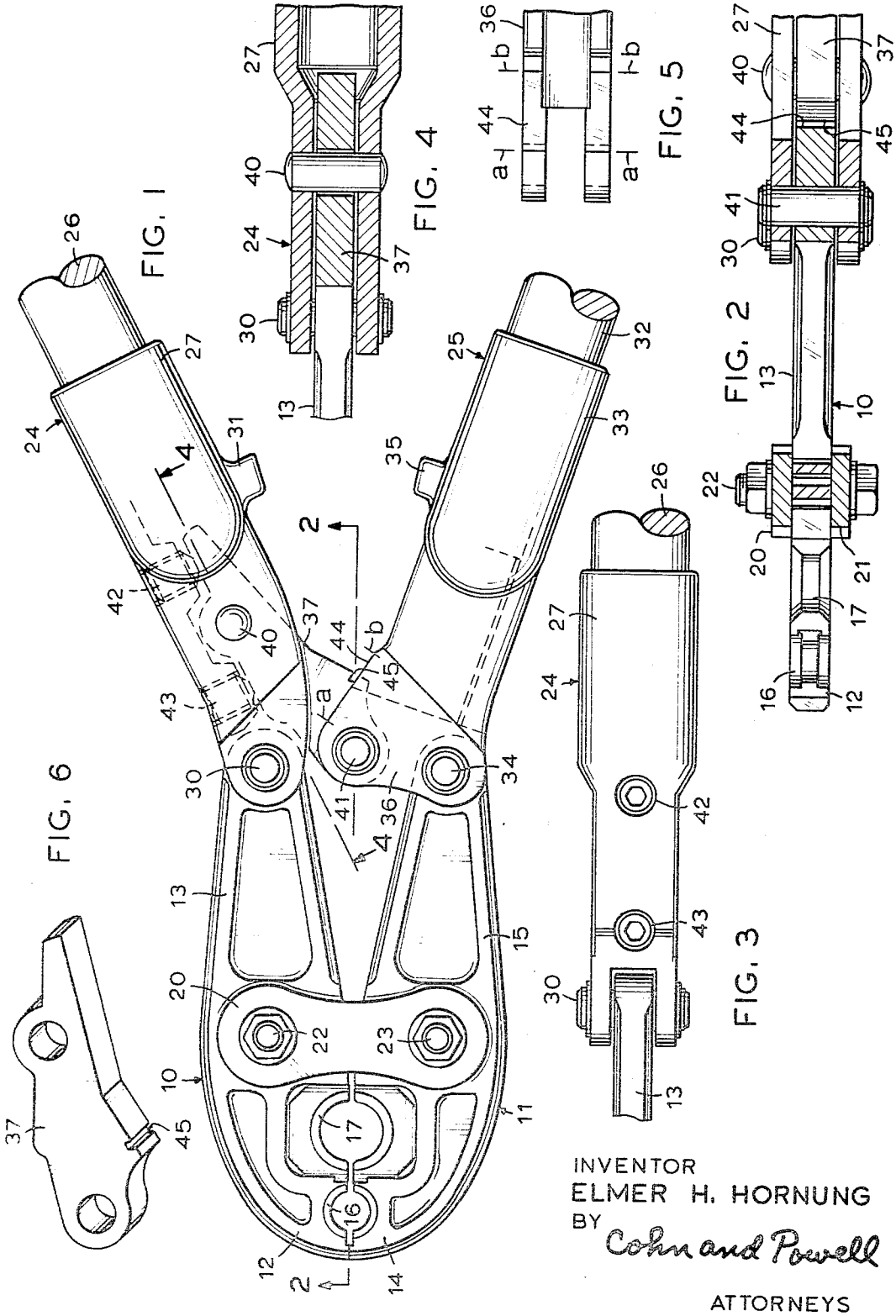
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GAGING MECHANISM FOR COMPRESSION TOOL

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GAGING MECHANISM FOR COMPRESSION TOOL

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This invention relates generally to improvements in a tool for compressing electrical connectors, and more particularly to an improved gaging mechanism for placing and maintaining the tool in precise alignment.

In the heretofore conventional types of compression tools incorporating a toggle joint and adapted to crimp line wire sleeve connectors into intimate clamping contact with the line wires inserted therein, the tool adjustment was checked by measurement of a specified distance between the handles with the jaw ends just touching by utilizing a separate loose gage bar supplied with the tool. Usually the distance between the handle stops was measured for this purpose. The procedure necessitated a series of alternating independent steps of first adjusting the position of the toggle joint and then checking the distance with the separate gage bar until the correct distance was attained. It will be understood that this was a time-consuming procedure and could not always be made immediately when desired or when needed because of the fact that the gage bar was usually stored separate and apart from the tool. Moreover, because this gage bar was loose, it was subject to being lost or misplaced.

An important object is achieved by making an adjusting gage an integral part of the tool so as to eliminate the possibility of loss or misplacement, and by constructing the gage so that it will continuously indicate the alignment condition of the tool when the jaw ends are just touching and will enable the adjustments to be made continuously while indicating the condition until the tool is brought selectively into correct alignment as indicated by the gage. It is necessary for the tool to be in proper adjustment at all times so that the appropriate and effective compression will be applied to the connector by the dies.

Another important object is realized by locating the gaging means on the toggle joint between and interconnecting the tool handles, the toggle joint being adjustable to bring the tool into alignment as indicated by the gaging means when the jaw ends are just touching and when the handles are disposed the appropriate distance apart.

Still another important objective is provided by the structural arrangement of a first toggle member on one handle and a second toggle member pivotally mounted to the other handle and pivotally connected to the first toggle member to form a toggle joint between the handles, and of a gaging means on the toggle members alignable to indicate tool alignment, the second toggle member being adjustably movable about its pivot connection to the associated handle to cause such tool alignment.

An important object is afforded in that the gaging means includes a gaging edge on one of the toggle members and a coacting indicator on the other toggle member. Advantageously, the indicator preferably consists of a narrow notch formed in the appropriate toggle member that is alignable with the gaging edge upon adjustably positioning the pivoted toggle member.

Another important objective is attained by constructing one handle to include a handle portion inwardly of the associated handle fulcrum, the handle portion constituting a relatively stationary toggle arm, and by pivotally mounting another toggle arm to the other handle and to the fixed toggle arm to provide a toggle joint between the handle fulcrums. The gage means is provided on the toggle arms to show the desired spread of the handles when the jaws are just touching. The pivotal position of

the pivoted toggle arm is adjustable to adjust the spread of the handles to bring the tool selectively in alignment as indicated by the gage means. The adjusting mechanism is capable of locking the pivoted toggle arm in the adjusted position to maintain such tool alignment.

Yet another important objective is achieved in that the relatively fixed toggle arm and the pivoted toggle arm overlap, and in that the gage includes a gage edge on one of the toggle arms and a gage indicator on the other toggle arm, both the gage edge and indicator being disposed in the overlapping area so that the gage edge and indicator are alignable upon adjusting the relative positions of the pivotally connected toggle arms.

An important object is to provide a gaging means for a compression tool especially adapted for crimping electrical connectors which is simple and durable in construction, economical to manufacture, highly efficient in operation, and which can be utilized by anyone with little or no instruction.

The foregoing and numerous other objects and advantages of the invention will more clearly appear from the following detailed description of a preferred embodiment, particularly when considered in connection with the accompanying drawing, in which:

FIG. 1 is a top plan view of the compression tool with the front end of the jaws just touching and with the gaging means aligned to indicate the appropriate tool adjustment;

FIG. 2 is a cross sectional view as seen along line 2—2 of FIG. 1;

FIG. 3 is a side elevational view as seen from the top of FIG. 1 illustrating the adjusting and locking mechanism;

FIG. 4 is a cross sectional view as seen along line 4—4 of FIG. 1;

FIG. 5 is a side elevational view of the gage edge, and

FIG. 6 is a perspective view of the pivoted and adjustable toggle arm.

Referring now by characters of reference to the drawing, and first to FIG. 1, it is seen that the compression tool includes a pair of levers generally indicated at **10** and **11**. The lever **10** includes an outer lever arm constituting a jaw **12**, and an inner lever arm **13**. Similarly, the other lever **11** includes an outer lever arm constituting a cooperating jaw **14**, and an inner lever arm **15**.

Retained by and between the mating faces of jaws **12** and **14** are a pair of dies **16** and **17**. The die **16** is carried by the jaws **12** and **14** near the front ends, the die **16** being capable of compressing a smaller electrical connector than the die **17**. The die **17** is located behind the die **16** and is detachably connected to the jaws **12** and **14** so that any one of a selection of such dies **17** may be selectively inserted so as to accommodate electrical connectors of different sizes.

Extending between the levers **10** and **11** are a pair of cross links **20** and **21**, one of which is located on each side of the levers **10** and **11**. The ends of the cross links **20** and **21** are pivotally connected to each other and to the levers **10** and **11** by bolt and nut connections **22** and **23** constituting fulcrums for the inner and outer lever arms. These cross links **20** and **21** serve to urge the jaws **12** and **14** together in order for the die **16** or **17** to compress an electrical connector located therein when the inner lever arms **13** and **15** are moved away from each other. On the contrary, when the inner lever arms **13** and **15** are moved toward each other, the cross links **20** and **21** through their fulcrum connections **22** and **23** cause a separation of the jaws **12** and **14** to permit the insertion of an electrical connector between the cooperating die **16** or **17** or to enable removal of the compressed electrical connector from between such jaws **12** and **14**.

Operatively connected to the levers **10** and **11** and to each other are a pair of handles generally referred to by **24** and **25**. The handle **24** includes a gripping portion **26** and a tubular casting portion **27**. The front end of handle casting portion **27** is pivotally connected to the inner lever arm **13** by a pivot pin **30**, this pivot connection constituting a fulcrum. Extending inwardly from the handle casting portion **27** is a handle stop **31**.

The other handle **25** includes a gripping portion **32** that is attached to a tubular casting portion **33**. The front end of the handle casting portion **33** is pivotally connected by pivot pin **34** to the inner lever arm **15**, the pivot connection constituting a fulcrum. Integrally formed on the inside of the handle casting portion **33** is a handle stop **35** aligned directly opposite the other handle stop **31** and adapted to coact and abut therewith to limit the movement of the handles **24** and **25** toward each other. The handle casting portion **33** includes an integral relatively fixed handle portion **36** located inwardly of the pivot pin **34** constituting the handle fulcrum. This fixed handle portion **36** constitutes a toggle arm of a toggle joint operatively interconnecting the handles **24** and **25**.

Another toggle arm **37** of this toggle joint is pivotally connected by pin **40** to the handle casting portion **27** and is pivotally connected by pivot pin **41** to the cooperating fixed handle portion **36**. It will be noted that this toggle joint is provided between the fulcrums of the handles **24** and **25**.

The pivotal position of the pivoted toggle arm **37** can be adjusted and fixed by a pair of cooperating screws **42** and **43** threadedly attached and held by the handle casting portion **27** and engageable with the toggle arm **37** on opposite sides of the pivot pin **40**. These locking and adjusting screws **42** and **43** respectively are threadedly manipulated to adjust the pivotal position of toggle arm **37** when the front ends of the jaws **12** and **14** are just touching in order to place the tool in alignment, or in other words, to place the spread of the handles **24** and **25** at the proper distance.

To adjust the toggle arm **37**, first, the locking screw **42** is backed off and the adjusting screw **43** is engaged with the toggle arm **37** until the desired spacing is realized between the handles **24** and **25**. Then, the locking screw **42** is urged tightly against the toggle arm **37** so that the screws **42** and **43** cooperate to retain the toggle arm **37** in its adjusted pivotal position.

A gaging means is provided on the toggle joint between the fulcrums of the handles **24** and **25** in order to determine visually and with considerable accuracy the proper alignment of the tool when the front ends of the jaws **12** and **14** are just touching. This gaging means includes a machined gage edge **44** formed on the fixed handle portion **36** in the overlapping area of the fixed handle portion **36** with the toggle arm **37**. This gage edge **44** extends for a distance along the fixed handle portion **36** between the points indicated *a* and *b* in FIGS. 1 and 5. The gage means also includes a notch **45** constituting an indicator formed in the pivoted toggle arm **37** in the overlapping area with the fixed handle portion **36**.

When the gage notch **45** is visually aligned with the gage edge **44**, when the front ends of the jaws **12** and **14** are just touching, the tool is in correct adjustment or alignment. If the notch **45** is misaligned from the gage edge **44** under these conditions, the tool is not in correct alignment, and appropriate steps must be taken to place the tool in alignment before it can be utilized to compress electrical connectors effectively. The pivotal position of the toggle arm **37** is adjusted and fixed by manipulation of the locking and adjusting screws **42** and **43**.

Of course, it will be understood that the relative locations of the gage edge **44** and the gage notch **45** may be reversed, and effective alignment results will still be realized. In other words, the machined gage edge **44** may

be provided on the pivoted toggle arm **37** while the gage notch **45** may be placed in the fixed handle portion **36**. Under these conditions, the gage edge **44** and notch **45** will operate in exactly the same manner to indicate alignment or misalignment.

It is thought that the usage and the functional advantage of the compression tool has become fully apparent from the foregoing detailed description of parts, but for completeness of disclosure, the use of the adjusting mechanism and the gaging means will be briefly described.

First, the tool is held up so as to give a front elevational view, as is illustrated in FIG. 1, and the handles **24** and **25** are moved toward each other until the front end of the jaws **12** and **14** are just touching. It is then noted whether or not the gage notch **45** is in alignment with the gage edge **44**. If the notch is not aligned with the gage edge **44**, the tool is out of adjustment or alignment. This misalignment of the tool can be caused by different reasons, one of which is the wearing of the pivot pins and bearings forming the fulcrums between the levers **10** and **11** and between the levers **10–11** with the associated handles **24–25**. The tool must be placed in correct alignment before it can be effectively and most efficiently used to compress electrical connectors.

To adjust the tool, the locking screw **42** is backed off from engagement with the toggle arm **37** and the pivotal position of toggle arm **37** is adjusted by manipulation of the adjusting screw **43**. Upon pivotal movement of the pivoted toggle arm **37**, the distance between the spread handles **24** and **25** is varied until the correct spread or distance is realized as is indicated by the alignment of the gage notch **45** with the gage edge **44**. When the gaging means indicates tool alignment, the locking screw **42** is tightened so that the screws **42** and **43** coact to fix the toggle arm **37** in the adjusted position.

It will be understood that the pivotal position of the pivoted toggle arm **37** is adjusted continuously by manipulation of the adjusting screw **43** until tool alignment is attained. There is no need for stopping the adjustment in order to use a separate gage bar to indicate the handle spread. The gage means constituted by the gage edge **44** and the gage notch **45** indicate at all times the alignment condition of the tool, and continuously indicate just what adjustments have to be made by the screw **43** in order to bring the tool into correct alignment.

Although the invention has been described by making detailed reference to a single preferred embodiment, such detail is to be understood in an instructive, rather than in any restrictive sense, many variants being possible within the scope of the claims hereunto appended.

I claim as my invention:

1. In a tool for compressing an electrical connector:

(a) a pair of levers each having a fulcrum and outer and inner lever arms, the outer lever arms comprising jaws having oppositely disposed complementary dies for receiving the connector,

(b) means pivotally connecting the levers at their fulcrums, the jaws and dies moving inwardly to compress the connector when the inner lever arms are rotated away from each other,

(c) a pair of handles pivotally connected to the inner lever arms for rotating the inner lever arms,

(d) means pivotally connecting the handles to provide an adjustable toggle joint therebetween, and

(e) gaging means on the toggle joint indicating tool alignment, the toggle joint being adjustable to bring the tool selectively in alignment as indicated by the gaging means.

2. In a tool for compressing an electrical connector:

(a) a pair of levers each having a fulcrum and having outer and inner lever arms, the outer lever arms comprising jaws having oppositely disposed complementary dies for receiving the connector,

(b) means pivotally connecting the levers at their fulcrums, the jaws and dies moving inwardly to compress the connector when the inner lever arms are rotated away from each other,
(c) a pair of handles each having a fulcrum,
(d) means pivotally connecting the fulcrums of the handles to the inner lever arms,
(e) means pivotally connecting the handles to provide a toggle joint between the fulcrums of the handles, and
(f) gaging means on the toggle joint indicating tool alignment with the ends of the jaws just touching, the toggle joint being adjustable to bring the tool selectively in alignment as indicated by the gaging means.

3. In a tool for compressing an electrical connector:
(a) a pair of levers each having a fulcrum and having outer and inner lever arms, the outer lever arms comprising jaws having oppositely disposed complementary dies for receiving the connector, the jaws having predetermined contact portions therebetween,
(b) means pivotally connecting the levers at their fulcrums, the jaws and dies moving inwardly to compress the connector when the inner lever arms are rotated away from each other,
(c) a pair of handles pivotally connected to the inner lever arms for rotating the inner lever arms toward or away from each other,
(d) one of the handles including a first toggle member,
(e) a second toggle member pivotally mounted to the other handle and pivotally connected to the first toggle member to form a toggle joint between the handles,
(f) gaging means on the toggle members alignable when the predetermined contact portions are just touching to indicate tool alignment, and
(g) means adjustable positioning the second toggle member to bring the tool selectively in alignment as indicated by the gaging means.

4. In a tool for compressing an electrical connector:
(a) a pair of levers each having a fulcrum and having outer and inner lever arms, the outer lever arms comprising jaws having oppositely disposed complementary dies for receiving the connector,
(b) means pivotally connecting the levers at their fulcrums, the jaws and dies moving inwardly to compress the connector when the inner lever arms are rotated away from each other,
(c) a pair of handles pivotolly connected to the inner arms for rotating the inner arms toward or away from each other,
(d) one of the handles including a first toggle member,
(e) a second toggle member pivotally mounted to the other handle and pivotally connected to the first toggle member to provide a toggle joint between the handles,
(f) a gaging means including a gaging edge on one of the toggle members and a coacting indicator on the other toggle member, which are alignable to indicate tool alignment, and
(g) means adjustably positioning and fixing the second toggle member to bring the tool selectively in alignment as indicated by the gaging means.

5. In a tool for compressing an electrical connector:
(a) a pair of levers each having a fulcrum and having outer and inner lever arms, the outer lever arms comprising jaws having oppositely disposed complementary dies for receiving the connector,
(b) means pivotally connecting the levers at their fulcrums, the jaws and dies moving inwardly to compress the connector when the inner lever arms are rotated away from each other,
(c) a pair of handles each having a fulcrum,
(d) means pivotally connecting the fulcrums of the handles to the inner lever arms,
(e) one of the handles including a handle portion constituting a toggle arm fixed inwardly of the associated handle fulcrum,
(f) another toggle arm pivotally mounted to the other handle and pivotally connected to the fixed toggle arm to provide a toggle joint between the fulcrums of the handles,
(g) a gage means on the toggle arms cooperating to show the desired spread of the handles, and
(h) means adjusting the pivotal position of the pivoted toggle arm to adjust the spread of the handles to bring the tool selectively in alignment as indicated by the gage means, the adjusting means selectively locking the pivoted toggle arm in the adjusted position.

6. In a tool for compressing an electrical connector:
(a) a pair of levers each having a fulcrum and each having outer and inner lever arms, the outer lever arms comprising jaws having oppositely disposed complementary dies for receiving the connector,
(b) means pivotally connecting the levers at their fulcrums, the jaws and dies moving inwardly to compress the connector when the inner lever arms are rotated away from each other,
(c) a pair of handles each having a fulcrum,
(d) means pivotally connecting the fulcrums of the handles to the inner lever arms,
(e) one of the handles including a handle portion extending inwardly of the associated handle fulcrum, the handle portion constituting a toggle arm stationary relative to the associated handle,
(f) another toggle arm pivotally mounted to the other handle and pivotally connected to the first toggle arm to provide a toggle joint between the fulcrums of the handles,
(g) a gage means on the toggle arms cooperating to show the desired spread of the handles when the ends of the jaws are just touching in order to provide the appropriate compression of the connector by the jaws when the inner lever arms are rotated away from each other,
(h) the gage means including a gage edge on one toggle arm and a notch in the other toggle arm, the edge and notch being alignable when the handles are spread the appropriate distance when the jaws are just touching, and
(i) means adjusting the pivotal position of the pivoted toggle arm to adjust the spread of the handles to bring the gage notch into alignment with the gage edge when the jaws are just touching and hence bring the tool selectively in adjustment, the last said means selectively locking the pivoted toggle arm in the adjusted position to maintain the tool in adjusted alignment.

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