Aug. 19, 1969 J. W. ANHALT 3,461,533

CONTACT TERMINAL EXTRACTION TOOL

Filed March 31, 1967 3 Sheets-Sheet 1

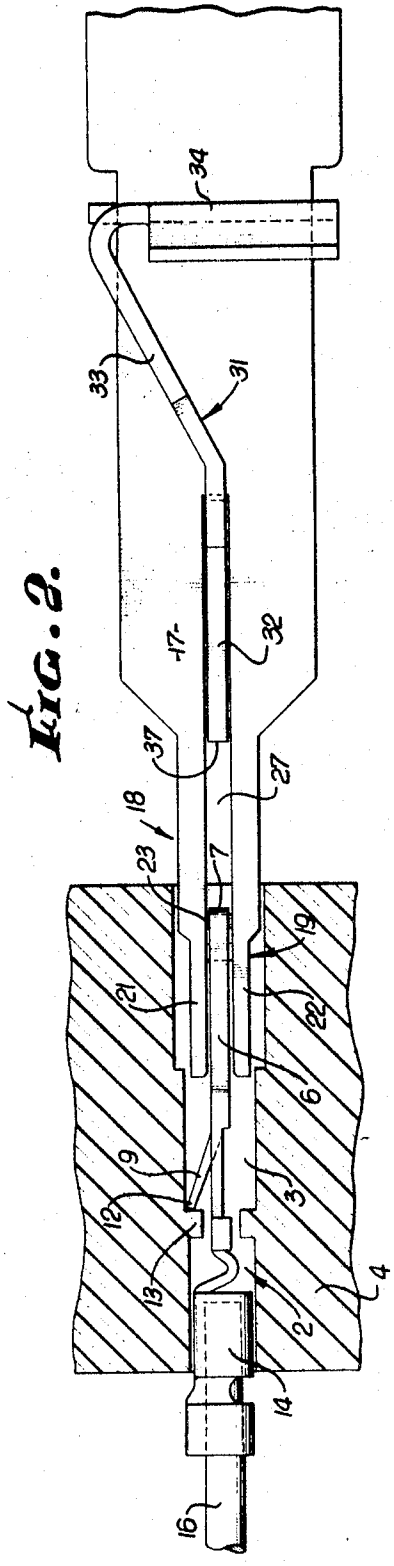


FIG. 2.

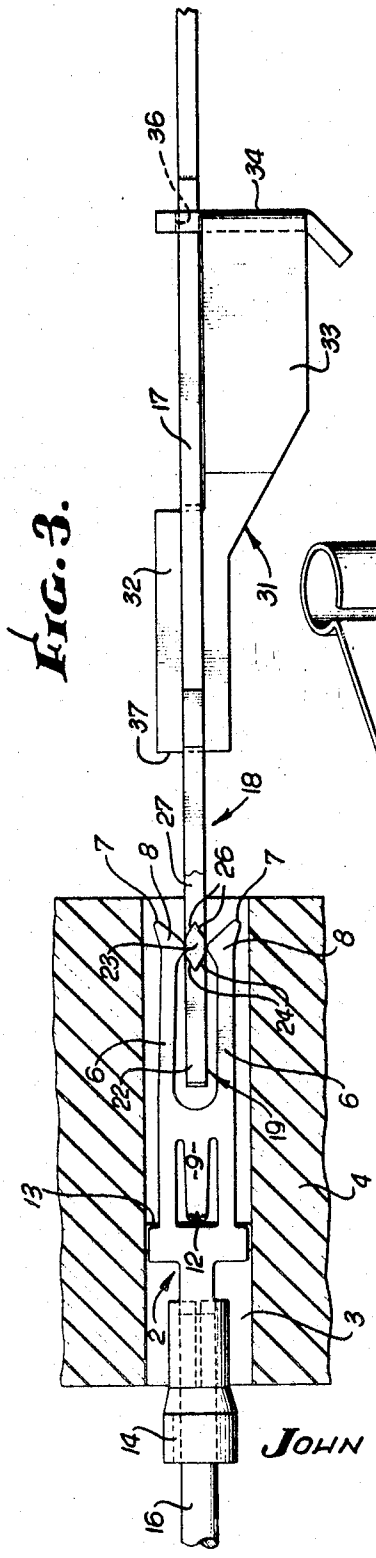


FIG. 3.

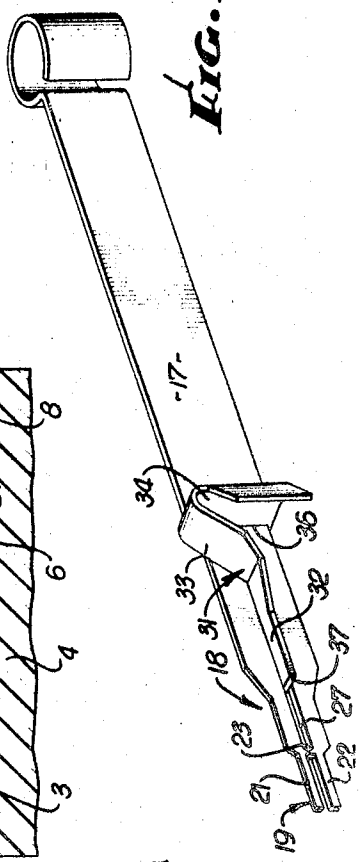


FIG. 1.

INVENTOR.
JOHN W. ANHALT

Aug. 19, 1969 J. W. ANHALT 3,461,533

CONTACT TERMINAL EXTRACTION TOOL

Filed March 31, 1967 3 Sheets-Sheet 2

FIG. 4.

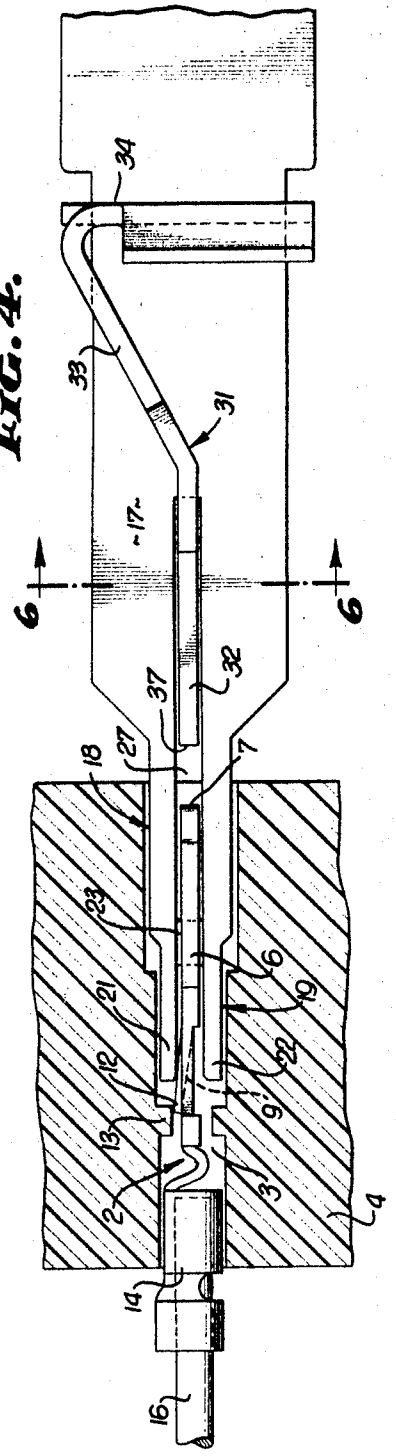


FIG. 5.

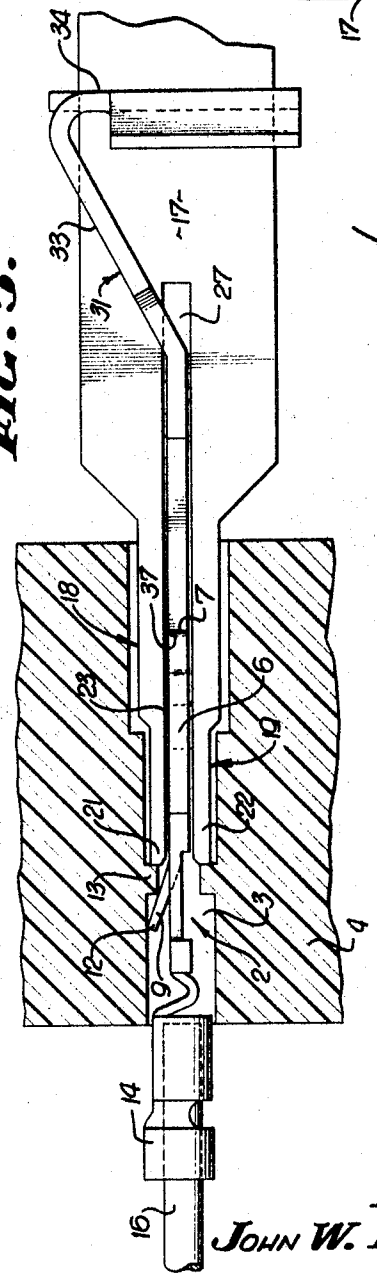
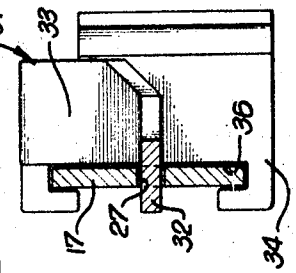


FIG. 6.



INVENTOR.
JOHN W. ANHALT

Aug. 19, 1969 J. W. ANHALT 3,461,533

CONTACT TERMINAL EXTRACTION TOOL

Filed March 31, 1967 3 Sheets-Sheet 3

FIG. 7.

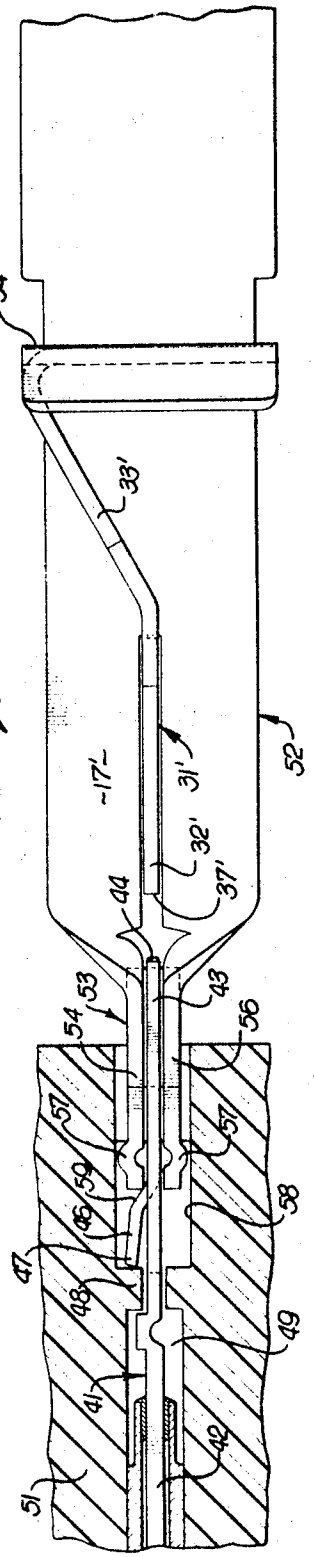


FIG. 8.

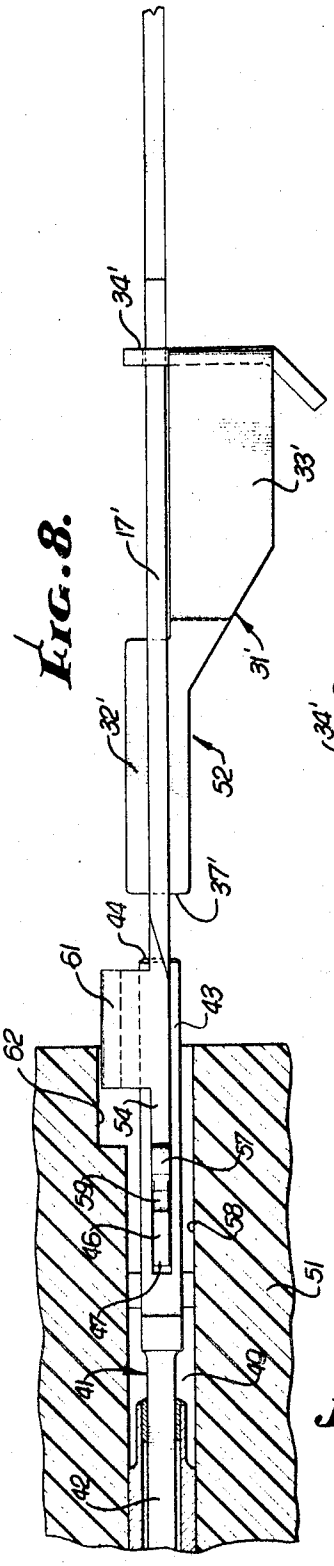
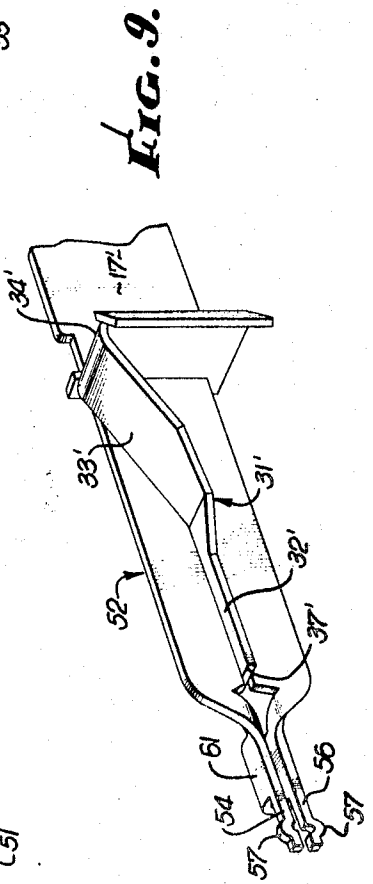


FIG. 9.



INVENTOR.
JOHN W. ANHALT

United States Patent Office 3,461,533 Patented Aug. 19, 1969

3,461,533

CONTACT TERMINAL EXTRACTION TOOL

John W. Anhalt, La Crescenta, Calif., assignor to International Telephone and Telegraph Corporation, New York, N.Y., a corporation of Maryland

Filed Mar. 31, 1967, Ser. No. 627,461
Int. Cl. B25b 27/00
U.S. Cl. 29—203 9 Claims

ABSTRACT OF THE DISCLOSURE

Microelectronic connectors utilizing contact terminals locked within a body of insulating material are used extensively in the electronics and related industries. The contact terminals are small and fragile and subject to destruction by mishandling and other causes. To insure proper connection between mating contacts it is the practice to lock the connectors within the connector body. A defective contact terminal must be removed from the connector body however, and because of its small size and locked relationship to the connector body this poses a problem. The extraction tool forming the subject matter of this invention is designed for insertion into the bore occupied by the contact terminal to release the locking mechanism that releasably locks the contact terminal within the bore. The tool additionally incorporates means for imposing a propelling force on the contact terminal once it has been released for extraction.

The present invention relates generally to an extraction tool for microelectronic contact terminals, and more particularly, to an extraction tool adapted to be inserted into a bore in a connector body occupied by a contact terminal and locked therewithin, to effect nondestructive unlocking thereof from the connector body and to impose a propelling force on the released terminal to drive it from the bore.

Background of invention

In the assembly and use of microelectronic and electrical connectors of the type wherein contact terminals are held within appropriate bores formed in a connector body it is desirable that the contact terminals be inserted with a minimum of force, that once inserted they be incapable of rotation so as to maintain the same orientation with the connector body throughout the life thereof, and that they be locked against inadvertent extraction from the connector body, but which when desired, may be unlocked and extracted from the connector body without being destroyed or damaged.

It is therefore one of the objects of the present invention to provide an extraction tool useful in conjunction with a contact terminal having the attributes discussed, and which is capable of releasing and nondestructively extracting a contact terminal which normally lies locked within a connector body.

The nature of microelectronic and electrical connectors utilizing the type of contact terminal contemplated and disclosed prevents occular observation of the contact terminal within the connector body. Accordingly, it is another object of the invention to provide an extraction tool which automatically orients itself in relation to the contact terminal to be extracted when the tool is inserted into the connector bore within which the contact terminal is locked.

Other objects and features of advantage will be apparent from the following description and the drawings. It should be understood, however, that the particular embodiment of the invention illustrated and described should not be taken as restrictive of the inventive concept since various embodiments are contemplated within the scope of the appended claims.

Summary of invention

In terms of broad inclusion, the contact terminal extraction tool of the invention is adapted for use in conjunction with an electrical or microelectronic connector including a body of dielectric material having one or more bores therethrough within each of which bores is supported a contact terminal having an integral and resilient tine projecting out of the plane of the contact terminal and releasably locked behind an abutment projecting into the bore, so as to prevent inadvertent extraction of the contact terminal from the connector body. Electrical connectors of this type include a backside and a frontside, with the contact terminal being inserted into the bore from the backside of the electrical connector. Electrical connection is made to associated electrical or electronic gear by inserting appropriate contact pins into the bores and into resilient engagement with the contact terminals from the frontside of the electrical connector.

Extraction of the contact terminal from within the connector body in a manner which does not destroy the contact terminal is exceedingly difficult if not impossible without the use of an appropriate tool. The extraction tool of the invention comprises an elongated blade having a bifurcated probe portion at one end adapted for insertion into a bore in the electrical connector from the frontside thereof. The probe portion is provided with means to engage the resilient tine so as to flex it out of engagement with the abutment within the bore, and thus release the contact terminal for extraction from the bore. Release of the contact terminal, however, does not automatically effect extraction. To extract the contact terminal, the extraction tool is provided with a driver movably mounted on the blade and having a plate portion oriented so as to abut the forward end of the contact terminal when the driver is moved into the bore. The application of force on the driver propels the contact terminal along the bore sufficiently to drive the resilient tine past the abutment in the bore and thus release the contact terminal for complete extraction from the backside of the connector body.

Brief description of drawings

FIG. 1 is a perspective view of one embodiment of the extraction tool of the invention.

FIG. 2 is a side elevation, partly in vertical section, showing the extraction tool, contact terminal and connector body in partial engagement.

FIG. 3 is a plan view partly in horizontal section disclosing the same relationship between the connector body, contact terminal and the extraction tool as shown in FIG. 2.

FIG. 4 is a view similar to FIG. 2, but showing the probe portion of the tool inserted to a greater depth to effect unlocking of the resilient tine.

FIG. 5 is a view similar to FIG. 4, but showing the tool inserted to its maximum depth and the driver moved forwardly into the bore to propel the tine past the abutment in the bore to release the contact terminal therefrom.

FIG. 6 is a vertical cross-sectional view taken in the plane indicated by the line 6—6 in FIG. 4.

FIG. 7 is a side elevational view similar to FIG. 2, but illustrating a different embodiment of the extraction tool, in conjunction with a portion of a connector body and a contact terminal.

FIG. 8 is a plan view of the tool shown in FIG. 7.

FIG. 9 is a perspective view of the extraction tool shown in FIGS. 7 and 8.

Description of preferred embodiment

Referring specifically to FIGS. 1–6, inclusive, the contact terminal extraction tool of the invention is adapted for use to effect the non-destructive extraction of a contact terminal referred to generally by numeral **2** from bore **3** formed in dielectric body **4** of an electrical connector. The contact terminal is provided with forwardly extending resilient fingers **6** spaced apart and converging toward their free ends **7** to provide opposed contact portions **8**. The contact terminal is also provided with a resilient tine **9** struck from the body of the contact terminal and projecting out of the plane thereof to provide a free end **12** adapted to engage behind abutment **13** projecting into bore **3** when the contact terminal is inserted thereinto. The contact terminal is also provided with a ferrule **14** crimped and soldered about an electrical conductor **16**.

To effect non-destructive extraction of the contact terminal described above, the extraction tool of the invention comprises an elongated blade **17** having at one end thereof a probe portion designated generally by numeral **18**, proportioned to permit insertion of the probe portion into the front end of bore **3** formed in the connector body. The probe portion is provided with a bifurcated section designated generally by numeral **19** and having elongated fingers **21** and **22** spaced apart to snugly receive therebetween the forward portion of the contact terminal. At a point spaced from their forward ends, the fingers are joined by a bridge **23** preferably having the same thickness as the blade, and having at each opposite end converging cam surfaces **24** and **26** as shown. The probe portion immediately behind bridge **23** is provided with an elongated longitudinally extending slot **27**, defined at its forward end by the bridge **23** and at its end remote from the bridge terminating in the blade **17**.

As shown best in FIG. 3, when the probe portion is inserted into the bore, fingers **21** and **22** are guided into the bore by contact portions **8** which, prior to engagement with bridge **23**, lie in close proximity to each other. The contact portions are resiliently biased away from each other by insertion of the bridge **23** therebetween. When the probe portion is inserted further into the bore, the fingers **21** and **22** are guided at their forward ends on the body of the contact terminal at the base of resilient fingers **6**, while the free ends of fingers **6**, specifically contact portions **8**, slide off cam surfaces **26** into slot **27** so that the probe portion is also guided during insertion by the forward end of the contact terminal working in slot **27**.

In the position of the probe portion shown in FIG. 4, finger **21** has engaged tine **9**, and has flexed it toward the plane of the contact terminal body so as to free it from abutment **13** as shown. The probe portion is then counter further until the ends of fingers **21** and **22** encounter abutments **13**, at which point the contact terminal is in condition to be extracted.

Inasmuch as the contact terminal is of small size and exceedingly fragile, it is not advisable to grasp the ferrule **14** or conductor **16** and impose tension on the contact terminal to effect extraction. To effect non-destructive extraction of the contact terminal from the bore, it is preferable that an impelling force be imposed on the front end of the contact terminal. The extraction tool is accordingly provided with a driver designated generally by numeral **31**. The driver includes a generally flat forward plate portion **32** lying in planar alignment with the contact portions **8** of the contact terminal. To retain the flat plate portion **32** of the driver in planar alignment with contact portions **8**, the plate portion **32** of the driver is engaged in the longitudinally extending slot **27**, and at its end remote from the contact terminal the flat plate portion **32** merges with a rearwardly extending inclined body section **33** disposed along one side of the blade **17**. The inclined body section **33** terminates in a depending tab **34** having a vertical slot **36** therein through which

the blade **17** extends and by which the driver is additionally guided in its movement along the blade.

It will thus be seen that with the extraction tool in the position shown in FIG. 4, movement of the driver forwardly by exerting a force on the depending tab **34** will bring the forward edge **37** of the driver into engagement with the forward ends **7** of the contact terminal. Continued force on the driver will propel the contact terminal to the left as viewed in FIGS. 1–5 and drive the tine **9** from its unlocked position shown in FIG. 4 to its fully released position shown in FIG. 5. Having thus released the contact terminal from its locked condition as shown in FIG. 2, and having initiated the extraction of the contact terminal from the bore by propelling it out of the contact terminal from the bore by propelling it out of the bore by use of driver **31**, a gentle tug on the ferrule **14** is sufficient to complete the extraction processes.

In the embodiment of the extraction tool shown in FIGS. 7–9, inclusive, the design of the contact terminal is different from the contact terminal shown in FIGS. 1–5. This difference in design in contact terminal requires a modification in the embodiment of the invention in the extraction tool shown in FIGS. 7–9.

Accordingly, with specific reference to the embodiment illustrated in FIGS. 7–9, the contact terminal designated generally by numeral **41** includes a tang **42** to which an electrical conductor (not shown) may be connected, and a forward contact portion **43** of elongated and rectangular cross section. Spaced from its forward end **44**, the contact portion **43** is provided with a tine **46** struck from the body of the contact and provided with a free end **47** adapted to lock behind an appropriate abutment **48** formed in the bore **49** of the connector block **51**. It will thus be seen that during insertion of the contact terminal into the bore **49**, the tine is depressed into the plane of the contact blade **43** by the camming action of the abutment **48**, until the blade moves forwardly sufficiently to permit the tine **46** to snap outwardly so that its forward end **47** engages behind abutment **48**. When this occurs, the contact terminal can no longer be extracted inadvertently by movement of the contact terminal to the left as shown in FIGS. 7 and 8.

To effect non-destructive extraction of the blade-like contact terminal, the extraction tool generally designated by numeral **52** is utilized to resiliently depress tine **46** to release the contact terminal to permit its rearward extraction from bore **49**. Primarily, the difference between the extraction tool shown in FIGS. 7, 8, and 9 and the extraction tool shown in FIGS. 1–6 involves the probe portion **53** which, in the present embodiment, comprises a pair of forwardly extending fingers **54** and **56**, spaced apart and adapted to slide snugly over the contact blade **43**, as shown best in FIG. 7. Adjacent their forward ends, the fingers **54** and **56** are provided with laterally projecting protuberances **57** proportioned to guide on the interior surface **58** of bore **49**. Thus, as shown best in FIG. 7, continued movement of the probe portion to the left will impose a vertical component of force on the tine by virtue of the inclined surface **59** thereon, so that as forward movement progresses the tine will be resiliently depressed into the plane of the contact blade **43**, thus releasing it from its engagement behind abutment **48**. With the tine thus released from engagement, forward movement of the driver **31'** effects engagement of the forward end thereof with the forward end **44** of the contact blade, so as to propel the contact blade to the left as seen in FIGS. 7 and 8 and out of the bore.

In order that the contact blade not be deformed upon insertion of the probe portion of the tool into the bore, the probe portion is provided with a laterally extending C-shaped portion **61** which bridges and lends rigidity to the fingers **54** and **56** adjacent their base where they merge with the blade **17'**. The C-shaped portion is snugly received in a key-slot or notch **62** formed in the bore

adjacent the front side of the connector body. Thus, the probe portion of the tool is guided in its movement through the bore, insuring that deflection thereof will not occur to deform the contact blade.

I claim:

1. A tool for use in conjunction with an electrical connector to effect non-destructive release and extraction from the connector body of a contact terminal member having an integral resilient tine projecting out of the plane of the contact member and releasably locked behind an abutment projecting into a bore extending through the electrical connector, comprising a blade having a probe portion adapted for insertion into the bore to depress the tine out of engagement with the abutment in the bore, and a driver movably mounted on the blade and movable into propelling engagement with the contact member within the bore to propel the depressed tine past the abutment to release the contact member for extraction from the connector body.

2. The combination according to claim 1, characterized in that the probe portion of the blade comprises a bifurcated section having fingers spaced to receive the contact member therebetween when the probe portion is inserted into the bore to depress the tine.

3. The combination according to claim 1, characterized in that the blade is provided with a longitudinally extending slot, and the driver is guided in its movement along the blade by the slot.

4. The combination according to claim 1, characterized in that the probe portion includes a finger adapted to project into the space between the bore wall and the tine to impose a transverse camming force on the tine to flex it out of engagement with the abutment.

5. The combination according to claim 1, characterized in that the driver is provided with a generally flat forward plate portion lying in planar alignment with the contact terminal member so as to engage and propel the contact terminal member when the probe is inserted in the bore and the driver is moved along the blade into the bore.

6. The combination according to claim 2, in which the contact terminal is provided with a bifurcated front portion having elongated arms converging toward their free ends to provide opposed contact portions spaced apart a distance less than the thickness of the blade, characterized in that a wedge member bridges the space between the fingers of the probe portion at a point spaced from the ends of the fingers so that initial insertion of the probe into the bore is guided by the opposed contact portions working in the space between the fingers and continued insertion forces the wedge member between the opposed contact portions to resiliently bias the arms away from each other and permit passage of the probe into the bore.

7. The combination according to claim 2, in which the contact terminal includes a rectangular pin portion with the tine struck therefrom and projecting out of the plane of the pin, characterized in that the end of the bore associated with the rectangular pin portion is formed with a key slot, and a C-shaped member extends between the fingers of the probe at a point spaced from their ends and is laterally displaced therefrom to engage the key slot when the probe is inserted into the bore.

8. The combination according to claim 3, characterized in that the driver is provided with a generally flat forward plate portion lying in the longitudinally extending slot in the blade, said forward plate portion merging with a rearwardly extending inclined body section disposed along one side of the blade and terminating in a depending tab having a slot through which the blade extends to guide the driver in its movement along the blade.

9. The combination according to claim 7, characterized in that the rectangular pin portion of the contact extends through the C-shaped member when the probe portion is inserted sufficiently to engage the C-shaped member in the key slot.

References Cited

UNITED STATES PATENTS

3,170,230	2/1965	Gaizauskas	29—203
3,197,849	8/1965	Johnson	29—203
3,325,884	6/1967	Blight et al.	29—203

THOMAS H. EAGER, Primary Examiner

U.S. Cl. X.R.

29—206, 278