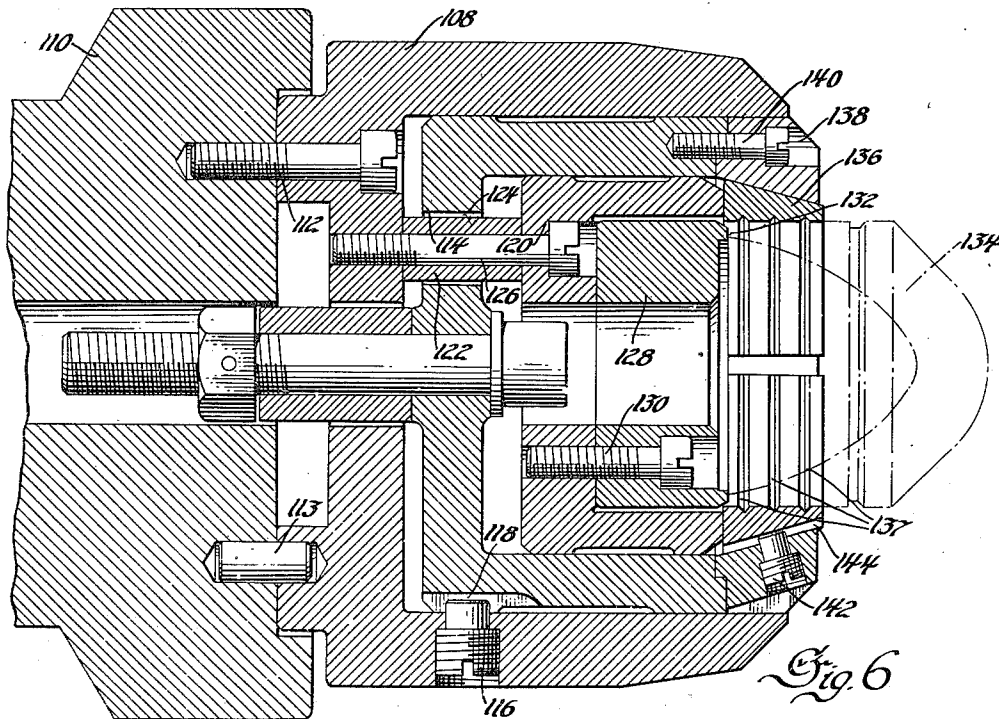
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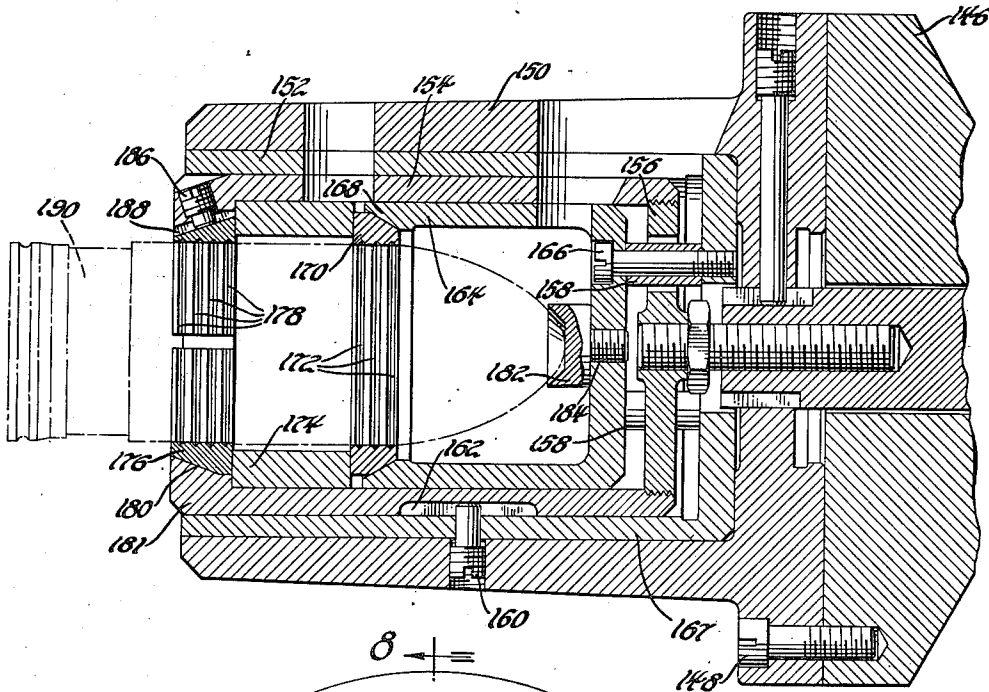


Fig. 8

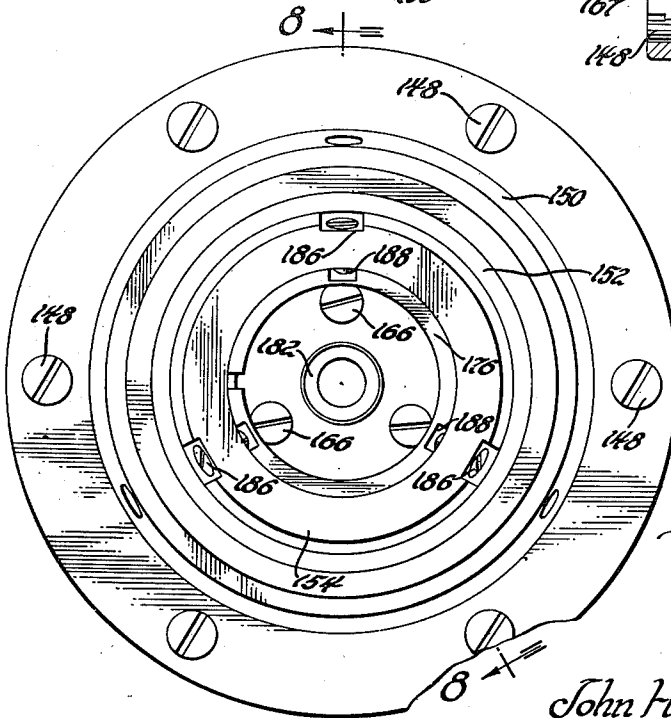


Fig. 9

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UNITED STATES PATENT OFFICE

2,415,482

COLLET

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5 Claims. (Cl. 279—50)

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This invention relates to improvements in collets adapted particularly to large volume production.

In large volume production on 75 mm. and 3" armor piercing shot, certain weaknesses or undesirable characteristics were revealed in standard collets and these weaknesses led to the development of the improved type of collet of the present invention. A number of species of collets are shown on the drawings to illustrate the invention. The improved collets enable a saving in critical material, have better gripping power and stability, and lower maintenance and initial cost. The main novelty to the invention is in the installation or the mounting of the collet rings.

Referring to the drawings:

Figure 1 is a longitudinal section through one type of collet installation applied to the usual spindle.

Figure 2 is an end view of the structure of Figure 1 looking from the right.

Figures 3 and 4 are views similar to Figures 1 and 2, respectively, of a second species, Figure 3 being taken on the line 3—3 of Figure 4.

Figure 5 is a sectional detail on the line 5—5 of Figure 4.

Figures 6 and 7 are views similar to Figures 1 and 2, respectively, of a third species, Figure 6 being taken on the line 6—6 of Figure 7.

Figures 8 and 9 are views similar to Figures 1 and 2, respectively, of a fourth species, Figure 8 being taken on the line 8—8 of Figure 9.

Referring to Figure 1, the numeral 2 indicates the spindle of the machine. The spindle is hollow and in the bottom thereof a base 4 is secured by the screws 5. The spindle 2 has an interior shoulder 6 at its front and on this shoulder in the front of the spindle there is mounted a hardened sleeve 8. The sleeve is held in the spindle by means of the screws 10.

An actuating cup-shaped sleeve 12 is slidably positioned in the spindle 2 and bears on the spindle at 14 and on the sleeve 8 at 16. A draw-bar 17 secured to the base of the sleeve 12 transmits slide adjustment to project and retract the sleeve and hold it in set position. An inner supporting cylinder 18 is positioned in the actuating cylinder and bears thereon at 20 and 22. Spacers 24 are placed between the base 4 and the end of the supporting sleeve 18. Openings 26 in the bottom of the actuating sleeve 12 enable the spacers to pass therethrough. The spacers also prevent the sleeve 12 from turning. The bottom of the supporting cylinder has openings which mate with openings in the spacers to enable the

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passage of screws 28. These screws are threaded into the base 4 and rigidly hold the base, the spacers 24 and the supporting cylinder 18 together.

The bottom of the supporting cylinder 18 has an internally threaded sleeve 30 mounted therein. A post 32 is screwed into this sleeve and a cap 34 is positioned on the post and held thereon by the head 36 of the post. A compressed coil spring 38 is positioned between the cap 34 and the bottom of the supporting sleeve 18 and always urges the cap toward the position shown in Figure 1. A seat 40 is placed on the cap 34 and secured thereto by screws 42. Parts 30 to 42 inclusive form a locating device for the work 44.

The outer end of the actuating sleeve 12 has its inner circumference formed into teeth 46 the inner faces of which are inclined as shown at 48. A split collet ring 50 is received in the toothed end of the sleeve 12. This collet ring has external teeth 52 equivalent in number to the teeth on the sleeve 12. The teeth 52 are tapered on their outside faces, as shown at 48, to correspond to the taper on the inner faces of the teeth 46. The teeth 52 are not as wide as the spaces 54 between the teeth 46. This difference in width enables the ring 50 to be inserted from the front of the spindle and then rotated sufficiently to cause the inclined faces of the teeth to mate or be in face contact with each other. When the collet ring is assembled in the end of the actuating sleeve 12, a key 56 is positioned in one of the mating spaces between the teeth 46 and 52 and this key is rigidly retained in place by a screw 58 which passes through the actuating sleeve and is screwed into the key 56. The collet ring 50 is thus retained within the nose of the actuator and in end to end abutment with the sleeve 18 but can be removed by first removing the screw 58 and the key 56 and then rotating the ring until its teeth 52 mate with the recesses between the teeth 46 on the sleeve. The ring can now be withdrawn and repaired or a new ring substituted.

A certain amount of space is provided at 60 and 62 above and below the bottom of the actuating sleeve to provide room for the opening and the closing of the collet and for the take-up due to wear of the collet rings.

When the work 44 is inserted in the collet ring 50, the actuation of the usual draw bar connected to the actuating sleeve 12 will cause the collet to grip the work for rotation with the spindle.

Figures 3, 4, and 5 show another species of an improved type of collet for a different shaped

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piece of work 44'. A housing is shown at 64 mounted on an adapter 66 which is secured to the spindle 68. The housing has positioned therein an actuating sleeve 70 held from turning relative to the spindle by screw 72 threaded into the housing with its end projected slidably in a longitudinal groove in the sleeve. The actuating sleeve has a bottom 74 screwthreaded thereinto and this bottom has screwthreaded axially thereinto one end of a post 76, the other end of which is screwthreaded into the usual drawbar (not shown). An opening 78 in the bottom of the housing allows the post 76 to pass therethrough.

Inside the sleeve 70 a rear closure cone 80 is positioned. This cone is spaced from the bottom of the housing by the tubular spacers 82 which pass through openings in the bottom 74 of the actuating sleeve. Bolts 84 pass through the closure cone and the spacers and are screwthreaded into the bottom of the housing.

The work locating device comprises the post 86 screwthreaded into the closure cone 80. The post 86 has a screwthreaded head 88, and a surrounding sleeve 90 limits the downward movement of the head. The top of the head has a ball-shaped recess to receive the ball end 92 of a locator pin 94. A cap 96 has an opening to enable the pin 94 to pass therethrough. The cap is threaded on the head 88 to hold the pin substantially in the position shown in Figure 3. The recess and ball head 92 enable movement of the locator pin 94 to accommodate for slight inaccuracies in the work 44', in this instance a projectile.

A rear split collet ring 96 has an outer conical surface to mate with and fit against the conical surface of the rear closing cone 80. A spacer 98 is received in the actuator sleeve 70 and abuts against the collet ring 96. Against the outer end of the spacer 98 there fits the front split collet ring 100. This front collet ring is held in place against the spacer by means of a ring-shaped retainer 102 which fits into the end of the housing 64. This retainer 102 is removably secured to the actuating sleeve by means of the screws 104 to enable ready replacement of worn collet rings. The retainer 102 and collet ring 100 have mating inclined surfaces as shown at 106.

In the operation of the species of Figures 3, 4, and 5, the operator inserts the piece of work 44' in the collet rings 100 and 96. The locator pin 94 will be received in the projectile 44' and limit its inward movement to the proper extent. Actuation of the cup-shaped sleeve 70 by the usual drawbar will draw the ring 102 toward the fixed abutment ring 80 and cause the collet rings 96 and 100 to grip the work and rotate the same with the housing 64.

Figures 6 and 7 illustrate a third species of improved collet ring application. The housing is indicated at 108 and is attached to the machine spindle 110 by bolts 112 and dowel pins 113. An actuating sleeve 114 is slidably mounted in the housing 108 and is held from turning by dog point screws 116 which pass through the housing and are received in grooves 118 in the sleeve. A ring support 120 is positioned in the sleeve 114 and is spaced from the bottom of the housing 108 by the cylindrical spacers 122 which pass through openings 124 in the bottom of the actuating sleeve 114. Bolts 126 pass through openings in the bottom of the ring support, through the spacers 122, and are screwthreaded into the bottom of the housing 108. A locator 128 is secured in the support 120 by means of bolts 130. The locator

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has a small part 132 of its surface machined so that it will accurately receive the work 134.

A split collet ring 136 is positioned in the structure with its inner face abutting against the end of the ring support 120. The ring 136 is preferably provided with three grooves 137 on its inner periphery. The outer periphery of the ring 136 is in the shape of the frustum of a cone and the collet ring is held in place by a retainer ring 138 which has an inner periphery shaped to fit against and cooperate with the outer periphery of the ring 136. The outer retainer ring 138 is removably held in place on the end of the sleeve 114 by screws 140 and enables ready replacement of worn collet rings. The collet ring 136 is held from turning relative to the retainer ring 138 by dog point screws 142 which enter grooves 144 formed in the outer periphery of the collet ring 136.

When the piece of work 134 is inserted in the collet ring, the movement of the slider sleeve 114 by the usual drawbar, not shown, will cause the collet ring to grip the work to cause it to turn with the spindle.

Figures 8 and 9 disclose a fourth species of the improved manner of installing or applying the collet rings. The spindle is indicated at 146 and to the spindle there is attached by means of screws 148 a housing 150. Inside the housing 150 a liner 152 is provided, and inside the liner an actuating sleeve 154 is mounted. The sleeve 154 has the bottom 156 screwthreaded thereinto, and this bottom is provided with suitable openings to enable the spacers 158 to pass therethrough. Dog point screws 160 pass through the housing 150, the liner 152, and enter grooves 162 in the actuating sleeve 154 to prevent the sleeve from turning. The screws 160 prevent the housing, the liner, and the sleeve from turning relative to each other.

A lower closing cone 164 is positioned inside the actuating sleeve 154 and screws 166 pass through the bottom of the closure cone 164, through the spacers 158 and are screw threaded into the bottom 167 of the liner 152. The spacers 158 keep the lower closing cone spaced from the bottom of the actuating sleeve 154. The forward edge or rim of the closing cone is internally truncated cone shaped or inclined as shown at 168, and seated on this inclined edge is the correspondingly inclined outer periphery of a lower split collet ring 170. The collet ring 170 has three grooves 172 on its inner periphery. A spacer cylinder 174 abuts at one end against the collet ring 172 and against the outer end there abuts the split upper collet ring 176 provided with four grooves 178 on its inner periphery. The outer periphery of the upper collet ring 176 is in the shape of a frustum of a cone. This frustum-shaped surface mates with or corresponds to a similarly shaped surface 180 on the inner edge of the ring 181 integral with the outermost part of the actuating sleeve 152, to hold the two collet rings 170 and 176 and the spacer 174 in assembled relation.

A locator 182 is positioned in the closing cone 164 and is secured to the bottom of the cone by the screwthreaded shank 184.

The upper collet ring 176 is prevented from turning relative to the actuating sleeve 154 by means of the dog point screws 186 which are screwthreaded in the sleeve and have their ends entering grooves 188 in the collet ring 176.

The work 190 is inserted in the collet rings until the end of the work strikes the locator. The work is then in a favorable position to be

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held by the collets. The rotation of the housing 150 by the spindle 146 will rotate the work gripped by the collet rings through the actuating sleeve 154.

When the screw 160 is backed out of its groove 162, the actuating sleeve 154 may be threaded off the bottom 156 and withdrawn to enable the repair or replacement of the collet rings.

I claim:

1. In a collet mounting means, said collet comprising a split ring adapted to be mounted in said means, a plurality of spaced teeth on the outer periphery of said ring, said teeth having inclined outer surfaces, a plurality of spaced teeth on the inside of said means, said teeth having inclined inner surfaces and being spaced apart to enable passage therethrough of the teeth of said ring, the inclined surfaces on said teeth on the ring and on the means cooperating with each other to retain the collet in the mounting means and to contract the ring upon relative axial movement of the ring and mounting means, and means secured to the mounting means and engaging the collet to prevent turning of the collet relative to the mounting means.

2. The structure of claim 1 wherein the last mentioned means comprises a block secured to the mounting means and projecting into the space between the teeth.

3. In a collet mounting means, a rotatable hollow housing, a cup-shaped actuator slidable axially within the hollow housing, a work gripping split ring contained within the open end of the cup-shaped actuator, means contained within the cup-shaped actuator inwardly of the ring and affording a bearing abutment to limit inward movement of the ring and outward sliding movement of the actuator, means to fasten said bearing abutment and the actuator to the housing comprising an anchorage post passing axially through an aperture in the base of the cup-shaped actuator and holding the abutment in fixed spaced relation to the housing and outwardly convergent mating cam surfaces internally of said outer end of the actuator and externally of the ring serving to retain the split ring within the actuator and in seated relation to said bearing abutment and to cause ring contraction upon sliding adjustment of the actuator relative to said fixed abutment.

4. In a collet, a rotatable hollow spindle, a cup-

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shaped actuator slidably mounted inside the spindle, a work locating abutment housed within the actuator, axially extending connector and spacer means projecting through the base of said cup-shaped actuator and fixing the abutment to the spindle, an outwardly convergent internal taper on the nose of the actuator beyond the outermost end of said work locating abutment, a split ring embraced within said nose of the actuator and axially retained thereby between the outer ends of said work locating abutment and said nose and an outwardly convergent taper peripherally of the ring mating with said internal taper on the nose for work gripping contraction of the ring upon inward travel of the actuator.

5. In a collet, a split contractible work gripper ring and an actuator therefor, a set of spaced teeth on the ring and a complementary set of spaced teeth on the actuator, both sets of teeth having frusto-conical surfaces for wedging inter-engagement when the teeth are in alignment and the spacing between the teeth being wider than the tooth width to enable free tooth passage through the spacing when the teeth are out of alignment and retainer means for keying the actuator and the ring against relative rotation with the teeth in aligned wedging engagement and for accommodating relative axial adjustment of the actuator in regulating ring diameter.

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