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

(11) Publication number: **0 040 454**
**A1**

# (12) EUROPEAN PATENT APPLICATION

(21) Application number: **81200524.7**

(22) Date of filing: **15.05.81**

(51) Int. Cl.³: **B 65 B 13/28**

(30) Priority: **19.05.80 NL 8002873**

(43) Date of publication of application:
**25.11.81 Bulletin 81/47**

(84) Designated Contracting States:
**AT BE DE FR GB IT NL**

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## (54) Apparatus for twisting together two wire ends.

(57) Apparatus for twisting together two wire ends, e.g. the ends of a wire placed around a bundle, has rotatable jaws (6,7) and a shaft (1) to rotate the jaws. In order to make this apparatus easy to use, and particularly to provide a portable apparatus, a support (4) is mounted on an end of the shaft (1) and is rotatable relative to the shaft. Two pairs of said jaws are diametrically opposed, each pair of jaws comprising one jaw (6) fixed on the support (4) and another jaw (7) moved by rotation of the shaft relative to the support so as to close towards the fixed jaw (6). Rotation of the shaft thus first causes the jaws to close together and then rotation of the jaws.

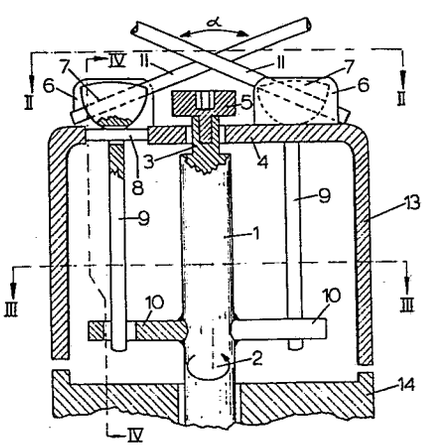


fig. 1

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"APPARATUS FOR TWISTING TOGETHER TWO WIRE ENDS"

The present invention relates to apparatus for twisting together two wire ends, for instance the ends of a metal wire which extends around an object, for example a bundle. The apparatus has rotatable jaws for holding the wire ends and a driven shaft to rotate the jaws. In practice there is frequently a need for bundling articles together. It is common to use a metal wire as the binding for this purpose and in particular to twist the ends of the wire together. Where bundling is not performed completely by hand but with the aid of a fixed apparatus or machine, then the articles to be bundled have to be brought to the apparatus or machine. So there is a need for a mobile apparatus which can be brought to the articles to be bundled so that they can be bundled in situ.

An apparatus is particularly necessary when a fairly thick wire is used as the binding, since twisting the ends together requires fairly heavy physical effort. One use of apparatus such as that of the present invention is for bundling together concrete reinforcing bars made of steel using 6 mm gauge mild steel wire. This is stiff wire and there is a need to improve working conditions by making the task of twisting the ends together easy. The principles of the invention can also be used in twisting together the ends of a metal wire of larger or smaller diameter and can be used on a fixed bundling machine.

NL 7800868 shows a wire-twisting device having a single jaw for each wire with a slot in the jaw to receive the wire. This device is particularly suitable as a fixed machine. FR 2 381 664 shows a device with a single pair of opposed jaws for gripping both wires. Thydraulic control is employed.

The present invention aims to provide apparatus for twisting wires which is easy to use and which particularly is suitable to be designed as a manually portable device.

The invention as claimed is intended to provide a solution. The apparatus has a pair of jaws for each wire, and in operation, after insertion of the wires, the simple action of turning the shaft causes first clamping of the wires and then turning of the jaws to twist the wires together.

One embodiment of the invention is illustrated by way of example in the following description with reference to the accompanying drawings, in which:

Figure 1 is cross-section through the apparatus on the line I - I in Figure 2,

Figure 2 is a view of the apparatus in the direction of arrows II - II in Figure 1,

Figure 3 is a cross-section of the apparatus on the line III - III in Figure 1,

Figure 4 is a cross-section of the apparatus on the line IV - IV in Figure 1,

Figure 5 is a general view showing the drive, and

Figure 6 is a view of the apparatus of Figure 5 from above

The embodiment of the invention shown in the drawings has a driven shaft 1 which is driven at its end 2 by a drive motor not shown in detail. At the other end 3 of the shaft, which is unsupported, a support 4 in the form of a plate is mounted on a reduced end portion of the shaft 1 and retained by a bolt 5 engaging the shaft end 3. The plate 4 is freely rotatable relative about the shaft axis relative to the shaft 1, to a limited extent only as will appear later.

The plate 4 carries two diametrically opposed upstanding jaws 6, which are fixed to the plate 4. Two movable jaws 7, respectively face-to-face with the fixed jaws 6 to provide two jaw pairs, are also carried by the plate 4 by means of pivot shafts 8 lying in a plane perpendicular to the axis of the drive shaft 1. The movable jaws 7 are swingingly mounted on the shafts 8 so as to be closable towards the fixed jaws 6 and extend rearwardly of the shafts 8 as levers 9 which are loosely received in apertures in arms 10 projecting radially from the shaft 1 at a distance from the plate 4.

Before further description of the apparatus,

its operation can now be described. A wire is placed around the articles to be bundled so that the ends 11 of the wire cross. The apparatus, with the pairs of jaws 6,7 open, is placed over these ends as shown in Figure 1. The drive to the shaft 1 is engaged. Initially, the plate 4 is prevented from turning by the ends 11, which come into contact with the fixed jaws 6 and thus arrest it. However, the levers 9 are moved by the arms 10, as a result of which the free movable jaws 7 are moved in towards the fixed jaws 6, thus clamping the ends 11. After clamping, the levers 9 cause the plate 4 to turn with them through the shafts 8. As the plate turns, the ends 11 are twisted together and the wire is stretched taut around the article being bundled. The size of the jaws 6 and 7, their positioning in relation to one another, and the length of the levers 9 have been selected for a given gauge of wire on the basis of tests so that on the one hand the ends are not snipped off after they are clamped in the jaws and on the other hand so that they do not slip. For a good connection between the ends of the wire about four revolutions of the shaft 1 are sufficient to twist the ends together at an angle $\alpha$ which is fairly close to 90°.

In order to hold the pairs of jaws 6,7 open when

the drive to the shaft 1 is not engaged, a spring element 12 is provided which is connected as shown to the base 4 (or to some other component which is fixed to the base). The other end of the spring element may be attached to one of the levers 9. It is preferred, as shown, to connect the spring element 12 with one of the arms 10.

For safety reasons, the rotating components are concealed in a housing 13, which can be connected either to the support 4, (as shown) or to the casing 14 of the drive unit. At the same time the housing 13 is flattened on two sides at 15 into a wedge shape (see Figure 4) in order to offer a better view of the work wires being twisted. For this reason the housing is coupled to the base 4. The housing 13 is constructed in such a way that its bottom edge is close to and flush with the casing 14 of the drive unit.

As shown in Figure 5, the drive is preferably provided by a pneumatic motor 16 with an angled transmission 17 of a known type. The pneumatic motor is connected via a hose 18 to a compressed air supply, for example the compressed air mains in a factory. The casing of the pneumatic motor is provided with a pair of roughened surfaces 19 to facilitate handling of the apparatus. The pneumatic motor is operated by means of a control device 20. The whole unit, in a version suitable for twisting

together the ends of a steel wire 6 mm in diameter, has a total weight of approximately 5 kg, and is thus easy to carry.

## CLAIMS

1. Apparatus for twisting together two wire ends, for instance the ends of a wire passed around an object, having rotatable jaws (6,7) for holding the wire ends and a driven shaft (1) to rotate the jaws (6,7) characterized in that:
a support (4) is mounted on an end of the shaft (1) and is rotatable, at least to a limited extent, about the shaft axis relative to the shaft, there being two pairs of said jaws (6,7) diametrically opposed with respect of the shaft axis, each pair of jaws comprising a jaw (6) fixed on the support (4) and a movable jaw (7) which is arranged to be moved by rotation of the shaft (1) relative to the support (4) so as to close towards the fixed jaw (6) in order to clamp a wire, so that rotation of the shaft (1) first causes the pairs of jaws to close and then causes rotation of the support and the jaws.

2. Apparatus according to Claim 1 wherein resilient means (12) is provided to hold the pairs of jaws open when the shaft drive is not engaged.

3. Apparatus according to Claim 1 or Claim 2 wherein the movable jaws (7) are carried by swinging arms (9) which are pivotally mounted on the support (4), the arms (9) being caused to swing so as to move the movable jaws (7) by a member or members (10) projecting radially from the shaft (1).

4. Apparatus according to Claim 3 as dependent on Claim 2 wherein said resilient means (12) is a spring element connected at one end to the support (4).

5. Apparatus according to Claim 4 wherein said spring element (12) is connected at another end to said radially projecting member or members (10).

6. Apparatus according to Claims 3 to 5 wherein the shaft (1), the swinging arms (9) and the radially projecting member or members (10) are enclosed by a housing (13).

7. Apparatus according to Claim 6 wherein the housing (13) is fast with the support (4) and has a pair of opposite sides which converge towards said jaws so that the housing has a wedge-shape.

8. Apparatus according to Claim 6 or Claim 7 wherein the housing (13) at its end remote from the jaws is closely adjacent with to a casing (14) of a drive unit for the shaft (1).

9. Apparatus according to preceding Claims having a pneumatic motor to drive the shaft (1).

10. Apparatus according to Claim 9 which is manually portable and is connectable to a compressed air supply by means of a hose.

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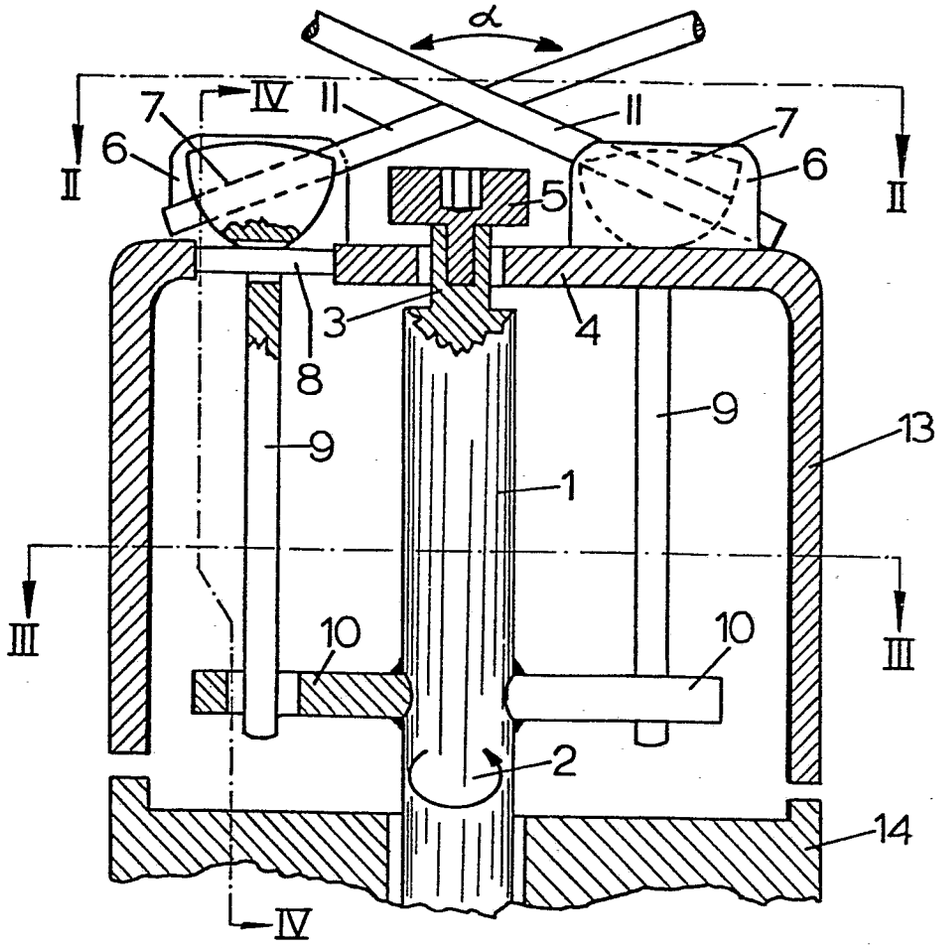


fig. 1

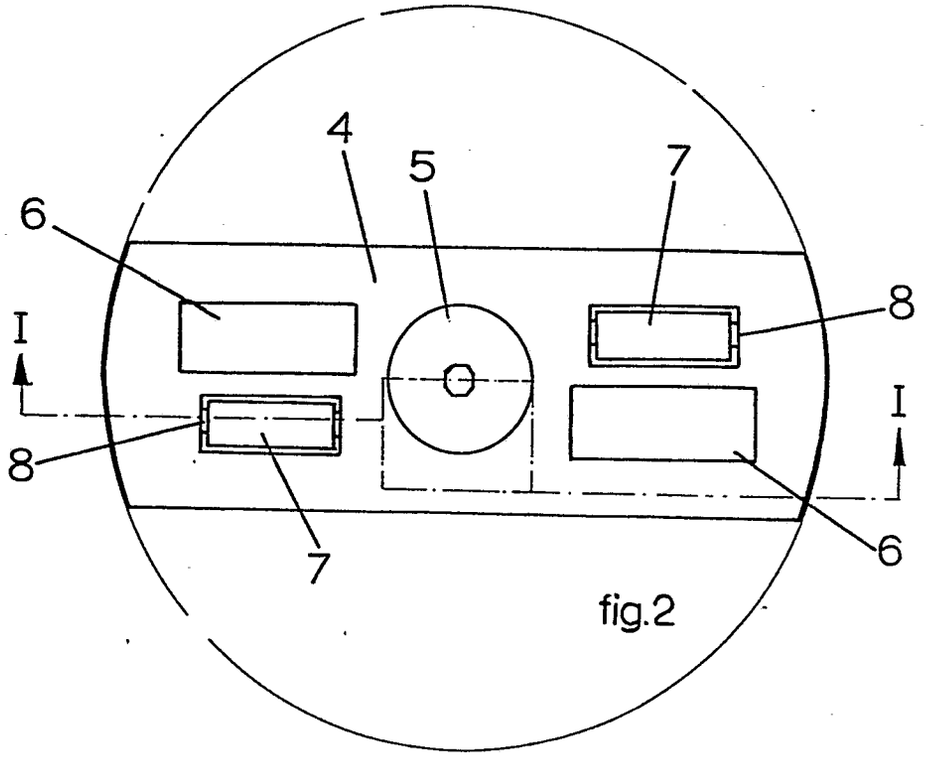


fig.2

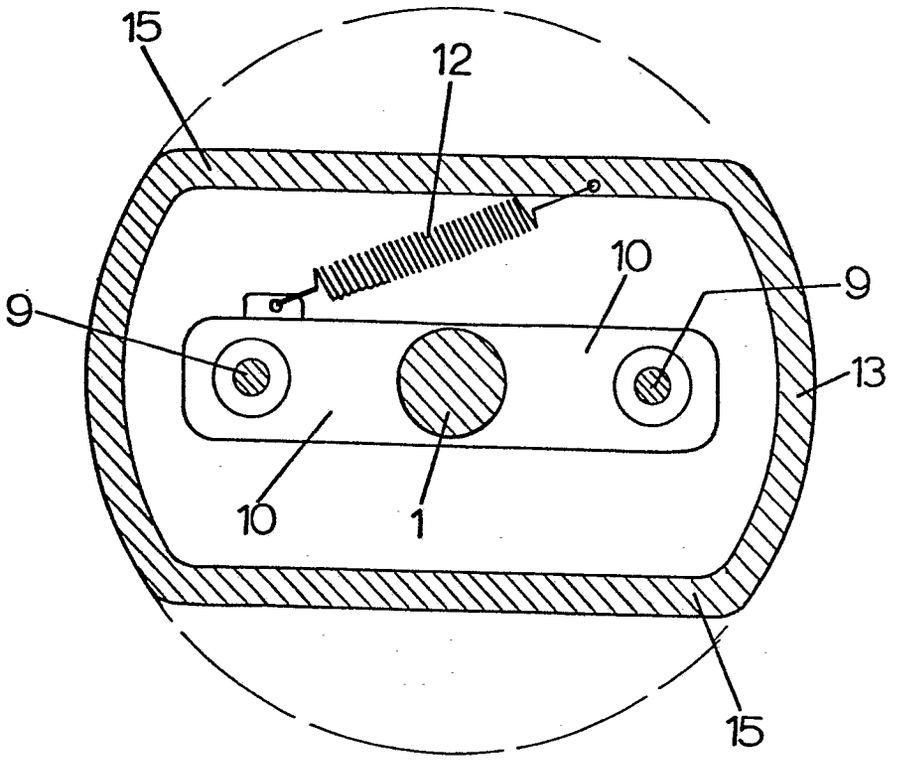


fig. 3

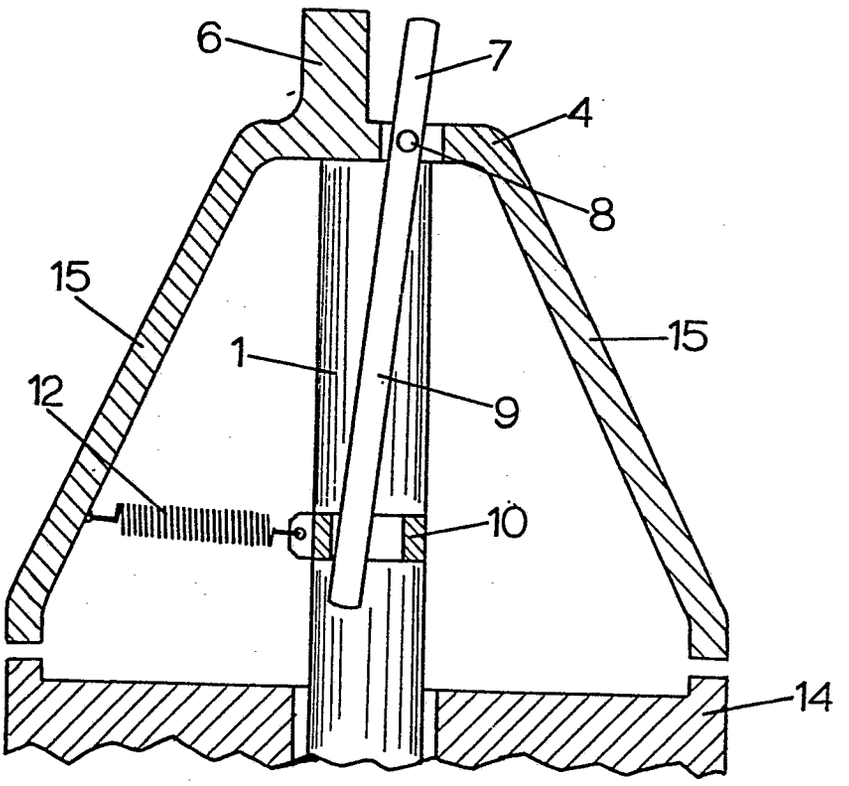


fig. 4

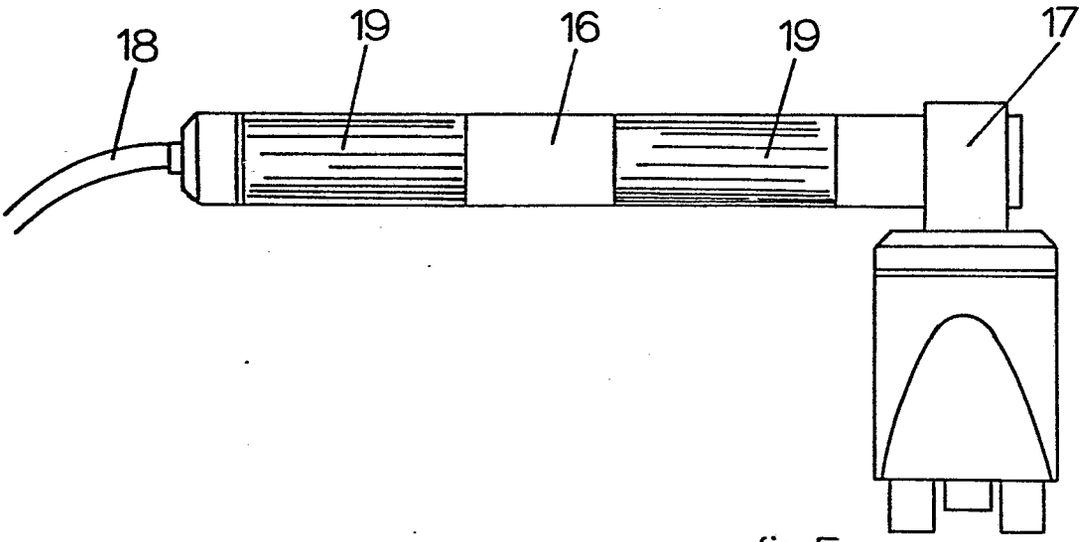


fig.5

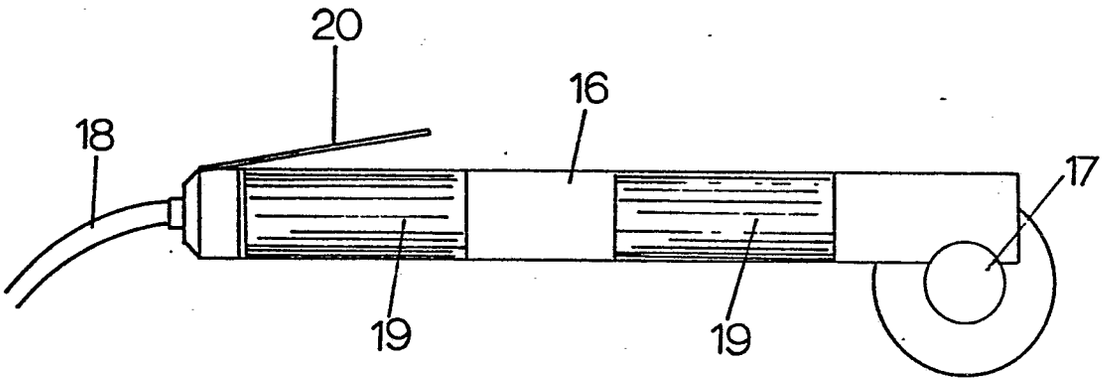


fig.6

European Patent Office

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Application number
EP 81 20 0524

# EUROPEAN SEARCH REPORT

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim |
|---|---|---|
| | NL - A - 78 00 868 (HOOGOVENS)<br>* page 2, lines 29-34 *<br>-- | 1 |
| | FR - A - 2 381 664 (BOTALAM)<br>* page 3, line 30 - page 4, line 19 *<br>& US - A - 4 160 469<br>--------- | 1 |

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

B 65 B 13/28

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

B 65 B

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 19-06-1981 | KIRSCHBAUM |