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(54) Crimping tool

(57) In a crimping tool (10) that compresses a compressible object between dies (7a and 7b) by a toggle mechanism formed by a first handle (11) having one die (7a), a jaw part (3) having the other die (7b) movably connected therewith, a second handle (12) movably connected with the jaw part (3), and an intermediate link member (5) movably connected with the handles (11 and 12), first gripping portions (13a and 13b) disposed adjacent to the each of the connecting shafts (5a and 5b) of the intermediate link member (5) and griped by one hand of a worker, and second gripping portions (14a and 14b) disposed at a position more separated therefrom and griped by the other hand of a worker are provided, and the handles (11 and 12) at the second gripping portions (14a and 14b) are bent in the same direction on the plane of movement with respect to the handles (11 and 12), respectively, at the first gripping portions (13a and 13b).

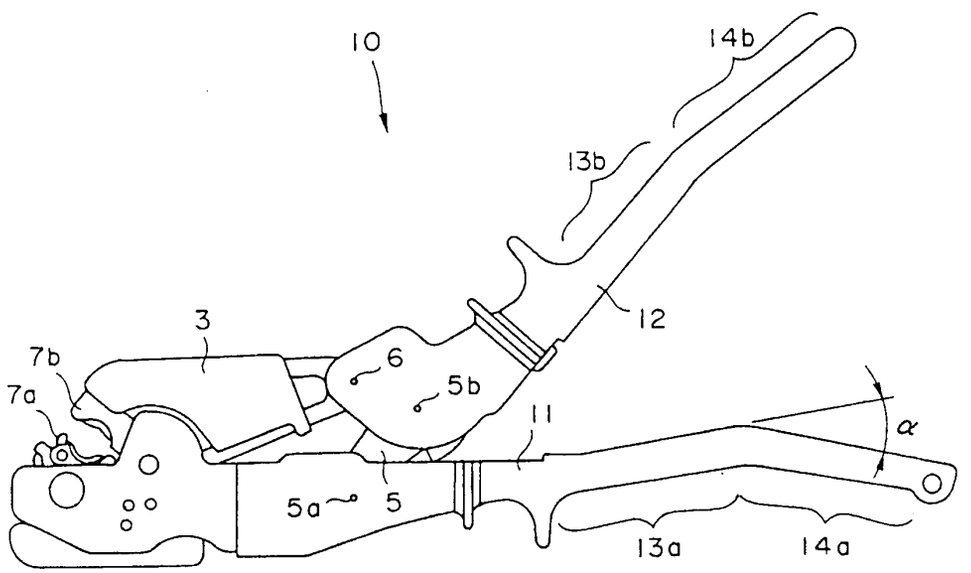

Fig 1.

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Description

[0001] This invention relates to a crimping tool that compresses a compressible object such as a crimp-style terminal bonded to an electric wire or a crimp-style connector.

[0002] As a crimping tool that compresses a crimp-style terminal in a conventional way, many types of structures have been proposed.

[0003] For example, the crimping tool I shown in Fig. 7 of the attached drawings, is a four joint link structure comprising a first handle 2 and a jaw part 3 which are pivotally connected and on which a pair of dies 7a and 7b, respectively, are mounted, a sword handle 4 pivotally connected to the jaw part 3, and a intermediate link member 5 movably connected respectively to the first handle 2 and the second handle 4, and when the connecting shafts 5a and 5b at both ends of the intermediate link member 5 and the connecting shaft 6 of the jaw part 3 and the second handle 4 are disposed in a straight line by closing both handles 2 and 4, a toggle mechanism is formed that generates an extremely large torque on the jaw part 3.

[0004] Because this crimping tool 1 uses a toggle mechanism, unlike general compression devices that use the lever principle, it has the advantage that only a small force needs to be applied to the handles 2 and 4.

[0005] The problem to be solved by the present invention is the following : in the job site where electrical wires are connected, for the convenience of device portability, compression of crimping-style terminals (not shown in the figure) over a wide range of gauges from small to large by one compression device is desirable.

[0006] That is, there are cases when crimping a thick wire using a crimping-style terminal of comparatively large gauge, and even in a compression device 1 using this type of toggle mechanism, it is necessary to apply a large force on the handles 2 and 4.

[0007] In this case, the worker compresses the crimping-style terminal by the gripping strength of both hands by operating the crimping tool 1 with both hands.

[0008] The first gripping portions 8a and 8b of handles 2 and 4, griped by the right hand and the second gripping portions 9a and 9b, of the handles 2 and 4 griped by the left hand are respectively disposed on a straight line, and the gripping force applied by the worker, as shown by the arrows A and B in Fig. 7, can be applied in the same direction.

[0009] In this case, theoretically, if the worker applies to the handles 2 and 4 of the crimping tool 1 a gripping force according to the design value, it should be possible to compress the crimping-style terminal, but in reality, even when the worker carries out the compressing operation with a gripping force equal to the design value, there is the inconvenience that it is not possible to completely compress the crimping-style terminal.

[0010] This is because the gripping force of the worker cannot be sufficiently propagated to the handles.

[0011] In consideration of the above-described problem, it is an object of this invention to provide a crimping tool that makes it possible for the gripping force of the worker being maximally propagated to the handle, and which can completely compress even a large gauge crimping-style terminal.

[0012] In order to achieve the above-described object, this invention provides a crimping tool provided with a first handle being provided with one of a pair of dies which compress the compressible object, a jaw member being provided with the other of said pair of dies and being pivotally connected to said first handle, a second handle being pivotally connected to said jaw member, and an intermediate link member being pivotally connected to said first and second handle, wherein said first handle and said second handle are provided with a first gripping part which is placed at the vicinity of each joint axes with said intermediate link member and is gripped by one hand of the operator, and a second gripping part which is placed further apart from said joint axes with said intermediate link member and is gripped by the other hand of the operator, and said first and second handle at said second gripping part is bent with respect to said handles at said first gripping part in a same direction within the rotating plane of said handles.

[0013] The above-described crimping tool is effective if the first gripping part of at least one of the handles among the first handle and the second handle is inclined in a direction approaching the other handle, and in addition, both handles can be inclined in one direction at the first gripping part and inclined in the opposite direction at the gripping part.

[0014] According to the present invention, the operator grips with one hand the first gripping portions provided on the first handle and the second handle, and grips the second gripping part with the other hand.

[0015] Because the first gripping part, adjacent to each part connecting to the intermediate link member, has a small gripping width compared to the second gripping part, at first, the gripping force is applied by one hand.

[0016] Next, by applying a gripping force to the first gripping part, the first and second handles approach each other to some degree, and then because the gripping width of the second gripping part becomes smaller, the worker then applies a gripping force to the second gripping part by the other hand.

[0017] In this case, in the crimping tool according to the present invention, because the first and second handle at the second gripping part are inclined in the same direction with respect to the first and second handle at the first gripping part, the direction in which the gripping force is applied to the first gripping part by one hand and the direction in which the gripping force is applied to the second gripping part by the other hand are disposed at a constant angle.

[0018] In the conventional crimping tool, because the first gripping part and the second gripping part are dis-

posed on a straight line, the direction of the gripping force added by both hands is in the same direction.

[0019] Because of this, the palms of both hands must be positioned side by side in a line, and the positional relationship between the palm and its wrist becomes cramped.

[0020] When one wrist and palm are disposed on the same line, so as to be able to effect maximum gripping force, it is not possible to dispose the wrist and palm of the other hand along the same line, and thus it is not possible to effect the desired gripping force.

[0021] In contrast, in the crimping tool according to the present invention, because the direction of the gripping force applied to the first and second gripping portions by both hands is disposed at a constant angle, it becomes possible to dispose the palm and wrist simultaneously on the same straight line, and thus it becomes possible to produce the maximum gripping force with both hands simultaneously.

[0022] In addition, if at least one among the first handle and the second handle of the first gripping part is inclined in the direction approaching to the other handle, it is possible to minimize the gripping width between the first gripping portions, and it is possible to make the compressing work easy with just one hand.

[0023] Furthermore, if both handles are inclined in one direction at the first gripping part and inclined in the opposite direction at the second gripping part, it is possible to form the handle of the device comparatively flatly, while at the same time guaranteeing that the gripping power of both hands is applied in a direction having a constant angle.

[0024] That is, in the case that only the second gripping part is inclined, if once it is inclined in the opposite direction at the first gripping part, it is possible to prevent the end of the handle from sticking out too far. As a result, it is possible to minimize the surface area occupied when storing or carrying the crimping tool.

[0025] Below, the preferred embodiment of the present invention is explained referring to the attached drawings, in which

Fig. 1 is a front view showing the crimping tool according to the embodiment of the present invention,

Fig. 2 is a figure for explaining the compressing operation by the crimping tool in Fig. 1, and shows the state when compressing by only one hand.

Fig. 3 is the same drawing as Fig. 2, and shows a state that has progressed from the state in Fig. 2, wherein the compression operation by both hands has begun,

Fig. 4 is the same drawing as Fig. 2, and shows a state that has progressed from the state in Fig. 3, wherein the compressing operation by both hands has been completed.

Fig. 5 is a front view showing the crimping tool according to the second embodiment of the present invention,

Fig. 6 is a front view showing an alternative example of the shape of the crimping tool according to the embodiment in Fig. 4,

Fig. 7 is a front view showing a conventional crimping tool.

[0026] Except for the shape of the handles 11 and 12, the crimping tool 10 according to the present embodiment is identical to the above-described conventional crimping tool 1.

[0027] In the explanation of the present embodiment, identical reference numerals denote parts that are identical to parts of the structure of the conventional crimping tool shown in Fig. 7, and their explanation is omitted.

[0028] As shown in Fig. 1, the handles 11 and 12 of the crimping tool 10 of the present embodiment respectively have first gripping portions 13a and 13b adjacent to the connecting shafts 5a and 5b of the intermediate link member 5 and second gripping portions 14a and 14b disposed at a position separated further from the connecting shafts 5a and 5b than the first gripping portions 13a and 13b, and comprise the first handle 11 and the second handle 12, and furthermore the second gripping portions 14a and 14b are inclined in the same direction in the plane of movement of the handles 11 and 12 with respect to the first gripping portions 13a and 13b.

[0029] In addition, the first gripping part 13a of the first handle 11 is inclined in a direction approaching the second handle 12.

[0030] That is, the first handle 11 has a second gripping part 14a extended inclining in a direction more distant from the second handle 12 in the plane of rocking movement with respect to the first gripping part 13a that is extended inclining from the connecting part 5a in the direction towards the second handle 12, and the second handle 12 has a second gripping part 14b that extends inclining in a direction approaching the first handle 11 in the plane of rocking movement with respect to the first gripping 13b that extends straight from the connecting part 5b.

[0031] Thereby, the second gripping portions 14a and 14b of the first and second handles 11 and 12 are disposed at a constant angle α, for example, 5° - 20°, preferably 9° - 15°, and more preferable, 12°, with respect to the first gripping portions 13a and 13b of the handles 11 and 12.

[0032] The compressing operation of a crimping-style terminal using the crimping tool 10 of the present embodiment formed in this manner will be explained below.

[0033] The worker places the crimping-style terminal (not shown) into which the wire has been inserted between the dies 7a and 7b mounted on the first handle 11 and the jaw part 3, and by gripping the first gripping portions 13a and 13b by, for example, the right hand R, begins to compress the crimping-style terminal.

[0034] The first gripping portions 13a and 13b, as shown in Fig. 2, are disposed adjacent to the connecting shafts 5a and 5b between the intermediate link member

5 and the handles 11 and 12, and thus the gripping width from the beginning of the compressing operation is narrow, and sufficient gripping power is applied by the right hand R.

[0035] Furthermore, the first gripping part 3a of the first handle 11 is inclined in the direction towards the second handle, and thus the gripping width of the first gripping portions 13a and 13b is even more narrow, and in addition, at this point in time, only a small amount of force is necessary in order to compress the crimping-style terminal, and it is possible to progress through the compressing operation easily with only the right hand R.

[0036] Next, when progressing through the compressing operation with only the right hand, the second gripping paets 14a and 14b of the first handle 11 and the second handle 12 together approach each other, and as shown in Fig. 3, can be gripped with the left hand L, and at the same time the force necessary for compression increases.

[0037] Thus, the worker applies a gripping force by gripping the second gripping portions 14a and 14b with the left hand L, and thereby the compressing operation progresses with the gripping power of both hands R and L.

[0038] In this case, in the crimping tool 10 according to the present embodiment the second gripping portions 14a and 14b of the above-described first and second handles 11 and 12 are disposed at a constant angle with respect to the first gripping portions 13a and 13b of each handle 11 and 12, and thus the direction (arrow A) of the gripping force applied to the handles 11 and 12 by the right hand R and the direction (arrow B) of the gripping force applied to the handles 11 and 12 by the left hand L differ only by an angle equal to the angle α defined by the gripping portions 13a, 13b, 14a, and 14b.

[0039] That is, it is not necessary that the palms of both hands be positioned side by side in a line, and it becomes possible to apply gripping force with the wrists of both hands simultaneously straight.

[0040] As a result, application of a gripping force with the wrists being bent is prevented, and it is possible to apply to handles 11 and 12 the maximum gripping force the worker can produce.

[0041] In this manner, in the crimping tool according to the present embodiment, it is possible to compress reliably a crimping-style terminal to the dimensions as designed by a worker having a gripping force of the design value.

[0042] In other words, it becomes possible to enlarge the dimensions of the compressible crimping-style terminals.

[0043] Moreover, in the crimping tool according to the present embodiment, the first gripping part 13a of the first handle 11 is inclined in a direction approaching the second handle, but instead, as shown in Fig. 5, the first gripping part 13a can be formed to be straight, not inclining.

[0044] However, in this case, because only the second gripping portions 14a and 14b are inclined on one direction, an inconvenience may occur such as the end of the handle protruding in one direction, and this way be considered an inconvenience in terms of the storage space of the crimping tool increasing and as a hindrance to portability.

[0045] That is, inclining the second gripping part 14a so that the first gripping part 13a and the second gripping part 14a define a desired angle, as in the crimping tool 10 according to the present embodiment, and at the same time apportioning this angle of inclination between the first gripping part 13a and the second gripping part 14a, by inclining the first gripping part 13a in the opposite direction, there are advantages from the point of view of storage and carrying because it is possible to form the crimping tool 10 comparatively rectilinearly.

[0046] In addition, as shown in Fig. 6, the gripping part 13a of the second handle 12 and the first gripping part 13a of the first handle 11 can be inclined in the same direction, that is, in a direction increasing in distance from the first handle 11.

[0047] In this case, there are the same effects as the above-described embodiment, and in addition there are further advantages from the point of view of storage and carrying.

[0048] As described in detail above, according to the crimping tool of the present embodiment, a compressing operation in which the wrists of the worker become cramped is prevented, and because it becomes possible to apply the gripping force of the worker maximally, it becomes possible to compress reliably even large gauge crimping-style terminals.

[0049] Explanation of reference numbers :

3	jaw part
5	intermediate link member
5a, 5b	connecting shafts
7a, 7b	dies
10	compression device
11	first handle
12	second handle
13a, 13b	first gripping portions
14a, 14b	second gripping portions

Claims

1. A crimping tool (10) which compresses a compressible object by means of a toggle mechanism comprising

a) a first handle (11) being provided with one of a pair of dies (7a) which compress the compressible object,

b) a jaw member (3) being provided with the other of said pair of dies (7b) and being pivotally connected to said first handle (11),

c) a second handle (12) being pivotally connected to said jaw member (3), and
d) an intermediate link member (5) being pivotally connected to said first (11) and second (12) handle,

wherein said first handle (11) and said second handle (12) are provided with a first gripping portion (13a, 13b) which is placed at the vicinity of each connecting shafts (5a, 5b) with said intermediate link member (5) and is gripped by one hand of the operator, and a second gripping portion (14a, 14b) which is placed further apart from said connecting shafts (5a, 5b) with said intermediate link member (5) and is gripped by the other hand of the operator, and said first (11) and second (12) handle at said second gripping portion (14a, 14b) is bent with respect to said handles at said first gripping portion (13a, 13b) in a same direction within the rotating plane of said handles.

2. A crimping tool as defined in claim 1 wherein said first gripping part (13a, 13b) of at least one of the first (11) and second (12) handles is bent in a direction of closing of other handle.

3. A crimping tool as defined in claims 2 or 3 wherein said both handles (11, 12) are bent at said first gripping part (13a, 13b) in a first direction and both handles (11, 12) at said second gripping part (14a, 14b) are bent in an opposite direction.

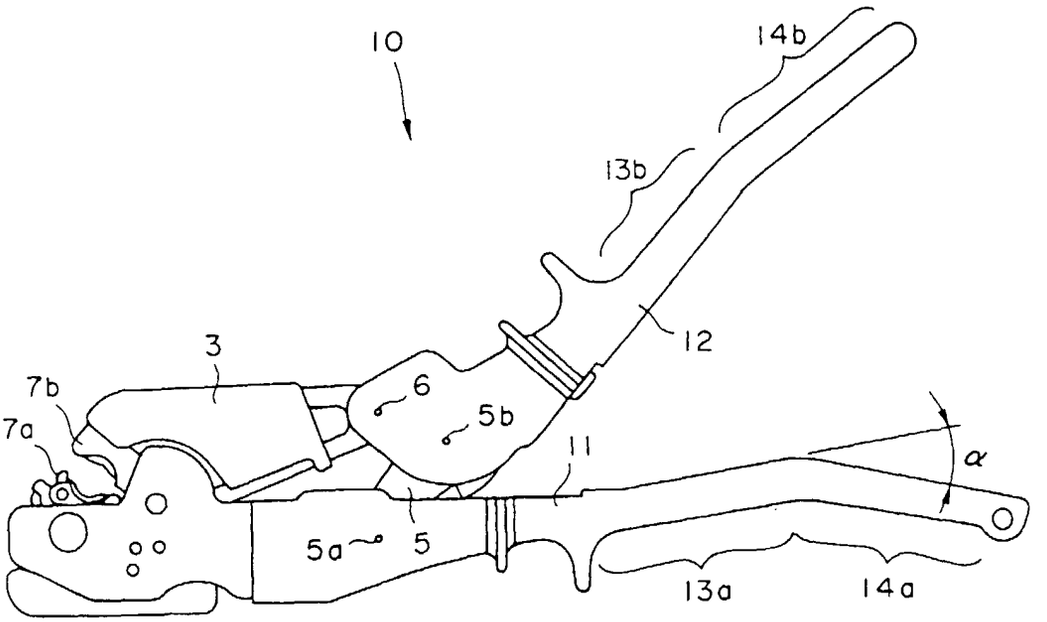

10
14b
13b
12
3
7b
7a
6
5b
11
α
5a
5
13a
14a

Fig 1.

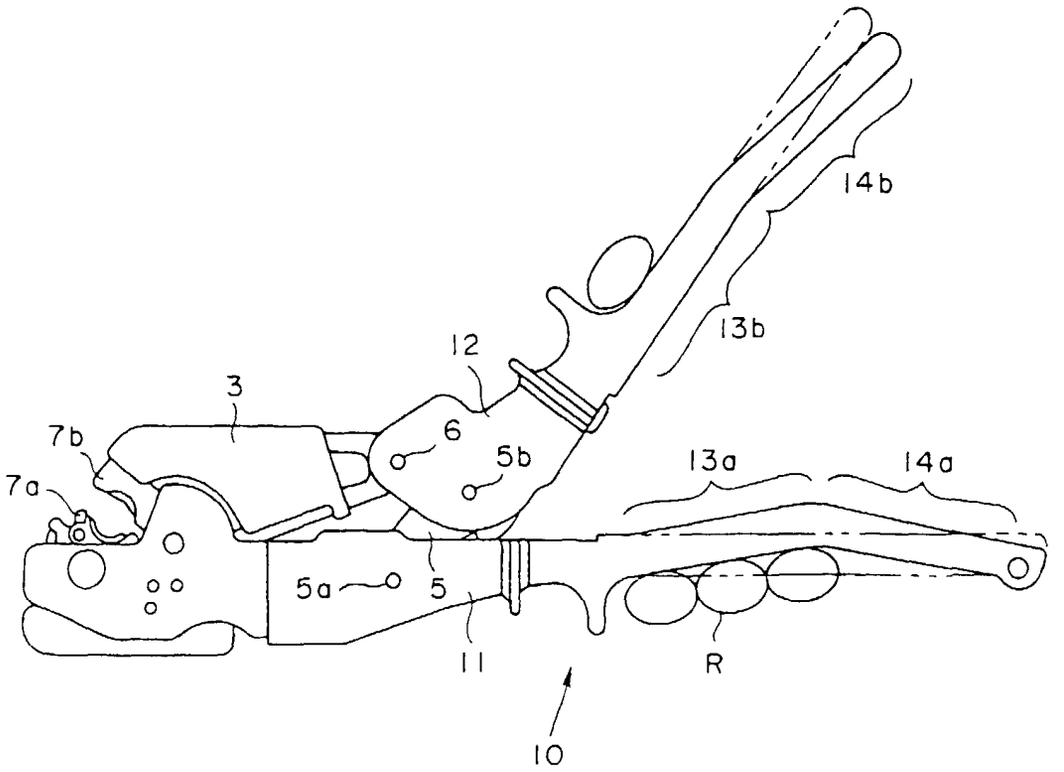
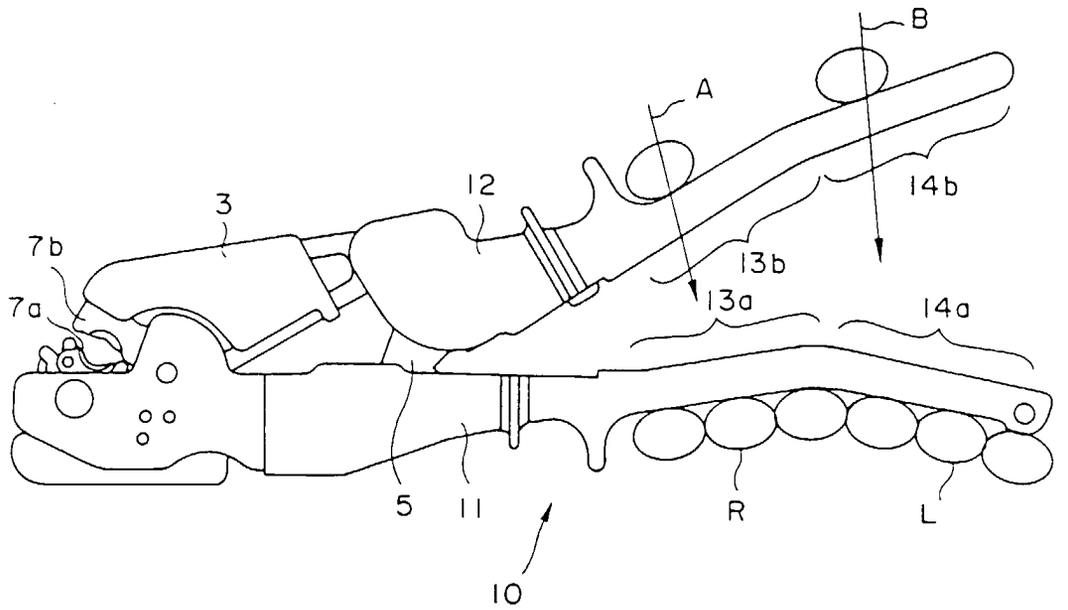

14b
13b
12
3
7b
6
5b
13a
14a
7a
5a
5
11
R
10

Fig 2.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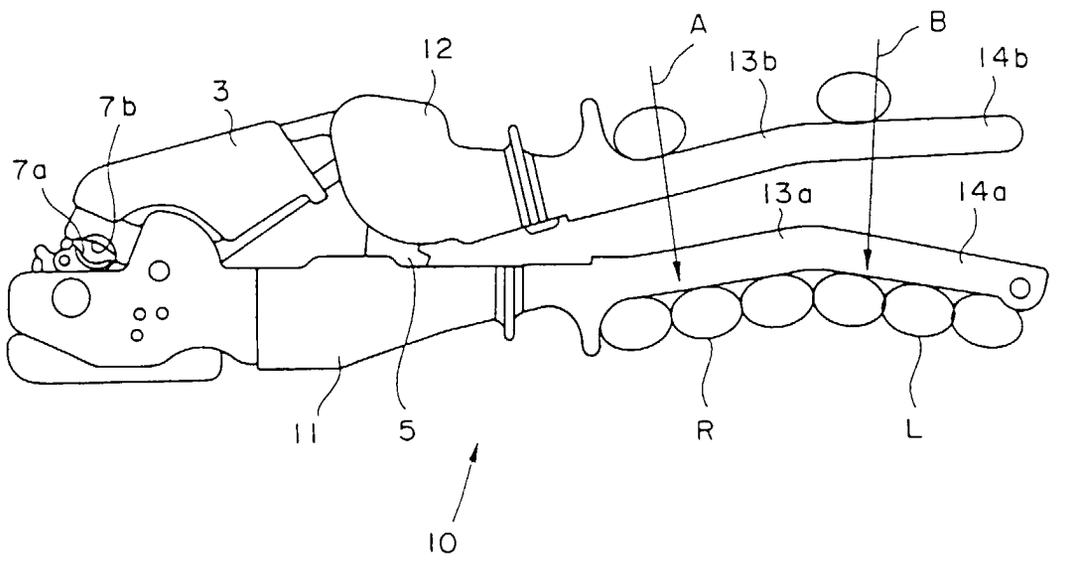
A
12
3
14b
7b
13b
7a
13a
14a
5
11
R
L
10

Fig 3.


A
B
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13b
14b
3
7b
7a
13a
14a
11
5
R
L
10

Fig 4.

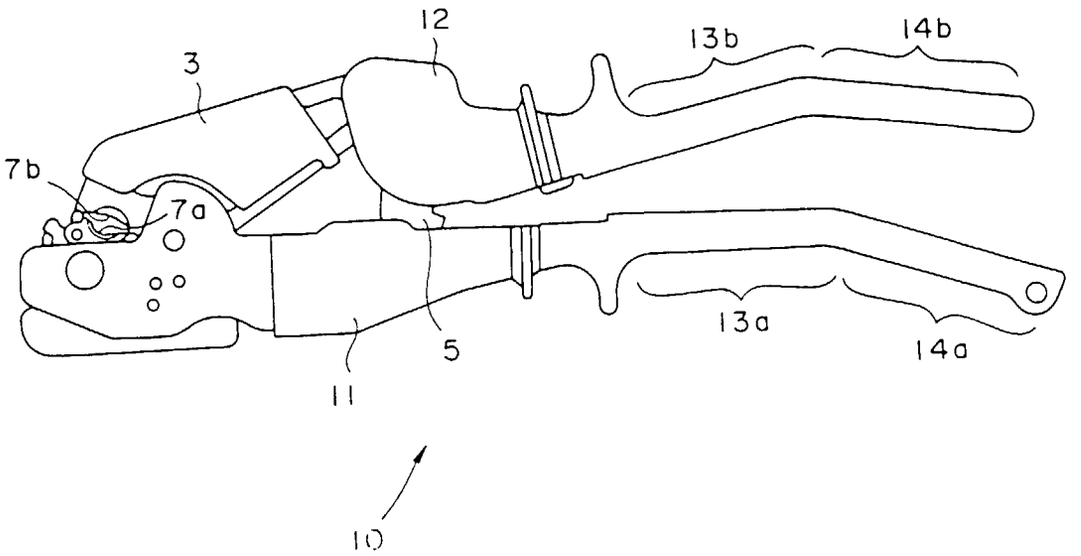

Fig 5.

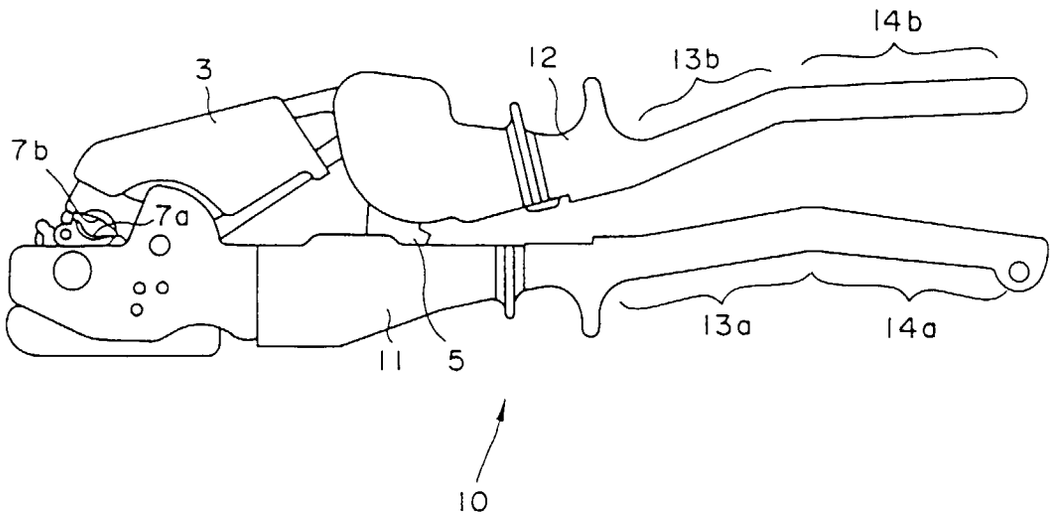

Fig 6.

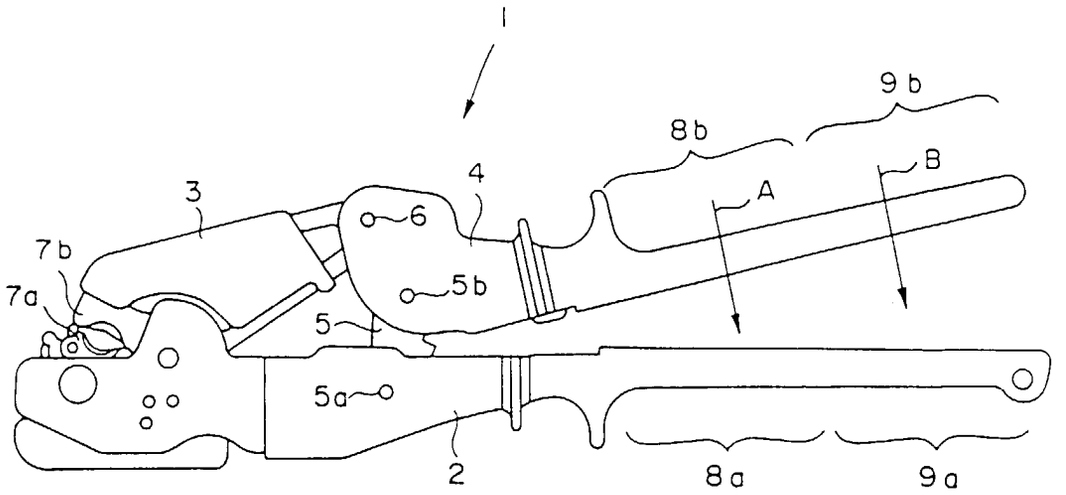

Fig 7.