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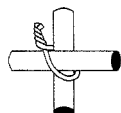
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(54) **Clip as well as a method and a hook for use in the method for fastening reinforcement steel bars**

(57) A clip for connecting steel bars, the clip having two loop shaped ends which are connected by an intermediate wire piece which is bent such that the clip can be mounted on a crossing of at least two rods and will keep its position on that rod before the clip is twisted to secure the rods together. Also disclosed is a hook for

engaging such a clip, wherein the hook has a shaft that, on one end is provided with the hook element and that, on the other free end is insertable in a hand power tool such as a hand drill. Further a method for connecting at least two steel bars crossing each other is provided, the method including the use of a jig, clips and a hook with a hand powered tool.

1. Cross wire knot



Clip #1

Used for filling in after the bars have been positioned to the correct grid line

Clips Lugs (Rings) at 0°



Clips Lugs (Rings) at 45°



Clips Lugs (Rings) at 90°



Double wired, ends at 90°



Fig. 1

Description

Field of the Invention

[0001] The disclosure relates to connecting reinforcement steel bars together.

Background of the invention

[0002] The Steelfixing (/ Rodman) is a semi-skilled tradesman who learns the 'tricks-of-the-trade' based on experience. In the assembly of loose concrete reinforcement steel bars for reinforced concrete structures, a number of straight and/or shaped reinforcement steel bars must be connected to each other. The skill of Steelfixing, is manual holding and wire manipulation, by being able to hold a hand tool in the preferred working hand, hold bars in other hand, wrap the wire around the reinforcement bar connection with finger manipulation on a horizontal or vertical plane and then tighten the wire with the other hand. Standard binding wire bundles is 25 kg or 1.1 kg spools for side reels that fit onto the tradesman belt. The experience is to choose from a variety of wire knots (see 1, 2 and 3) the most appropriate wire knot for the situation (see drawing A,B,D &E). The application of fastening wire around the reinforcement steel bars is physically demanding can cause Repetitive Strain Injury on the wrist and the risk of musculoskeletal injury because of trunk posture.

[0003] Alternative manual wire fastening methods used on connecting reinforcement steel bars are sack (Bag) ties; straight wire lengths with two rings applied to the end and hand wire clips; shaped wire clips that can be applied around reinforcement steel bar connection. These alternatives fastening application are restrictive as fastening techniques based on single knot application. Alternative manual wire fastening is a two hands application, one to hold the wire material and the other to apply.

[0004] Aids for Steelfixers to reduce Repetitive Strain Injury on the wrist and the risk of musculoskeletal injury by assembly of reinforcement steel shaped bars in a more ergonomic work environment are jigs combined with automated wire fasteners. Jigs are shaped as a mould of the concrete element with positioning clamps to hold bars at the correct distance, such specialized jig system is WO 2005/1156820.

[0005] A variety of automated hand powered tools existing on the market prefer different mechanical fastening techniques, i.e. 1) a continuous wire spool wire is driven by motor to spin the wire a number of times around the connection, wire is served and then applied wire is twisted tight by motor: WC 03/037545 or 2) by pre shaped wire clips that are manually held around the connection and fastened by rupture US 4 838 726, or held in a magazine and spiraled on to the connection point of the reinforcement WO 01/46537.

[0006] These power hand tools are not preferred on jigs to manual fastening because they are too large to

fasten in restricted areas, cumbersome, only twist in one direction, single speed, two handed, require specialized power supply, do not meet new health and safety regulation or sensitive to the building site working environment.

Summary of the invention

[0007] In one aspect of the disclosure a clip for connecting steel bars is provided, the clip having two loop shaped ends which are connected by a intermediate wire piece which is bent such that the clip can be mounted on a crossing of at least two rods and will keep its position on that rod before the clip is twisted to secure the rods together.

In another aspect a hook for engaging a clip is provided, wherein the hook has a shaft that, on one end is provided with the hook element and that, on the other free end is insertable in a hand power tool such as a hand drill.

[0008] In another aspect of the disclosure a method for connecting two steel bars crossing each other is provided, the method including:

- providing a jig in which the bars can be positioned relative to each other so that the steel bars together determine at least one crossing, for example as disclosed in WO 2005/1156820;
- providing a clip as disclosed herein;
- providing a hook as disclosed herein;
- placing the hook in a hand power tool, such as a hand power drill preferably having a clockwise and counterclockwise rotation possibility;
- applying the at least one clip on the at least one crossing,

wherein the clip maintains its position by virtue of its shape;

- placing the hook through the loop shaped ends of the at least one clip;
- powering the powered hand tool so that the clip is twisted and the substantially fixed is connected by the twisted clip.

[0009] More particular, the disclosure relates to a process and device for mutually connecting the crossing of at least two straight or bent elongated elements, such as concrete reinforcement steel bars, whereby formed ring eared clips with extending arms are placed around at the crossing of straight or shaped bars causing extending ring ears to protrude angled above the crossing to await closure caused by twisting until the clip is tightly wrapped around crossing or the ring ears are ruptured from the clip, the variable twisting speed being performed clock or anti-clock wise by a longitudinal powered conical hook which hooks in the open state the clips two ring ears, turns and twists evenly the wire ends until tighten or ruptured.

The disclosure is to enhance the assembly on building sites and with jigs such as WO 01/46537 and includes a process and a device for mutually connecting the crossing of at least two loose straight or bent reinforcement steel bars when positioned free standing in situation or on a jig. The process can be applied with a variety of shaped wire clips to meet the different assembly application requirements. Extended arms are looped to make it easier to slip clip around and/or over the cross connection, loops are twisted at such an angle so the clips rests still on the connection before being closed. The loops present an easy target for the powered conical hooked tool to attach to and grip before powered rotation is applied for twisting closed the open clip. Shaped Loop Clips fasten reinforcement steel bars connection from diameter 6mm to 57 mm

[0010] The device includes a powered conical hook that twists shaped loop clips closed through rotates in both directions; clock & anti-clock wise; able to tighten and loosen the shaped loop clip to desired tightness, by a variable degree of speeds.

The powered conical hook application operates in narrow and restricted areas.

Advantages

[0011]

- Loop Shape is unique for each powered conical hook closure
- Loops on clips combined with powered conical hook rotate close the clip tight around the crossed bars
- Loop can rupture from wire clip
- Loop rests on connection before closing
- Powered conical hook rotate clips both directions clock & anti-clock wise; therefore able to loosen the clip move the connecting crossed bars and then proceed tighten
- Powered conical hook rotate at variable speeds in the clock and anti-clock wise

Short description of the drawings

[0012] Figures 1-5 show different type of wire knots and different types of clips preferred for fastening on the different reinforcement steel bar connections (A-D)

[0013] Fig. 6 shows a powered hand drill 1 with an embodiment of a hook 2 in it.

Claims

1. A clip for connecting steel bars, the clip having two loop shaped ends which are connected by a intermediate wire piece which is bent such that the clip can be mounted on a crossing of at least two rods and will keep its position on that rod before the clip is twisted to secure the rods together.

2. The clip according to claim 1, wherein the loop shaped ends have a internal diameter such that it can be engaged by a hook.

3. The clip according to claim 1 or 2, wherein the intermediate wire piece is U-shaped, the U having two legs interconnected by a body.

4. The clip according to claim 1 or 2, wherein the intermediate wire piece is U-shaped, the U having two legs interconnected by a body, the legs containing at least one bent over a line which is substantially parallel to the body.

5. The clip according to claim 3 or 4, wherein the loops extend in a plane which includes an angle with the plane in which the legs of the U-shaped intermediate piece extend near the loops.

6. The clip as shown in any of the enclosed drawings of this application.

7. Hook for engaging a clip according to claim 1 or 2, wherein the hook has a shaft that, on one end is provided with the hook element and that, on the other free end is insertable in a hand power tool such as a hand drill.

8. Hook according to claim 7, wherein the hook tapers towards the free end thereof.

9. Method for connecting two steel bars crossing each other, the method comprising:

- providing a jig in which the bars can be positioned relative to each other so that the steel bars together determine at least one crossing, for example as disclosed in WO 2005/1156820;
- providing a clip according to any one of claims 1-6;
- providing a hook according to claim 6 or 7;
- placing the hook in a hand power tool, such as a hand power drill preferably having a clockwise and counterclockwise rotation possibility;
- applying the at least one clip on the at least one crossing, wherein the clip maintains its position;
- placing the hook through the loop shaped ends of the at least one clip;
- powering the powered hand tool so that the clip is twisted and the substantially fixed is connected by the twisted clip.

10. Method according to claim 9, wherein multiple clips are applied to multiple crossings before and wherein, after that, the multiple clips are twisted with the hook powered by the hand powered hand tool.

11. Method according to claim 9 or 10, wherein the powered hand tool is powered until the loop shaped ends break off the twisted intermediate part of the clip.

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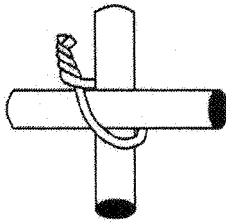
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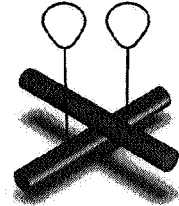
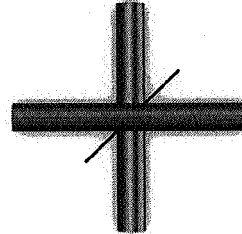
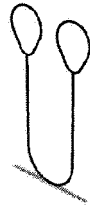
1. Cross wire knot

Clip #1

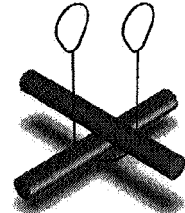
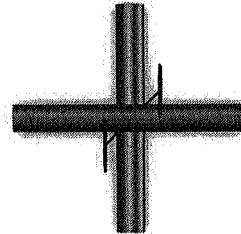


Used for filling in after the bars have been positioned to the correct grid line

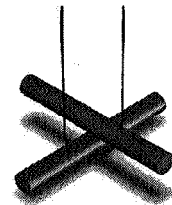
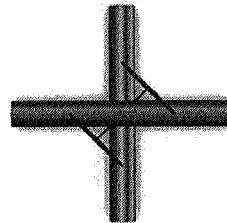
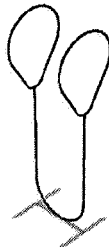
**Clips Lugs
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**Clips Lugs
(Rings) at 45°**



**Clips Lugs
(Rings) at 90°**



**Double wired,
ends at 90°**

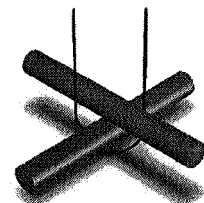
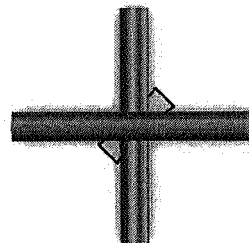
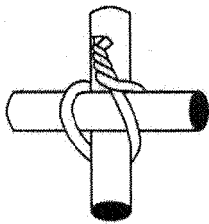


Fig. 1

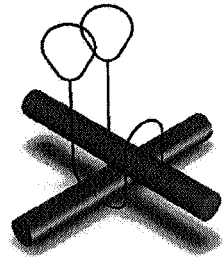
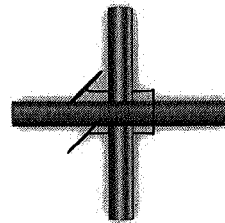
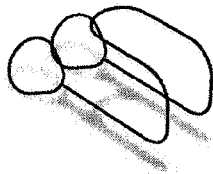
2. Looped Cross bar wire knot.

Clip #2



Used to position bars on a flat surface to the grid line or stop bars slipping.

**Clips Lugs
(Rings) at 45°**



**Clips Lugs
(Rings) at 0°**

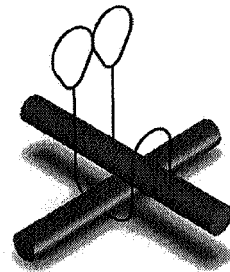
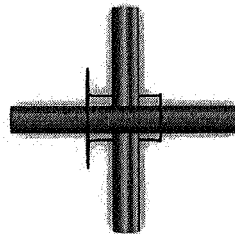
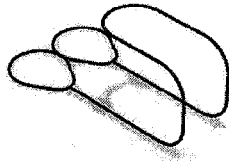
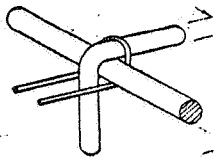


Fig. 2

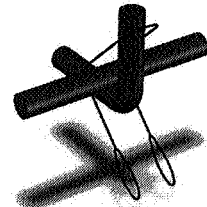
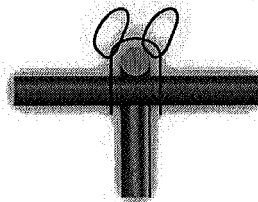
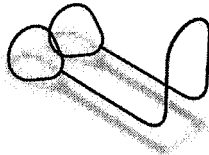
3. Corner wire knot

Clip #3



Used to pull stirrup legs together / bent bars with a 90 degree angle onto a straight cross bar

**Clips Lugs
(Rings) at 45°**



**Clips Lugs
(Rings) at 0°**

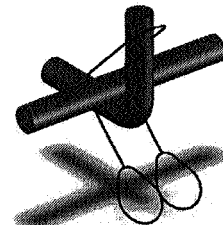
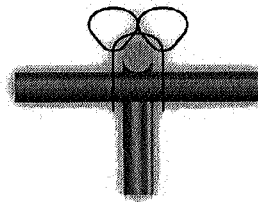
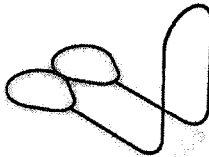


Fig. 3

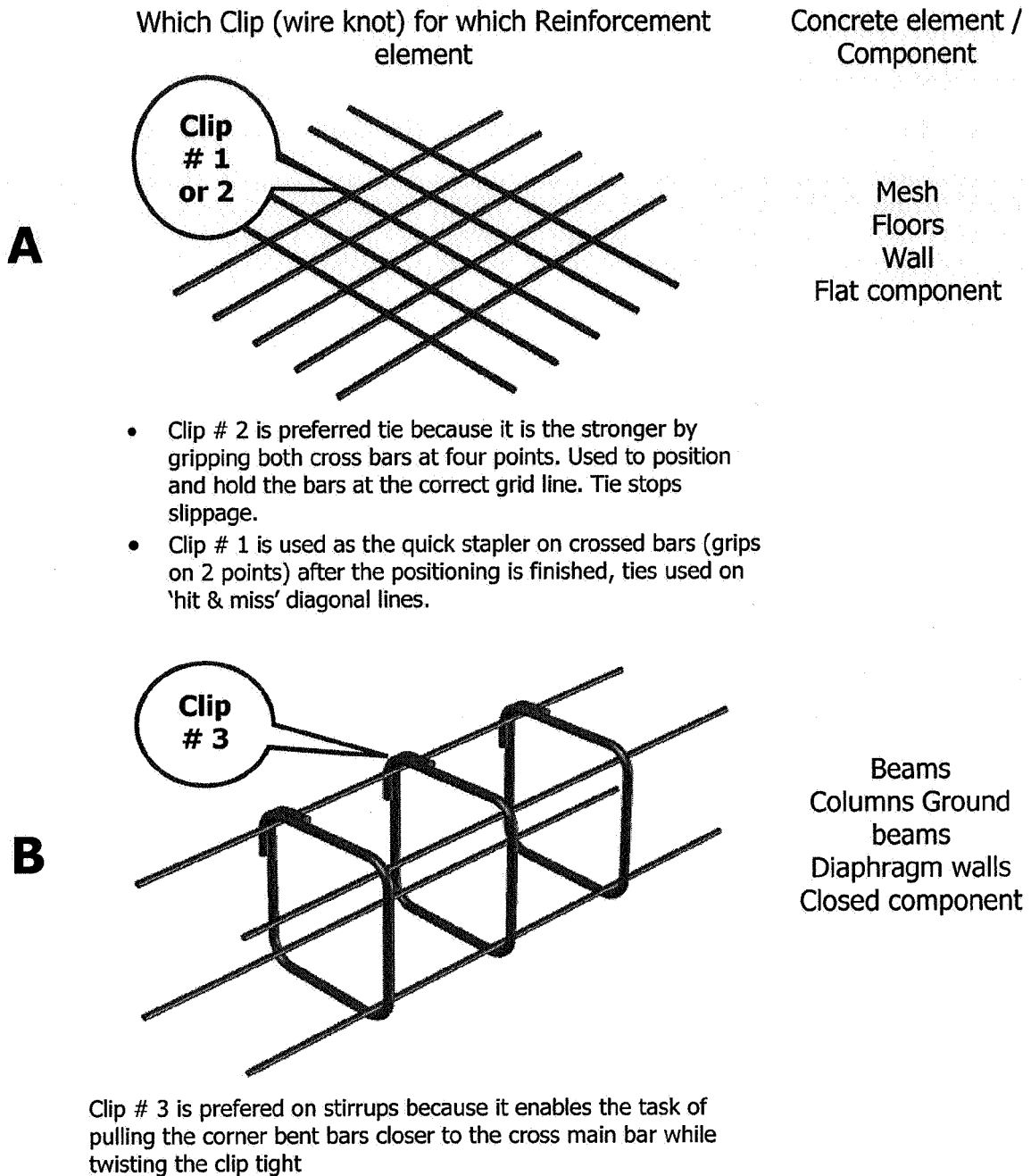
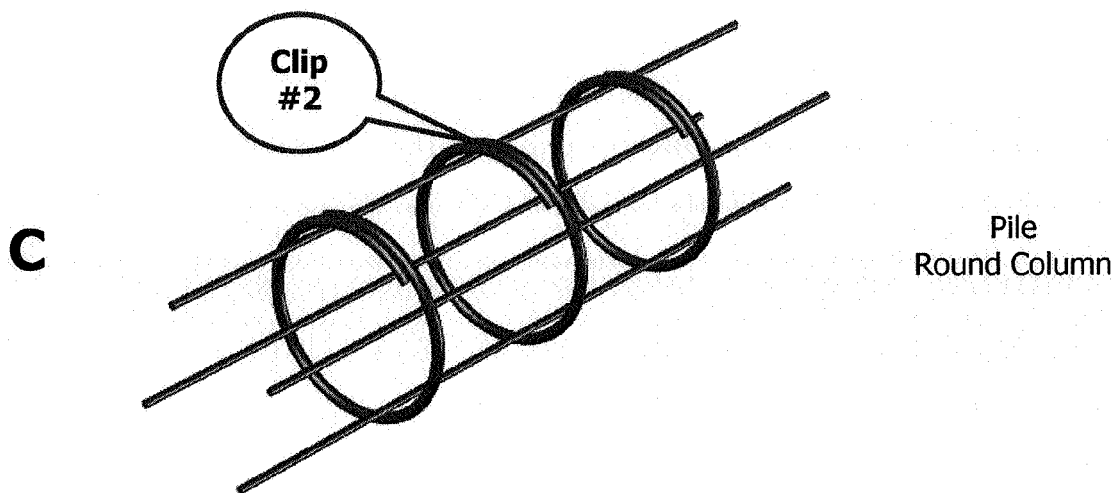
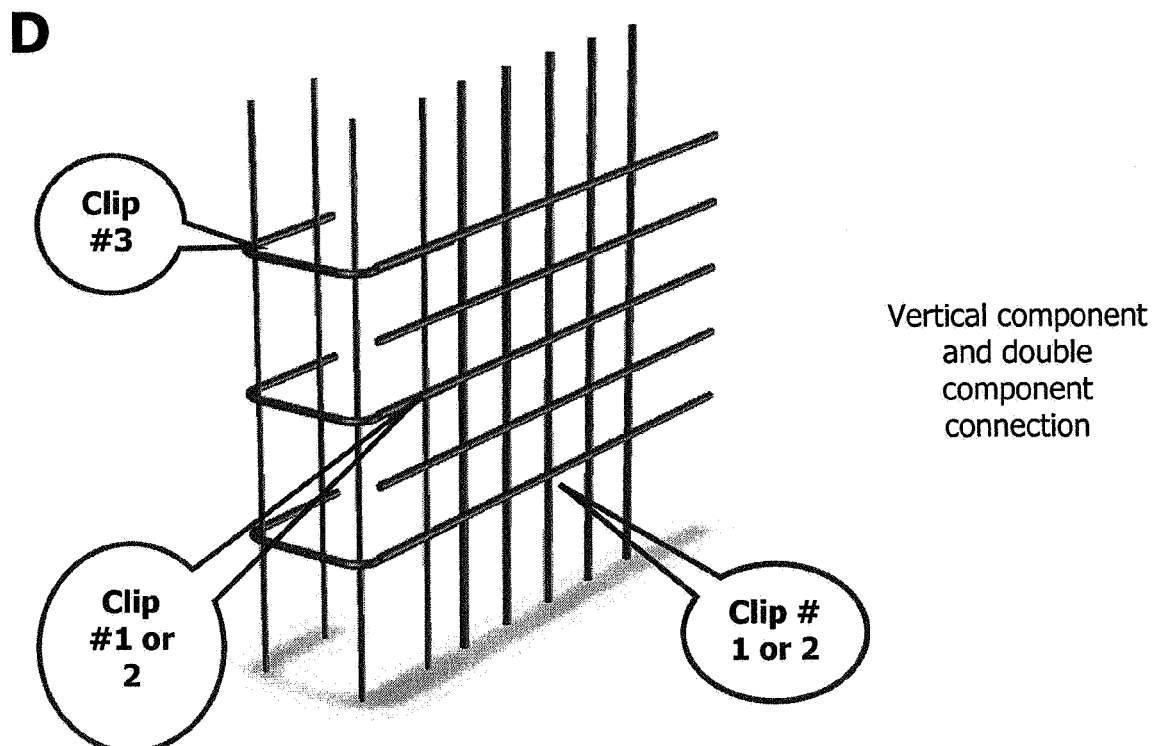


Fig. 4



Clip #2 is preferred on radius, spiral, or round material as the tie grips the bars in both direction, due to the 4 point grip of the tie. The Clip #2 stops slipping or movement of the round form on the straight main bars.



Tie combinations when assembling vertical bars, the clip # 2 tie to stop the horizontal bar slipping down the vertical bar, along the length the staple clip # 1 is used. The corner component uses Clip #3 and the connection of double bars when two component shapes are assembled using a combination of Clip #1 or #2

Fig. 5

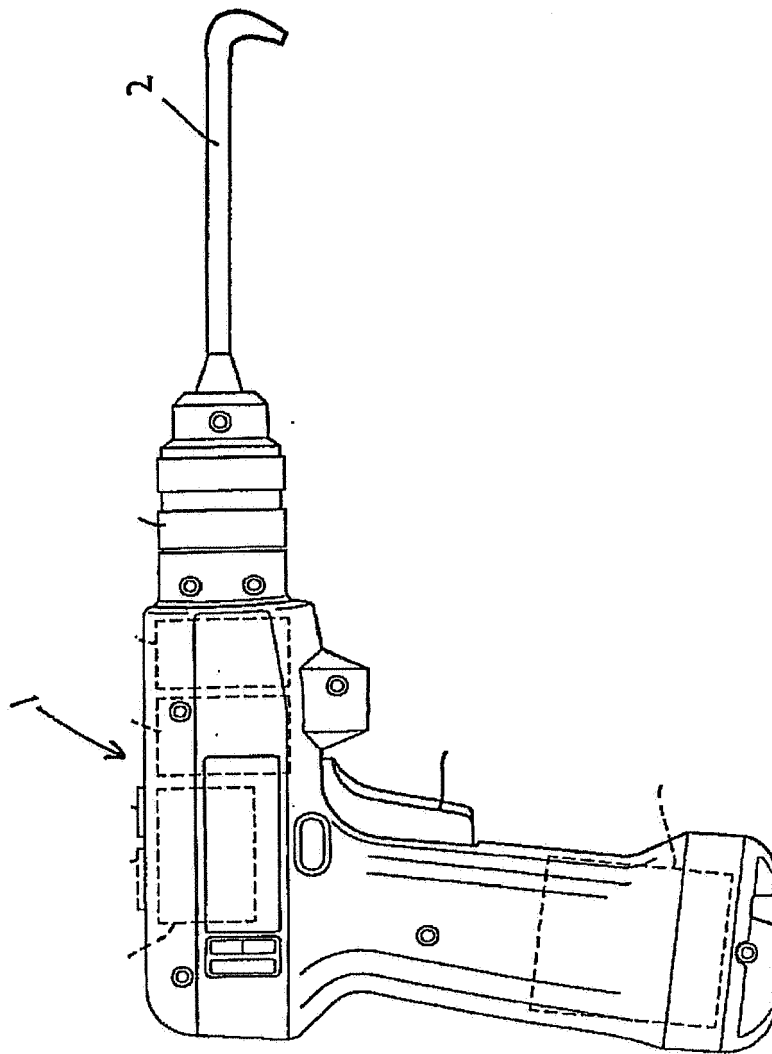


Fig. 6



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 6 May 2008	Examiner Demeester, Jan
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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