Aug. 23, 1966 J. BERNUTZ 3,268,850

ELECTRICAL CONNECTORS EMPLOYING A PLUG-IN CONTACT SPRING

Filed Nov. 6, 1964 4 Sheets-Sheet 1

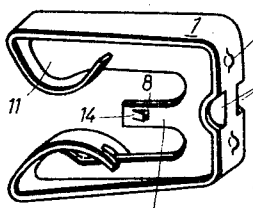


Fig.1A



Fig.1B

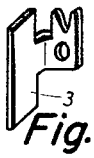


Fig.1C

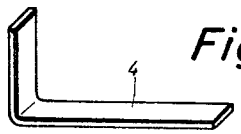


Fig.1D

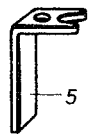


Fig.1E

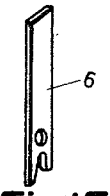


Fig.1F

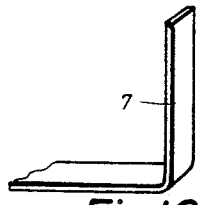


Fig.1G

Fig.2A

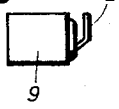


Fig.2B

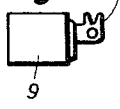
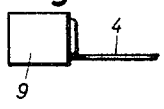


Fig.2C



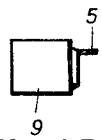


Fig.2D

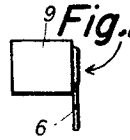


Fig.2E

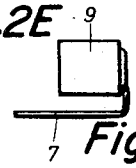


Fig.2F

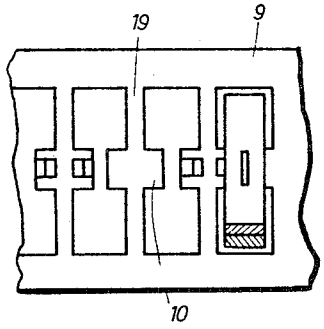


Fig.3

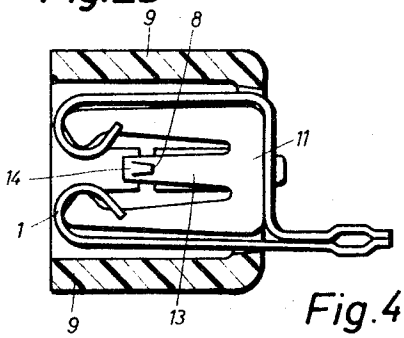


Fig.4

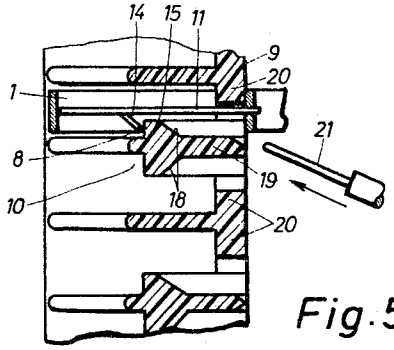


Fig.5

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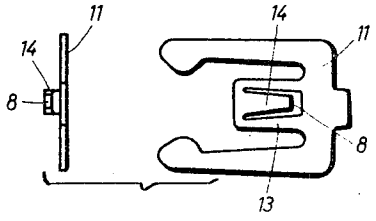


Fig.6

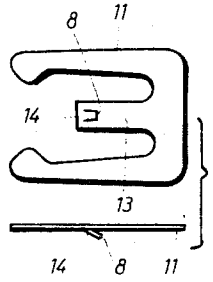


Fig.7

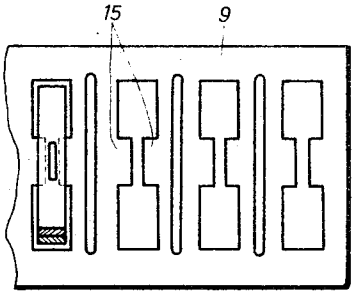


Fig.8

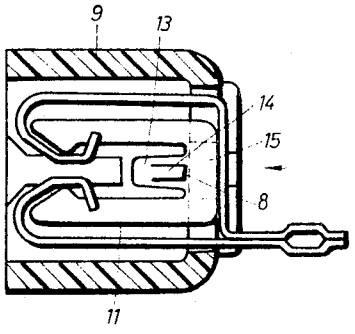


Fig.9

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ELECTRICAL CONNECTORS EMPLOYING A PLUG-IN CONTACT SPRING

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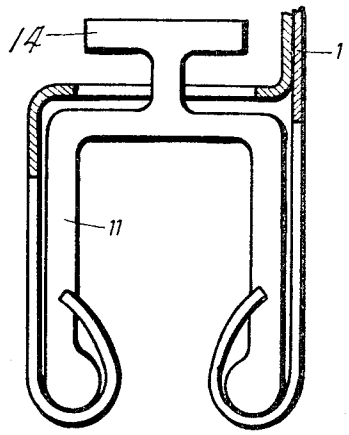


Fig. 10

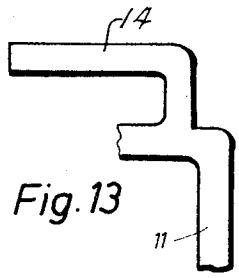


Fig. 13

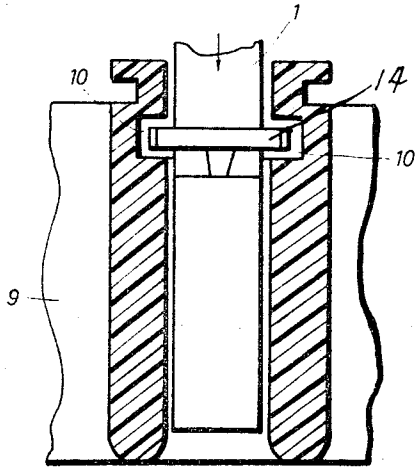


Fig. 11

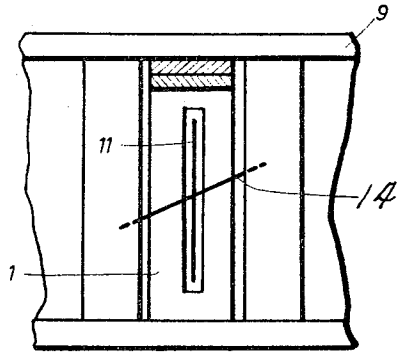


Fig. 12

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ELECTRICAL CONNECTORS EMPLOYING A PLUG-IN CONTACT SPRING

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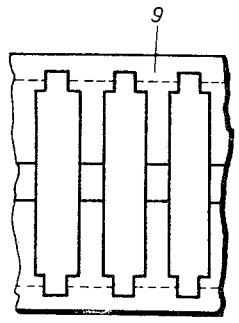


Fig. 14

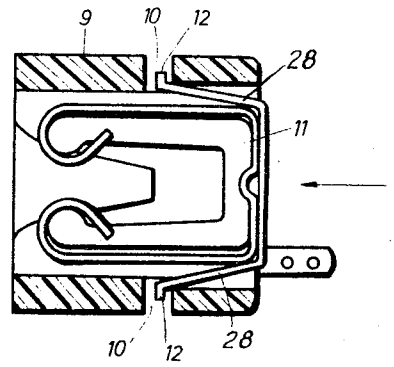


Fig. 15

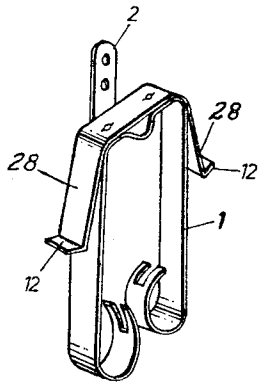


Fig. 16

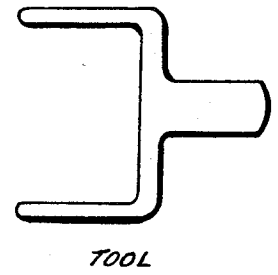


Fig. 17

United States Patent Office 3,268,850 Patented August 23, 1966

3,268,850

ELECTRICAL CONNECTORS EMPLOYING A PLUG-IN CONTACT SPRING

Johannes Bernutz, Ludwigsburg-Hoheneck, Germany, assignor to International Standard Electric Corporation, New York, N.Y., a corporation of Delaware

Filed Nov. 6, 1964, Ser. No. 409,520
Claims priority, application Germany, Nov. 14, 1963, St 21,326
7 Claims. (Cl. 339—217)

The invention relates to electrical connectors and particularly to a plug-in contact spring to be inserted into a spring strip housing.

It is an object of the invention to provide devices having contact springs which may be used to connect leads in different ways, e.g. by soldering, wrapping or crimping.

It is a further object of the invention to make allowances for the removal of individual contact springs from the connecting end of a spring strip housing without the necessity of taking the housing apart or of disconnecting the leads connected to the contact spring.

It is yet another object of this invention to provide contact springs which are adaptable for mass production and employ relatively few steps, while making proper contacts and holding dimensions to close tolerances.

These objects are achieved, according to the invention, by providing the contact-making part with soldering lugs for use with different types of connecting techniques such as soldering, wrapping crimping, or by welding. In a preferred embodiment the contact spring embodies at least one elastic stud which engages into corresponding recesses in the contact strip housing after the contact spring has been inserted into the housing from the connecting end, thereby securing the plug-in contact spring against shifting when a knife-blade is inserted or removed from said contact strip, however, permitting removal of a contact spring from said strip housing in the direction of the connecting end, after the stud has been disengaged. It is thereby achieved that the plug-in contact spring is provided in a simple way, besides for connection of leads by soldering of the conventional type also for wrapping or crimping and that the contact spring can be removed from the housing at the connecting end without impairing the advantages known with this contact spring construction.

In a further embodiment of the invention the contact-making portion of the contact spring is provided at the connecting end with two elastic studs, which with their bent ends engage into corresponding recesses in the housing, from which recesses they can be disengaged by means of a U-shaped extraction-tie for removing said contact spring.

A further embodiment of the invention provides that the tie is provided with a center-stud showing a stud which presses in the plug-in direction towards a protecting part of the spring strip housing.

In a further embodiment of the invention, said stud of the center-stud is made elastic, or the center-stud of the tie is made elastic and is stud rigid.

Another embodiment of the invention is that said stud is T-shaped, elastically twisted and fixed to the tie, and that it engages in the twisted position into recesses of the contact spring strip housing, or that the stud has the shape of an L, also elastically twisted, fixed to the tie, and that it engages into recesses of the housing in its twisted position.

The accompanying drawings show examples of embodiments of the invention, wherein:

FIGS. 1A–1G show perspective views of a contact spring and six different connecting lugs;

FIGS. 2A–2F show assemblages of the elements in FIGS. 1A–1G into a housing;

FIGS. 3, 4 and 5 show a spring strip with several plug-in contact springs from FIG. 1 as seen from the connecting end, in section from the side, and in section from the top;

FIGS. 6 and 7 show different shapes of the tie or tieing device in two elevations;

FIGS. 8 and 9 show a spring strip with contact springs and ties according to FIG. 6 seen from the connecting end, and in section from the side;

FIG. 10 shows a contact spring provided with a tie of another shape;

FIGS. 11 and 12 show a partial view with a section through a contact spring strip with a contact spring according to FIG. 10;

FIG. 13 shows a partial view of a tie with another shape;

FIGS. 14 and 15 show a spring strip in elevation and section, the contact springs of which are equipped with elastic studs at the contact-making portion;

FIG. 16 shows a perspective view of a contact spring; and

FIG. 17 shows a tool to extract a contact spring according to FIG. 16 from a spring strip as shown in FIGS. 14 and 15.

The contact spring according to FIG. 1A consists of a contact-making part **1** which can be connected with different terminal lugs **2** to **7**, shown in FIGS. 1B–1G. This connection can be made by welding the two welding points **16** of part **1**. Part **1** encloses tie **11**, shown more fully in FIG. 7, which is kept in place in part **1** by two grooves **17**, as well as slots in the ends of part **1**. The tie **11** shows an elastic center-stud **13**, provided with a rigid stud **14**.

When inserting a contact spring, according to FIG. 1A, into the spring strip housing **9**, according to FIGS. 3, 4 and 5, from the connecting end, tab or tongue **8** of the stud **14** slides, with an elastic bending of the center stud **13** of the tie **11**, along the oblique surface **18** of the fillet **19** in the housing **9**, and engages into the final position of the contact spring in said housing in recesses or receptacles **10** into which the tab **8** inserts.

The contact spring is thereby fixed in the housing **9** at all sides with a very narrow play, because the contact-making part **1** of the contact spring is supported, when removing an inserted contact knife-blade, towards the housing side **20**, thereby securing the contact spring also against shifting toward the contact knife-blade.

When the contact spring should be removed towards the connecting end the elastic center-stud **13** of the tie **11** is laterally pushed by means of a pin-shaped tool **21** to such an extent that the tab **8** disengages from receptacles **10** and thereupon the contact spring can be removed.

In another type of construction according to FIG. 6 the tie **11** is provided with a rigid center-stud **13**, having an elastic stud **14**. This stud engages with its tab **8**, when inserting the contact spring into the housing **9**, according to FIGS. 8 and 9, behind the stud **15** on said housing. This type of contact spring is extracted from the housing in the same way as described above, in that the elastic stud **14** is disengaged by means of a pin-shaped tool **21**, shown in FIG. 5, and thereupon the contact spring may be removed towards the terminal end.

Another construction type of the contact spring according to FIG. 10 shows a tie **11**, provided with a T-shaped stud **14**. This stud engages, when inserting the contact spring into the housing **9**, according to FIGS. 11 and 12, into recesses or receptacles **10** in said housing, thus securing the contact spring against shifting. When the contact spring should be removed from the contact strip housing **9** the elastic spring stud **14** is turned back so

that it disengages from the recesses or receptacles **10** and the contact spring can be pulled off towards the terminal end.

According to another type of the tie **11**, according to FIG. 13, the tension-spring stud **14** has the shape of an L, the effect, however, is the same.

FIG. 16 shows another type of the contact spring. In this type the contact-making part **1** is welded to the springs or studs **28** which serve the function of the studs **14**. The springs **28** engage the recesses or receptacles **10** of the housing **9** according to FIGS. 14 and 15, besides being welded with the terminal lug **2**, the bent ends **12** of said holding springs **28** secure the contact spring against shifting through engaging into the recesses or receptacles **10**.

When a contact spring shall be pulled off the housing **9**, a fork-shaped tool, shown in FIG. 17, is plugged onto the contact spring. Thereby the two holding springs **28** are disengaged from the recesses **10** and the contact spring can be pulled off towards the terminal end.

While the principles of the invention have been described above in connection with specific apparatus and applications, it is to be understood that this description is made only by way of example and not as a limitation on the scope of the invention.

What is claimed is:

1. An electrical connector, comprising:
a housing;
receptacles in said housing for receiving studs;
a plug-in contact spring to be inserted into said housing;
said spring including a contact-making part, slotted ends, and a terminal lug;
a flat tie to control contact pressure, shaped to fit within said spring and to lock into said slotted ends;
means on said terminal lug for receiving a suitable conductor;
said tie including an elastic stud to mate with said receptacles in said housing to hold the plug-in contact spring and tie in said housing;
said combination of housing, spring and tie forming a durable electrical connector to receive suitable contact knife blades and to disengage from such blades; and
said combination remaining easy to disassemble by disengaging said stud and moving the contact spring in the direction of the terminal lug.

2. An electrical connector substantially as claimed in claim **1**, in which:
said housing incorporates two recesses as receptacles for receiving studs;
said tie includes two elastic studs to mate with said two recesses; and
space is provided in said housing to permit a U-shaped extracting tool to be received in order to extract said spring by disengaging the studs from the recesses.

3. An electrical connector substantially as claimed in claim **1**, in which:
the housing incorporates a projecting part as a receptacle for receiving and retaining studs; and
the tie is provided with a center stud having a stud portion to be held by said projecting part.

4. An electrical connector substantially as claimed in claim **3**, in which:
the stud portion of the center stud is made elastic.

5. An electrical connector substantially as claimed in claim **3**, in which:
the center stud is composed of elastic material; and
the stud portion of the center stud is composed of rigid material.

6. An electrical connector substantially as claimed in claim **1**, in which:
the stud is made T-shaped; and
the receptacles in said housing are recesses which the stud can engage when twisted.

7. An electrical connector substantially as claimed in claim **1**, in which:
the stud is L-shaped; and
the receptacles in said housing are recesses which the stud can engage when twisted.

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EDWARD C. ALLEN, *Primary Examiner.*
PATRICK A. CLIFFORD, *Examiner.*