(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 862 250 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
02.09.1998 Bulletin 1998/36

(51) Int. Cl.[6]: **H01R 43/01**

(21) Application number: **98103287.3**

(22) Date of filing: **25.02.1998**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **26.02.1997 JP 42344/97**

(71) Applicants:
- **Harness System Technologies Research, Ltd.**
  Nagoya-shi, Aichi (JP)
- **SUMITOMO WIRING SYSTEMS, Ltd.**
  Yokkaichi-shi, Mie (JP)
- **SUMITOMO ELECTRIC INDUSTRIES, LTD.**
  Osaka-shi, Osaka 541 (JP)

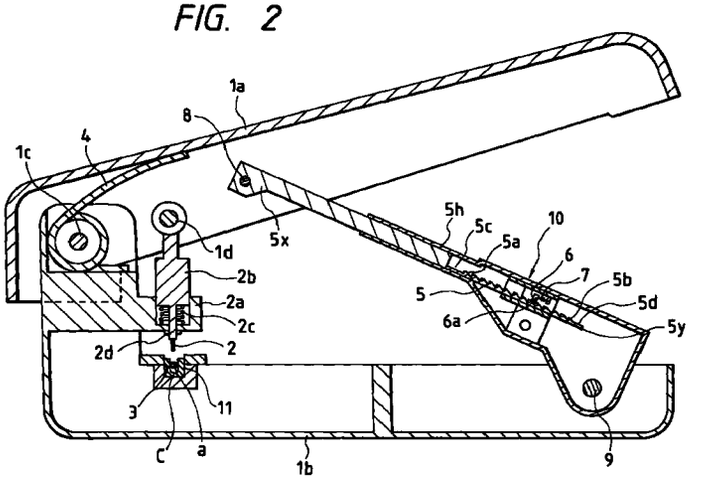
(72) Inventor:
Shioda, Ryosuke,
Harness System Techn. Res., Ltd.
Nagoya-shi, Aichi (JP)

(74) Representative:
KUHNEN, WACKER & PARTNER
Alois-Steinecker-Strasse 22
85354 Freising (DE)

(54) Crimp connecting jig used for wire harness

(57) A task of the present invention is to provide a handy type crimp connecting jig in which no variations are caused by every worker with respect to whether or not a distance between the electric wire and the connector terminal is maintained at a predetermined crimp connecting height. In a pair of operation levers there are respectively provided a crimp connecting blade and a hollow into which a connector housing is temporarily attached. There is provided a ratchet mechanism operated in such a manner that when a connector housing, in which an electric wire is temporarily attached to a terminal, is provided in the hollow and the crimp connecting blade and the hollow are made to come close to each other, the operation levers are not returned by the action of the ratchet mechanism until a distance between the terminal and the electric wire exceeds a predetermined value which satisfies a predetermined crimp connecting height, even if the operation levers are released from a holding state. When a worker holds the operation levers while the release position of the ratchet mechanism is used as a guide, it is possible to maintain a predetermined crimp connecting height from the terminal to the electric wire.

FIG. 2



EP 0 862 250 A1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a crimp connecting jig used for connecting an electric wire with a connector terminal of a wire harness by means of crimp connection. More particularly, the present invention relates to a handy type crimp connecting jig by which a crimp connecting section of a wire harness, which is not a single body unlike a wire harness incorporated into a car body, can be repaired.

2. Discussion of Related Art

Crimp connection is conventionally conducted as follows. As shown in Fig. 5(a), an insulating covered wire "a" (referred to as an electric wire "a" in this specification hereinafter), the diameter of which is a little larger than the width of a groove 12, is pushed into the groove 12 of a terminal 11 by a crimp connecting blade not shown in the drawing. The electric wire "a" is fixed into the groove 12 by the action of spring back of the terminal 11. When the electric wire "a" is pushed into the groove 12, the covering material 13 is torn away by an inner surface of the groove 12 and the conductor 14, which has been exposed, comes into contact with the terminal 11, so that the electric wire "a" can be electrically communicated with the terminal 11.

An intensity of the spring-back action of the terminal 11 and a pushing distance of the electric wire "a" which has been pushed down are relatively related to each other. When the pushing distance of the electric wire "a" is increased, the intensity of the spring-back action of the terminal 11 is increased. However, when the pushing distance of the electric wire "a" is excessively increased, the terminal 11 is plastically deformed, and the intensity of the spring-back action is decreased or further decreased to zero. In the above case, the crimp connection becomes unstable, and the electric wire "a" is disconnected from the terminal 11 even if a low intensity of force is given to the crimp connecting section from the outside or even if the crimp connecting section is somewhat vibrated. In the same manner, when the pushing distance of the electric wire "a" is too short, the intensity of spring back action becomes low, so that the crimp connection becomes unstable.

In order to positively connect the electric wire "a" to the groove 12 by means of crimp connection by the action of spring back so that the electric wire "a" can be positively communicated with the terminal 11, it is necessary that the electric wire "a" is pushed into the groove 12 by an appropriate distance.

As shown in Fig. 5(b), the pushing distance of the electric wire "a" into the groove 12 of the terminal 11 is referred to as "a crimp connection height H" which is a distance from a lower surface of the terminal 11 to an outer circumference of the electric wire "a" (an upper outer circumferential surface of the electric wire "a").

In this connection, the above crimp connecting work is conventionally conducted by the following methods:

(1) a method in which an automatic machine is used,
(2) a method in which a manually operated hand press having a crimp connecting blade at the end is used, and
(3) a method in which a handy type crimp connecting jig is manually operated.

The method described in the above item (1) in which the automatic machine is used is advantageous in that the manufacturing speed is high, and the quality of products is uniform, for example, there is caused no variation in "the crimp connecting height H", which is an important dimensional factor, which tends to be caused in the conventional manual method in which an intensity of force given by a worker varies. Therefore, according to the method described in item (1), it is possible to obtain highly reliable products of high quality.

However, apart from a case in which a wire harness is newly manufactured, in a case in which a wire harness has already been manufactured and incorporated into a car body, it is difficult to pick the wire harness up as a single body, and when the wire harness is picked up, a crimp connecting section of the wire harness is damaged and requires repair. In the above case, it is impossible to adopt this automatic machine described in item (1), and further it is impossible to adopt the method described in item (2) in which the hand press is used, because the size of the apparatus is large.

When the wire harness which has been put into the above condition is repaired, the method described in item (3) is adopted, in which the handy type crimp connecting jig is used.

An example of a handy type crimp connecting jig which is commonly used is shown in Fig. 6(a). There are provided a pair of operation levers 1a, 1b, and one end of each operation lever is rotatably connected with each other so that the operation levers 1a, 1b can be freely rotated round the fulcrum 1c. In a space in which both operation levers 1a, 1b are opposed to each other, there are provided a crimp connecting blade 2 and a hollow 3 used for temporarily connecting a connector housing. Both operation levers 1a, 1b are biased by the action of a coil spring 4 in a direction so that they can be opened.

As shown in Fig. 6(b), the crimp connecting blade 2 is arranged at one end of a cylinder 2b having a step portion which is slidably inserted into a cylindrical guide 2a attached to the operation lever 1b. This cylinder 2b is biased upward in the guide 2a by the action of a spring 2c. This cylinder 2b is restricted by a stopper 2d arranged close to the crimp connecting blade 2 so that

the cylinder 2b can not be disconnected from the guide 2a. When an upper surface of the step portion of the cylinder 2b exposed from the guide 2a is pushed downward by a pushing pin 1d arranged in the operation lever 1a, the crimp connecting blade 2 is moved downward.

When crimp connection is conducted with this jig, a connector housing C, in which the electric wire "a" is temporarily inserted into the groove 12 of the terminal 11, is temporarily attached into the hollow 3, and both operation levers 1a, 1b are held in one hand and made to come close to each other, so that the crimp connecting blade 2 is moved downward, and the electric wire "a" is pushed into the groove 12 of the terminal 11 and connected by means of crimp connection.

The above handy type crimp connecting jig is effectively used for not only the repair of a crimp connecting section but also the crimp connection conducted in a common wire harness manufacturing process.

However, when a crimp connecting work is manually conducted with the above crimp connecting jig, the following problems may be caused. As described before, when a crimp connecting work is manually conducted, the crimping force varies by every worker, and the crimp connecting height H (pushing distance of the electric wire "a") also varies. This crimp connecting height H is a very important dimensional factor for accomplishing the electric function of wire harness.

A task to be accomplished by the present invention is to suppress the occurrence of variations in the predetermined crimp connecting height in the case of crimp connection in which the above handy type crimp connecting jig is used, even if a worker is changed.

SUMMARY OF THE INVENTION

In order to solve the above and other problems, the present invention is to provide a crimp connecting jig used for a wire harness composed as follows. A spring for opening both levers is arranged between both levers so that the electric wire and terminal can be interposed between the pair of operation levers, and a regulating means for regulating the operation levers is arranged so that the operation levers can not be returned by the spring when the terminal and the electric wire are interposed between them, until both crimp connecting pieces come close to each other exceeding a predetermined distance which satisfies a predetermined crimp connecting condition.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view showing a crimp connecting jig of the embodiment.

Fig. 2 is a cross-sectional view of the crimp connecting jig of the embodiment.

Fig. 3 is an exploded perspective view of a primary portion of the embodiment.

Fig. 4 is a schematic illustration showing a model of the ratchet mechanism of the embodiment.

Fig. 5(a) is a view showing a method of crimp connection.

Fig. 5(b) is a view showing a crimp connecting height.

Fig. 6(a) is a perspective view showing the entire crimp connecting jig used for wire harness.

Fig. 6(b) is a cross-sectional view of the crimp connecting section of an example of the conventional crimp connecting jig.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Due to the above arrangement, when the operation levers are made to come close to each other until they are put into a condition in which they are capable of returning, it becomes possible to conduct crimp connection in which a predetermined crimp connecting height is attained.

The regulating means is preferably composed of a ratchet mechanism including a rack arranged in one of the operation levers in the rotational direction of the operation lever and also including a presser claw arranged in the other operation lever, engaging with the rack to prevent the return of the operation lever, and the rack and the presser claw are released from each other and both levers are returned when both operation levers come close to each other exceeding the predetermined distance, and the presser claw and the rack are engaged with each other when both operation levers come close to each other from the returning position.

Due to the above arrangement, the crimp connecting height is restricted by a distance between both operation levers, that is, the crimp connecting height is not restricted by a force to hold the operation levers in a hand. Therefore, variations in the crimp connecting height can be suppressed even if a worker is changed.

Referring to the accompanying drawings, an embodiment of the present invention will be explained below. As shown in Figs. 1 and 2, the crimp connecting jig of this embodiment is composed in such a manner that a ratchet mechanism 10 for restricting the rotation of both operation levers 1a, 1b is arranged on the opposing surfaces of both operation levers 1a, 1b of the conventional handy type crimp connecting jig described before. Except for the ratchet mechanism 10, the structure of the crimp connecting jig of this embodiment is the same as that of the conventional example. Therefore, like reference characters are used to indicate like parts, and the explanations are omitted here.

Fig. 3 is an exploded perspective view showing a primary portion of the ratchet mechanism 10. The ratchet mechanism 10 includes: a rack 5 arranged in the rotational direction of both operation levers 1a, 1b; an engaging claw 6 engaging with the rack 5 so as to prevent the rotation of both operation levers 1a, 1b in one direction; and a spring 7 that biases the engaging claw

6.

As shown in Fig. 2, one end 5x of the rack 5 is rotatably attached to the support shalt 8 arranged in the operation lever 1a, and a tooth train arranged from the other end 5y of the rack 5 is inserted into the rack housing 5h which is used for both guiding and protecting the rack 5. The rack housing 5h is rotatably attached to the support shaft 9 arranged in the other operation lever 1b.

The engaging claw 6 is capable of rotating round the support shaft 6a arranged on the side wall in the rack housing 5h. The portion of the engaging claw 6 located on the opposite side to the portion of the engaging claw 6 engaging with the rack 5 is biased clockwise round the support shaft 6a by the spring 7 arranged in the rack housing 5h. This ratchet mechanism 10 is operated as follows.

Fig. 4(a) shows a state in which the engaging claw 6 is engaged with a middle portion of the tooth train of the rack 5. It is possible for both operation levers 1a, 1b to be made to come close to each other from the above engaging state in which the engaging claw 6 is engaged with the rack 5. When both operation levers 1a, 1b are held in a hand and further made to come close to each other, the engaging claw 6 exceeds a tooth 5a which is closest to the end 5x of the rack 5. At this time, the engaging claw 6 is engaged with a large clearance 5c of the rack 5. A distance between both operation levers 1a, 1b is determined at this time, and positions of the end face of the crimp connecting blade 2 and the bottom face of the hollow 3 are also determined at this time so that the electric wire "a" and the terminal 11 can be connected to each other by means of crimp connection while the predetermined crimp connecting height H is maintained. Movements of both operation levers 1a, 1b are stopped by a stopper not shown in the drawing when they come closer to each other than the above positions.

Alter the engaging claw 6 has been engaged with the clearance 5c, the engaging claw 6 is not restricted by the teeth of the rack 5 as illustrated in Fig. 4(b). In this embodiment, the ratchet mechanism is set as follows. Length of the spring 7 attached to the engaging claw 6 is set so that it can become a natural length, and an intensity of the spring force is set so that the engaging claw 6 can be set to be perpendicular to the length direction of the rack 5 in the above state. When the setting of the ratchet mechanism is determined as described above, the ratchet mechanism is operated as follows. When the engaging claw 6 is moved with respect to the rack 5 in the direction of an arrow shown in Fig. 4(b) and the end portion of the engaging claw 6 comes into contact with the end portion of the tooth of the rack 5 so that the engaging claw 6 is rotated round the fulcrum 6a, the rotating direction of the engaging claw 6 is the same as the biasing direction of the spring 7, that is, the rotating direction of the engaging claw 6 is clockwise. Therefore, the engaging claw 6 is not engaged with the rack 5 but it only touches an end portion of the tooth of the rack 5. Therefore, when an intensity of force to hold the operation levers 1a, 1b is reduced, they can be opened by the action of the coil spring 4 without being restricted by the operation levers 1a, 1b.

When both operation levers 1a, 1b are opened and the engaging claw 6 exceeds the closest tooth 5b on the end portion 5y side of the rack 5 and comes to a position 5d at which the engaging claw 6 is not restricted by the teeth of the rack 5, as shown in Fig. 4(c), in the same manner as that shown in Fig. 4(b), since the spring 7, which biases the engaging claw 6 clockwise round the rotational fulcrum 6a, is set so that the length of the spring 7 can become a natural length while the spring 7 is not restricted by the teeth of the rack 5, the engaging claw 6 rises perpendicularly. Movements of both operation levers 1a, 1b are stopped by a stopper not shown in the drawing when they are opened a little more than the above position 5d. In this state, both operation levers 1a, 1b are opened to the maximum. When both operation levers 1a, 1b are held in a hand and made to come closer to each other again in the above state, the engaging claw 6 is moved with respect to the rack 5 in the direction of an arrow in Fig. 4(c), so that the engaging claw 6 exceeds the closest tooth 5b on the end portion 5y side of the rack 5 and engages with the rack 5 again. Operation of the crimp connecting jig arranged in the above manner will be explained as follows.

In the case of crimp connection, as shown in Fig. 2, first, the connector housing C, in which the electric wire "a" is temporarily inserted into the groove of the terminal 11, is set in the hollow 3 formed in the above operation lever 1b.

Next, both operation levers 1a, 1b are held in one hand in the above state and made to come close to each other to an approximate position at which the predetermined height H can be obtained, while resisting a force of the coil spring 4. In the middle of the above operation, when the ratchet mechanism 10 functions and the operation levers 1a, 1b are not opened even if the holding force to hold the operation levers 1a, 1b is reduced, the operation levers 1a, 1b are further held so that they can be made to come closer to each other.

When a force to hold the operation levers 1a, 1b is reduced at a position, the operator feels that the operation levers 1a, 1b are going to open. At this position, the engaging claw 6 and the rack 5 are released from each other, that is, at this position, the ratchet mechanism is put in the state shown in Fig. 4(b). At this time, crimp connection has been completed at this position while the predetermined crimp connecting height H is obtained. At this position, it is possible for the operation levers 1a, 1b to be returned by the action of the coil spring 4.

As described above, when the crimp connecting jig of this embodiment is used, the position, at which both operation levers 1a, 1b are made to come close to each

other so as to obtain the predetermined crimp connecting height H, coincides with a release position of the ratchet mechanism 10 at which the ratchet mechanism 10 is released. When the operation levers 1a, 1b are held in a hand so that the operation levers 1a, 1b can reach the position at which the ratchet mechanism 10 is released, the electric wire "a" and the terminal 11 are connected to each other by means of crimp connection while the predetermined crimp connecting height H is obtained. That is, whether or not the predetermined crimp connecting height H is obtained is restricted by the distance between both operation levers 1a, 1b which are made to come close to each other. In other words, whether or not the predetermined crimp connecting height H is obtained is restricted by the stroke of the crimp connecting blade 2. Accordingly, even if an intensity of force given by each worker is changed, no variations are caused in the operation of crimp connection.

As explained above, according to the handy type crimp connecting jig used for wire harness of the present invention, when the crimp connecting pieces respectively arranged in a pair of operation levers are made to come close to each other while a terminal and an electric wire are interposed between the crimp connecting pieces, there is provided a ratchet mechanism by which the operation levers are not returned until a distance between the connecting pieces exceeds a predetermined value which satisfies a predetermined crimp connecting height, even if the operation levers are released from holding. Accordingly, when the operation lever is held by a worker until the ratchet mechanism is released, it becomes possible that the electric wire is maintained at a predetermined crimp connecting height. Accordingly, even if a worker is changed, no variations are caused in the crimp connecting condition of the electric wire and the terminal.

Claims

1. A crimp connecting jig for use with a wire harness comprising:

   a pair of operation levers connected with each other at one end, wherein both operation levers are capable of being held in one hand and made to come toward each other during crimp connection;
   crimp connecting pieces for conducting the crimp connection of an electric wire with a terminal of the wire harness, provided on opposing surfaces of both operation levers;
   a spring for opening both levers so that the electric wire and the terminal can be interposed between both operation levers, the spring being arranged between the pair of operation levers; and
   a regulating means for regulating the operation levers so that the operation levers are not returned by the spring when the terminal and the electric wire are interposed between the operation levers until both crimp connecting pieces are brought together so as to exceed a predetermined distance which satisfies a predetermined crimp connecting condition.

2. A crimp connecting jig for use with a wire harness according to claim 1, wherein the regulating means comprises a ratchet mechanism including a rack arranged in one of the operation levers in a rotational direction of the operation lever and also including a presser claw arranged in the other operation lever, engaging with the rack to prevent a return of the operation lever, and the rack and the presser claw are released from each other and both levers are returned when both operation levers are brought close together so as to exceed the predetermined distance, and the presser claw and the rack are engaged with each other when both operation levers are brought close together from a returning position.

3. A crimp connecting jig for use with a wire harness according to claim 1, wherein the connection at one end of the operation levers comprises a rotatable connection about a fulcrum.

4. A crimp connecting jig for use with a wire harness according to claim 1, wherein the crimp connecting pieces comprise a crimp connecting blade attached to one of the pair of operation levers and a hollow accommodating the terminal in the other of the pair of operation levers.

5. A crimp connecting jig for use with a wire harness according to claim 1, wherein the regulating means is located between the pair of operation levers and is rotatably attached at one end to one of the operation levers and rotatably attached at the opposite end to the other of the operation levers.

6. A crimp connecting jig for use with a wire harness comprising:

   a pair of operation levers connected with each other at one end, wherein both operation levers are capable of being held in one hand and made to come toward each other during crimp connection;
   crimp connecting pieces for conducting the crimp connection of an electric wire with a terminal of the wire harness, provided on opposing surfaces of both operation levers;
   a spring for opening both levers so that the electric wire and the terminal can be interposed between both operation levers, the

spring being arranged between the pair of operation levers; and

a regulator which regulates the operation levers so that the operation levers are not returned by the spring when the terminal and the electric wire are interposed between the operation levers until both crimp connecting pieces are brought together so as to exceed a predetermined distance which satisfies a predetermined crimp connecting condition.

7. A crimp connecting jig for use with a wire harness according to claim 6, wherein the regulator comprises a ratchet mechanism including a rack arranged in one of the operation levers in a rotational direction of the operation lever and also including a presser claw arranged in the other operation lever, engaging with the rack to prevent a return of the operation lever, and the rack and the presser claw are released from each other and both levers are returned when both operation levers are brought close together so as to exceed the predetermined distance, and the presser claw and the rack are engaged with each other when both operation levers are brought close together from a returning position.

8. A crimp connecting jig for use with a wire harness according to claim 6, wherein the connection at one end of the operation levers comprises a rotatable connection about a fulcrum.

9. A crimp connecting jig for use with a wire harness according to claim 6, wherein the crimp connecting pieces comprise a crimp connecting blade attached to one of the pair of operation levers and a hollow accommodating the terminal in the other of the pair of operation levers.

10. A crimp connecting jig for use with a wire harness according to claim 6, wherein the regulator is located between the pair of operation levers and is rotatably attached at one end to one of the operation levers and rotatably attached at the opposite end to the other of the operation levers.

11. A method for crimp connecting a wire to a terminal of a wire harness with the crimp connecting jig according to claim 6, comprising:

locating the electric wire and the terminal in association with the crimp connecting pieces and between the operation levers;

pressing the operation levers toward each other, the pressing continuing until the levers are brought close together to a point exceeding the predetermined distance, whereupon the operation levers are prevented from further pressing together and the regulator acts to permit the operation levers to open away from each other; and

releasing the operation levers, thereby obtaining a crimp connection in which the electric wire is located in the terminal at the predetermined crimp connecting condition.

FIG. 1

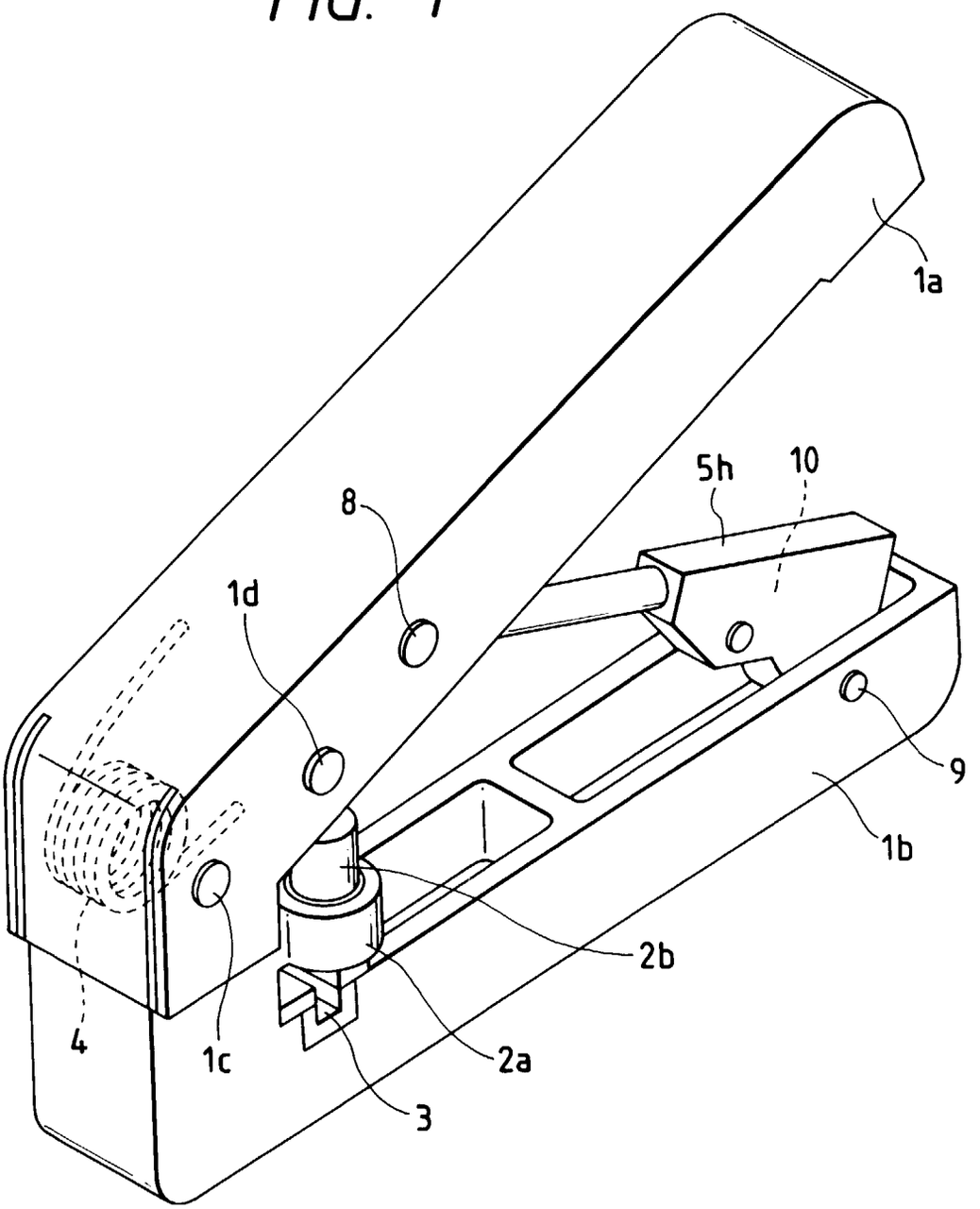
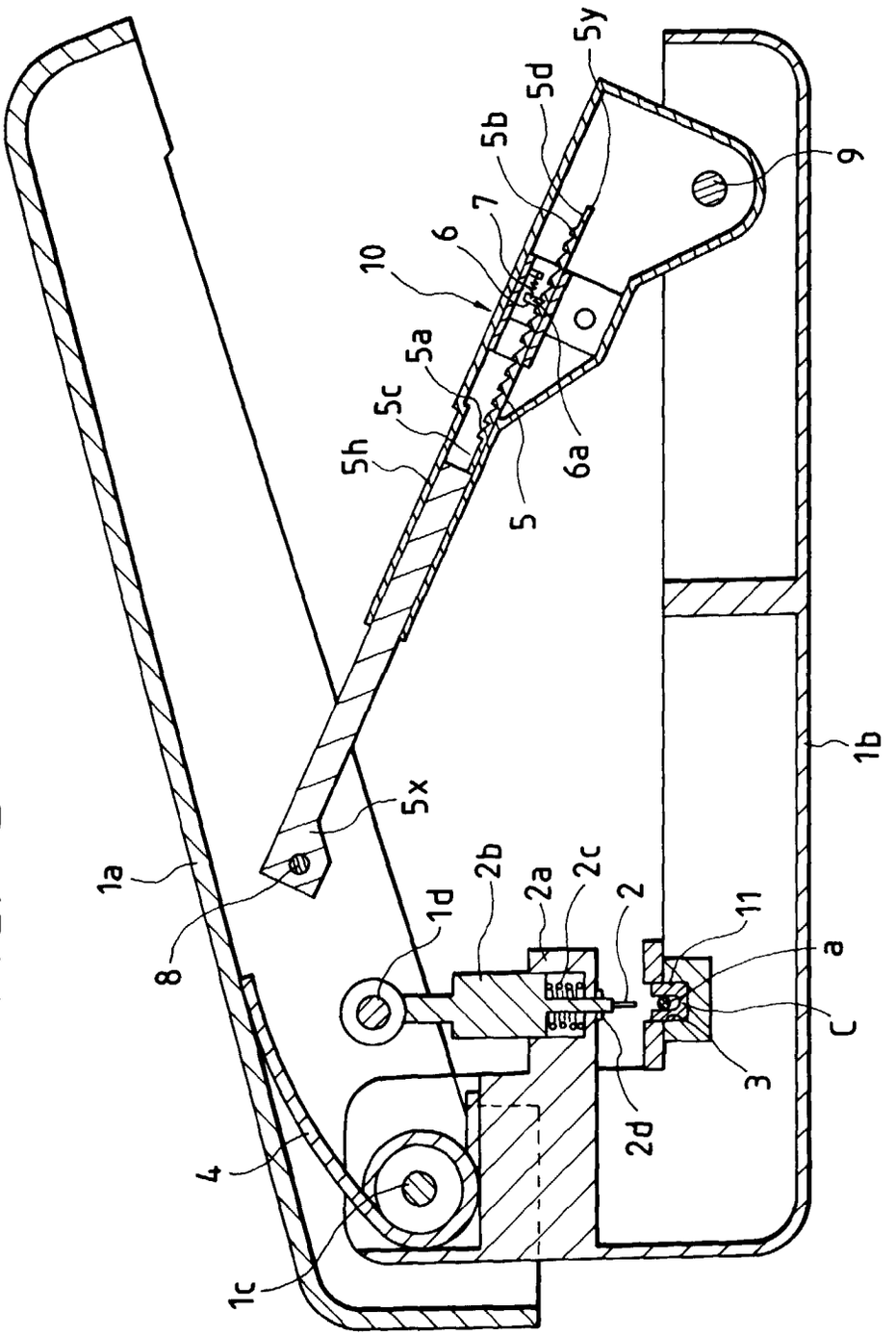


FIG. 2



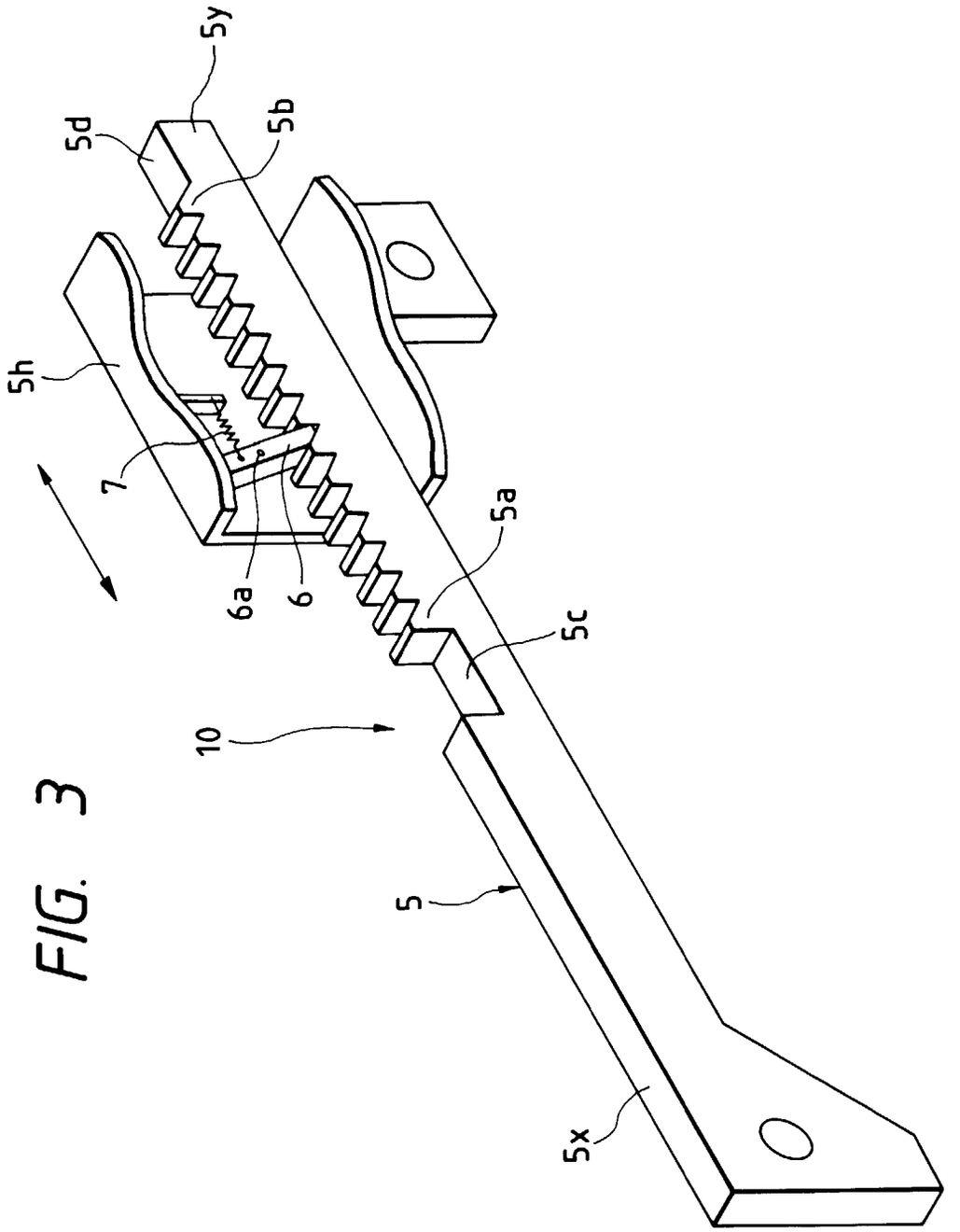


FIG. 3

FIG. 4(a)

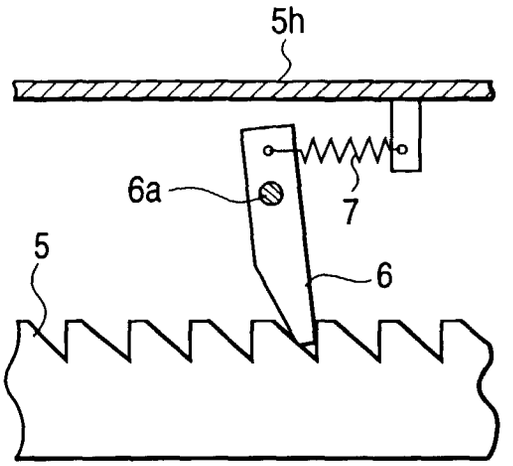


FIG. 4(b)

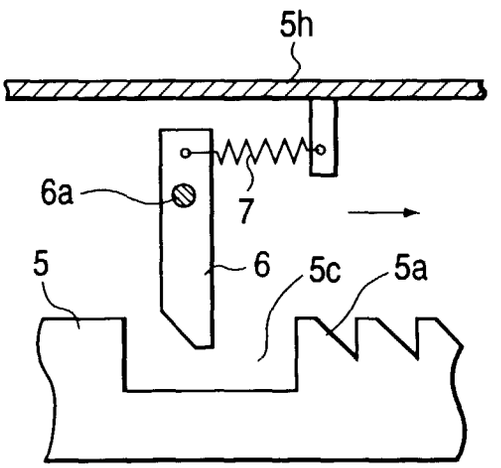


FIG. 4(c)

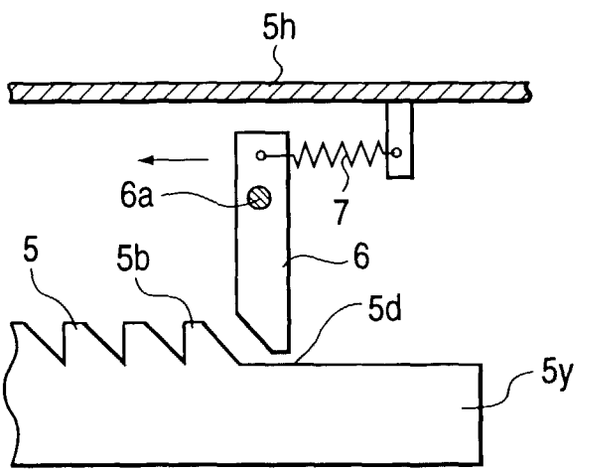


FIG. 5(a)

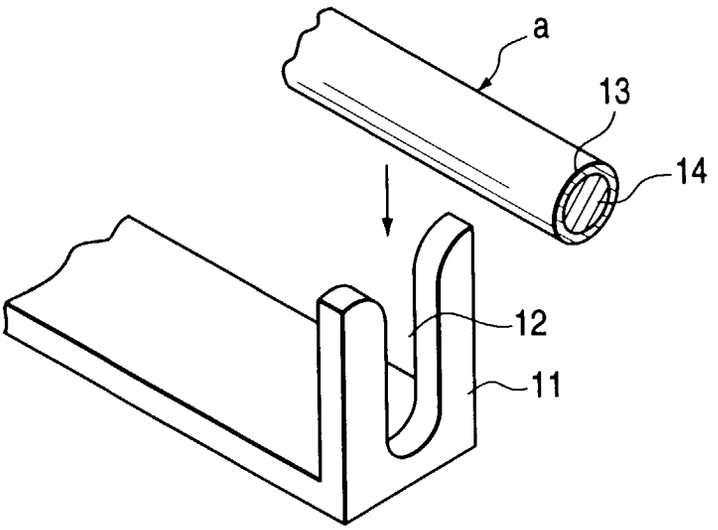


FIG. 5(b)

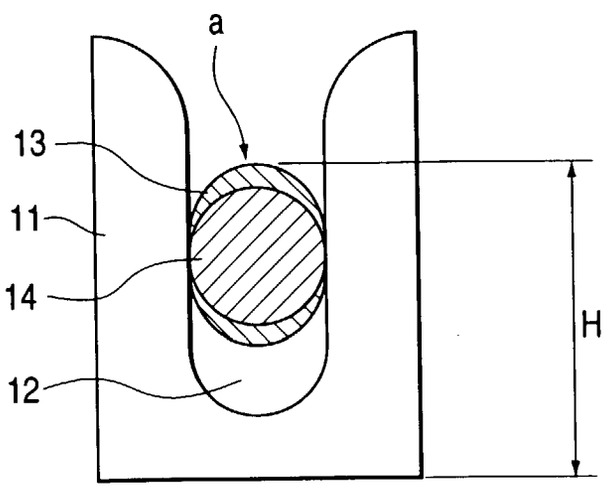


FIG. 6(a)
PRIOR ART

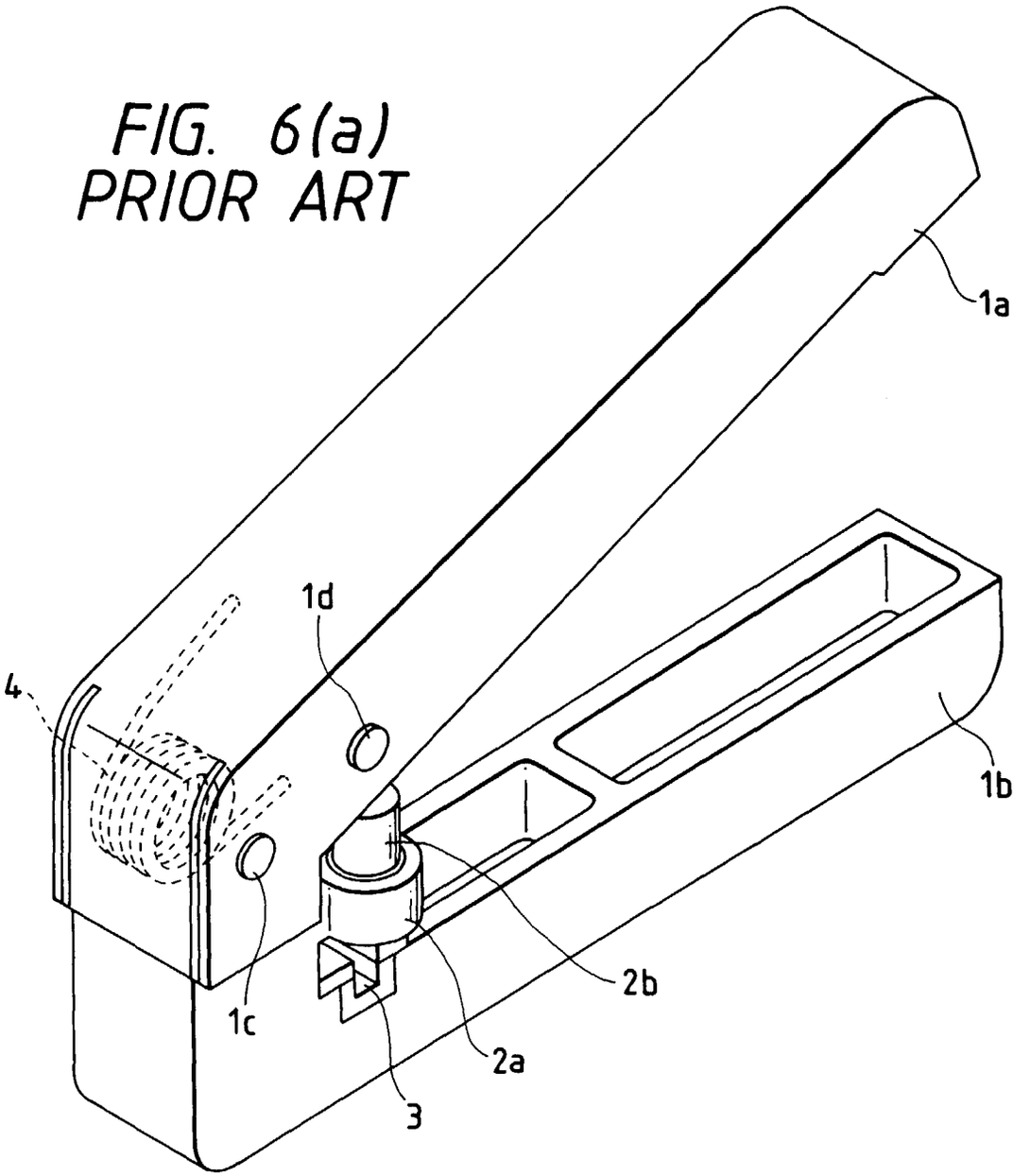
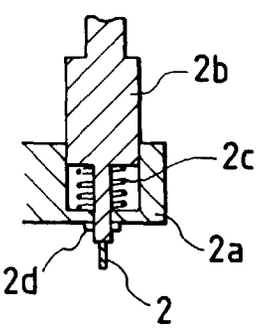


FIG. 6(b)
PRIOR ART



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 10 3287

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	GB 871 885 A (AMP INCORPORATED) 5 July 1961 * page 2, column 1, line 16 - column 2, line 82 * * page 2, column 2, line 110 - page 3, column 2, line 109 * * figures 1-7 *	1-11	H01R43/01
Y	DE 94 13 561 U (PANDUIT GMBH) 27 October 1994 * page 15, line 6 - page 16, line 3 * * figure 9 *	1-11	
A	DE 27 22 299 A (BUNKER RAMO) 1 December 1977 * page 9, paragraph 2 - page 12, paragraph 1 * * page 13, paragraph 3 - page 14, paragraph 1 * * page 15, paragraph 2 * * figures 4-7 *	1-11	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	24 April 1998	Stirn, J-P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)