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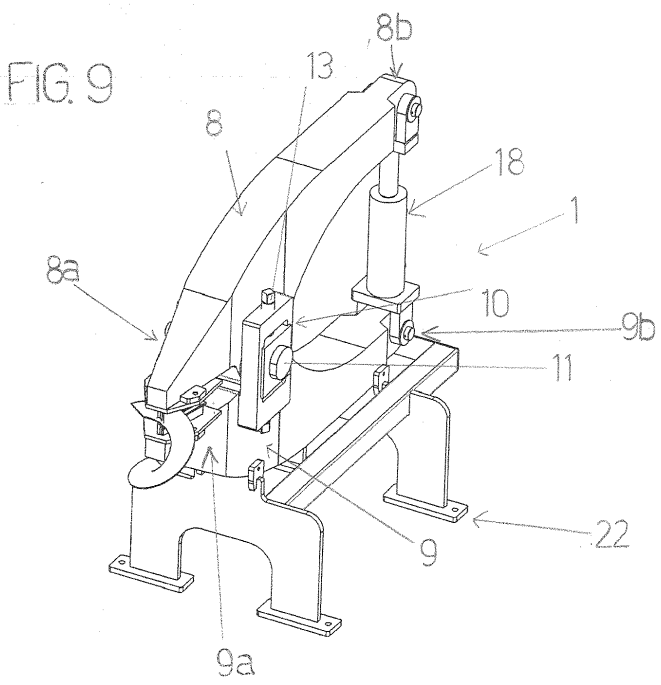
(54) A PRESS FOR DEFORMING A PLANAR SHEET HAVING AN OPEN-RING CONFORMATION UP TO GIVING THE PLANAR SHEET A HELICAL SWEEP

(57) A press (1) for deforming a planar sheet (2) having an open-ring conformation up to giving the planar sheet (2) a helical sweep, comprising: a first deforming element (4), borne by a first arm (8), comprising a first wall (5) which conforms a helicoid sector defining a first helical axis (X); a second deforming element (6), borne by a second arm (9), comprising a second wall (7) which conforms the helicoid sector defining a second helical axis (Y).

The first arm (8) and the second arm (9) are rotatably coupled to one another, with respect to a relative rotation axis (Z), so that the first wall and the second wall are facing one another and so that the rotation axis (Z) is in a predetermined position so that, during the deformation of a portion (3) of the planar sheet (2), the first helical axis (X) and the second helical axis (Y) define between them an angle (α) that is greater than zero so that the deforming force decreases in a direction going from the internal edge (3a) to the external edge (3b) of the portion (3).

FIG. 9



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Description

DESCRIPTION OF THE INVENTION

[0001] The present invention relates to the technical sector concerning presses for deforming planar sheets. In particular, the invention relates to a press for deforming a planar sheet having an open-ring conformation up to giving the planar sheet a helical sweep.

[0002] With reference to figures 1 and 2, reference numeral (100) denotes a press for deforming a planar sheet having an open-ring conformation up to giving the planar sheet a helical sweep.

[0003] The planar sheet having an open-ring conformation comprises a portion conformed as a ring sector in turn comprising an internal edge and an external edge. The portion having an ring sector conformation, once subjected to the action of the press (100), will assume a helical sweep: it will be transformed into a portion having a helicoid sector conformation, having a determined pitch, a determined internal radius and a determined external radius.

[0004] With further reference to figures 1 and 2, the press (100) comprises: a frame (101); - a first arm (102) which is mobile; a second arm (103) which is fixed to the frame (101); a first deforming element (104), fixed to the first arm (102), comprising a first wall which conforms a helicoid sector, so that a first helical axis is defined; a second deforming element (105), fixed to the second arm (103), comprising a second wall which conforms the helicoid sector, so that a second helical axis is defined.

[0005] In particular, the first arm (102) is arranged superiorly of the second arm (103), so that the first deforming element (104) faces the second deforming element (105), and is translatable with respect to the second arm (103) so as to near/distance the first deforming element (104) to/from the second deforming element (105) so that the first helical axis is always parallel to the second helical axis.

[0006] Therefore, during the deformation of the planar sheet, the first arm (102) is translated towards the second arm (103) so that the first deforming element (104) is translated towards the second deforming element (105): the first wall of the first deforming element (104) will press the portion of the planar sheet against the second wall of the second deforming element (105), applying a same deforming force over all the portion of the planar sheet.

[0007] In particular, supposing the first deforming element (104) and the second deforming element (105) to be fixed, with the above-described known press (100) a certain number of helicoid elements can be obtained: i. e. sheets can be obtained having a helical sweep with a pitch, internal radius and external radius that are variable within a certain range. This modularity is obtained thanks to the possibility of varying the position of the planar sheet with respect to the first deforming element (104) and the second deforming element (105). In other words, the portion of the planar sheet is arranged resting on the second deforming element (105) in a position that is variable (more forward or to the rear than the second deforming element (105)) so as to vary the pitch, the internal radius and the external radius of the helix that is obtained.

[0008] However, the number of helices, different to one another and obtainable with the above-mentioned press (100), supposing the first deforming element (104) and the second deforming element (105) to be fixed, is limited.

[0009] In fact, as it is known that the internal edge of the portion of the planar sheet to be deformed is the one that is to be subject to a greater deformation in order to take on a helical sweep, the known-type press (100) does not enable obtaining helices requiring a deformation of the upper internal edge to a certain amount (this is due to the fact that the known press (100) applies a uniform deformation force on the whole surface to be deformed).

[0010] Further, with the increase of the deformation force applied by the press (100) of the prior art, the first deforming element (104) and the second deforming element (105) tend to distance their ends that are in proximity of the internal edge of the portion of the planar sheet; consequently, the deformation of the internal edge of the planar sheet is limited.

[0011] In the light of the above, the aim of the present invention consists in obviating the above-mentioned drawback.

[0012] In particular, the aim of the present invention is to provide a press which enables obtaining, fixed to the first deforming element and the second deforming element, a greater number of helices, with a greater variation than what is attainable with the press of the prior art.

[0013] The above aims are obtained by a press, for deforming a planar sheet having an open-ring conformation up to giving the planar sheet a helical sweep, according to claim 1.

[0014] In the press of the present invention the first arm and the second arm are rotatably coupled to one another with respect to a relative rotation axis.

[0015] In particular, said first arm and second arm are rotatably coupled so that the first wall and the second wall are facing and the rotation axis is in a predetermined position so that, during the deforming of the portion of the planar sheet, the first helical axis and the second helical axis define between them an angle that is greater than zero.

[0016] In other words, differently to the prior art, the deformation force applied on the portion of the planar sheet to be deformed will not be uniform but will decrease in a direction going from the internal edge to the external edge of the portion.

[0017] In particular, the press of the present invention advantageously enables obtaining, with the first deforming element and the second deforming element being fixed, a greater number of helices, with a greater variation than what is attainable with the prior art. In particular, the press of the present invention enables obtaining a lengthening of the internal edge of a portion of planar sheet that is greater by 20%-30% with respect to the lengthening

obtainable with the press of the prior art.

[0018] Specific embodiments of the invention will be described in the following part of the present description, according to what is set down in the claims and with the reference to the accompanying tables of drawings:

- figures 1 and 2 respectively illustrate a perspective view and a lateral view of the known press described in the foregoing;
- figures 3 and 4 respectively illustrate a perspective view and a lateral view of the press of the present invention;
- figure 5 is a section view of figure 4 along section A-A;
- figure 6 is a section view of figure 4 along section B-B;
- figures 7 and 8 respectively illustrate a perspective view and a lateral view of the press of figure 3, with the planar sheet conformed as an open-ring;
- figures 9 and 10 respectively illustrate the press of figures 7 and 8, in which the planar sheet has assumed a helical sweep;
- figures 11 and 12 are schematic lateral views of the portion of planar sheet, of the first deforming element and the second deforming element of the press of the present invention in different operating steps;
- figure 13 is a view from above of the open-ring planar sheet, utilisable with the press of the present invention.

[0019] With reference to figures 3-13 of the appended tables of drawings, reference numeral (1) denotes in its entirety a press for deforming a planar sheet (2) that is the object of the present invention.

[0020] With reference to figure 13, the planar sheet (2) having an open-ring conformation comprises a portion (3) conformed as a ring sector in turn comprising an internal edge (3a) and an external edge (3b). The planar sheet (2) is a metal band. The portion (3) conformed as a ring sector, once subjected to the action of the press (1), will assume a helical sweep: it will be transformed into a portion having a helicoid sector conformation, having a determined pitch, a determined internal radius and a determined external radius.

[0021] The press (1) of the present invention comprises: a first deforming element (4) comprising a first wall (5) which conforms a helicoid sector, so that a first helical axis (X) is defined; a second deforming element (6) comprising a second wall (7) which conforms the helicoid sector, so that a second helical axis (Y) is defined; a first arm (8) which bears the first deforming element (4); a second arm (9) which bears the second deforming element (6).

[0022] The first arm (8) and the second arm (9) are rotatably coupled (articulated/hinged) to one another, with respect to a relative rotation axis (Z), so that the first wall (5) and the second wall (7) are facing one another and so that the rotation axis (Z) is in a predetermined position so that, during the deformation of the portion (3) of the planar sheet (2), the first helical axis (X) and the second helical axis (Y) define between them an angle (α) that is greater than zero so that the deforming force applied to the portion (3) decreases in a direction going from the internal edge (3a) to the external edge (3b) of the portion (3) so as to deform the portion (3) up to giving the portion (3) a helical sweep.

[0023] The first arm (8) and the second arm (9) are rotatably coupled with respect to one another at a coupling point. During the deformation of the portion (3) of the planar sheet (2), the portion (3) of the planar sheet (2) is arranged between the first deforming element (4) and the second deforming element (6) so that the external edge (3b) is closer to the coupling point than the internal edge (3a).

[0024] The rotation axis (5) of the first deforming element (4) and the second wall (7) of the second deforming element (6) define the helicoid sector. In detail, the first deforming element (4) and the second deforming element (6) are conformed in such a way that, if the rotation axis (5) is placed in contact with the second wall (7), the first wall (5), and the second wall (7) match as they form a sector of the same helix.

[0025] With reference to figures 11 and 12, the reciprocal movement of the first arm (8) and the second arm (9) are schematically illustrated, and therefore of the first deforming element (4) and the second deforming element (6). In particular, in figure 11 the first helical axis (X) and the second helical axis (Y) are parallel (in the figure they coincide) defining between them an angle (α) of 0. With reference to figure 12, the first arm (8) and the second arm (9) have been reciprocally rotated and the first helical axis (X) and the second helical axis (Y) define between them an angle (α) of greater than zero: in this way, the deformation force applied to the portion (3) will decrease in a direction going from the internal edge (3a) to the external edge (3b) of the portion (3).

[0026] According to a particular embodiment, the press (1) preferably comprises regulating means (10) for regulating the position of the rotation axis (Z) so as to be able to regulate the angle (α) defined between the first helical axis (X) and the second helical axis (Y) and therefore the deforming force applied to the portion (3) of the planar sheet (2).

[0027] The possibility of choosing the position of the rotation axis (Z) advantageously enables choosing the entity of the deformation force to be applied on the internal edge (3a) of the portion (3) of the planar sheet (2): on the basis of the position of the rotation axis (Z) this varies the difference between the deformation force applied at the internal edge (3a) with respect to the deformation force applied at the external edge (3b).

[0028] The first arm (8) preferably comprises a first through-hole (28) coaxial to the rotation axis (Z) and the regulating means (10) comprise: a shaft (11) which crosses the first through-hole (28), which is rotatably coupled to the first arm (8) (the first arm (8) can rotate about the shaft (11)), which is coaxial to the rotation axis (Z) and which comprises a second through-hole; a first threaded bar (13) which is solidly constrained to the second arm (9) and which is conformed so as to engage the second through-hole so as to enable translation of the shaft (11) along the first threaded bar (13); a first threaded element (14) which is coupled to the first threaded bar (13) in order to slide along the first threaded bar (13) so that by moving the first threaded element (14) along the first threaded bar (13), the shaft (11) is translated along the first threaded bar (13) so as to enable regulation of the position of the rotation axis (Z).

[0029] In particular, by moving the shaft (11) along the first threaded bar (13) the first arm (8) is also moved.

[0030] This embodiment of the regulating means (10) is advantageously very simple and this translates into lower costs of realisation and maintenance.

[0031] In greater detail, with reference to figures 5 and 6, the shaft (11) of the regulating means (10) can comprise a third through-hole and the regulating means (10) can comprise: a second threaded bar (16) which is solidly constrained to the second arm (9) and which is opposite and parallel to the first threaded bar (13) and which is conformed so as to engage the third through-hole so as to enable translation of the shaft (11) along the second threaded bar (16); the first threaded bar (13) and the second threaded bar (16) being arranged at the opposite sides of the second arm (9); a second threaded element (17) which is coupled to the second threaded bar (16) so as to slide along the second threaded bar (16) so that, by moving the first threaded element (14) and the second threaded element (17) along respectively the first threaded bar (13) and the second threaded bar (16), the shaft (11) is translated along the first threaded bar (13) and the second threaded bar (16) so as to enable regulation of the position of the rotation axis (Z).

[0032] In particular, by moving the shaft (11) along the first threaded bar (13) and the second threaded bar (16), the first arm (8) is also moved.

[0033] This latter embodiment of the regulating means (10) is advantageously structurally symmetrical and this ensures a better mechanical functioning and also enables a better regulating of the position.

[0034] In further detail (in particular with reference to figure 5), the regulating means (10) can further comprise a third threaded element (20) which is coupled to the first threaded bar (13) so as to slide along the first threaded bar (13) and a fourth threaded element (21) which is coupled to the second threaded bar (16) for sliding along the second third threaded bar (16). In particular, the first threaded element (14) and the third threaded element (20) are coupled to the first threaded bar (13) so that the shaft (11) is between them. Likewise, the second threaded element (17) and the fourth threaded element (21) are coupled to the second threaded bar (16) so that the shaft (11) is between them.

[0035] In this embodiment, in order to translate the shaft (11) along the first threaded bar (13) and the second threaded bar (16) so as to enable regulating the position of the rotation axis (Z) it is necessary to move the first threaded element (14) and the third threaded element (17) along the first threaded bar (13) and the second threaded element (17) and the fourth threaded element (21) along the second threaded bar (16).

[0036] It is implicit that a technical expert of the sector might provide further embodiments of the regulating means (10).

[0037] The second arm (9) is preferably fixed. In particular, the press (1) can comprise a frame (22) and the second arm (9) can be fixed to the frame (22) (see figures 3-10).

[0038] The second arm (9) advantageously functions as a rest for the portion (3) of the planar sheet (2), during the deformation of the portion (3) of the planar sheet (2). In other words, the second wall (7) of the second deforming element (6) functions as an abutment for the portion (3) of the planar sheet (2) during the deformation thereof.

[0039] The press (1) preferably comprises movement means (18) for rotatably moving the first arm (8) and the second arm (9) with respect to one another.

[0040] The first arm (8) can comprise a first end (8a) in proximity of which the first deforming element (4) is fixed, and a second end (8b) opposite the first end (8a). The second arm (9) can in turn comprise a first end (9a), in proximity of which the second deforming element (6) is fixed, and a second end (9b) opposite the first end (9a).

[0041] In a preferred embodiment, the movement means (18) can comprise a piston (19) comprising a first end (19a) hinged in proximity of the second end (8b) of the first arm (8) and a second end (19b) hinged in proximity of the second end (9b) of the second arm (9).

[0042] The use of the piston (19) advantageously enables rotatably coupling the first arm (8) and the second arm (9) in relation to one another in a very simple way and this translates into lower costs for realising and maintenance.

[0043] The first deforming element (4) is preferably removably fixed to the first arm (8) and the second deforming element (6) is removably fixed to the second arm (9).

[0044] It is advantageously possible to replace the first deforming element (4) and the second deforming element (6) with other suitable deformation elements. This enables realising a still greater number of types of helices.

[0045] The rotation axis (Z) is preferably horizontal.

Claims

1. A press (1) for deforming a planar sheet (2) having an open-ring conformation up to giving the planar

sheet (2) a helical sweep, in which the planar sheet (2) having an open-ring conformation comprises a portion (3) conformed as a ring sector in turn comprising an internal edge (3a) and an external edge (3b), the press (1) comprising:

a first deforming element (4) comprising a first wall (5) which conforms a helicoid sector, so that a first helical axis (X) is defined;
a second deforming element (6) comprising a second wall (7) which conforms the helicoid sector, so that a second helical axis (Y) is defined;
a first arm (8) which bears the first deforming element (4);
a second arm (9) which bears the second deforming element (6);
the press (1) being **characterised in that**:

the first arm (8) and the second arm (9) are rotatably coupled to one another, with respect to a relative rotation axis (Z), so that the first wall (5) and the second wall (7) are facing one another and so that the rotation axis (Z) is in a predetermined position so that, during the deforming of the portion (3) of the planar sheet (2), the first helical axis (X) and the second helical axis (Y) define between them an angle (α) that is greater than zero so that the deforming force applied to the portion (3) decreases in a direction going from the internal edge (3a) to the external edge (3b) of the portion (3) so as to deform the portion (3) up to giving the portion (3) a helical sweep.

2. The press (1) of the preceding claim, comprising regulating means (10) for regulating the position of the rotation axis (Z) so as to be able to regulate the angle (α) defined between the first helical axis (X) and the second helical axis (Y) and therefore the deforming force applied to the portion (3) of the planar sheet (2).

3. The press (1) of the preceding claim, wherein the first arm (8) comprises a first through-hole (28) coaxial to the rotation axis (Z) and the regulating means (10) comprise:

a shaft (11) which crosses the first through-hole (28), which is rotatably coupled to the first arm (8), which is coaxial to the rotation axis (Z) and which comprises a second through-hole;
a first threaded bar (13) which is solidly constrained to the second arm (9) and
which is conformed so as to engage the second through-hole so as to enable translation of the shaft (11) along the first threaded bar (13);
a first threaded element (14) which is coupled to the first threaded bar (13) in order to slide along the first threaded bar (13) so that by moving the first threaded element (14) along the first threaded bar (13), the shaft (11) is translated along the first threaded bar (13) so as to enable regulation of the position of the rotation axis (Z).

4. The press (1) of the preceding claim, wherein the shaft (11) of the regulating means (10) comprises a third through-hole and wherein the regulating means (10) comprise:

a second threaded bar (16) which is solidly constrained to the second arm (9) and which is opposite and parallel to the first threaded bar (13) and which is conformed so as to engage the third through-hole so as to enable translation of the shaft (11) along the second threaded bar (16);
the first threaded bar (13) and the second threaded bar (16) being arranged at the opposite sides of the second arm (9);
a second threaded element (17) which is coupled to the second threaded bar (16) so as to slide along the second threaded bar (16) so that, by moving the first threaded element (14) and the second threaded element (17) along respectively the first threaded bar (13) and the second threaded bar (16), the shaft (11) is translated along the first threaded bar (13) and the second threaded bar (16) so as to enable regulation of the position of the rotation axis (Z).

5. The press (1) of any one of the preceding claims, wherein the second arm (9) is fixed.

6. The press (1) of any one of the preceding claims, comprising movement means (18) for rotatably moving the first arm (8) and the second arm (9) with respect to one another.

7. The press (1) of any one of the preceding claims, wherein:

the first arm (8) comprises a first end (8a) in proximity of which the first deforming element (4) is fixed, and a second end (8b) opposite the first end (8a);
the second arm (9) comprises a first end (9a) in proximity of which the second deforming element (6) is fixed, and a second end (9b) opposite the first end (9a);
the movement means (18) comprise a piston (19) comprising a first end (19a) hinged in proximity of the second end (8b) of the first arm (8) and a second end (19b) hinged in proximity of the second end (9b) of the second arm (9).

8. The press (1) of any one of the preceding claims,

wherein the first deforming element (4) is removably fixed to the first arm (8) and the second deforming element (6) is removably fixed to the second arm (9).

9. The press (1) of any one of the preceding claims, wherein the rotation axis (Z) is horizontal.

PRIOR ART

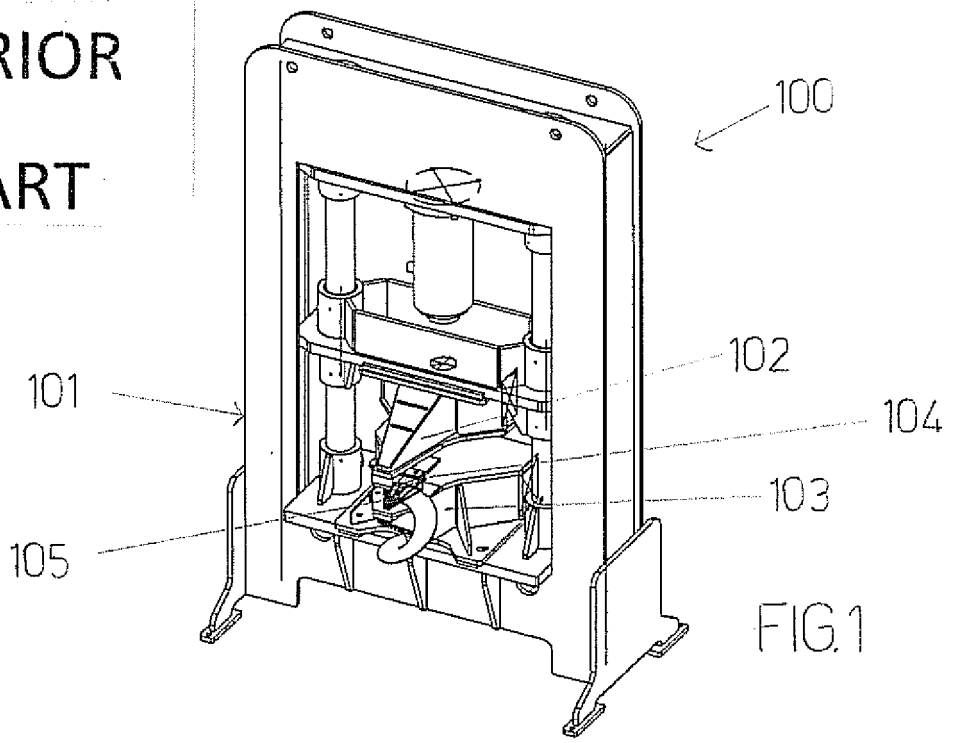


FIG.1

PRIOR ART

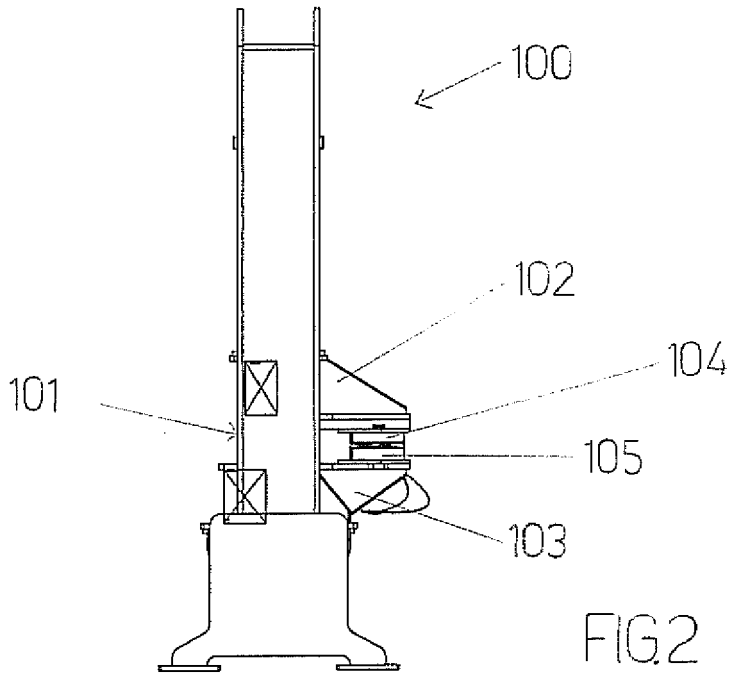
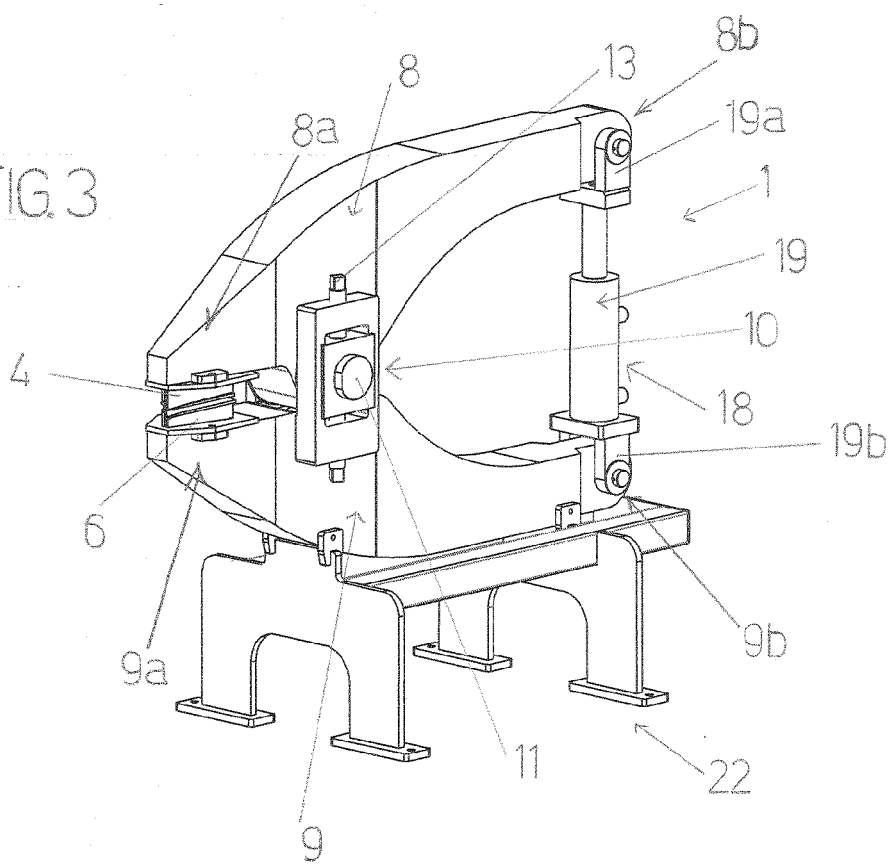


FIG.2

FIG. 3


8b
13
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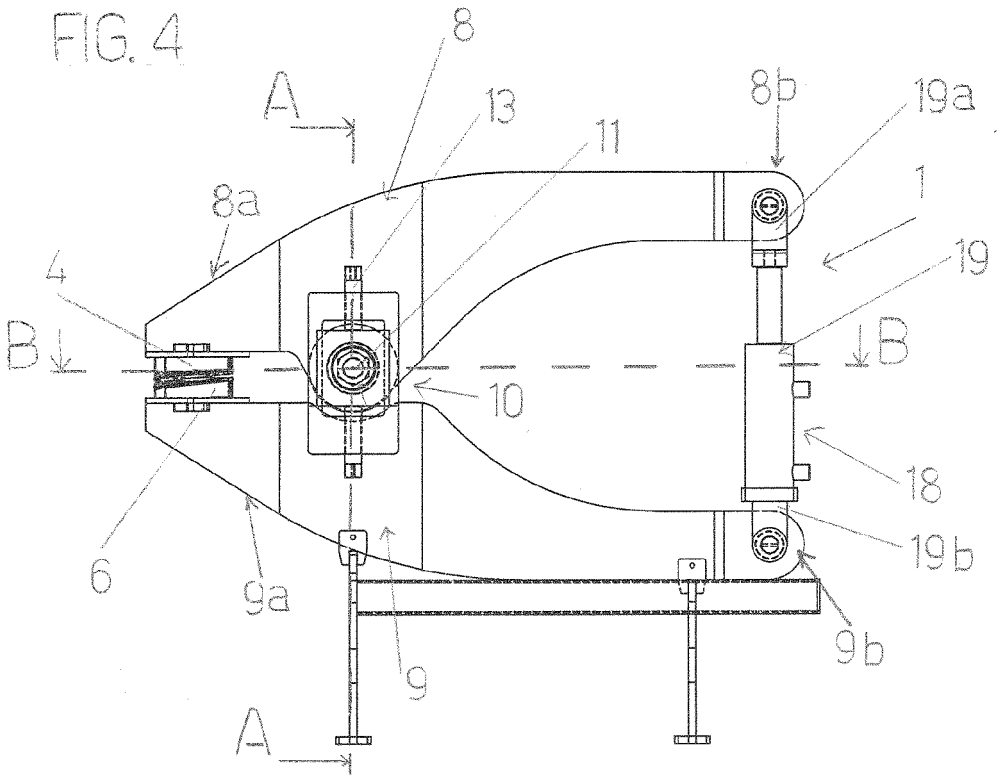
18
19b
6
9b
9a
11
22
9

FIG. 4


8
A
13
8b
19a
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8a
19
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B
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18
19b
6
9a
9b
9
A

FIG.5

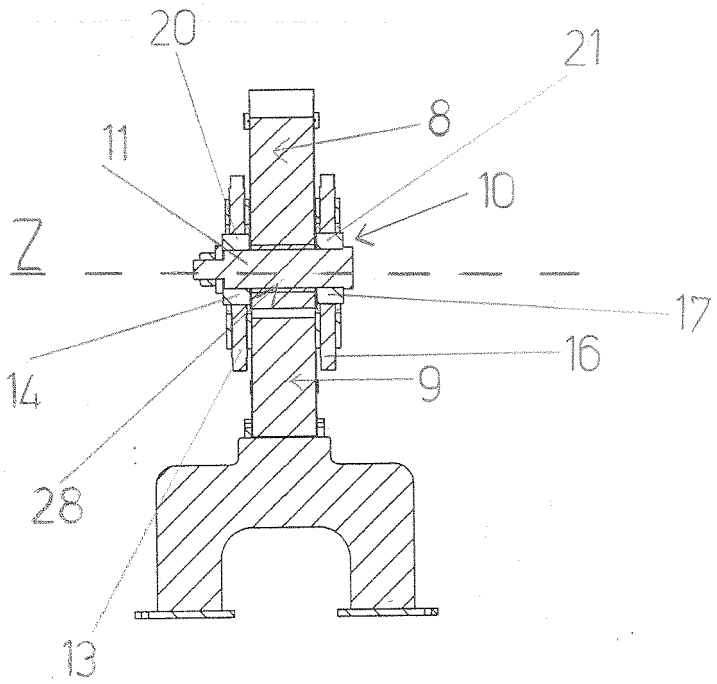


FIG.6

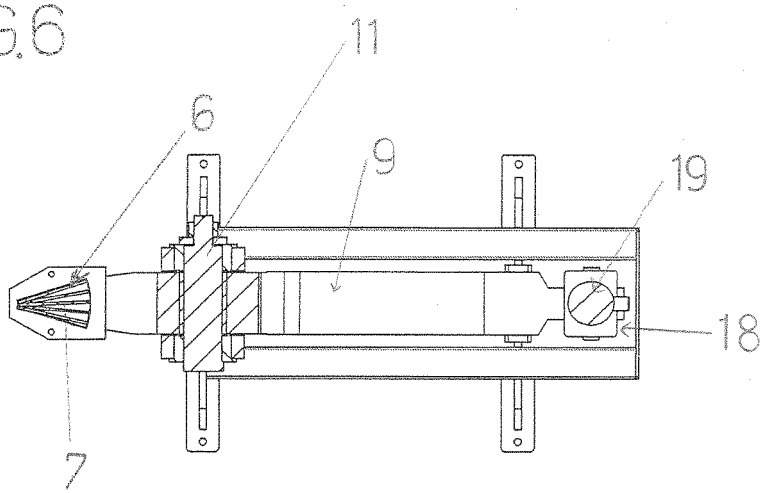
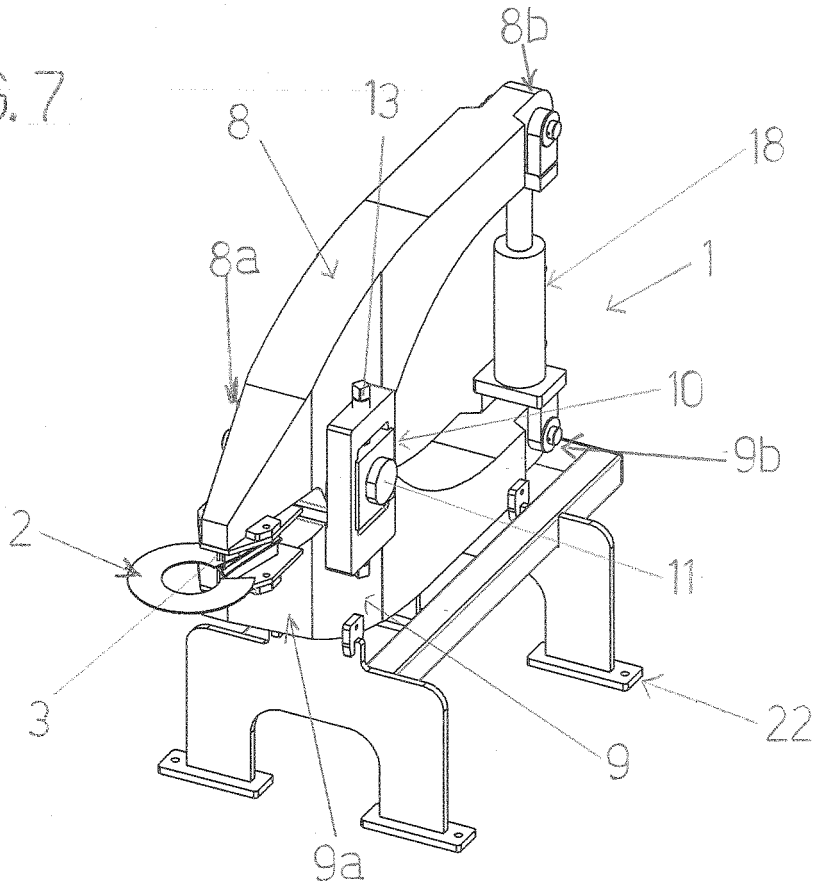


FIG. 7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9b
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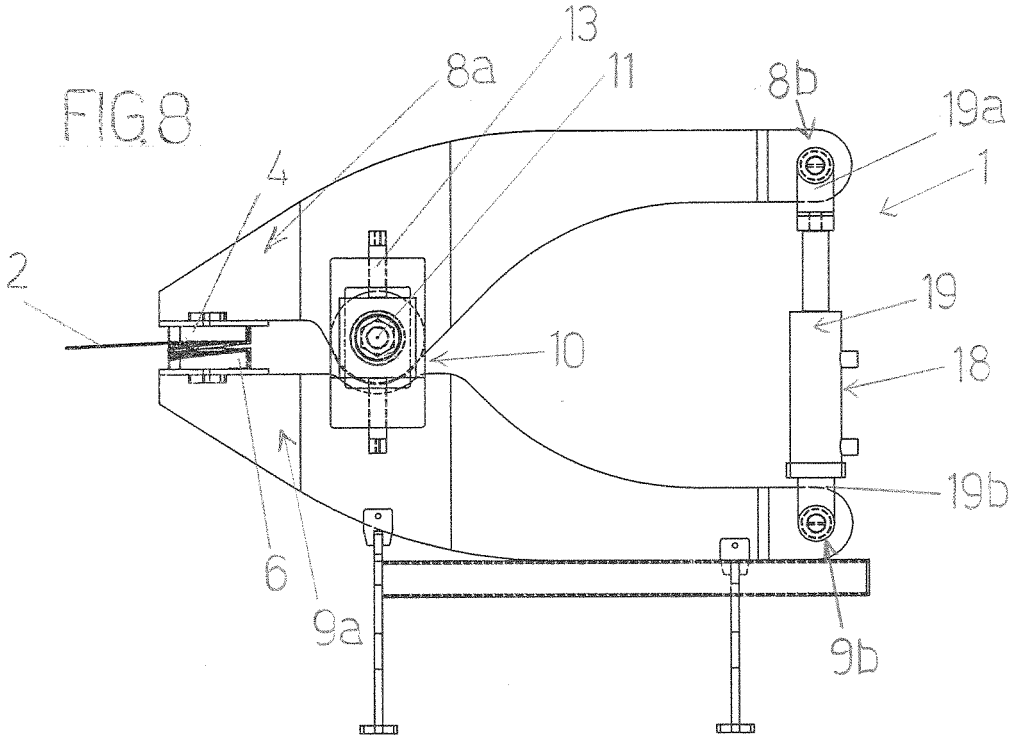
9
9a

FIG. 8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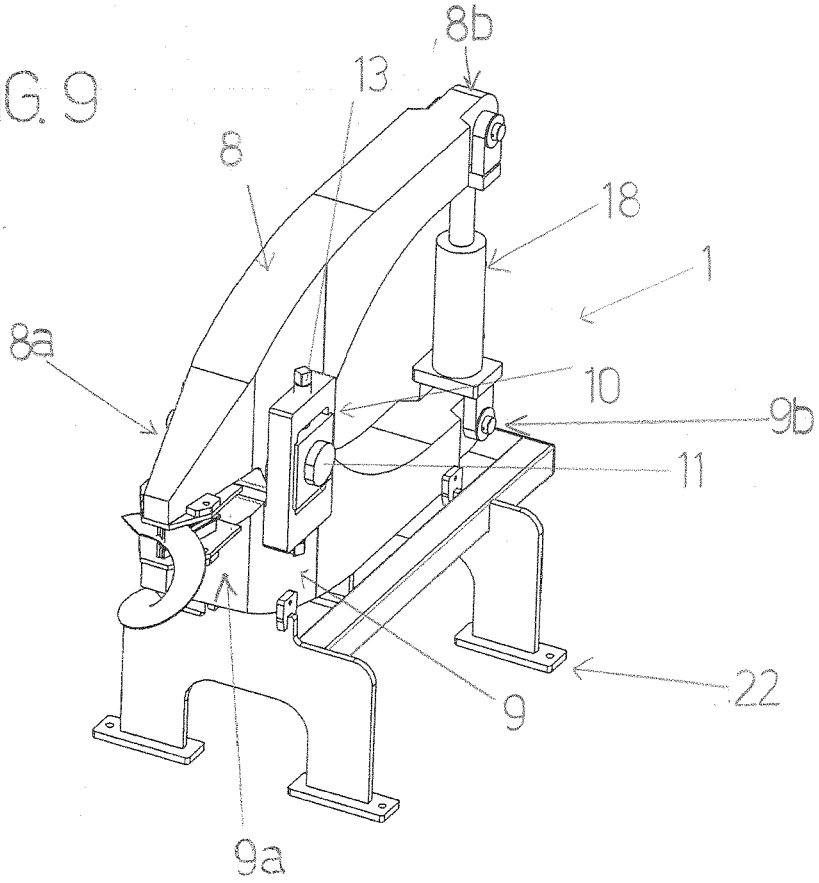
11
8b
19a
4
1
2
19
10
18
19b
6
9a
9b

FIG. 9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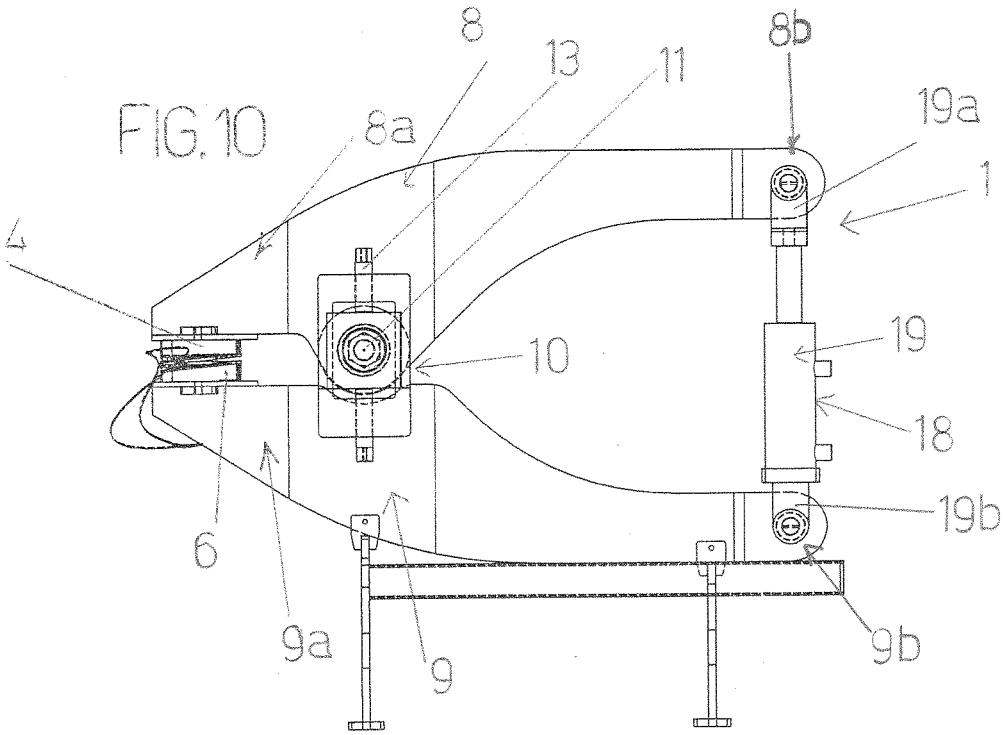
11
22
9
9a

FIG. 10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13
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8a
1
4
19
10
18
19b
6
9a
9
9b

FIG.11

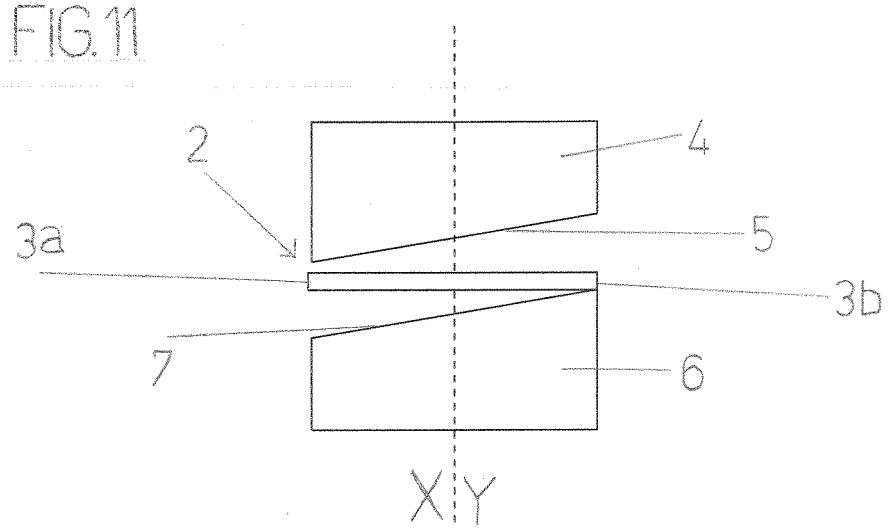
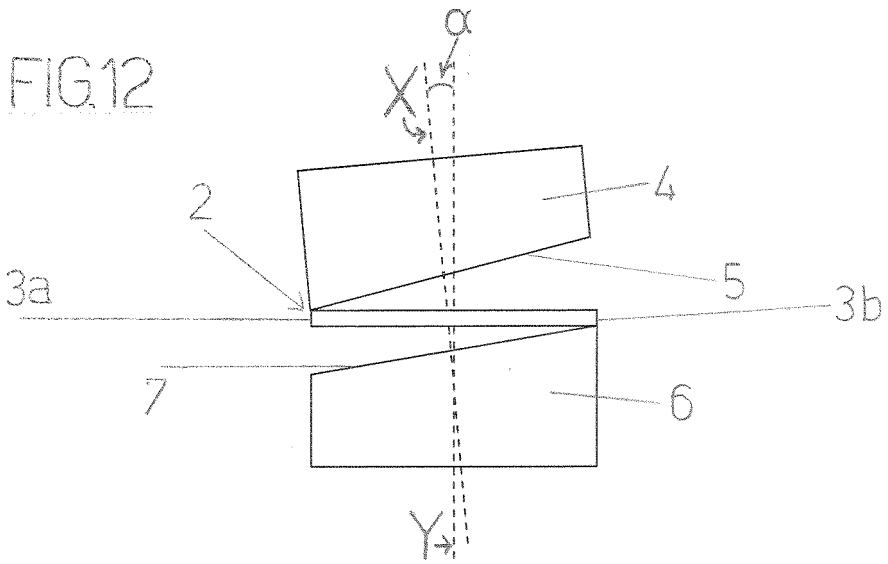


FIG.12



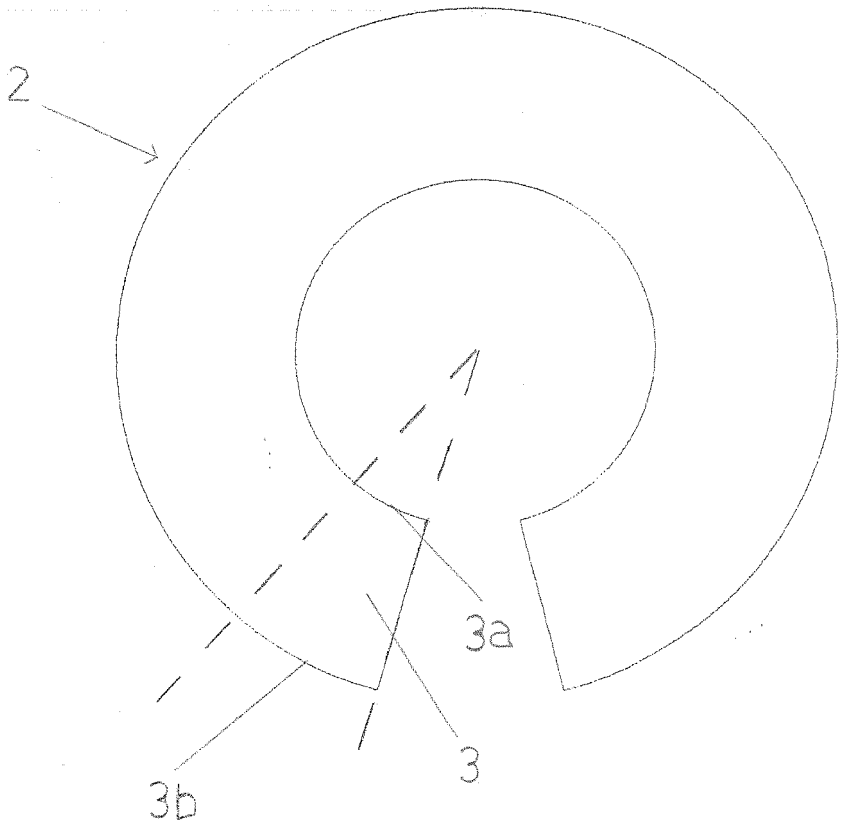


FIG. 13

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EUROPEAN SEARCH REPORT

Application Number
EP 17 18 4807

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

B21D
B30B
A21D
A23P

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 November 2017	Vernier, Frédéric

CATEGORY OF CITED DOCUMENTS

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27-11-2017

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82