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

(11) EP 1 634 664 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
03.01.2007 Bulletin 2007/01

(51) Int Cl.:
B21F 45/04 *(2006.01)*

(21) Application number: **04425670.9**

(22) Date of filing: **08.09.2004**

(54) **Device for manufacturing semi-finished retention cages for bottles made of metal wire**

Vorrichtung zur Herstellung von halbfertigen Sicherheitsdrahtstücken für Flaschen aus Metalldraht

Dispositif de fabrication des muselets semi-finis, à partir d'un fil en métal, pour des bouteilles

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR

(43) Date of publication of application:
15.03.2006 Bulletin 2006/11

(73) Proprietor: **Gefin S.r.l.**
10100 Torino (IT)

(72) Inventors:
- **Artosi,Ferdinando**
  c/o I.C.A.S
  10090 Ivrea (IT)
- **Bordignon, Franco**
  c/o I.C.A.S
  10090 Ivrea (IT)
- **Calandri, Giancarlo**
  c/o I.C.A.S
  10090 Ivrea (IT)
- **Getto, Piero**
  10010 Banchette (IT)
- **Marchetti, Vittorio**
  c/o I.C.A.S
  10090 Ivrea (IT)

(74) Representative: **Cerbaro, Elena et al**
STUDIO TORTA S.r.l.,
Via Viotti, 9
10121 Torino (IT)

(56) References cited:
DE-A- 4 412 203
IT-B- 1 072 710
US-A- 2 416 672

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 634 664 B1

Description

[0001] The present invention relates to a device for semi-finished products made of metal wire, in particular for the manufacture of retention cages for bottles containing sparkling drinks. A device according to the preamble of claim 1 in e.g. known from document DE-A-4412203.

[0002] Generally, retention cages comprise a reticular body positioned on a cap of the bottle and a circumferential retention ring connected to the reticular body to secure the reticular body to the bottle.

[0003] The cages are obtained by plastic deformation of a metal wire thanks to automated machines which comprise a first station for forming the reticular body and a second station for mounting the retention ring on the reticular body.

[0004] Machines commonly used to obtain the reticular bodies comprise in a same plane four pincers actuated by a first cam and slidable along a first pair of perpendicular axes and four linear actuators actuated by a second cam and slidable along a second pair of perpendicular axes having the same origin as the first pair of axes and angularly offset in phase by 45 degrees.

[0005] During an initial step of the productive process, the metal wire is automatically sheared and positioned at the pincers which close gripping it or retaining in an initial circular position so that respective ends are superposed and maintained tight by a single pincer.

[0006] Subsequently, the linear actuators and the pincers move towards the origin of the axes in co-ordinated way, obtaining a cross-shaped body that constitutes the starting semi-finished product for the manufacture of the reticular body.

[0007] During the deformation step described above, breaks occur in the metal wire which cause an interruption of the continuous production cycle causing productivity losses.

[0008] The object of the present invention is to provide a device for the manufacture of semi-finished products made of metal wire that is free of the drawbacks described above.

[0009] A further object of the present invention is further to increase the production rate.

[0010] According to the present invention, a device is provided for the manufacture of semi-finished products made of metal wire, as defined in claim 1.

[0011] For a better understanding of the present invention, a preferred embodiment shall now be described purely by way of non limiting example and with reference to the accompanying drawings, in which:

- Figure 1 is a partial front view of an embodiment of the device according to the present invention;
- Figure 2 is an axonometric view of a cage for closing a bottle containing sparkling drinks;
- Figure 3 is a partial section according to the line III-III of Figure 1;
- Figure 4 schematically shows a detail of the device of Figure 1 in a first and a second position; and
- Figures 5 and 6 respectively show enlarged details of the device of Figure 1;

[0012] In Figure 1, the reference number 1 globally designates a device for the manufacture of semi-finished products made of metal wire, particularly for the manufacture of a reticular body 2 of a cage 3 further comprising a retention ring 4 connected to the reticular body 2 to close a cap of a body containing sparkling drinks.

[0013] In particular, the reticular body 2 (Figure 2) is obtained from a single segment of metal wire and comprises four equidistant uprights 5 obtained by twisting the metal wire and connected to each other by respective curvilinear segments 6 globally delimiting a circular profile 7 closed substantially perpendicular to the uprights 5.

[0014] The reticular body 2 is obtained by means of the device 1, comprising a fixed support 8, four pincer assemblies 9 movable on the fixed support 8 along respective orthogonal axes A having an origin 10 and four tappet linear actuators 11 movable on the fixed support 8 along respective axes B positioned coplanar to and along the bisectors of the axes A.

[0015] Each pincer assembly 9 comprises a gearwheel element 12 rigidly connected to the fixed support 8, a slide 13 movable on the fixed support 8 along the axis A, a mandrel 14 supported rotatably around the axis A by the slide 13 and a pair of jaws of the type 15, 15a depending on whether the pincer assembly 9 respectively grips a single portion of metal wire or two ends of the segment. Both types of jaws 15, 15a are hinged on the mandrel 14 towards the origin 10 and maintained in an open position by an annular spring 16.

[0016] In particular (Figure 3), the gearwheel element 12 supports, freely rotatable around the axis A, a shaft 17 comprising at opposite ends a bevel pinion 18 and grooved portion 19 engaging in a corresponding coaxial grooved slot 20 borne by the mandrel 14 and open at the opposite part with respect to the jaws 15, 15a.

[0017] Each pinion 18 is connected to the two pinions 18 of the adjacent pincer assemblies 9 thanks to respective transmission shafts 21 comprising a pair of end bevel gears 22 meshing with the related pinions 18 and globally forming a closed gear transmission 23 driven by an intermittent motor unit 24 connected to one of the transmission shafts 21 to command the simultaneous rotary motion of the jaws 15, 15a.

[0018] The jaws 15, 15a are positioned symmetrically to the respective axes A and comprise respective grip portions 25 oriented towards the origin 10 and actuating portions 26 positioned at the opposite part of the grip portions 25 relative to the hinge and superficially co-operating with an end shaped portion 27 connected in detachable way to a respective actuating tappet rod 28 movable along the axis A and slidable in guide holes 29 having the axis A and borne respectively by the mandrel 14 and by the shaft 17.

[0019] Each actuating rod 28 is connected in freely rotatable way around the axis A on a slide support 30 comprising a spring assembly 31 to dampen the impacts in a direction parallel to the axis A.

[0020] In particular (Figure 4), each actuating portion 26 has an end projection 32 maintained in contact with the shaped portion 27 of the actuating rod 28 by the action of the annular spring 16 and a pair of planar surfaces 33 which convert towards the origin 10 starting from the end projection 32 and are made of wear-resistant material.

[0021] The shaped portion 27 (Figure 6) has a pair of planar guide surfaces 34 defining a respective angle α relative to the axis A to impose the law for opening and closing the jaws 15.

[0022] However, the shaped portion 27 of the pincer assembly 9 comprising the jaws 15a, i.e. the one which grips the ends of the segment of metal wire, has, at the guide surfaces, 34 a shaped profile 35 (Figure 5) having starting from an opposite end to the actuating rod 28, a first and a second rectilinear segment 36 inclined by the angle α relative to the axis A, a concave segment 37 intermediate between the rectilinear segments 36 and a last lateral segment 38 parallel to the axis A and defining a lateral flank of the guide surface 34.

[0023] The actuation of the movable members along the axes A and B, i.e. of the linear actuators 11, of the slides 13 and of the actuating rods 28 is achieved by means of a desmodromic cam device comprising a disk 50 (Figure 3) connected to the fixed support 8 slidably around an axis C passing through the origin 10 perpendicularly to the axes A and B and having guide walls 51, 52 respectively for the linear actuators 11 and the slides 13. The guide walls 51, 52 are closed and continuous, having respective pairs of rolling surfaces 60, 61 having generatrices parallel to the axis C and co-operate with respective multiplicities of pairs of rollers 54a each borne by the respective linear actuators 11 and by the respective slides 13.

[0024] In particular, both the roller 53 and the rollers 54a are positioned at opposite parts of the respective guide walls 51, 52 co-operating with the respective rolling surfaces 60, 61 borne at radially opposite parts of the respective walls 51, 52.

[0025] Moreover, the disk 50 has a guide groove 55 circumferentially obtained in the guide wall 52 and having a pair of rolling surfaces 62 facing each other and co-operating with four pairs of pulleys 54b having respective axes, parallel to each other and integral with the respective slide supports 30.

[0026] The guide walls 51, 52 and the guide grooves 55 are axially symmetrically having identical sectors every 90° and the slides 13 of the pincer assemblies 9 and the linear actuators 11 are positioned equidistant with respect to the axis C.

[0027] In particular, the rolling surfaces 61, 62 have profiles comprising a succession of ascending, descending and circumference arc segments following the teaching, for example, of the patent IT 1264109. The rolling surface 60 is obtained similarly in relation to the surface 61 considering that, in the instants in which the linear actuators 11 move simultaneously with the slides 13, the segments of the rolling surfaces 60 must be offset in phase by 45° from the corresponding segments of the rolling surfaces 61.

[0028] The operation of the device 1 is as follows.

[0029] The disk 50 is driven by a motor member not shown herein, rotating at constant speed around the axis C and the guide walls and grooves 51, 52, 55 actuate in simultaneous and mutually identical way respectively the linear actuators 11 and the four slides 13 of the pincer assemblies 9 since they are axially symmetrical and have four identical angular sectors and the actuators 11 and the pincer assemblies 9 are angularly equidistant.

[0030] The cross-shaped body of the reticular body 2 is obtained starting from a step in which the rollers 53, 54a, 54b are in a radially extreme end stop position and the segment of metal wire is positioned in known way between the grip portions 25 according to a circular trace.

[0031] Subsequently, respective descending segments of the rolling surfaces 62 move the actuating rods 28 relative to the respective slides 13 towards the origin 10 closing the jaws 15, 15a on the wire and then advance integrally with the slides 13 travelling a shorter run than the linear actuators 11.

[0032] In this way the metal wire is bent forming the cross-shaped body in a plane that is perpendicular to the axis C after defining in continuous way a succession of closed intermediate geometric figures having rectilinear sides and rounded bending vertices both at respective junction portions between arched segments 6 and uprights 5 and at respective bending projections 56 exiting perpendicularly to the respective axis A from the grip portions 25 of the respective jaws 15, 15a.

[0033] In particular, the vertices rounded at the jaws 15, 15a are defined by portions of metal wire bend around the bending projections 56 and the perimeter of the intermediate geometric figures can be calculated instant by instant based on the positions of the pincer assemblies 9 and of the linear actuators 11.

[0034] Consequently, the profiles of the rolling surfaces 60, 61, 62 are radially and circumferentially dimensioned so the percent change in length of the perimeter of the two intermediate geometric figures remains unaltered or may vary within a margin that is smaller than the percentage of yielding or ultimate elongation of any metal wire suitable for working processes by plastic deformation.

[0035] Once the linear actuators 11 have reached a respective radial end stop towards the origin 10, damping heads 59 supported by the respective linear actuators 11 abut against a pivot 60 of axis C and the transmission 23 simultaneously actuates the four mandrels 14 which, rotating around the respective axes A, twist the wire obtaining the uprights 5.

[0036] Lastly, the jaws 15, 15a open freeing the cross-shaped semi-finished product that continuous towards

subsequent work processes and the pincer assemblies 9 and the actuators 11 move away from the axis C returning to the initial position.

[0037] The law of motion along the axes A, B of the slides 13 and of the linear actuators 11 is defined directly by the respective rollers 54a, 53 which roll on the respective guide walls 52, 51 whilst the law of motion of the opening and of the closing of the jaws 15, 15a is jointly defined by the law of motion defined by the guide groove 55 and by the law of motion defined by the guide surface 34 of the shaped portion 27 borne by the actuating rods 28.

[0038] In particular, the rollers 54b impose point by point to the respective actuating rods 28 the identical displacements defined by identical radial dimensions every 90 degrees on the rolling surfaces 62 actuating the jaws 15 together with the respective guide surfaces 34.

[0039] The jaws 15a, instead, co-operate with the shaped profile 35 integral with the respective actuating rod 28 and being positioned in the opening step along the concave segment 37, follow the entire concave segment 37 and then the rectilinear segment 36 until closing when they reach the rectilinear segment 38. Subsequently, the shaped portion 27 further advances until the rectilinear segments 36 impact with the planar surfaces 33 achieving the locking of the jaws 15a and actuating the spring assembly 31.

[0040] In particular, the concave segment 37 locally a slope relative to the upper axis A with respect to the angle α, allowing a shorter closing time of the jaws 15a which close pressing on the end portions of the metal wire before the jaws 15.

[0041] The jaws 15 are actuated similarly to the manner described above, but following the guide surface 34 and during the closing phase the projection 56 is coupled with a conjugated seat borne by a grip portion 25 opposite to the grip portion 25 having the projection 56 radially locking the segment in the radial direction.

[0042] In this way, the jaws 15 close pressing on the metal wire after the jaws 15a, but radially retain the wire already when they are closing, whilst the jaws 15a retain the end portions of the wire only when the respective shaped portion 27 abuts against the actuating portions 26.

[0043] Moreover, the guide surface 34 and the shaped profile 35 are therefore studied to convert the long and relatively slow travel of the actuating rods 28 actuating by the cam 50 into rapid and shorter displacements of the jaws 15, 15a.

[0044] From an examination of the characteristics of the device according to the present invention, the advantages it allows to achieve are readily apparent.

[0045] In particular, the jaws 15a can be actuated independently from the jaws 15 to lock more rapidly the two ends which in case of excessively slow closure could escape, requiring the idling of the machine for maintenance purposes.

[0046] Moreover, the early closure of the jaws 15a stably secures the wire segment and makes more reliable the subsequent grip by the jaws 15, enhancing the precision of the subsequent work processes.

[0047] The use of a single disk cam 50 to actuate all members in alternating motion along the axes A and B allows to make very precise the phase offsets of the individual operations performed by the device 1 allowing to raise the production rate.

[0048] Use of a common cam 50 and the requirement for different laws of motion for the jaws 15 and 15a is possible thanks to the use of respective shaped portions 27 which are able to modify the common law of motion imposed by the disk cam 50 having respectively guide surfaces 34 and shaped profiles 35 differing from each other.

[0049] Moreover, both the guide surfaces 34 and the shaped profile 35 are dimensioned to obtain a rapid closure reducing the slopes of the rolling surfaces 61, 62 and thus minimising wear.

[0050] The shaped portions 27 can be worked more easily and are less costly than the disk 50 and are easily replaceable enabling to correct any geometric inaccuracies of the guide walls 52 by acting on the geometry of the profile, which can differ from the one described to obtain other laws of motion.

[0051] Moreover, the choice of appropriate geometry of the rolling surfaces 60, 61, 62 respectively of the guide walls and grooves 51, 52, 55 allows reliably to reach particularly low elongation values, enabling to use various types of metal wires suitable for plastic deformation work processes without breaks.

[0052] Moreover, it is clear that the device described and illustrated herein can be subject to modifications and variants without thereby departing from the scope of protection of the present invention, as defined in the accompanying claims.

Claims

1. A device for the manufacture of semi-finished retention cages for bottles made of metal wire comprising a fixed support (8), a multiplicity of pincer assemblies (9) slidable on said fixed support (8) along respective first axes (A) equidistant and converging in an origin (10), said pincer assemblies (9) comprising respective pairs of jaws (15, 15a) movable between a closed position and an open position and respective actuating members (28) for actuating said pairs of jaws (15, 15a), a multiplicity of linear actuators (11) slidable on said fixed support (8) along respective second axes (B) positioned along the bisector of two adjacent lines of said first axes (A), and an axially symmetrical actuating cam (50) rotatable around an axis (C) passing through the origin (10) and cooperating respectively with said pincer assemblies (9) and said actuating members (28), **characterised in that**:

- said actuating cam (50) also actuates said linear actuators (11);
- at least a first one of said actuating members (28) has a first command profile (34) actuating at least a first of said pairs of jaws (15) according to a first law of motion and **in that** a second one of said actuating members (28) has a second command profile (35) actuating a second one of said pairs of jaws (15a) according to a second law of motion.

2. Device as claimed in claim 1, **characterised in that said** actuating members (28) are tappets and **in that** said first command profile (34) comprises a rectilinear segment inclined by an angle (α) relative to the respective one of said first axes (A) and **in that** said second command profile (35) comprises a curvilinear segment (37).

3. Device as claimed in claim 2, **characterised in that** said curvilinear segment (37) is convex.

4. Device as claimed in one of the claims 2 or 3, **characterised in that** in said open position said second pair of jaws (15a) co-operates with said curvilinear segment (37).

5. Device as claimed in any of the previous claims, **characterised in that** said pincer assemblies (9) and said linear actuators (11) are movable towards said origin (10) according to a respective third and fourth law of motion.

6. A method of actuating a device for the manufacture of semi-finished retention cages for bottles made of metal wire as claimed in any of the previous claims, **characterised in that** it comprises the following steps:

- gripping said metal wire by a first pair of jaws (15a) ;
- subsequent gripping said metal wire segment by at least a second pair of jaws (15).

7. Method as claimed in claim 6, **characterised in that** said metal wire defines a closed geometric figure and **in that** said first pair of jaws (15a) grips respective ends of said metal wire.

8. Method as claimed in claim 6, **characterised in that** said metal wire is elongated within its yield elongation.

Patentansprüche

1. Vorrichtung zur Herstellung halbfertiger Rückhaltekäfige für Flaschen aus Metalldraht, umfassend eine feste Unterkonstruktion (8), eine Mehrzahl von Kneifzangenanordnungen (9), die auf der festen Unterkonstruktion (8) jeweils an ersten Achsen (A) verschiebbar sind, welche in Äquidistanz von einem Ausgangspunkt (10) verlaufen und in diesem konvergieren, wobei die Kneifzangenanordnungen (9) jeweils Backenpaare (15, 15a) umfassen, die zwischen einer geschlossenen und einer offenen Stellung bewegt werden können, und entsprechende Betätigungselemente (28) zur Betätigung der Bakkenpaare (15, 15a), des weiteren eine Mehrzahl von linearen Betätigungselementen (11), die auf der festen Unterkonstruktion (8) an entsprechenden zweiten Achsen (B) verschiebbar sind, welche entlang der Halbierenden zweier benachbarter Linien der ersten Achsen (A) positioniert sind, und einen axialsymmetrischen Betätigungsnocken (50), der um eine Achse (C) rotierbar ist, welche durch den Ursprung (10) führt, und mit den Kneitzangenanordnungen (9) bzw. den Betätigungselementen (28) zusammen wirkt, **dadurch gekennzeichnet, dass**

- der Betätigungsnocken (50) auch die linearen Betätigungselemente (11) betätigt; und
- mindestens ein erstes der Betätigungselemente (28) ein erstes Befehlsprofil (34) aufweist, das mindestens ein erstes der Backenpaare (15) gemäß einem ersten Bewegungsgesetz betätigt, und dass ein zweites der Betätigungselemente (28) ein zweites Bewegungsprofil (35) aufweist, das ein zweites der Backenpaare (15a) gemäß einem zweiten Bewegungsgesetz betätigt.

2. Vorrichtung gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Betätigungselemente (28) Stößel sind und dass das erste Befehlsprofil (34) ein rechteckiges Segment umfasst, das um einen Winkel (α) im Verhältnis zu der einen der ersten Achsen (A) geneigt ist und dass das zweite Befehlsprofil (35) ein gekrümmtes Segment (37) aufweist.

3. Vorrichtung gemäß Anspruch 2, **dadurch gekennzeichnet, dass** das gekrümmte Segment (37) konvex ist.

4. Vorrichtung gemäß Anspruch 2 oder 3, **dadurch gekennzeichnet, dass** das zweite Backenpaar (15a) mit dem gekrümmten Segment (37) zusammen wirkt.

5. Vorrichtung nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Kneifzangenanordnungen (9) und die linearen Betätigungselemente (11) nach einem dritten und vierten Bewegungsgesetz auf den Ursprung (10) zu beweglich sind.

6. Verfahren zur Betätigung einer Vorrichtung für die

Herstellung halbfertiger Rückhaltekäfige für Flaschen, die aus Metalldraht gefertigt sind, gemäß einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** dieses die folgenden Schritte umfasst:

- Erfassen des Metalldrahts durch ein erstes Backenpaar (15a);
- anschließendes Erfassen des Metalldrahtsegments durch mindestens ein zweites Backenpaar (15).

7. Verfahren gemäß Anspruch 6, **dadurch gekennzeichnet, dass** der Metalldraht eine geschlossene geometrische Figur umschreibt und dass das erste Backenpaar (15a) die jeweiligen Enden des Metalldrahts erfasst.

8. Verfahren gemäß Anspruch 6, **dadurch gekennzeichnet, dass** der Metalldraht im Rahmen seiner Streckgrenze gestreckt wird.

Revendications

1. Dispositif pour la fabrication de muselets semi-finis, réalisés en fil métallique, pour des bouteilles, le dispositif comprenant un support fixe (8), une pluralité de dispositifs de pinçage (9) susceptibles de coulisser sur ledit support fixe (8) le long de premiers axes (A) respectifs, équidistants et convergeant vers une origine (10), lesdits dispositifs de pinçage (9) comprenant des paires de mâchoires (15, 15a) respectives, mobiles entre une position fermée et une position ouverte, et des organes d'actionnement (28) respectifs pour actionner lesdites paires de mâchoires (15, 15a), une pluralité d'actionneurs linéaires (11) susceptibles de coulisser sur ledit support fixe (8), en suivant des deuxièmes axes (B) respectifs, positionnés le long de la bissectrice de deux droites adjacentes formées par lesdits premiers axes (A), et une came d'actionnement (50) axialement symétrique, pouvant tourner autour d'un axe (C) passant par l'origine (10) et coopérant respectivement avec lesdits dispositifs de pinçage (9) et lesdits organes d'actionnement (28), **caractérisé en ce que** :

- ladite came d'actionnement (50) actionne également lesdits actionneurs linéaires (11) ;
- au moins un premier organe d'actionnement parmi lesdits organes d'actionnement (28) présente un premier profil de commande (34) actionnant au moins une première paire de mâchoires parmi lesdites paires de mâchoires (15) selon une première loi de déplacement et **en ce qu'**un deuxième organe d'actionnement parmi lesdits organes d'actionnement (28) présente un deuxième profil de commande (35) actionnant une deuxième paire de mâchoires parmi lesdites paires de mâchoires (15a) selon une deuxième loi de déplacement.

2. Dispositif tel que défini dans la revendication 1, **caractérisé en ce que** lesdits organes d'actionnement (28) sont des poussoirs et **en ce que** ledit premier profil de commande (34) comprend un segment rectiligne, incliné d'un angle (α) par rapport à un axe respectif parmi lesdits premiers axes (A) et **en ce que** ledit deuxième profil de commande (35) comprend un segment (37) curviligne.

3. Dispositif tel que défini dans la revendication 2, **caractérisé en ce que** ledit segment (37) curviligne est de forme convexe.

4. Dispositif tel que défini dans l'une des revendications 2 ou 3, **caractérisé en ce que**, dans ladite position ouverte, ladite deuxième paire de mâchoires (15a) coopère avec ledit segment (37) curviligne.

5. Dispositif tel que défini dans l'une quelconque des revendications précédentes, **caractérisé en ce que** lesdits dispositifs de pinçage (9) et lesdits actionneurs linéaires (11) sont susceptibles d'être déplacés en direction de ladite origine (10) selon une troisième et une quatrième loi de déplacement respectives.

6. Procédé d'actionnement d'un dispositif de fabrication de muselets semi-finis, réalisés en fil métallique, pour des bouteilles, tel que défini dans l'une quelconque des revendications précédentes, **caractérisé en ce que** le procédé comprend les étapes suivantes :

- la saisie dudit fil métallique par une première paire de mâchoires (15a) ;
- la saisie subséquente dudit segment de fil métallique par au moins une deuxième paire de mâchoires (15).

7. Procédé tel que défini dans la revendication 6, **caractérisé en ce que** ledit fil métallique définit une figure géométrique fermée et **en ce que** ladite première paire de mâchoires (15a) saisit des extrémités respectives dudit fil métallique.

8. Procédé tel que défini dans la revendication 6, **caractérisé en ce que** ledit fil métallique est étiré dans la plage de sa limite d'allongement.

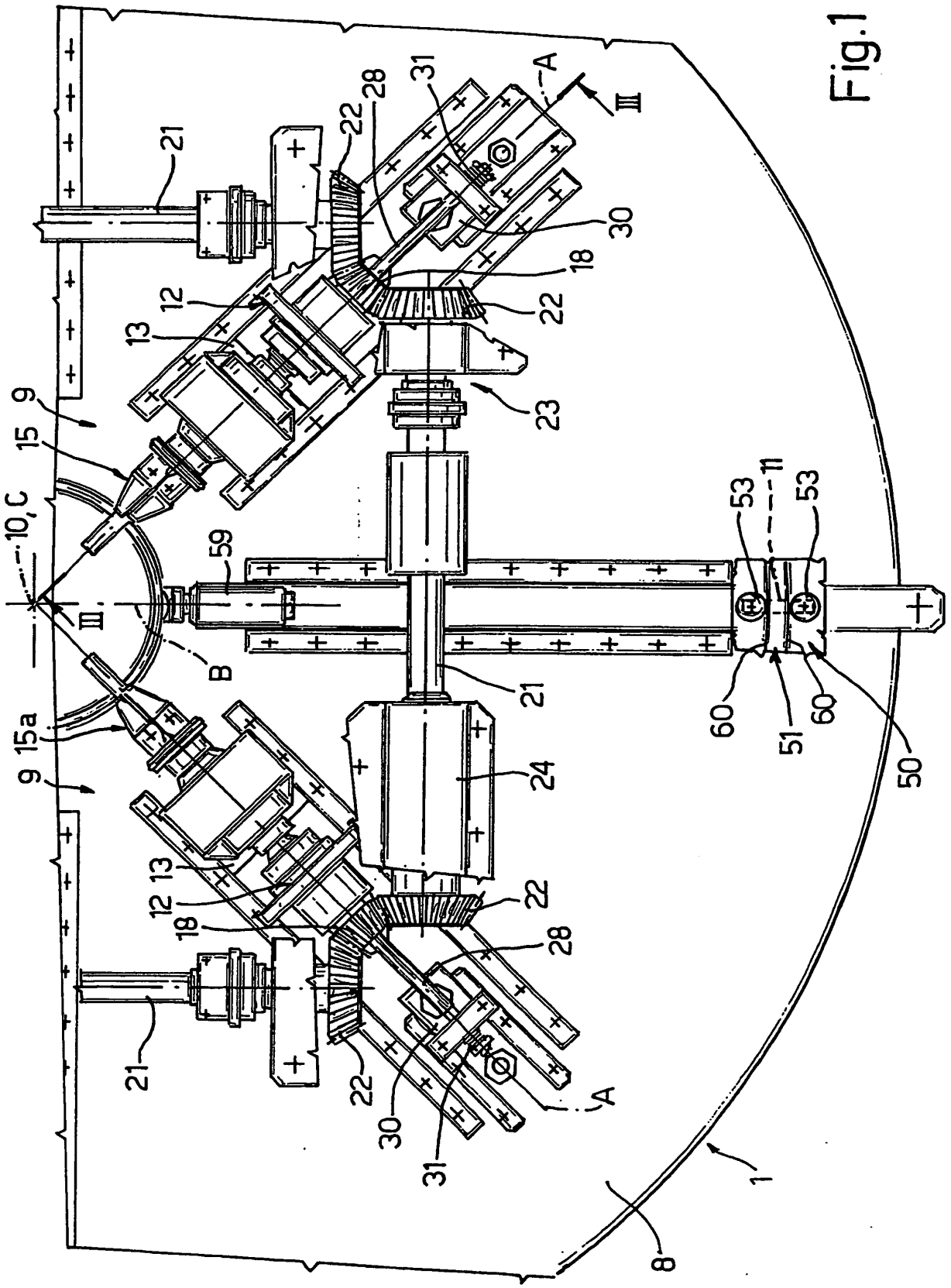

21
22
28
31
A
III
30
18
12
13
23
9
15
10,C
59
III
B
53
11
53
60
51
60
50
21
15a
9
24
13
12
18
22
28
21
22
30
31
A
1
8

Fig.1

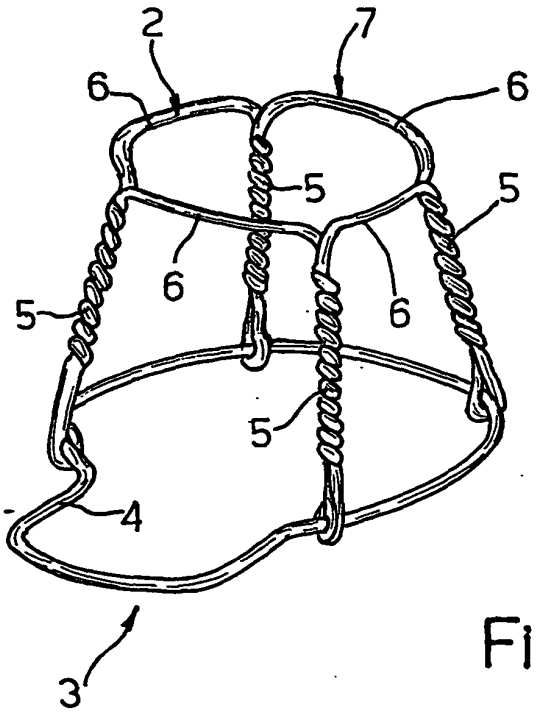


Fig. 2

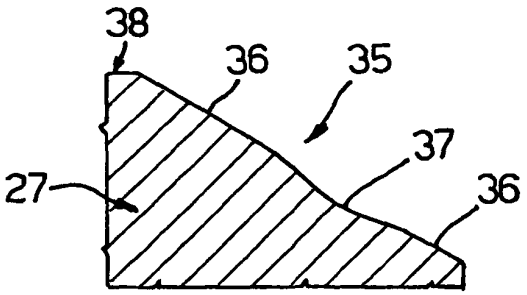


Fig.5

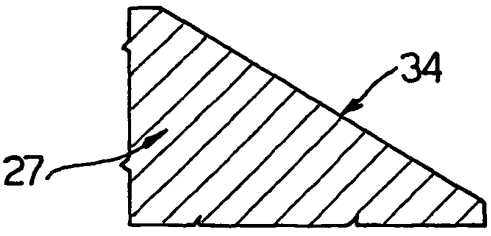


Fig.6

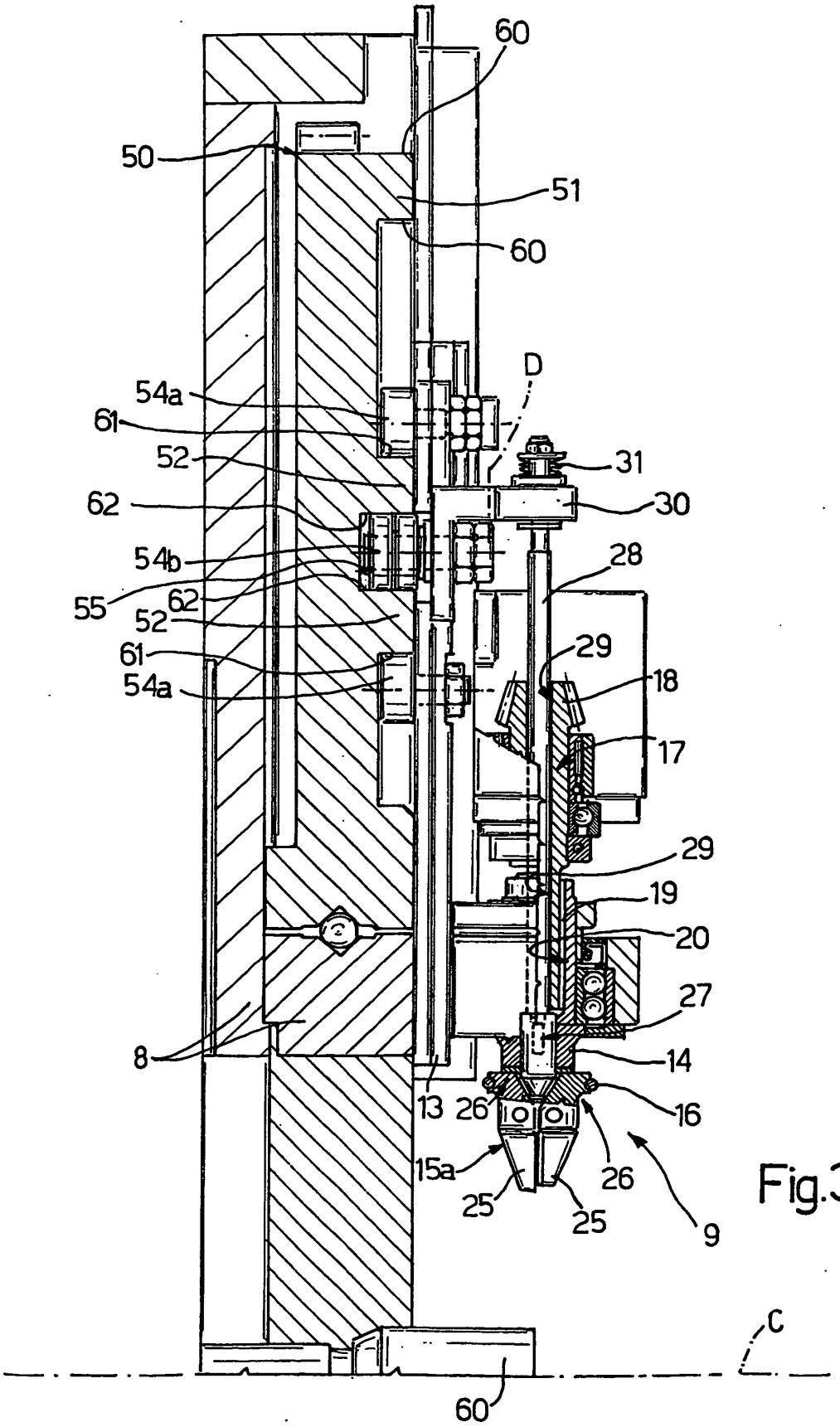

60
50
51
60
D
54a
61
52
31
62
30
54b
28
55
62
52
29
61
18
54a
17
29
19
20
27
8
14
13
26
16
15a
26
25
25
9
C
60

Fig.3

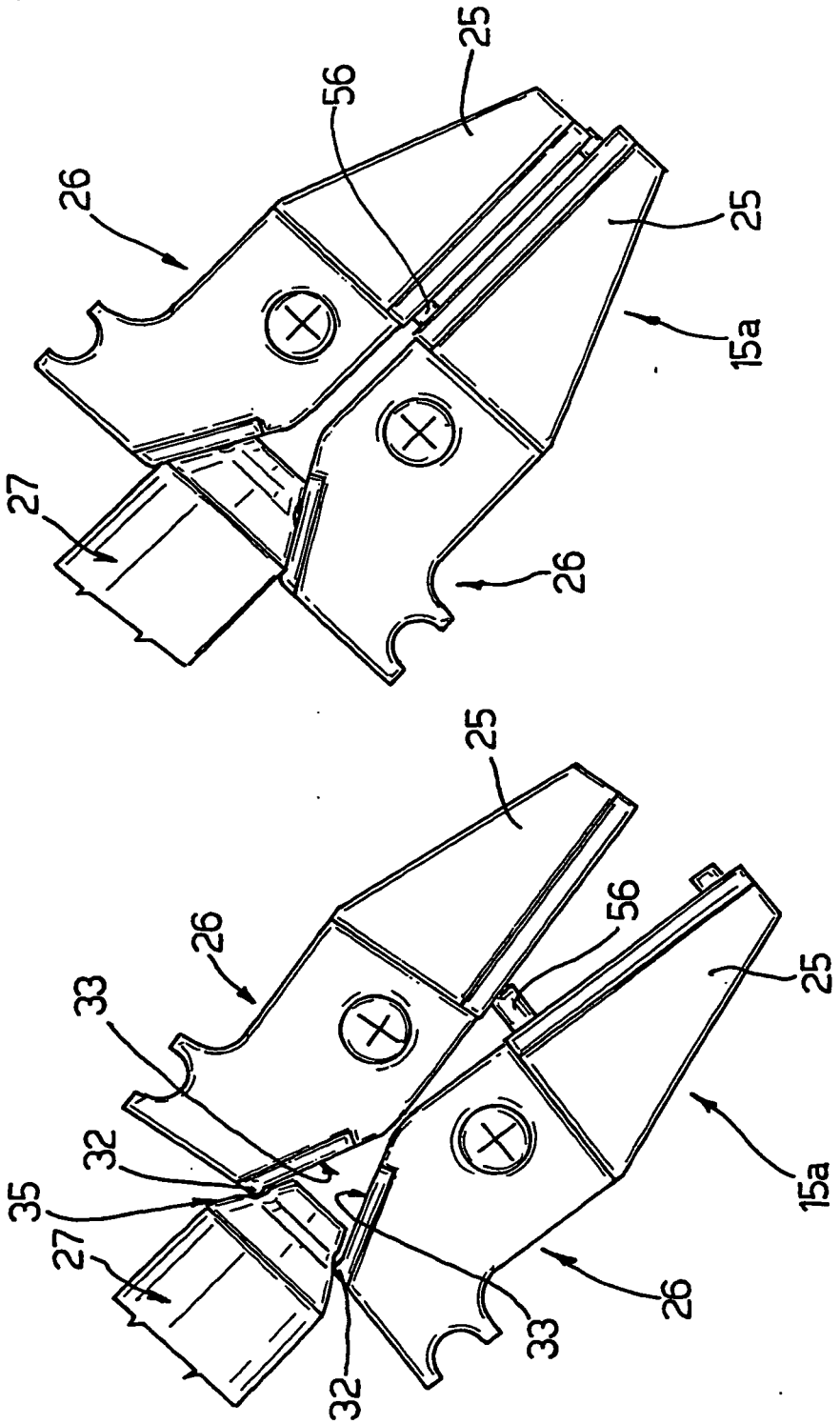


Fig. 4