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Holmes et al.

[11] **3,738,150**

[45] **June 12, 1973**

[54] **TURRET HEAD ASSEMBLY**

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[21] Appl. No.: **145,221**

[52] **U.S. Cl.** ..... **72/410,** 72/36, 29/203 H, 29/282

[51] **Int. Cl.** **B21d 9/08**

[58] **Field of Search** ..... 72/409, 410, 36; 29/203 H, 203 HC, 203 HT, 203 HM, 282; 81/303, 311, 341

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Assistant Examiner—M. J. Keenan
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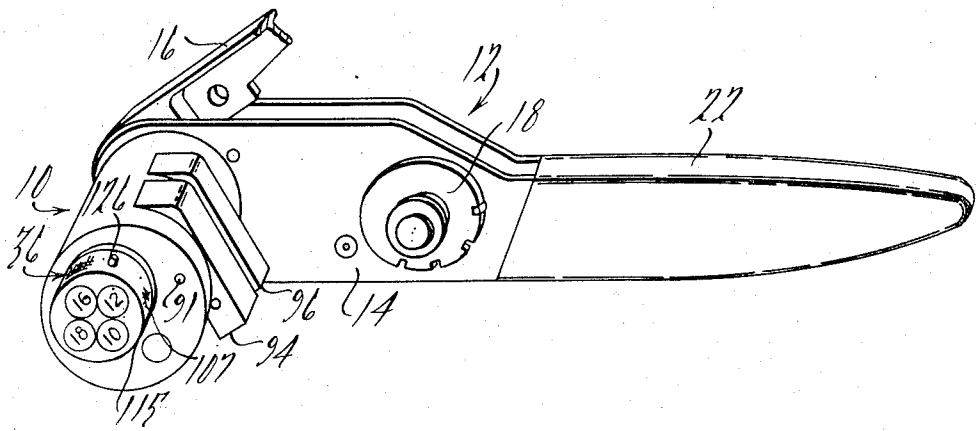
[57] **ABSTRACT**

This disclosure pertains to an improved turret head assembly for use with a crimping tool for connecting an electrical contact or the like to a wire conductor. As used herein, the term "contact" is intended to include male and female contacts, connectors, terminals, and like devices adapted to be affixed to the end of a wire conductor. A plurality of contact positioners adapted to accommodate various contact sizes are provided in a selectively rotatable turret head disposed in a bore of a housing member. The turret head is further adapted to be selectively positioned axially within the bore to accommodate contacts of varying length. The positioners locate and hold the contacts so that the portion thereof to be crimped is axially and radially positioned at the desired point in line with the crimping dies to effect crimping.

24 Claims, 14 Drawing Figures



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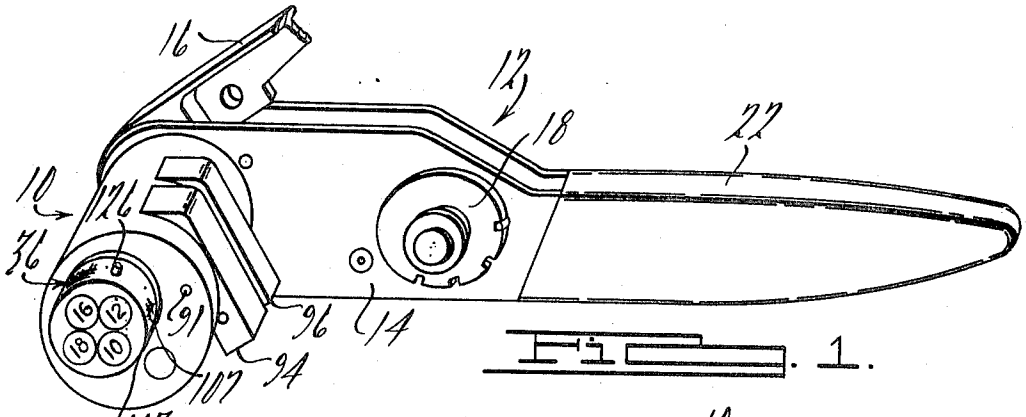
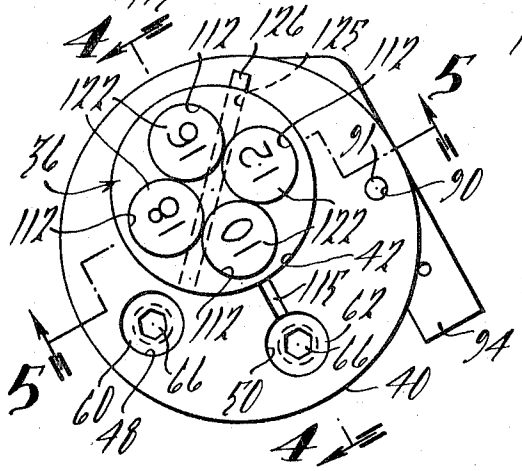


FIG. 1.



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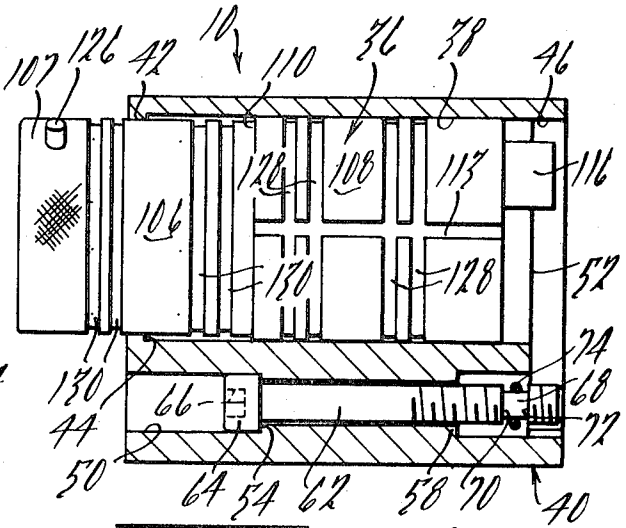

FIG. 4.

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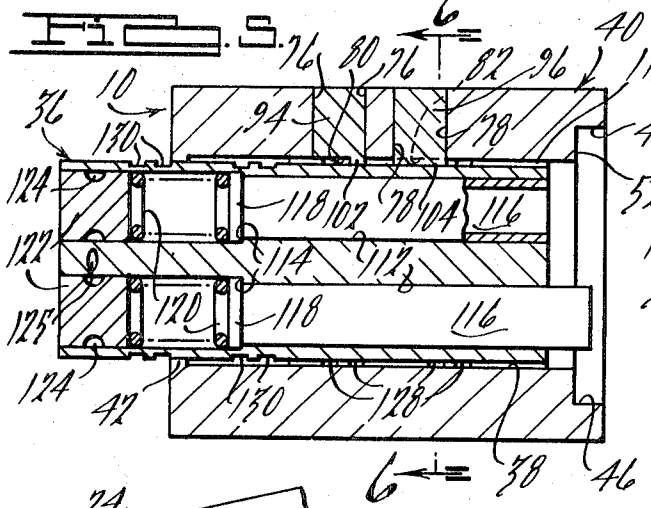

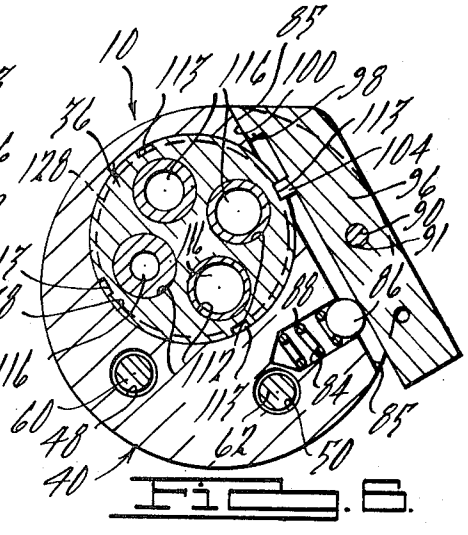

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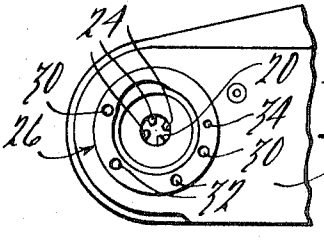

FIG. 2.

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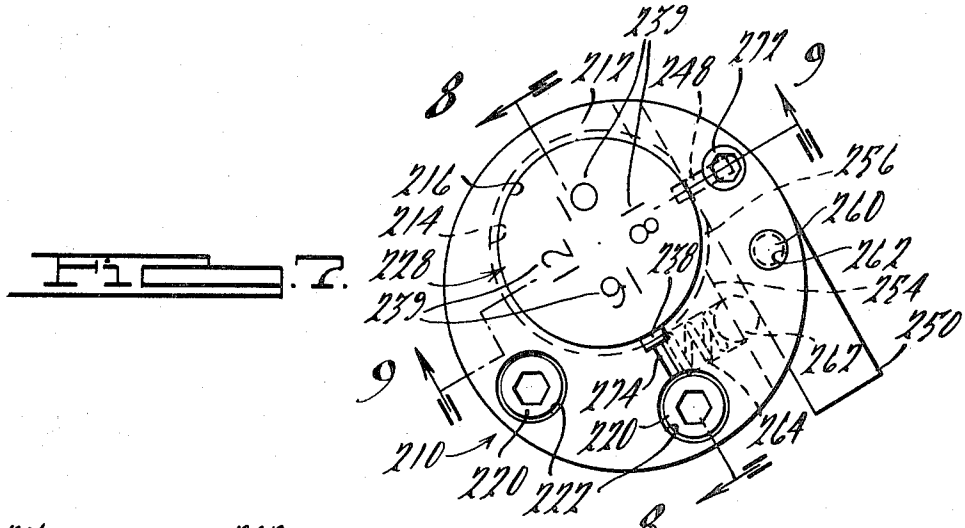

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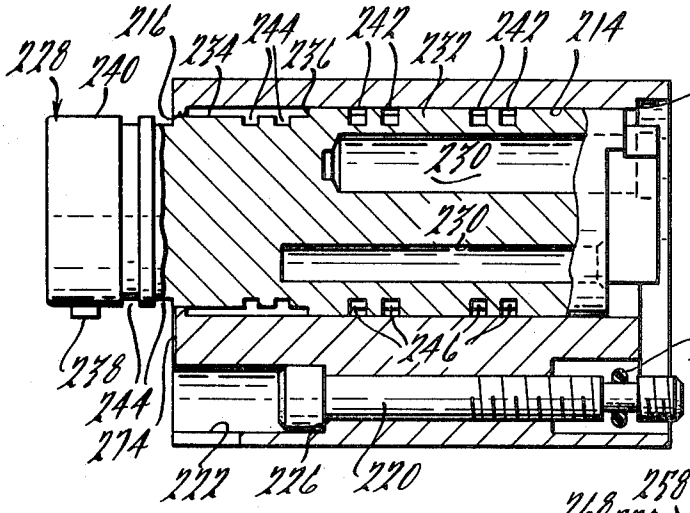

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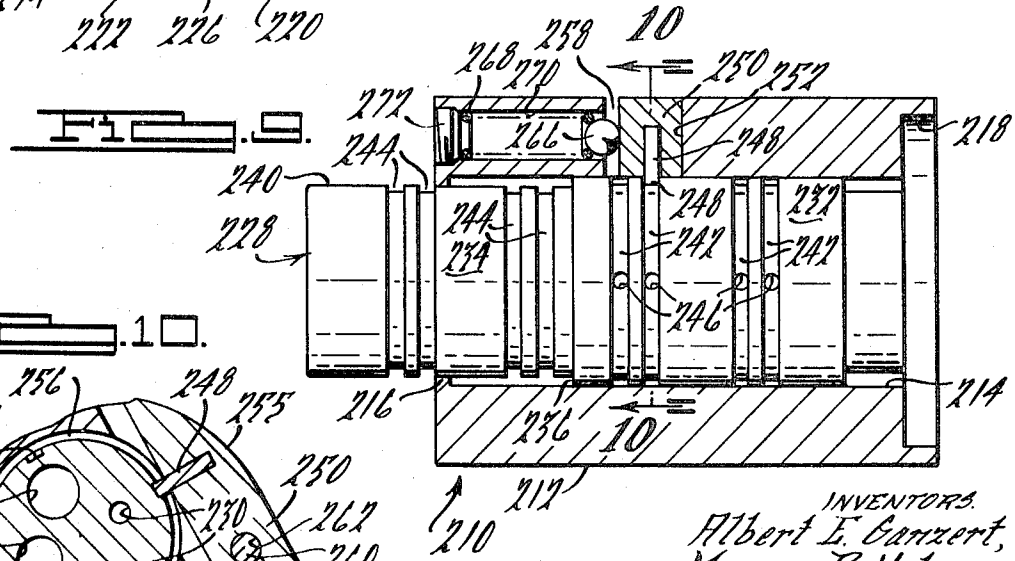
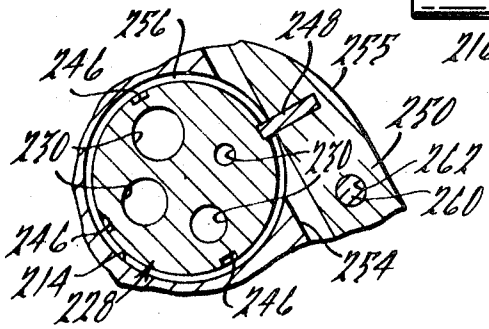


FIG. 9.

FIG. 10.



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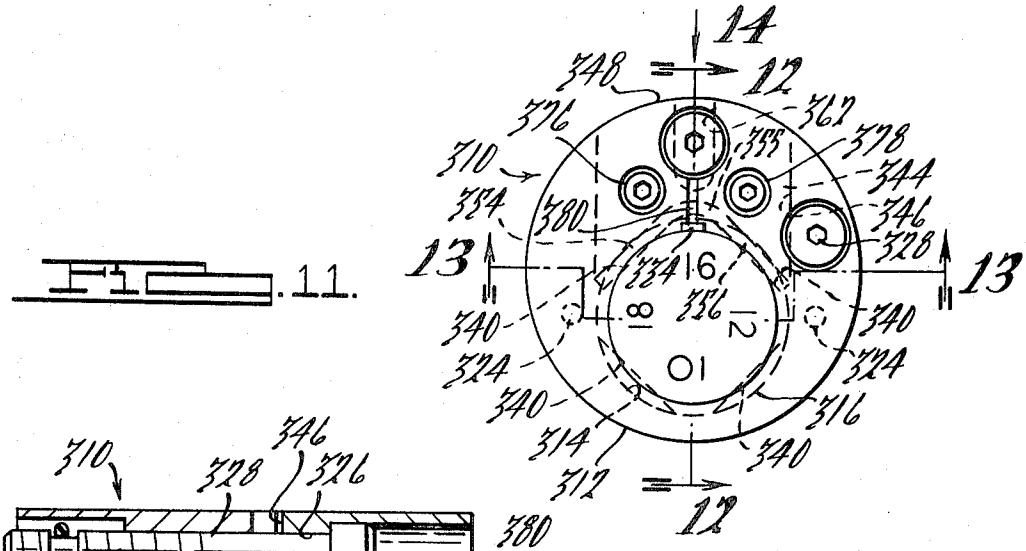

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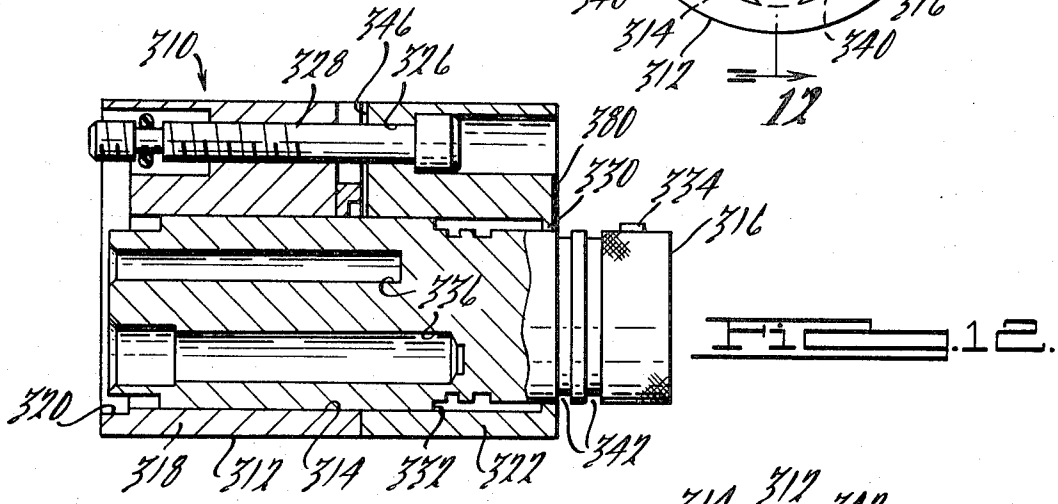

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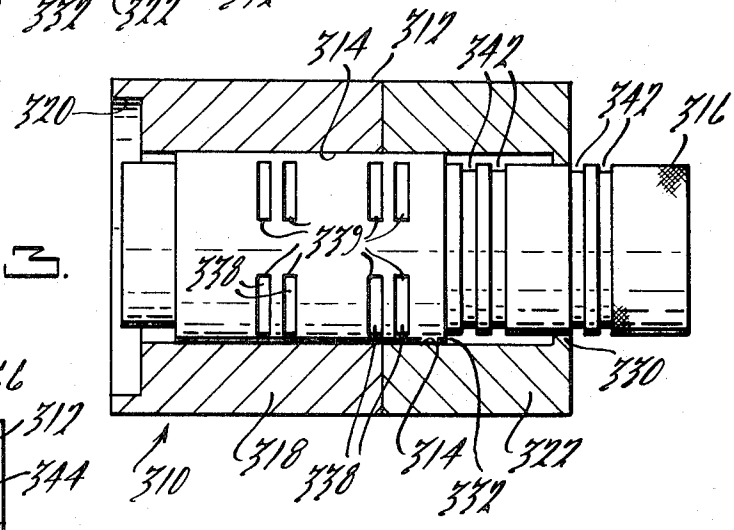

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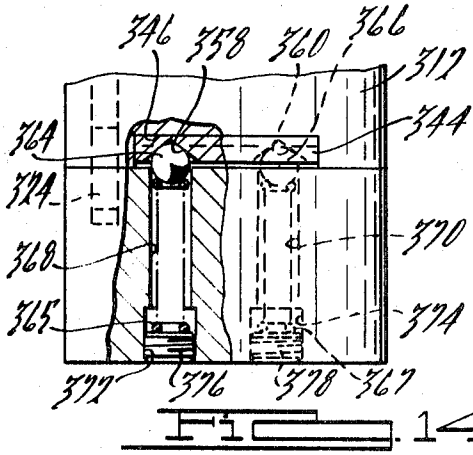

FIG. 14.

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TURRET HEAD ASSEMBLY

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates generally to crimping devices for securing electrical contacts to conductors, and more particularly to an improved and more versatile contact locating turret head assembly for use therewith.

Heretofore, various turret head devices have been employed to increase the versatility of crimping tools by accommodating various sized electrical contacts by means of a plurality of contact positioners or locators encased in a rotatable member. For example, see U.S. Pat. Nos. 3,059,511, 3,172,211, 3,199,334, and 3,199,335. The positioners or locators themselves are adapted to suitably receive and locate either the end or tip of the electrical contact or a radially extending projection or shoulder on the electrical contact. With either method, however, it will be appreciated that the position of the portion which is adapted to receive the crimp is fixed with reference to the portion located, for any particular type of contact.

Previously known turret head assemblies suitable for use on hand tools have a maximum of three or four positioners because of space limitations, as a consequence of which they can accommodate only three or four contact sizes (diameters if shoulder locating type, or lengths if end locating type). Versatility is, therefore, somewhat limited. To overcome this, a number of interchangeable turret head assemblies are often provided with each crimping tool for the purpose of accommodating the relatively large number of various contact sizes normally encountered. This, however, means that the installer must detach one turret head assembly from the crimping tool and subsequently attach a second interchangeable turret head assembly to accommodate additional contact sizes. As an alternative to the above, certain other known crimping tool assemblies are provided with a plurality of individual removable contact positioners. Both types of assemblies have the disadvantage of too many separate parts which are susceptible to loss and require the consumption of valuable time in changing positioners.

With reference now to the subject invention, an improved turret head assembly is disclosed which is adapted to be removably mounted to an appropriate surface of a crimping tool. A rotatable turret head having a plurality of contact positioners of varying preselected diameters, lengths and/or shapes is movably received in an eccentric bore of a housing member. In a first preferred embodiment of the subject invention an outer portion of the turret head received within the bore is provided with a plurality of circumferential and axial grooves adapted to be engaged and thereby locked in place by a pair of spring loaded operating latches, a first latch engaging a circumferential groove for axially positioning the turret head relative to the indentor means of the crimping tool, and a second latch engaging an axial groove for rotationally locking the desired positioner in alignment with the indentor means.

In a second preferred embodiment of the subject invention a rotatable turret head is provided with a plurality of circumferential grooves, each groove having a plurality of circumferentially spaced blind apertures located therein corresponding in number to the number of contact positioners. A single latch is provided adapted to engage the circumferential grooves for axially positioning the turret head relative to the indentor means of the crimping tool, the latch including a relatively small finger member adapted to engage the desired blind aperture for rotatably locking the desired contact positioner in circumferential alignment with the indentor means.

In a third preferred embodiment of the subject invention the outer annular surface of the turret head includes a plurality of axially spaced sets of circumferentially spaced slots, the number on each circumference conforming to the number of contact positioners disposed in the turret head. The turret head is movably locked relative to the indentor means of the crimping tool by means of a spring loaded sliding member having a pair of bifurcated fingers which are adapted to engage an adjacent pair of the circumferentially spaced slots for locking therein. A preselected rotational movement of the turret head is adapted to disengage the bifurcated fingers from the slots so that the turret head may be moved axially for providing an axial length adjustment.

It is a primary object of the present invention to provide an improved crimping tool turret head assembly capable of locating an increased number of electrical contacts of differing lengths, diameters and shapes, thus obviating the need in many applications for plural turret assemblies.

It is another object of the present invention to provide a crimping tool turret head assembly which is easy to use and which shows its setting by simple inspection.

It is still another object of the present invention to provide a crimping tool turret head assembly having no loose parts.

It is yet another object of the present invention to provide a crimping tool turret head assembly wherein the contact positioners therein assume locked preselected postions relative to the indentor means of the crimping tool.

It is another object of the present invention to provide a standard crimping tool turret head assembly suitable for use with a wide variety of types of electrical contacts, connectors and the like.

It is still another object of the present invention to provide a turret head assembly having means for compensating for the axial expansion caused by the indentor dies when crimping the electrical contact.

It is a further object of the present invention to provide a turret head assembly which is relatively easy to manufacture and simple to assembly.

Other objects and advantages of the present invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a pictorial view of a first preferred embodiment of the turret head assembly of the present invention detachably mounted to a crimping tool of conventional construction;

FIG. 2 is a fragmentary pictorial view of the left end of the crimping tool of FIG. 1 with the turret head assembly removed;

FIG. 3 is an enlarged plan view of the turret head assembly of the first preferred embodiment of the present invention;

FIG. 4 is a cross-sectional elevation thereof taken along the line 4—4 of FIG. 2, with the turret head shown in elevation;

FIG. 5 is a cross-sectional elevation thereof taken along the line 5—5 of FIG. 3.

FIG. 6 is a transverse cross-sectional view thereof taken along the line 6—6 of FIG. 5;

FIG. 7 is an enlarged plan view of a second preferred embodiment of the turret head assembly of the present invention;

FIG. 8 is a cross-sectional elevation thereof taken along the line 8—8 of FIG. 7;

FIG. 9 is a cross-sectional elevation taken along the line 9—9 of FIG. 7, with the turret head shown in elevation;

FIG. 10 is a transverse cross-sectional view of FIG. 9, taken along the line 10-10 thereof;

FIG. 11 is an enlarged plan view of a third preferred embodiment of a turret head assembly of the present invention;

FIG. 12 is a cross-sectional elevation of FIG. 11 taken along the line 12—12 thereof;

FIG. 13 is a cross-sectional elevation of FIG. 11 taken along the line 13—13 thereof, with the turrt head shown in elevation; and

FIG. 14 is a partial fragmentary side elevation of the upper portion of the turret head illustrated in FIG. 11 taken in the direction of the arrow 14 indicating the means for resiliently biasing the bifurcated finger.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to FIG. 1 of the drawings, a first preferred turret head assembly is indicated generally at 10 detachably mounted to a hand crimping tool 12. The crimping tool 12 forms no part of the present invention, and may be of any type known in the art wherein means is provided to selectively adjust the indentor gap to positively crimp various sizes of contacts to a desired indentation. For example, see U.S. Pat. No. 3,226,968.

The crimping tool 12 illustrated in FIG. 1 comprises a first operating handle member 14 of a generally U-shaped cross section pivotably connected at one end to a second operating handle member 16 of generally solid cross section. The internal portion of first operating handle member 14 defines a housing for receiving the indentor mechanism, indentor gap control mechanism, and a ratchet and pawl arrangement, none of which are illustrated, but all of which comprise well known portions of crimping tools. A rotatable indentor gap control member 18 is disposed on the front face of crimping tool 12 and affords means for adjusting the indentor gap for use with various sizes of contacts. The connectors or contacts are adapted to be received in a suitable aperture 20 (see FIG. 2), coaxial with the pivotal axis of operating handle members 14 and 16, and accessible from the rearward side of the crimping tool as viewed in FIG. 1. Both operating handle members 14 and 16 are preferably provided with resilient hand grips 22 telescoped over the free ends thereof to afford a comfortable gripping surface for manually manipulating the crimping tool.

As is common with devices of the type described, a plurality of indentors 24, disposed around the periphery of aperture 20, are actuated inwardly by pivoting handle members 14 and 16 toward one another and are retracted when the handle members are pivoted apart.

As best observed in FIG. 2, a turret head connecting adapter ring 26 is connected to the forward face of the operating handle member by means of a pair of suitable fasteners 30. A pair of threaded apertures 32 and an alignment aperture 34 are circumferentially spaced on the face of ring 26. Threaded apertures 32 are adapted to connect the turret head assembly 10 to crimping tool 12 whereas alignment aperture 34 is adapted to receive a turret locating pin, as shall hereinafter be explained.

Turret head assembly 10 comprises a cylindrically shaped turret head 36 movably disposed in an axially eccentric bore 38 extending through a cylindrically shaped housing member 40. As best observed in FIGS. 4 and 5, an annular lip or flange 42 extends inwardly from the forward end of eccentric bore 38 having an inward surface which defines a shoulder 44 thereabout. At the rearward end of housing member 40, there is centrally disposed a counterbore 46 defining a face 52. The diameter of bore 46 is slightly larger than that of ring 26 and is of a depth slightly greater than the thickness of the ring in order to fit thereover.

A pair of axially extending bores 48 and 50 extend between rearward face 52 and the opposite forward end face housing member 40, bores 48 and 50 being aligned with threaded apertures 32 disposed in adapter ring 26 when assembled therewith. As illustrated in FIG. 4, each of bores 48 and 50 are counterbored from the forward face of the housing member defining shoulders 52 and 54, respectively. Bores 48 and 50 are also counterbored from the rearward end face of the housing member to define shoulders 56 and 58, respectively, and to receive a pair of threaded bolts 60 and 62, respectively, for use in attaching turret head assembly 10 to crimping tool 12.

Bolts 60 and 62 are identical and will be described with respect to bolt 62, as best observed in FIG. 4. Bolt 62 comprises an enlarged head portion 64 preferably having a blind hexagonal shaped bore 66 disposed therein its upper face to facilitate manipulation thereof with an Allen wrench or the like. At the opposite end of the bolt, a groove 68 is provided defining a pair of opposed shoulders 70 and 72. The groove is adapted to receive an annular spring clip 74 having an outside diameter slightly larger than bore 62 which serves to restrict axial movement of the bolt and prevent it from accidently falling out of its bore.

In addition to bolts 60 and 62, an axially extending pin (not shown) projects rearwardly from face 52 and is adapted to fit within alignment aperture 34 disposed on adapter ring 26. As will be appreciated, the engagement of the pin in the aperture suitably aligns turret head assembly 10 with the crimping tool and facilitates the alignment of bolts 60 and 62 with their respective bolt holes.

With reference now to FIGS. 5 and 6, a pair of spaced rectangularly shaped transverse slots 76 and 78 are provided through the outer surface of housing member 40 centrally thereof. Slots 76 and 78 have inward surfaces 85 which intersect and communicate with eccentric bore 38, defining a pair of openings 80 and 82. A pair of blind bores (indicated in FIG. 6 at 84) extend inwardly from face 85, each being adapted to receive therein a ball shaped member 86 biased outwardly by a coil spring or the like 88. A relatively small aperture 90 extends axially the length of housing mem-

ber 40, intersecting both slots between blind bores 84 and openings 80 and 82.

A pair of latches 94 and 96 are pivotably connected to housing member 40 within slots 76 and 78, respectively, by means of a pin member 91 press fitted in aperture 90. Both of the latches are provided at one end with lug portion 98 having a flat inward face 100 normally urged against face 85 of its slot under the influence of the ball-spring combination 86 and 88. As best observed in FIGS. 5 and 6, latch 94 is provided with a circumferentially extending projection 102 which extends through the opening 80 and latch 96 is provided with an axially extending projection 104 adapted to extend through the opening 82. For reasons that will later become apparent latch 94 may be inscribed "length latch" and latch 96 may be inscribed "size latch" to facilitate easy selection adjustment of the turret head.

Turret head 36 generally comprises first and second cylinder sections 106 and 108 with the juncture of the sections defining a shoulder 110. Preferably, the peripheral surface of the forward end of section 106 is provided with a knurled surface 107 to afford good gripping for manipulating the turret head. Dimensionally, the outside diameter of section 106 is slightly less than the inside diameter of lip 42 of housing member 40. The outside diameter of section 108 is slightly less than the diameter of eccentric bore 38. Thus, the turret head is adapted to be inserted in eccentric bore 38 from its rearward end and is restrained from movement all the way therethrough by the interference of radial shoulder 110 and shoulder 44 defined by lip 42.

A plurality of circumferentially spaced axial cavities or bores 112 are disposed through turret head 36, each bore 112 being radially spaced from the axial centerline of the turret head a distance equal to the radial distance between the axial centerlines of the turret head and the center of aperture 20 when the turret assembly is assembled to the crimping tool. Adjacent each bore 112 there is provided an axially extending locating groove 113 along the outer periphery of cylinder section 108 adapted to be lockingly engaged by projection 104 of "size" latch 96. The center axis of each of bores 112 is adapted to be selectively oriented in alignment with aperture 20 by manually rotating turret head 36 and grooves 113 are so positioned that the head will be locked in such alignment by engagement of projection 104 and the appropriate groove 113, the locked relationship being maintained by the bias of spring 88. Pivotal movement of latch 96 against the bias of spring 88 disengages projection 104 and permits rotation of the turret head so that another of the bores 112 may be brought into alignment with aperture 20. Any number of bores 112 and slots 113 may be provided, depending on the relative sizes of the parts, for any given application. To assist in the positioning, a given bore indicia 115 may be provided on the outer face of housing member 40.

As best observed in FIGS. 4 and 5, each of the bores 112 is counterbored from the forward face of turret head 36, the counterbore defining an annular internal shoulder 114. A contact positioner 116 having a flange 118 disposed at one end thereof is positioned in each of the bores with flange 118 engaging shoulder 112 to axially locate the parts. With reference to FIG. 6, it should be noted that each of the positioners 116 is suitably bored (diameters, shoulders, lengths, etc.) to receive a particular size or shape contact, or class of contacts, to properly locate same with respect to the crimping tool indentors when the appropriate bore 113 is aligned with aperture 20.

While positioners 116 are positively restrained from rearward movement by the respective abutment of radial flange 118 and internal shoulder 114, resilient means provides restraint in the opposite direction, such means comprising a coil spring member 120 interposed between the outward face of flange 118 and the inward face of a positioner retaining member 122, both members 120 and 122 being disposed within the counterbored portion of axial bore 112. The purpose of spring loading positioners 116 is to provide for possible axial expansion of the electrical contact during the crimping thereof. As will be appreciated when indentors 24 radially indent or crimp the contact, there is necessarily a corresponding flow of the displaced metal, usually in the axial direction. If the positioners were rigidly mounted, distortion of the contact might occur, and the larger the contact size the greater will be the expansion, and hence distortion. Each spring should therefore be chosen strong enough to resist compression when the contact is inserted in the turret for crimping, but should be weak enough to yield during crimping before axial stresses reach a high enough level to cause permanent deformation of the contact. Coil spring members 120 are, therefore, stiffer for large positioners than for smaller size positioners.

Positioner retaining members 122 are cylindrically shaped having an outside diameter slightly less than the counter-bored portion of the axial bore in order to facilitate insertion therein. An annular grooves 124 is provided around the central portion of each member 122 to secure the latter to the turret head. As best observed in FIGS. 3 and 4, the exemplary turret head assembly disclosed herein has four positioners 116 retained by four positioner retaining members 122. The latter are retained by means of a pin 126 press fitted into a transverse hole 125 and tangentially engaging each of the grooves 124. One end of pin 126 projects beyond the radial surface of the turret head and further functions as a stop for restraining inward movement of turret head 36 into eccentric bore 38 of housing member 40.

In order to provide increased locating flexibility, turret head 36 is also adapted to be selectively locked in a number of axial postions with respect to the indentor means of the crimping tool. As best observed in FIGS. 4 and 5, a plurality of peripheral or circumferential grooves 128 are selectively disposed around portion 108 of turret head 36. Grooves 128 are adapted to be individually engaged by the circumferentially oriented projection 102 of operating latch 94, the bias exerted by ball-spring combination 86 and 88 holding the projection in the groove, whereby the turret head may be locked in a number of spaced axial positions. Reverse pivotal movement of latch member 94 releases projection 102 from its associated groove and permits subsequent engagement in any of the other grooves 128. As can be seen, because of the configuration thereof, projection 102 will not fit in any axial groove 113, nor will projection 104 fit in any circumferential groove 128.

To afford the crimping tool operator a means for visually determining the axial setting of turret head 36, a plurality of circumferential indexing grooves 130, preferably individually color coded to conform to a given type or size contact, are disposed about the sec-

tion **106** of turret head **36.** Indexing grooves are axially spaced to conform to the axial spacing of the grooves **128** disposed around inward second section **108.** Thus the indexing groove **130** which appears flush above the forward face of the housing member indicates to the operator which groove is engaged below.

To operate outwardly turret head assembly, the housing **40** is connected to the crimping tool by means of the bolt connectors **60** and **62,** and to crimp a particular connector, the "length" latch **94** is depressed to permit the turret head to be fully ouwardly extended to withdraw any long positioner from rotational interference with aperture **20.** This step, of course, may be omitted if there is no likelihood of such interference. The "size" operating latch **96** is then turret and the rutet head rotated until the desired positioner is opposite indexing groove **115.** Preferably indicia, such as wire size or the like, is inscribed on each positioner retainer member **122** to facilitate selecting the desired cavity. Operating latch **96** is then released and the turret head rotated slightly to insure locking engagement of the latch projection with its preselected axial groove. The contact length is then set by depressing operating "length" latch **94** and pushing the turret head into housing **40** until the selected color coded groove is flush with the forward face of the housing. The latch is then released and the turret head should be axially manipulated to insure engagement of the latch projection with the desired circumferential groove. The depth of crimp is then set by selectively rotating indentor gap control member **18** and the tool is now ready to use. These steps may, of course, by performed in any order desired. The electrical contact either with or without the conductor wire disposed therein is then inserted into aperture **20** from the side of the tool opposite the turret head assembly until the contact is in firm locating engagement with the positioner, the wire is inserted into the contaCt if not already there, and the tool handles are then closed and then opened to perform the crimping operation. The crimped contact is then withdrawn in the same manner it was inserted.

With reference now to FIG. **7** of the drawings, a second preferred embodiment of a turret head assembly of the subject invention is indicated generally at **210,** assembly **210** being a modification of turret head assembly **10** of the first preferred embodiment. Turret head assembly **210** is comprised of an outer cylindrically shaped housing **212** having a relatively large eccentric bore **214** which extends axially therethrough. An inwardly extending lip **216** extends inwardly from the upper end of eccentric bore **214,** and the lower end of housing **212** includes an annularly shaped shoulder **218** for locating the turret head assembly over adapter ring **26** of the crimping tool **12.** Housing **212** may be removably connected to the crimping tool **12** by suitable bolts **220,** bolts **220** being located in axially extending bores **222.** Preferably, each bolt **220** is slidably retained within its bore **222** in one direction by means of a retainer ring **224** disposed in an undercut portion at the lower end of the bolt and engageable with the shoulder at the bottom of the bore, and in the other direction by an annular shoulder **226** defined by a counterbore at the upper end of the bore which engages the bolt head.

Slidably located within eccentric bore **214** of housing **212** is a turret head **228.** Contact locating apertures are defined therein by suitably spaced axially extending bores **230** extending inwardly from the lower face thereof, as opposed to the separate spring loaded positioner elements as disclosed in the first embodiment.

As best observed in FIG. **10,** each of the locating apertures **230** is of a different diameter, length and/or shape to accommodate contacts of different sizes. Turret head **228** includes a lower cylindrically shaped portion **232** having a diameter slightly less than the eccentric bore **214** and an upper cylindrical portion **234** having a diameter slightly less than the diameter of the lip **216.** The upper and lower portions **232** and **234** define a radially extending shoulder **236** which axially retains the slidable turret head **228** from outward disassociation from the housing **212** via an abutting engagement with the lip **216.** For retention in the opposite direction, a suitable set screw **238** or the like is radially located in an upper operating head portion **240** of the turret head **228.** Preferably the outer circumferential surface of the operating head **240** is knurled to provide easy manual manipulation. For selectively positioning the turret head **228** axially relative to the indentor dies of the crimping tool lower portion **232** includes a plurality of axially spaced circumferential grooves **242,** and in conformance with the first embodiment a corresponding set of circumferential indexing grooves **244** suitably located in an upper portion thereof. Differing, however, from the first embodiment, the turret head **228** does not include any axially extending grooves **113,** but instead each of the circumferential grooves **242** includes a number of inwardly, radially extending, blind bores **246,** the number conforming to the number of locating apertures **230,** and each bore **246** being circumferentially spaced opposite a locating aperture **230.** As shall hereinafter be described, blind bores **246** are adapted to selectively rotationally locate turret head **228** relative to a selected locating aperture **230** by being engaged by a projecting finger **248** disposed at one end of an operating latch **250.**

Operating latch **250** is disposed in a slot **252** having a generally rectangular cross section, including a generally flat inner wall **254** which defines a window **256** in the eccentric bore **214.** As best observed in FIG. **9,** the axial distance across slot **252** is greater than the axial thickness of latch **250,** whereby a clearance space **258** is defined on the upper surface thereof. Latch **250** is pivotably connected to housing **212** by means of a pin member **260** supported in an axially extending bore **262,** and finger member **248** is suitably connected, as by means of a press fit, to the inner face of latch **250,** the finger **248** being suitably positioned to extend through window **256** into engagement with the turret head. Latch **250** is resiliently held in engagement with the turret head by means of a spring **264** acting radially thereon through a ball member **262.** The outer surface of latch **226,** opposite the finger member **248,** is preferably arcuately curved, as indicated at **255,** to complement the curvature of housing member **212,** such complementary curvature further serving to indicate to the operator of the crimping tool whether or not latch **250** is fully seated in a selected bore **246.**

With reference now to FIG. **9,** latch **250** is axially biased against the lower surface of the slot **252** to establish a normally operating axial position by means of a second ball member **266** urged downwardly by a coil spring **268.** Ball member **266** and spring **268** are located in a bore **270** which is preferably axially transversely aligned with finger **248,** the bore **270** being

closed at its upper end by means of a suitable set screw 272 or the like.

To afford the crimping tool operator a means for visually determining the appropriate contact size setting of the turret head assembly 210, each of the locating apertures includes an appropriate contact size or type inscription 239 on the upper surface of operating head 240 as illustrated in FIG. 7. Additionally, as in the first embodiment, each of the indexing grooves 244, which are axially spaced to conform to the axial spacing of circumferential grooves 242, are preferably individually color coded to conform to a given length or type of contact. Indexing groove 244, which appears flush above the forward face of housing 212, indicates to the operator which groove is engaged by latch 250 below, and hence the axial position of the locator.

For operation the turret head assembly 210 is connected to crimping tool 12 by means of fasteners 220. To crimp a particular connector, latch 250 is depressed against the bias of spring 264 to permit turret head 228 to be outwardly extended to suitably position the desired indexing groove 244 flush with the outer radial surface of housing 212. Latch 250 is then released, causing finger member 248 to engage the corresponding circumferential groove 242 complementary with the desired color coded indexing groove 244. Turret head 228 is then rotated until the desired contact size is opposite a radial extending indexing line 274, located on the upper surface of housing 212, at which time finger member 248 will engage the appropriate bore 246, conforming to the selected size and diameter, wherein the latch will be fully seated. In this position, it will be appreciated that the curved outer surface 255 of latch 250 will conform to the annular cylindrical surface of housing 212 to provide the user with a visual indication of a proper engagement.

The electrical contact, either with or without the conductor wire disposed therein, is then inserted into aperture 20 from the side of crimping tool 12 opposite the turret head assembly until the contact is in firm located engagement in the locating aperture. The wire is then inserted into the contact if not already there, and the tool handles are then closed and then opened to perform the crimping operation in a manner similar to that described for the first embodiment. In the above sequence of steps, it will be noted that when the indentor dies crimp the electrical contact, the indentor die will cause the contact to axially expand slightly. For accommodation of this expansion of the contact, latch 250 is adapted to move upwardly against the bais of spring loaded ball 266. When the tool handles are opened, the crimped contact is then withdrawn in the same manner but in the opposite direction as it was inserted.

With reference now to FIG. 11, a third preferred embodiment of the turret head assembly is indicated generally at 310, assembly 310 being generally a modification of the second embodiment. Assembly 310 is comprised of a cylindrically shaped housing member 312 having an eccentrically located axially extending bore 314, and a turret head 316 movably disposed therein.

Housing member 312 is comprised of a lower cylindrically shaped section 318 having an annular shoulder 320 disposed at a lower outer end for nesting over adapter ring 26 of crimping tool 12, and an upper cylindrically shaped section 322 axially connected to lower section 318 by means of a pair of axially aligned dowel pins 324. Housing member 312 includes a pair of axially extending counterbores 326 in which are located bolts or the like 328 for detachably connecting the turret head assembly to the crimping tool in a manner previously described.

Turret head 316 is slidably disposed in the eccentric bore 314 of housing member 312 and is restrained from outward movement therefrom by an inward radially extending lip 330 disposed at the outer upper end of the bore 314 which abutts a radially extending shoulder 332 defined on an axial intermediary portion of turret head 316 and in the opposite direction by the head of a retaining screw 334 or the like located on the outer surface of turret head 316. With respect to the inner construction of turret head 316, a plurality of contact receiving apertures 336 of varying sizes, diameters and shapes are provided in the same manner as previously described for the second embodiment.

Turret head 316 is selectively positioned and supported in bore 314 of housing member 312 by means of a number of sets of locating grooves 338. These grooves are of a modified configuration with respect to the grooves of the first and second embodiments.

As best observed in FIGS. 11 and 13, each of the sets of axially disposed locating grooves 338 consists of a plurality of flat sub-grooves or slots 339 each having an inner face 340 which defines a chord with the segmented arc removed. The radial center line of each inner face 340 is located so as to straddle the radial center line of the corresponding contact receiving apertures 336. Thus, in the exemplary embodiment illustrated, wherein four contact receiving apertures 336 are utilized, four sub-grooves 339 are provided. For purposes of denoting the axial location of turret head 316 a plurality of indexing grooves 342 are disposed in the upper end of the turret head in a manner identical with the indexing grooves of the first and second embodiments.

Locating grooves 339 are adapted to be engaged by a bifurcated key member 344 disposed in a rectangularly shaped, transversely extending slot 346. As best observed in FIG. 14, the axial distance across the slot 346 is slightly greater than the thickness of the bifurcated key 344 for purposes which will hereinafter be explained. As best observed in FIG. 11, key 344 has a generally circular outer face 348, the radius of which conforms to the radius of housing member 312. A pair of bifurcated sub-groove engaging fingers 354 and 356 are disposed at the inward surface of key 344, the fingers being of a thickness less than that of key 344 and adapted to engage an adjacent pair of sub-grooves 339. In the embodiment illustrated in FIG. 11, wherein four contact receiving apertures 336 are illustrated, the engaging fingers 354 and 356 are substantially at right angles to one another, intersecting the mid-point of key 344 in a generally arcuate surface 355. Spaced outwardly from engaging fingers 354 and 356 are a pair of cone-shaped indentions 358 and 360 and a slot 362, the slot 362 straddling one of the connector bolts 328.

Key 344 is biased against the lower face of slot 346 by a pair of ball members 364 and 366 loaded by a pair of coil springs or the like 365 and 367, springs 365 and 367 being disposed in a pair of axially extending bores 368 and 370 between slot 346 and an outer face of the housing member 312. The upper portion of the bores 368 and 370 being closed by counterbore portions 372

and **374** in which are disposed a pair of threaded set screws **376** and **378.**

It will be observed that the resilient loading of key **344** accomplished two functions. First, when turret head assembly **310** is suitably mounted on a crimping tool, and during the crimping operation therewith, key **344** is free to travel axially against the bias of the springs **365** and **367** to compensate for axial expansion of the contact. Secondly, the seating of the spring loaded balls **364** and **366** with the cone-shaped indentions **358** and **360** provides sufficient transverse radial movement of key member **344** relative to the housing member **312,** whereby the key will snap into engagement in a pair of adjacent sub-grooves **339** when turret head **316** is properly aligned.

In operation, turret head assembly **310** is detachably connected to crimping tool **12** in the same manner previously described with respect to the first and second embodiments. As illustrated in FIG. **11,** the upper face of turret head **316** is suitably inscribed to designate the contact sizes, etc. and the housing member includes an inscribed indexing line **380.** The axial adjustment for the desired contact is first selected by rotating the turret head relative to the housing member until the inscribed size designation between adjacent members generally straddles indexing line **380.** In this position it will be noted that the indexing grooves are generally normal to indexing line **380** and turret head **316** is free to be moved axially due to disengagement of the fingers of key **344** with sub-grooves **339.** Indexing grooves **342** are again preferably color coded and the desired groove is located flush with the upper face of housing member **312.** In this axial position, turret head **316** is rotated until the proper inscribed size or diameter is opposite indexing line **380.** In this position it will be noted that the engaging fingers **354** and **356** will engage the adjacent pair of sub-grooves **339** and snap therein. For visual assurance that the key **344** is suitably engaged within grooves **338** the operator can check whether the outer circular face **348** of key member **344** is flush with the outer annular surface of housing member **312.** The electrical contact may now be crimped in an indentical manner described for the previous embodiments.

Regardless of the type of positioners used (end locating, shoulder locating, etc.) the increased flexibility resulting from being able to lock the turret head in a number of preselected axial positions, in addition to the normally provided rotational positions, is readily apparent. The number and spacing of these preselected axial positions will depend on the particular positioners utilized, as will be apparent to one skilled in the art. It is further contemplated that these axially spaced locations may also be utilized to crimp a single contact at predetermined axially spaced locations on successive crimping operations.

Additionally it will be noted that springs **365** and **367,** and spring **268** of the second embodiment are chosen based on the same criteria as are springs **120** in the first embodiment and as described therewith.

While it will be apparent that the three preferred embodiments of the invention disclosed herein are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. A turret head assembly for locating an electrical contact or the like relative to the crimping zone defined by the indentor means of a crimping tool, the assembly comprising:

housing means adapted to be connected to the crimping tool;

locating head means supported by said housing means;

first means defining at least two spaced circumferential grooves in an outer surface of said locating head means, said grooves being spaced different distances from the crimping zone;

locating means difining at least two locating apertures on said locating head means for receiving and locating the electrical contacts; and

actuating means for positioning one of said locating aperatures in coaxial alignment with the crimping zone, and being respectively cooperable with one of said grooves for locating said locating head means a first distance from the crimping zone and with another of said grooves for locating said locating head means a different distance from the crimping zone.

2. The assembly recited in claim **1,** further including second means defining at least two circumferentially spaced axial grooves in the outer surface of said locating head means; and wherein said actuating means comprises a first latch having a finger portion selectively engageable with one of said axial grooves for positioning one of said locating apertures in coaxial alignment with the crimping zone, and a second latch having a finger portion selectively cooperable with said circumferential grooves.

3. The assembly recited in claim **2,** wherein said first and second latches are pivotably connected to said housing means, and said assembly further includes spring means supported in said housing for resiliently biasing said finger portions into said grooves.

4. The assembly recited in claim **1,** further including second means defining at least two circumferentially spaced indentations in the bottom of each of said circumferential grooves; and wherein said actuating means comprises a latch having a finger portion adapted to selectively engage said indentations.

5. The assembly recited in claim **1,** wherein each of said circumferential grooves consists of a set of at least segmental shaped grooves lying in a common plane.

6. The assembly recited in claim **5,** wherein said actuating means comprises a key having a bifuricated end portion adapted to selectively engage a pair of said segmental shaped grooves.

7. The assembly recited in claim **1,** further including second means defining an indentation in the bottom of each of said circumferential grooves; and wherein said actuating means comprises a latch having a finger portion adapted to selectively engage said indentations.

8. The assembly recited in claim **7,** wherein said finger portion cooperates with said grooves to control the axial position of said locating head means with respect to said housing means, and wherein said finger portion cooperates with said indentations to control both the axial position of said locating head means with respect to said housing means and the coaxial alignment of the contact with the crimping zone.

9. The assembly as claimed in claim **1,** wherein each of said circumferential grooves is continuous and ex-

tends about the entire circumference of said locating head means.

10. The assembly as recited in claim 1, wherein each of said circumferential grooves extends only partially around the circumference of said locating head means.

11. The assembly as claimed in claim 10, wherein each said circumferential groove is generally segment shaped.

12. The assembly as recited in claim 1, further comprising spring means biasing a located electrical contact axially toward the crimping zone, whereby contact expansion during crimping may be accommodated.

13. The assembly as recited in claim 12, wherein said spring means is operable between said locating head means and said housing means.

14. The assembly as recited in claim 12, wherein said spring means is operative between said acutating means and said locating head means.

15. The assembly as recited in claim 1, further comprising second means defining at least two circumferentially spaced axial grooves in the outer surface of said locating head means, said actuating means being cooperable with said axial grooves to accomplish said coaxial alignment.

16. A turret head assembly for locating an electrical contact or the like relative to the crimping zone defined by the indentor means of a crimping tool, the assembly comprising:

housing means adapted to be connected to the crimping tool;

locating head means supported by said housing means and movable longitudinally parallel to the axis of the crimping zone, said locating head means defining at least one locating aperture for receiving and locating an electrical contact;

first means defining a plurality of axially spaced indicia on an outer surface of said locating head means, the position of said indicia with respect to said housing means indicating the axial position of said locating aperture relative to the crimping zone; and

second means for locating said locating head means at different axial distances from the crimping zone.

17. The assembly recited in claim 16, wherein said first means is a plurality of spaced circumferential grooves on the outer surface of said locating head means.

18. The assembly recited in claim 17, further including at least two additionally axially spaced circumferential grooves on the outer surface of said locating head means, said second means being selectively cooperable with said additional grooves.

19. A turret head assembly for locating an electrical contact or the like relative to the crimping zone defined by the indentor means of a crimping tool, the assembly comprising:

housing means adapted to be connected to the crimping tool;

locating head means supported by said housing means;

locating means defining at least one locating aperture on said turret head means for receiving and locating an electrical contact;

means defining a plurality of axially spaced recesses in an outer surface of said locating head means, said recesses being spaced different predetermined distances from the crimping zone, said distances corresponding in position to the desired axial locations of the located contacts with respect to the crimping zone during crimping and corresponding in number to the number of such locations; and

actuating means selectively engageable with one of said recesses for positioning said locating head means a first predetermined distance from the crimping zone and with another of said recesses for locating said locating head means a different predetermined distance from the crimping zone.

20. A turret head assembly for locating an electrical contact or the like relative to the crimping zone defined by the indentor means of a crimping tool, the assembly comprising:

housing means adapted to be connected to the crimping tool;

locating head means supported by said housing means;

first means defining at least two pairs of circumferential grooves in an outer surface of said locating head means, said pairs of grooves being circumferentially spaced and each spaced a different distance from the crimping zone, the grooves of each pair being circumferentially spaced;

locating means defining at least two locating apertures on said locating head means for receiving and locating the electrical contacts; and

actuating means respectively cooperable with one of said pairs of grooves for positioning said locating head means a first distance from the crimping zone with one of said locating apertures in coaxial alignment with the crimping zone and with another of said pairs of grooves for positioning said locating head means a different distance from the crimping zone with the other of said locating apertures in coaxial alignment with the crimping zone.

21. The assembly as recited in claim 20, wherein said actuating means comprises a pair of spaced fingers, end portions of which are respectively engageable within the grooves of a pair of said grooves, said end portions being selectively engageable with the ungrooved portions of said outer surface disposed circumferentially between said grooves for permitting said locating head means to be adjusted to different axial positions.

22. The assembly recited in claim 20, further including spring means supported by said housing, said actuating means being biased in an axial direction towards the crimping zone by said spring means, and means limiting movement of said actuating means in said direction, whereby expansion during crimping of a contact located by said locating aperture may be accommodated.

23. The assembly recited in claim 22, further including at least one ball member interposed between said actuating means and said spring means, and wherein said actuating means includes an indentation for receiving said ball member.

24. The assembly recited in claim 23, wherein said indentation is cone-shaped to provide transverse movement of said actuating means relative to said housing means.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,738,150 Dated June 12, 1973

Inventor(s) Marion B. Holmes and Albert E. Ganzert

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, line 32, "grooves" should be -- groove --.
Column 7, line 7, "outwardly" should be -- the --.
Column 7, lines 15 and 16, "turret and the ruttet" should be -- depressed and the turret --.
Column 7, line 38, "contaCt" should be -- contact --.
Column 9, line 51, "bais" should be -- bias --.

Signed and sealed this 25th day of December 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents

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