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[54] CARTRIDGE-TYPE CRIMPING TOOL

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[21] Appl. No.: **18,929**

[52] **U.S. Cl.**.....**72/410**, 29/212 D, 29/203 D

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

[58] **Field of Search**.....29/203 DT, 203 H, 203 HC, 212 D, 29/243.56, 280; 72/409, 410

[56] **References Cited**

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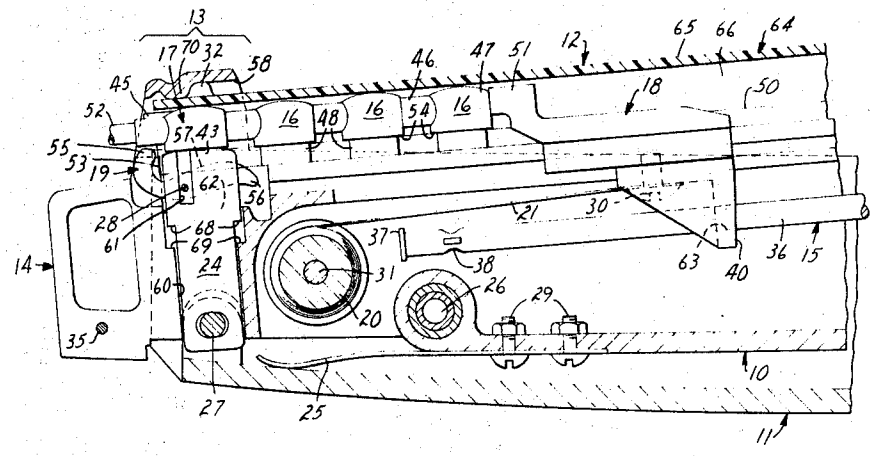
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[57] **ABSTRACT**

A hand tool which rigidly holds a connector in position to accept a plurality of wires to be joined, assures permanent electrical connection by retaining the connector until a proper crimp has been made, forces the properly crimped connector from the tool, and automatically presents a new connector in the proper position from a supply cartridge. The connectors are of the type having a wire receiving base portion and a telescoping cover portion movable into the base portion.

8 Claims, 8 Drawing Figures



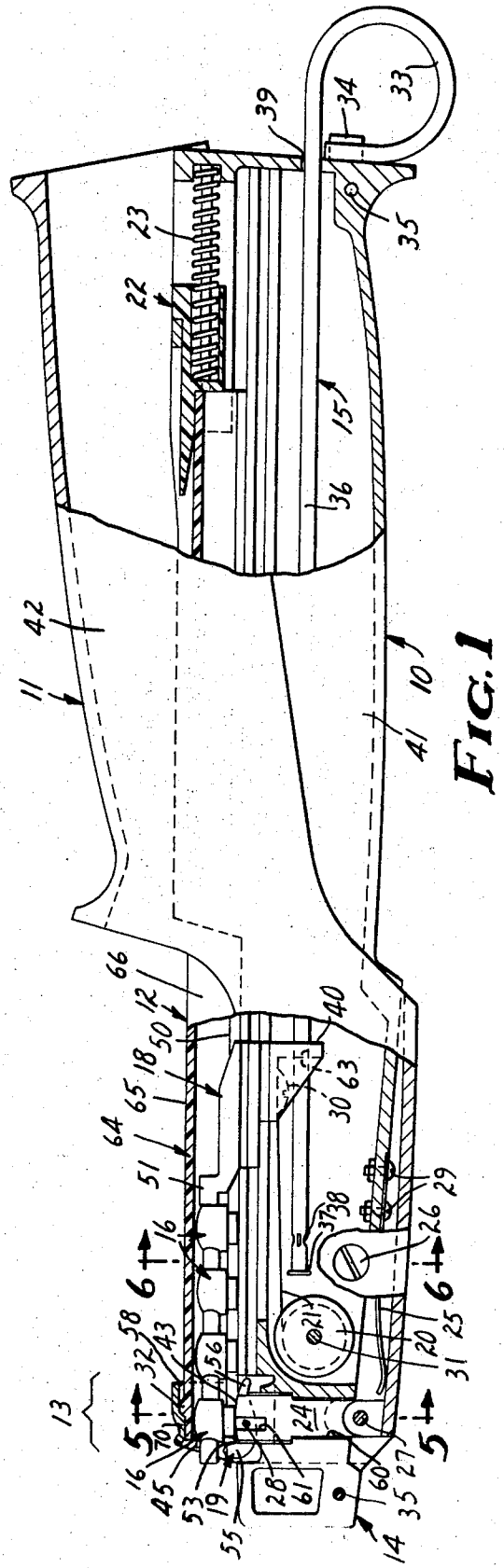


FIG. 1

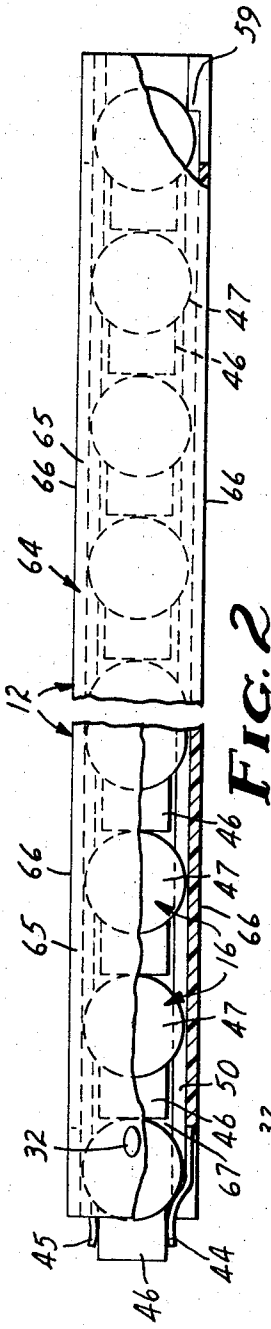


FIG. 2

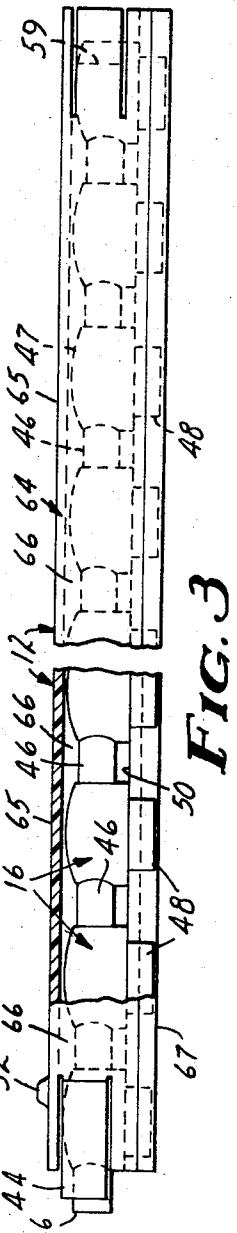


FIG. 3

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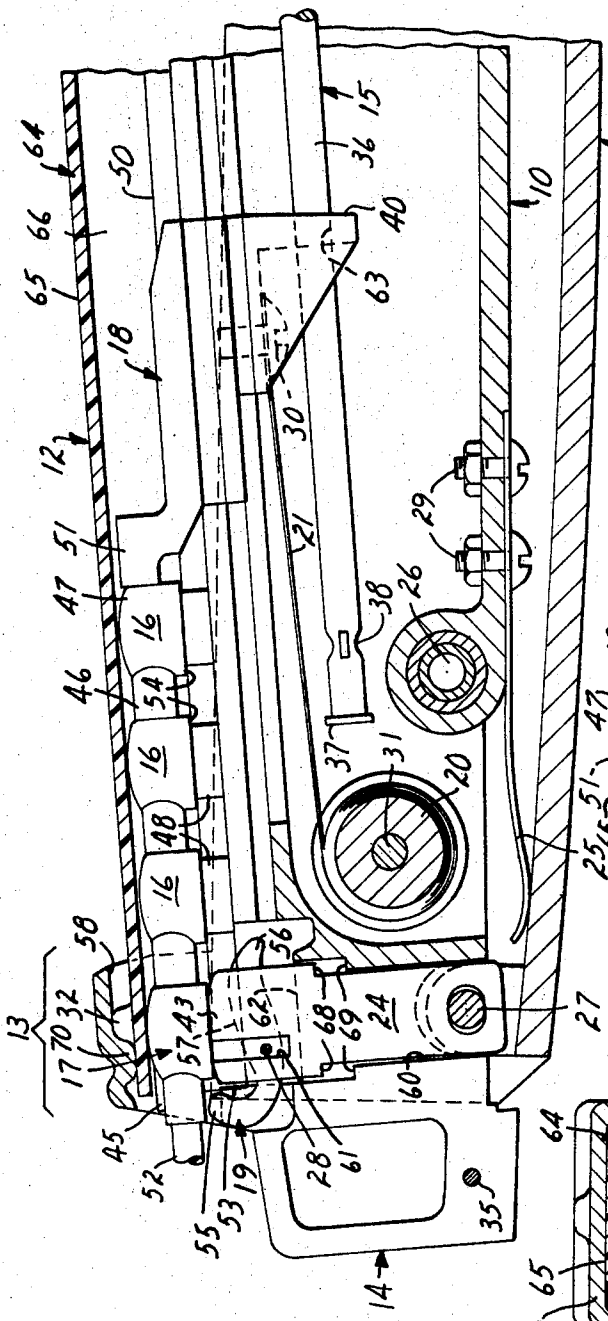


FIG. 4

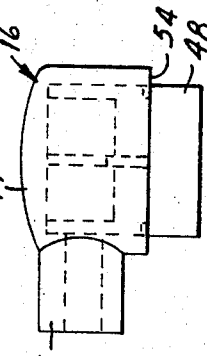


FIG. 7

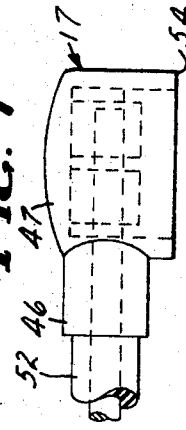


FIG. 8

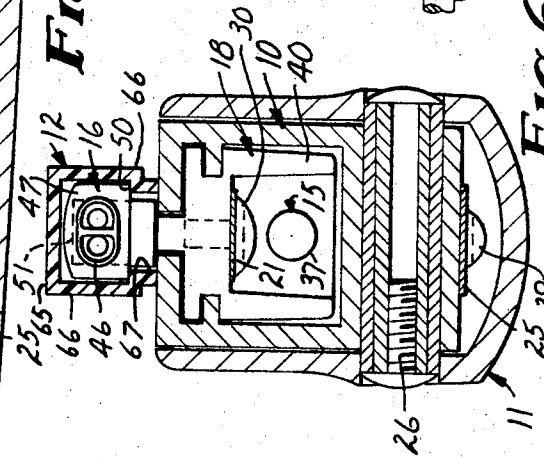


FIG. 6

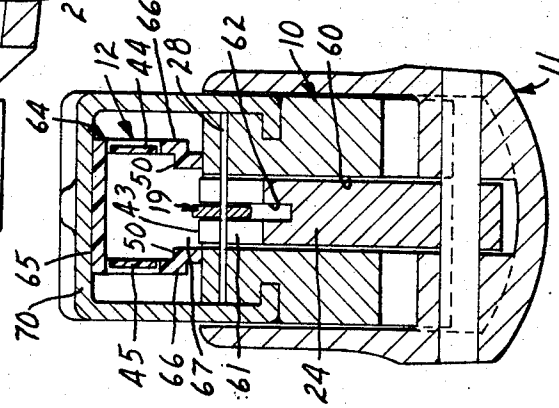


FIG. 5

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CARTRIDGE-TYPE CRIMPING TOOL

This invention relates to hand tools for crimping electrical connectors of the type requiring considerable pressure on opposite surfaces thereof to properly join a plurality of wires therein.

Connectors of the aforementioned type comprise a base portion and a telescoping cover portion movable toward each other; for example see U.S. Pat. No. 3,012,219. To insure positive permanent connection between wires inserted into the base portion of this type of connector the cover portion must be forced into the base while preventing tilting or cocking of the cover. This is of particular importance when wires of different sizes are being connected.

Previously known tools for crimping the aforementioned connectors are of the pliers type such as that shown in U.S. Pat. No. 3,220,241. The crimping tool shown there provides the needed uniformly distributed pressure but holds only one connector per operation, requiring the operator to handle each connector individually. Besides being inconvenient, individual handling is wasteful due to the high frequency of dropping and losing these small connectors.

According to the present invention there is provided a tool which rigidly holds a connector in position to accept a plurality of wires to be joined, assures a permanent electrical connection by retaining the connector until a proper crimp has been made, forces the properly crimped connector from the tool, and automatically presents a new connector in the proper position.

There is further provided a tool which will allow one-handed holding and crimping operations, leaving the other hand free to hold and adjust the plurality of wires to be joined.

There is further provided a tool capable of performing a large number of wire connecting operations per unit time.

The many advantages and features of the present invention can best be understood and appreciated by reference to the accompanying drawings which illustrate a tool incorporating the preferred embodiment of the present invention and wherein:

FIG. 1 is a side elevational view of the tool with parts being broken away to show detail of the internal elements;

FIG. 2 is a top plan view of a connector carrier with parts broken away;

FIG. 3 is a side elevation of a connector carrier with parts broken away;

FIG. 4 is a cross-sectional elevation taken near the longitudinal axis of the front portion of the tool while it is in the crimping or closed position;

FIG. 5 is a transverse cross-sectional elevation taken approximately at line 5—5 of FIG. 1 showing the crimping station of the tool;

FIG. 6 is a transverse cross-sectional elevation taken approximately at line 6—6 of FIG. 1;

FIG. 7 is an elevational side view of a typical connector prior to crimping; and

FIG. 8 is an elevational side view of a typical connector crimped to a pair of wire-ends by the present tool.

Referring to the drawings and particularly to FIG. 1, the tool there shown comprises an elongate housing, generally designated **10**, that is pivotally connected by a pin **26** to a channel-shaped elongate handle member **11**. The housing **10** has at one end crimping station **13** and at the other end handle portion **41**. In the preferred embodiment the housing comprises a left and a right shell cast of metal and held together by assembly pins **35**. The elongate handle member **11** has channel-shaped handle portion **42** partially overlapping the top of the housing handle portion **41** as shown in FIG. **1**. Handle member **11** extends toward the crimping station **13** in a streamlined shape on either side of the housing to overlap that portion of the housing below the crimping station **13** as shown. The handles in the preferred embodiment are contoured to provide a comfortable grip so that the tool is easily retained in one hand even while wearing gloves. A tool hanger loop **14** is provided in an extension of the housing beyond the crimping station.

Plunger **24**, terminally pivotally mounted on handle member **11** by pin **27** for slidable movement within channel **60** in the housing, is advanced into the crimping station **13** in response to movement of the handle portions toward each other. Plunger surface **43** defines a compression region within the crimping station. As the plunger **24** is moved into the crimping station **13**, surface **43** is pressed against connector cap **48** which in turn is forced into connector body **47**. Compression cover **70**, overlaying the dispensing end of carrier **12** positioned in the crimping station **13**, prevents vertical movement of the connector body **47** during the pressing. Uncrimped connector **16** shown in FIG. **7** assumes the shape of crimped connector **17** shown in FIG. **8** upon completion of a crimping operation. The travel of plunger **24** into the crimping station **13**, sufficient to provide movement of the cap **48** of a connector contained therein from the open position to the closed position into the connector body **47**, is terminated at that position by contact of the handle portions with each other. The handle **11** is biased toward the open position by spring **25** attached to the housing by fasteners **29**, pressing against the forward part of the handle. Plunger shoulder **68** rests upon containment ledge **69** restraining the downward retractive movement of the plunger **24** thereby preventing undue separation of the handle portions. Plunger pivot pin **27** traveling in an arc about handle pivot pin **26**, rides in an elongated hole in the plunger **24** to compensate for forward movement of pin **27** and allows substantially vertical movement of plunger **24** in channel **60**.

The tool is adapted to receive a cartridge or connector carrier containing a plurality of wire-connectors. As shown in FIGS. **2**, **3**, **5** and **6**, carrier **12** is characterized by having a channel-shaped body **64**, a substantially flat top **65**, substantially flat walls **66** perpendicular to the top, and an open base portion **67**. The walls have internal longitudinal ridges near the base providing connector support ridges **50** running the length of the carrier. Restraining and aligning fingers **44** and **45** prevent the connectors from sliding out the front of the carrier; and stop **59** prevents connectors from sliding out the rear of the carrier. Connectors may be inserted or removed at both ends of the carrier with the application of moderate force. As shown in the Figure the connectors are contained in the carrier with wire-receiving portion **46** directed toward the aligning fingers **44** and **45**, and the body **47** supported by its shoulder **54** upon support ridges **50** suspending cap **48** over the open base. Alig-

ning fingers 44 and 45 align the connector as it comes out of the front of the carrier so that wire-receiving portion 46 of the connector is centered with respect to the walls of the carrier.

A centering knob 32, projecting upwards from the top forward portion of the carrier 12, centers the carrier when it is inserted into centering slot 58 in the crimping station 13. The rear portion of the carrier is centered in the tool by U-shaped carrier receiving and grasping member 22. The tool will accommodate carriers of varying widths including narrow carriers containing small connectors as well as wider carriers containing relatively large connectors. Member 22 slidably mounted in the housing (see FIG. 1) is urged against the rear portion of the carrier by spring 23 therein holding the carrier in place. Carrier 12 is prevented from forward movement by contact of the centering knob 32 with the compression cover 70 forward of slot 58.

The manner in which connectors are fed to the crimping station for crimping is illustrated in FIGS. 1, 4 and 6 of the drawings. Referring to FIG. 1, the carrier 12 is shown in this figure in the position it occupies in the tool. In the open position shown in FIG. 1 plunger 24 is in a retracted position with the handle portions urged apart by spring 25. The connectors 16 in the carrier 12 are urged toward the crimping station 13 by a feed means provided by follower 18 attached to coil spring 21 contained on pulley 20 mounted on shaft 31 attached to the housing. The spring 21 is attached to follower 18 by fastener 30. The follower 18, slidably movable in the housing (see FIGS. 4 and 6) having member 51 extending upwards into the open base of the carrier and pressing against the end connector therein, is urged toward the crimping station by spring 21. The spring 21 in the preferred embodiment is of the constant tension variety such as provided by a negator spring.

An open connector in the crimping station 13 is prevented from exiting therefrom by ridge 53 therein which creates a restriction between the carrier and the ridge that will prevent the passage of an uncrimped connector but allow the passage of a properly crimped connector. The cap 48 of the connector in the crimping station is the obstructing portion which contacts ridge 53 and prevents the connector from leaving the crimping station.

To crimp a connector, handles 41 and 42 are pressed together against spring 25 advancing plunger 24 from the position shown in FIG. 1 to that of the position shown in FIG. 4 causing plunger surface 43 to press on cap 48 lying thereabove forcing it into connector body 47 connecting wires 52 inserted therein. Releasing handles 41 and 42 provides for their separation by the action of spring 25 resulting in the retraction of the plunger 24. The crimped connector 17, now free of the obstructing cap 48, is easily forced past ridge 53 over sear 19 out of the tool. As the crimped connector leaves, the next connector is moved into place to be rigidly held and positioned therein as previously described.

Sear 19, pivotally mounted to the housing on pin 28, controls the advancement rate of the connectors in the carrier, slowing their movement into the crimping station 13. Plunger 24 is cut away to form transverse slot 61 to provide clearance for pin 28 when the plunger is actuated and to form sear slot 62 to allow movement of the sear 19, as shown in more detail in FIGS. 4 and 5. As a crimped connector exits the tool it depresses rounded sear front portion 55 raising rear portion 56 causing the next connector to ride over rounded upper rear portion 57 slowing the movement of that connector until the crimped connector has cleared front portion 55. Sear 19 prevents rapid movement and abrupt stopping of connectors in the carrier which may cause the connector parts to become separated.

Changing the carrier requires the retraction of follower 18 into the handle portion 41 of the housing until it presses upon carrier holding member 22 and compresses spring 23 releasing the cartridge. Retraction arm 15 having shaft 36 passing through hole 39 in housing handle portion 41 and through hole 63 in planar pendant portion 40 of follower 18, slidably movable through each, when withdrawn accomplishes the desired release of the carrier. When drawn toward the handle portion 41 the shaft having flange 37 incapable of passing through hole 63, pulls the follower back against tension provided by spring 21 until it abutts member 22. Shaft 36 is drawn back to press member 22 against spring 23 until member 22 releases its grasp on carrier 12. Thereafter carrier 12 can be removed and replaced if desired.

Ring 33 at the external end of shaft 36 provides a convenient configuration to grasp when drawing the retraction arm back. Ring holder 34 restrains the retraction arm 15 from movement when it is not in use. Key portion 38, in the shaft 36, when drawn through an appropriately shaped hole 39 and turned, provides a simple means for holding the follower in the load position so that the tool can be held in one hand and the carrier may be changed with the other.

It is, of course, to be understood that the foregoing description is illustrative only and that numerous changes can be made in the embodiment described without departing from the spirit of the invention as set forth in the claims.

What is claimed is:

1. A hand tool adapted for crimping the foremost connector of a series of connectors supplied in an elongate open-faced trough-like carrier onto wire-ends inserted into said connector, said connector being of the type having a wire receiving base portion and a cover portion projecting from and insertable into said base portion, said tool comprising:

an elongate housing having a longitudinal open-ended passage for receiving said carrier, and having a channel near one end of said passage which intersects said passage, said housing also having a compression member adjacent said one end and opposite said channel,

a plunger slidably fitting within said channel and being movable across said passage toward said compression member,

an elongate handle member pivotally mounted on said housing and pivotally attached to said plunger for slidably moving said plunger within said channel and for applying crimping pressure to a connector retained at the intersection of said channel and said passage between said compression member and said plunger,

retaining means within said one end of said channel for holding an uncrimped connector in alignment between said plunger and said compression member by engaging the cover thereof in its projected position and for permitting removal of a connector with its cover portion inserted against said compression member by said plunger into its body portion, whereby said foremost connector is automatically expelled over said retaining means upon release of said handle member.

2. The tool of claim 1 wherein is included connector restraining means for retarding the forward movement of said series of connectors during removal of a fully crimped foremost connector.

3. The tool of claim 1 wherein said feed means comprises follower means fitting within said open-faced carrier for sliding movement along said carrier and spring means for slidably advancing said follower member along said carrier.

4. The tool of claim 1 wherein is included, at the forward end of said passage, carrier positioning and engaging means, said passage being dimensioned to receive an elongate carrier, said carrier having an open-faced trough-like body with a connector dispensing end, an open end, longitudinal connector supporting ridges, and, at the dispensing end, means engageable in said carrier engaging means for centering and aligning at least the dispensing end of the carrier within said passage.

5. The tool of claim 1 wherein is included a retractable carrier grasping member biased toward the forward end of said tool and in position for engageable contact with the open end of said carrier for centering said open end within said passage and holding said carrier in fixed position within said tool.

6. The tool of claim 5 in combination with a carrier containing a plurality of wire-connectors of the type having a wire receiving base portion and a telescoping cover portion, said carrier being installed into the longitudinal passage of the tool and held therein in fixed position by said grasping member.

7. A carrier for use in a crimping tool as defined in claim 1 adapted to contain and dispense wire-connectors of the type having a wire receiving base portion and a telescoping cover portion and comprising an elongate open-faced trough-like body having a dispensing end, an open end, longitudinal connector supporting ridges, and, at the dispensing end, means engageable in said tool to align and center at least the dispensing end of said carrier within said tool.

8. The carrier of claim 7 further comprising connector aligning fingers at said dispensing end to align the wire-receiving portion of said connectors as they are dispensed from said carrier.

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